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INTEGRATING AI IN TEACHING THE INDIAN KNOWLEDGE SYSTEM THROUGH DIGITAL PEDAGOGIES

Asmita Patel & Krishna Rana

Abstract

The Indian Knowledge System (IKS) holds a vast repository of wisdom encompassing Vedic Mathematics, Bhagavad Gita's philosophical teachings, and Jyotirvigyan (Vedic astrology). In the modern era, integrating this knowledge into contemporary curricula requires innovative approaches. This paper explores the role of technology, particularly Artificial Intelligence (AI) and multimedia tools, in revitalizing and preserving IKS.By leveraging AI-generated videos, immersive simulations, and interactive digital platforms, we propose pedagogical strategies to make Vedic Mathematics more engaging, Bhagavad Gita's ethical teachings more applicable, and Jyotirvigyan more comprehensible. The research underscores the significance of interdisciplinary applications, integrating IKS with mathematics, philosophy, psychology, and astronomy. It further suggests incorporating AI-assisted learning models into modern education frameworks, aligning with the National Education Policy (NEP) 2020, which emphasizes including traditional knowledge systems. Through this study, we recommend a reformed pedagogy that blends ancient Indian wisdom with AI-powered educational methodologies, ensuring both preservation and modernization. The paper argues that AI can act as a bridge between ancient wisdom and contemporary learning paradigms, making IKS relevant for the 21st century. This integration not only enhances learning outcomes but also fosters cultural appreciation and intellectual diversity in global education.

Keywords: Indian Knowledge System (IKS), Vedic Mathematics, Bhagavad Gita, Jyotirvigyan, Artificial Intelligence (AI), Digital Pedagogy, Multidisciplinary Learning, NEP 2020, Ancient Wisdom, Technological Integration

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Introduction

The Indian knowledge system, rooted in the Gurukul tradition, emphasized personalized, immersive learning where students (shishyas) lived with their teachers (gurus) and gained knowledge through direct mentorship. This system covered diverse subjects such as mathematics, astronomy, philosophy, and ethics, integrating texts like Vedic Mathematics and the Bhagavad Gita to develop intellectual and moral understanding. Unlike conventional classroom education, Gurukuls relied on experiential learning, including oral recitation, debates (shastrartha), and hands-on applications. In the modern era, advancements in artificial intelligence (AI) and digital pedagogies offer new ways to preserve and adapt these traditional methods. AI-powered tools can personalize learning experiences, simulate interactive debates, and enhance memorization techniques through adaptive assessments(Nikam, 2025). By integrating AI-driven technologies with digital platforms, the core principles of the Indian knowledge system can be effectively transmitted, making them more accessible and relevant in contemporary education.

Figure 1: Ancient Gurukul: The Traditional Learning of Astrology

Jyotish as a Core Component of Indian Knowledge Systems (IKS)

Jyotish, or Vedic astrology, a core component of Indian Knowledge Systems (IKS), is an ancient "science of light" rooted in the Vedas. Practiced for over 5,000 years, it has evolved alongside Indian philosophy, with sages like Parasara Muni codifying its principles in texts such as the *BrhadParasara Hora Shastra*. Jyotish interprets celestial positions at birth through the *Kundali*, comprising houses, zodiac signs, planetary positions, and the ascendant. The *Dasha* system further delineates planetary influences over time, guiding life events (K & K, 2025). Beyond prediction, it fosters self-awareness and offers remedial measures like gemstones and rituals. As an integral part of IKS, Jyotish synthesizes spiritual, scientific, and philosophical knowledge, aligning with Ayurveda and Vaastu for holistic well-being. As

Jyotish evolved, it not only remained a tool for predicting life events but also became a bridge between cosmic forces and human existence, shaping timekeeping, rituals, and societal structures.

Integrating AI into Jyotish

The integration of Artificial Intelligence (AI) into Jyotish enhances predictive accuracy and accessibility by leveraging machine learning algorithms, big data analytics, and Natural Language Processing (NLP). AI-driven models can analyze complex planetary patterns, improving astrological predictions beyond human intuition (Kanade, 2023). AI tools can process vast historical astrological datasets, refining forecast reliability through self-learning mechanisms (Jeevanandam, 2024). While AI streamlines calculations and automates horoscope generation, it should complement rather than replace traditional astrological wisdom, ensuring a balanced approach between computational precision and intuitive expertise (Paul, 2021).

Astrology and AI Applications

AI is transforming Jyotish by creating innovative platforms that enhance accessibility and personalization (Jeevanandam, 2024). Several platforms utilize computational techniques to provide personalized astrological insights through predictive modeling and data analysis (Astrosign, 2025).

