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Bridging Indian Knowledge Systems and Digital Pedagogy: A Culturally Responsive Framework for School Education under NEP 2020

[1]Neeraj Kumar
[2]Chandana Dey
[1]Research Scholar, [2]Professor, Department of Education
Khwaja Moinuddin Chishti Language University Lucknow, Uttar Pradesh, India
Email: neerajkbbau1007@gmail.com

Abstract - The National Education Policy (NEP) 2020 and the National Curriculum Framework for School Education (NCF-SE) 2023 emphasise Indian rootedness, experiential learning, multilingualism, local contexts, holistic development and appropriate use of technology. In this policy context, Indian Knowledge Systems (IKS) can contribute to culturally relevant school learning, but their integration requires more than adding traditional content to textbooks. This conceptual paper develops an IKS Digital Pedagogy Integration Framework that connects IKS with contemporary knowledge through inquiry, dialogue, experiential learning and digitally supported knowledge creation. The paper adopts a qualitative conceptual design based on critical analysis of policy documents, official IKS materials and relevant literature on digital pedagogy, culturally responsive education, constructivist learning and teacher preparedness. The proposed framework comprises six interrelated dimensions: policy foundation, knowledge bridging, pedagogical process, digital enablement, inclusion and expected learning outcomes. It emphasises digital storytelling, local knowledge mapping, multilingual resources, collaborative inquiry and community participation while stressing source verification, accessibility, ethical documentation and teacher preparedness. The discussion suggests that digital technology should function as a pedagogical enabler rather than an end in itself. The framework offers a practical conceptual basis for curriculum developers, teachers and teacher educators and identifies directions for empirical validation.

Keywords: Indian Knowledge Systems; Digital Pedagogy; NEP 2020; NCF-SE 2023; Culturally Responsive Pedagogy; Inclusive Education; Holistic Education; School Education

1. INTRODUCTION

Education is not only concerned with the transmission of information; it also shapes what is recognised as knowledge, how knowledge is interpreted, and how learners relate classroom learning to their social and cultural contexts. In a diverse country such as India, school education operates across multiple languages, communities, ecological settings and cultural practices. The renewed policy attention to Indian Knowledge Systems (IKS) therefore raises an important pedagogical question: how can knowledge traditions rooted in Indian contexts be meaningfully connected with contemporary curriculum, digital technologies and critical inquiry?

The National Education Policy (NEP) 2020 provides a clear policy basis for this discussion. It emphasises Indian rootedness, holistic development, experiential learning, multilingualism, critical thinking, scientific temper, ethics and appropriate use of technology [1]. The National Curriculum Framework for School Education (NCF-SE) 2023 further translates these orientations into curricular and pedagogical directions by emphasising Indian rootedness, local resources, community participation, experiential learning and interdisciplinary connections [2]. The IKS Division of the Ministry of Education also promotes interdisciplinary and transdisciplinary research, documentation and dissemination of Indian knowledge traditions [3].

At the same time, digital technologies have expanded the possibilities for teaching, learning, documentation and collaboration. Digital storytelling, interactive mapping, virtual heritage resources, multimedia archives, open educational resources and collaborative platforms can help learners engage with local knowledge in ways that extend beyond the conventional textbook. However, digital technology does not automatically improve learning. Evidence on

digital pedagogy highlights the importance of teacher competence, professional development and purposeful pedagogical design [4]–[6].

This creates a conceptual opportunity. IKS is sometimes positioned as representing tradition and locality, whereas digital pedagogy is associated with innovation and technological change. Such a binary is not educationally productive. A more useful approach is to examine how digital tools can support learners in documenting, comparing, interpreting and critically evaluating knowledge traditions while connecting them with contemporary disciplinary knowledge. Recent studies on IKS have identified opportunities for holistic and culturally meaningful education but have also highlighted challenges related to teacher preparation, curricular integration and epistemological negotiation [7]–[13].

This paper responds to this need by proposing an IKS Digital Pedagogy Integration Framework for school education. The framework does not treat IKS as a replacement for contemporary scientific or disciplinary knowledge. Instead, it proposes a dialogic and evidence-sensitive approach in which students investigate knowledge practices, examine their contexts and limitations, and connect them with contemporary questions. The paper therefore focuses on pedagogical integration rather than symbolic inclusion.

