

Inbox Starred Snoozed Sent Drafts Purchases Digital Tools & AI for IKS-Informed Geography Teaching

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Abstract

This paper proposes a transdisciplinary framework for integrating **Artificial Intelligence (AI)** and **Digital Tools** to revitalize **Geography teaching** through the **Indian Knowledge System (IKS)**, aligning with the mandates of **NEP 2020**. The study addresses a critical pedagogical challenge: bridging the **holistic, context-specific** wisdom of IKS (rooted in oral tradition and qualitative observation) with the **reductive, universal** analytical demands of modern geography. We detail how technologies such as **GIS (Geographic Information Systems)** for spatial visualization and **NLP (Natural Language Processing)** for textual analysis can translate fragmented IKS knowledge (**Vastu Shastra** for sustainable planning, traditional water management) into **spatially explicit, verifiable, and engaging** educational content. Key findings reveal that digital tools are essential for achieving **epistemological pluralism** in the classroom. This integrated approach fosters **critical, culturally-rooted** thinking and ensures that India's deep heritage is preserved, celebrated, and made relevant to contemporary ecological challenges, supporting the quality education focus of this institution.

Keywords: IKS, Geography Pedagogy, Artificial Intelligence (AI), Digital Transformation, Vastu Shastra, Epistemological Pluralism.

Introduction: Modernizing the Map with IKS

The **National Education Policy (NEP) 2020** mandates the integration of the **Indian Knowledge System (IKS)** across academic disciplines. Geography, as the study of human-environment interactions, offers a fertile ground for this integration, particularly in areas like ancient urban ecology, water harvesting, and sustainable land use. However, IKS content—often qualitative, deeply relational, and preserved via oral or complex classical texts—is difficult to incorporate into modern, quantitative-centric curricula.

This research identifies a critical **translation gap**: The failure to use modern analytical tools to effectively interpret and visualize the unique geographical wisdom of IKS. Current pedagogy often ignores IKS due to its incompatibility with standard empirical methodologies. This paper argues that **AI and Digital Tools** provide the necessary bridge to translate the **holistic** IKS perspective into the **analytical, documented, and engaging** formats required for 21st-century education. We propose a framework for this digital integration, demonstrating how technology serves as a preservation and pedagogical tool.

The IKS-Geography Nexus: Distinct Epistemologies

Effective integration must acknowledge the fundamental **epistemological differences** between IKS and dominant Western scientific geography. These differences explain why a technological solution is required:

Feature	IKS in Geography (Contextual/Relational)	Modern Science/Geography (Universal/Reductive)
Worldview	Holistic: Views human habitat as integral to nature (e.g., temple direction tied to cosmology).	Reductive: Seeks to isolate and study physical phenomena independent of human/spiritual context.
Transmission	Oral/Experiential: Knowledge passed through practice, observation, and tradition (intergenerational).	Written/Formal: Relies on standardized, documented, and universally tested facts.
Focus	Qualitative: Emphasis on ethical practice, local adaptation, and sustainable resource <i>stewardship</i> .	Quantitative: Emphasis on measurable data, predictive models, and universal laws.

This table illustrates that IKS's value-based, qualitative understanding of local ecology cannot simply be cut-and-pasted into a modern syllabus. **Digital tools are essential to provide the missing analytical layer**—converting textual descriptions into spatial models and qualitative observations into searchable data.

Technological Integration: A Two-Pillar Framework

Our framework relies on two primary digital pillars to achieve the required translation and pedagogical enhancement:

Pillar A: Spatial Translation with GIS

Geographic Information Systems (GIS) is deployed to transform IKS's abstract spatial concepts into verifiable, visual layers.

- **Case Study: Vastu Shastra & Urban Planning:** GIS enables students to georeference ancient town plans described in texts like *Manasara* or based on **Vastu Shastra** principles. By overlaying these ancient layouts onto modern terrain data (DEMs), students can analyze the effectiveness of traditional site selection based on slope, water flow, and exposure to cardinal directions. This moves Vastu from a belief system into a verifiable spatial engineering problem.
- **Case Study: Traditional Water Management:** GIS can map the historical locations of traditional water harvesting structures (*Johads*, stepwells) as described in local IKS literature, alongside modern hydrological data. This allows for comparative analysis of ancient water security systems versus contemporary practices, providing evidence of IKS effectiveness.

Pillar B: Data Extraction and Interpretation with AI

Artificial Intelligence (AI), specifically Natural Language Processing (NLP), is crucial for unlocking the textual data trapped in classical Indian languages.

- **Overcoming Language Barriers:** NLP models can be trained on Sanskrit, Pali, or historical regional scripts to automate the **extraction and classification** of geographical terms (names of soil, flora, fauna, climate indicators) from vast, non-digitized repositories (e.g., *Puranas* or Ayurvedic texts).
- **Systematic Cataloging:** This AI-driven cataloging allows researchers and students to build systematic, searchable databases of IKS ecological observations, converting fragmented textual evidence into a coherent, **documented knowledge system** that meets modern academic standards.

Findings and Pedagogical Implications

Applying this digital framework demonstrates that technology acts as a **de-risking strategy** for IKS integration:

- **Enhanced Engagement:** The use of GIS and VR (Virtual Reality for site visits) transforms passive learning into an **immersive, inquiry-based experience**. Students are more engaged when they can digitally validate ancient wisdom against modern geospatial data.
- **Fostering Critical Thinking:** The framework naturally promotes **Epistemological Pluralism**. Students must critically analyze *why* IKS arrived at certain geographical conclusions (e.g., through long-term qualitative observation) and compare them to the conclusions reached by modern quantitative methods, leading to a richer, more nuanced understanding of local geography.
- **Preservation and Documentation:** The systematic application of NLP and GIS formalizes IKS data, protecting this heritage from loss due to oral tradition breakdown or fragmented documentation, thus serving the **cultural preservation** objective of NEP 2020.

Conclusion and Policy Recommendations

Digital Tools and AI are not optional supplements; they are the essential methodological enablers for IKS integration into Geography education. The failure to adopt this technology ensures the continued marginalization of India's intellectual heritage. The evidence suggests that technology is the only viable method to bridge the qualitative-quantitative divide, making IKS content analytical, accessible, and relevant.

Policy Recommendations for Educational Institutions:

- **Mandate GIS/NLP Proficiency:** Make basic GIS and NLP data-mining skills compulsory for all Geography faculty and post-graduate researchers focused on IKS themes.
- **Develop Digital Repositories:** Invest in university-level digital infrastructure dedicated to digitizing and tagging IKS texts related to regional geography and ecology.
- **Curriculum Co-Design:** Partner with computer science and language departments to collaboratively design modules that apply AI to IKS challenges, fostering true transdisciplinarity.

By embracing this digital path, institutions like [PLACEHOLDER: Insert Your Institution Name] can fulfill the NEP 2020 mission, producing graduates who are not only scientifically competent but also profoundly aware of their culturally-rooted intellectual strengths.

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