- **AstroTalk** connects users with astrologers, using AI to generate birth charts and provide predictions based on user data and potentially refined through machine learning.
- **Kundli GPT** acts as a personalized astrology chatbot, automating readings based on Kundli analysis and using NLP to interpret queries, with machine learning improving predictive capabilities.
- **Co-Star** offers a modern approach, using NASA data and algorithms to generate personalized horoscopes and insights, employing machine learning to tailor content delivery.

These platforms typically require users to input birth details (date, time, and location) for natal chart generation. Their algorithms analyze astrological parameters, including planetary positions and transits, to provide predictions and guidance.Machine learning is applied to refine algorithms based on user feedback and historical data, improving accuracy and personalization over time (Astrology, 2024).These platforms demonstrate how AI can be

integrated into Jyotish, impacting data input, algorithmic predictions, and continuous improvement through machine learning.

AI-Driven Advancements in Jyotish Education

Integrating artificial intelligence (AI) and digital tools into Jyotish education enhances accessibility, engagement, and pedagogical efficiency. Modern technological frameworks facilitate structured, interactive, and research-oriented learning.

i. **MOOCs and E-Learning Platforms** – Platforms like Coursera, Udemy, and edX offer structured courses covering Jyotish fundamentals, predictive methods, and chart interpretation.
ii. **Gamification and Virtual Simulations** – Interactive tools simplify complex astrological computations, improving conceptual clarity and retention.
iii. **AI-Powered Kundali Analysis** – AI-driven tools enable real-time chart interpretations with instant, data-backed feedback, refining students' analytical skills.
iv. **Personalized AI-Based Tutoring** – Adaptive learning systems tailor instruction based on learner progress, optimizing comprehension.
v. **Chatbots and Virtual Mentors** – AI-powered assistants (e.g., Kundli GPT) provide real-time guidance and query resolution.
vi. **NLP for Jyotish Text Digitization** – NLP technologies enhance accessibility by digitizing, translating, and indexing Sanskrit Jyotish scriptures for academic research.

These AI-driven advancements modernize Jyotish education, integrating traditional knowledge with digital methodologies for a more structured and research-focused learning experience.

Vedic Mathematics: Origins, Pedagogical Framework, and AI Integration

Vedic Mathematics is a system of mathematical techniques that originated from ancient Indian texts, particularly the Sulba Sutras (c. 800–500 BCE), which form part of the Vedanga—one of the six auxiliary disciplines of the Vedas. These texts present advanced mathematical concepts, including algebra, geometry, and arithmetic operations, which were integral to Indian education (Joseph, 2000).Acharyas such as Baudhayana, Apastamba, and Katyayana contributed significantly to mathematical discoveries, some of which predate similar findings in Western mathematics. The BaudhayanaSulba Sutra contains an early form of the Pythagorean theorem, demonstrating the advanced level of mathematical knowledge in ancient India (Datta& Singh, 1935). The pedagogical approach in Vedic Mathematics involved memorization and application of mathematical sutras (formulas) such as EkadhikenaPurvena (By One More than the Previous) and

NikhilamNavatashcaramamDashatah (All from 9 and the Last from 10), enabling rapid mental calculations (Tirthaji, 1965).

Vedic Mathematics as a Core Component of Indian Knowledge Systems (IKS)

Vedic Mathematics, rooted in ancient Indian traditions, has been redefined through AI-driven tools, enabling faster computations, automated problem-solving, and adaptive learning. AI applications enhance traditional Vedic Mathematics techniques by developing intelligent tutoring systems that provide step-by-step guidance, making complex calculations more accessible. Recent studies highlight AI's role in improving mental arithmetic skills and its integration into modern computational models for efficient algorithm development (Aithal& Sharma, 2023; Bansal & Srivastava, 2023). By incorporating AI, Vedic Mathematics not only preserves its cultural significance but also evolves as a valuable tool in modern education and cognitive skill enhancement (Nikam, 2025).

AI Integration in Vedic Mathematics

Artificial intelligence can significantly enhance the teaching and learning of Vedic Mathematics through:

- **AI-Powered Tutoring Systems**: Personalized AI-driven platforms can adapt to individual learning paces, providing real-time feedback and interactive problem-solving sessions.
- **Gamified Learning Apps**: AI-based gamification can make Vedic Mathematics engaging for students through quizzes, challenges, and adaptive difficulty levels.
- **Automated Assessment Tools**: AI can assess students' problem-solving speed and accuracy, offering insights into areas that need improvement.
- **Virtual Reality (VR) and Augmented Reality (AR)**: These technologies can help visualize complex mathematical concepts, such as geometric constructions and algebraic patterns, improving comprehension.

Studies affirm that integrating AI with Vedic Mathematics enhances computational efficiency and problem-solving skills, making it a valuable tool for modern education (Aithal& Sharma, 2023).

The Bhagavad Gita is a fundamental text within the Indian Knowledge System (IKS), offering deep philosophical and ethical wisdom that remains relevant in modern education. The Gita's teachings on duty (dharma), action (karma), and knowledge (jnana) provide a structured approach to personal growth, leadership, and moral decision-making. Recent research highlights its importance in contemporary education, particularly in fostering ethical leadership, resilience, and emotional intelligence (Sharma, 2016). The integration of

Bhagavad Gita's concepts into management, psychology, and holistic learning has been explored, showing its applicability in guiding students toward self-awareness and mindful decision-making (Bansal & Srivastava, 2023). Moreover, advancements in artificial intelligence and digital pedagogy have enabled Gita's teachings to be accessible through AI-driven learning platforms, interactive chatbots, and adaptive educational tools, making its wisdom more engaging and widely available (Aithal& Sharma, 2023). These developments demonstrate the Bhagavad Gita's continued influence in both traditional and modern educational frameworks, ensuring its teachings remain a vital part of academic and ethical discourse.

The Bhagavad Gita and AI-Driven Pedagogical Applications

The Bhagavad Gita, a revered spiritual and philosophical text from the Mahabharata (c. 400 BCE–200 CE), played a crucial role in moral and ethical instruction within the Gurukul system. It imparted teachings on dharma (duty), karma (selfless action), jnana (wisdom), and bhakti (devotion), serving as a guide for personal development and leadership (Radhakrishnan, 1948).

In Gurukuls, students engaged in oral recitations, memorization, and discussions to interpret Krishna's teachings to Arjuna, applying them to real-life situations. The Gita's influence extended to political governance (rajaniti), psychology (manovijnana), and self-discipline (atma-samyama). Historical records suggest that leaders such as Chandragupta Maurya and ShivajiMaharaj studied the Bhagavad Gita to cultivate leadership and decision-making skills (Bhaktivedanta Swami, 1972).

AI Integration in Teaching the Bhagavad Gita

- **Natural Language Processing (NLP) for Gita Interpretation**: AI models can analyze and compare different commentaries on the Bhagavad Gita, offering contextual insights and translations in multiple languages.
- **AI Chatbots for Philosophical Inquiry**: Interactive AI chatbots can answer questions related to the Bhagavad Gita's teachings, providing personalized explanations based on a student's queries.
- **Sentiment Analysis for Ethical Learning**: AI can analyze textual interpretations of the Bhagavad Gita and assess how its teachings impact students' emotional and moral development.
- **Voice-Assisted Learning**: AI voice assistants can read verses, explain meanings, and engage users in reflective discussions to deepen their understanding of the scripture.

Recent research highlights that the Bhagavad Gita's principles enhance leadership, corporate management, and psychological resilience in modern contexts (Bansal & Srivastava, 2023). By incorporating AI-driven tools, these teachings can reach a broader audience and foster ethical decision-making in contemporary society.

Research Questions

i. What are the perceptions of pre-service teachers regarding the integration of AI in teaching the Indian Knowledge System (IKS) through digital pedagogies?

ii. What are the attitudes of pre-service teachers toward AI-based pedagogical approaches in IKS education?

The study focuses on integrating AI in teaching the Indian Knowledge System (IKS) through digital pedagogies and examines pre-service teachers' perceptions of this approach. A quantitative research design with a survey-based methodology is employed, using a perception scale to assess attitudes, skills, and behavioral responses. The study is conducted in Bharuch district, with a purposive sample of 60 pre-service teachers from DIET, Bharuch. The objectives of the study include examining pre-service teachers' perceptions of integrating AI in teaching IKS through digital pedagogies and analyzing their attitudes, skills, and behavioral responses toward AI-based pedagogical approaches. Data collection involves administering a structured perception scale focusing on three key concepts: Bhagavad Gita, Vedic Mathematics, and Astrology. The perception scale consists of multiple questions categorized into attitude, skills, and behavioral aspects. Responses are recorded on a Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Descriptive statistical analysis, including mean and standard deviation, is conducted using SPSS to evaluate teachers' perspectives on AI-enhanced digital pedagogy in IKS education. The findings aim to provide insights into the effectiveness and potential of AI-driven instructional strategies in teacher education.

Data Interpretation and Analysis of Astrology, Vedic Mathematics and Bhagavad Gita

The statistical analysis of responses highlights a strong positive perception of AI-based education across Astrology, Vedic Mathematics, and the Bhagavad Gita.

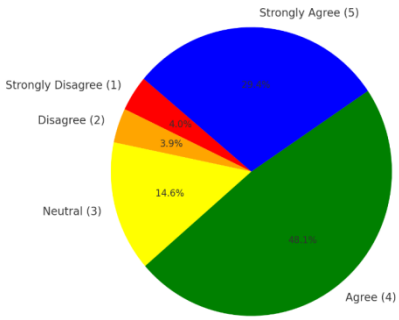
For Astrology, the mean score of 3.94 indicates a generally favorable view, with 48.08% agreeing and 29.45% strongly agreeing. The standard deviation of 0.98 suggests moderate variation in opinions, though disagreement remains minimal (7.86%). This reflects a widespread but slightly varied belief in astrology's relevance.

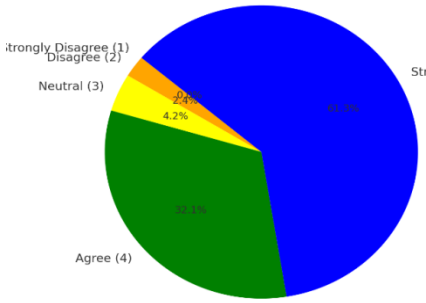
Vedic Mathematics received stronger support, with a mean of 4.29 and a low standard deviation (0.69), indicating consistent agreement. 90.53% of respondents agreed or strongly

agreed, confirming its perceived effectiveness in education. Minimal disagreement (2.37%) further reinforces this.

Table:1 **Astrology, Vedic Mathematics, Bhagavad Gita**

Statistic	Astrology	Vedic Mathematics	Bhagavad Gita
Mean (Average Response)	3.94	4.29	4.52
Standard Deviation	0.98	0.69	0.67





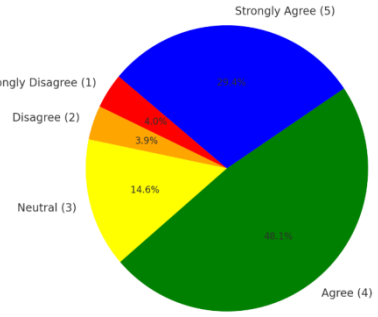


Chart:1 Astrology **Chart:2 Vedic Mathematics**

Chart:3 Bhagavad Gita

The Bhagavad Gita showed the highest acceptance, with a mean of 4.52 and the lowest standard deviation (0.67), reflecting a strong consensus. A significant 61.31% strongly agreed with its relevance, making it the most positively received domain. The absence of strong disagreement indicates widespread recognition of its educational value.

Future Prospects and Research Directions

i. Establish partnerships between astrologers and AI researchers to blend traditional knowledge with technological advancements while maintaining cultural authenticity.
ii. Work with research institutions to create reliable AI-driven Jyotish frameworks with ethical guidelines, data privacy measures, and validation protocols.
iii. Conduct real-world applications of AI-driven Jyotish to assess effectiveness, gather feedback, and improve AI accuracy and ethical considerations.
iv. Integrate Vedic Mathematics into STEM education by incorporating AI-driven adaptive assessments and gamified learning experiences.
v. Develop AI-generated problem sets and tutorials to personalize learning experiences, catering to different levels of student proficiency.
vi. Analyze the impact of Vedic Mathematics on computational efficiency and its potential role in modern-day algorithms and cryptography.

vii. Create AI-driven self-reflection and ethical decision-making models based on Bhagavad Gita principles for leadership and personal growth.

viii. Develop AI-powered chatbots and virtual mentors that provide personalized insights from the Bhagavad Gita, making philosophical concepts more accessible.

ix. Integrate Bhagavad Gita teachings into mindfulness and mental well-being programs using AI for guided meditation and stress management.

Conclusion

The findings highlight strong support for integrating AI-based education in traditional Indian knowledge systems, with the Bhagavad Gita receiving the highest acceptance and consensus. Vedic Mathematics also showed strong agreement with minimal disagreement, while Astrology, though positively viewed, displayed more variability in responses. AI-driven pedagogies enhance accessibility and engagement while preserving the intellectual and ethical foundations of these traditions. Future research should focus on ethical frameworks, data security, and model validation to ensure responsible AI integration. Collaboration among scholars, educators, and technologists is essential to maintain the philosophical and ethical essence of these knowledge systems in the digital age.

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