2. CONCEPTUAL BACKGROUND

2.1 Indian Knowledge Systems in Contemporary Education

Indian Knowledge Systems may be understood as diverse bodies of knowledge, practices, intellectual traditions and modes of inquiry that have developed within the Indian civilisational context across different periods and communities. They include, among other areas, mathematics, astronomy, medicine, agriculture, ecology, linguistics, philosophy, arts, architecture, crafts, literature and ethical thought [3], [7], [8]. IKS should not, however, be presented as a single homogeneous system. Regional, linguistic, philosophical and community-level variations are important to its educational interpretation.

For curriculum purposes, the value of IKS lies not simply in presenting historical achievements. It can provide contexts for investigation. Local water-management practices, for example, may be examined alongside contemporary environmental science; traditional mathematical ideas can be connected with mathematical reasoning; craft traditions can provide contexts for geometry, design and economics; and oral histories can support language and social-science learning. Such integration shifts the focus from memorising cultural information to investigating how knowledge is produced, transmitted and applied.

Recent scholarship suggests that the educational integration of IKS is increasingly moving from policy advocacy toward questions of classroom practice. Studies have discussed cultural identity, holistic development, value education and interdisciplinary learning, while also identifying concerns related to teacher preparedness, curricular alignment, evidence and implementation [7]–[13]. An empirical study of secondary-school students in Gujarat, for example, reported positive affective outcomes associated with IKS-based pedagogy, although such findings should be treated as context-specific rather than as automatic consequences of IKS integration [10]. Qualitative work on teachers has also highlighted epistemological negotiations and institutional constraints in operationalising IKS [11].

2.2 Digital Pedagogy and Educational Possibilities

Digital pedagogy refers to the purposeful use of digital technologies in the design, facilitation and assessment of learning. It is broader than displaying digital content or transferring conventional teaching materials to an online platform. The pedagogical value of technology depends on how it changes opportunities for inquiry, interaction, creation, feedback and reflection [4], [5], [15]. The TPACK perspective, for example, emphasises the relationship among technological, pedagogical and content knowledge required for meaningful technology integration [15].

2.3 Culturally Responsive and Contextual Learning

A culturally responsive approach similarly recognises learners' cultural experiences and community knowledge as resources for learning. Culturally relevant and culturally responsive pedagogies emphasise meaningful connections between curriculum and learners' lived worlds while maintaining academic expectations and critical engagement [16], [17]. For IKS integration, this principle is especially relevant because local knowledge can make curricular concepts more contextually meaningful. Yet cultural relevance should not be confused with unquestioning acceptance.

Knowledge claims whether traditional or contemporary can be examined through evidence, context, applicability, historical change and ethical considerations.

Constructivist perspectives further support this orientation because they emphasise learning through active engagement, interaction and reflection [18]. Digital tools can strengthen such processes when they enable students to create, investigate, communicate and revise knowledge rather than merely consume information. The convergence of these perspectives provides the conceptual basis for the proposed framework.

3. REVIEW OF RELATED LITERATURE

The literature reviewed for this paper can be organised into four interconnected strands.

First, policy and curriculum documents establish the normative context. NEP 2020 promotes Indian rootedness, experiential learning, multilingualism, holistic development and technology-enabled education [1]. NCF-SE 2023 provides a curricular framework in which local resources, community knowledge, languages and interdisciplinary learning can become meaningful components of schooling [2]. The IKS Division provides an institutional mechanism for promoting research and dissemination related to Indian knowledge traditions [3].

Second, the emerging IKS literature indicates that integration is increasingly being discussed in relation to modern educational aims rather than as a simple recovery of historical content. Studies have examined the relationship between IKS and NEP 2020, the reintegration of Indian knowledge into contemporary education, and the potential contribution of IKS to holistic and value-oriented learning [7]–[10]. At the same time, recent work points to the need for teacher preparedness, epistemic sensitivity and stronger links between policy and classroom practice [11]–[13].

Third, digital pedagogy research indicates that technology is most educationally valuable when it is integrated with appropriate pedagogy and content knowledge. Teacher professional development can influence attitudes and confidence toward digital technologies [4], while research in the Indian context has also demonstrated the relevance of digital pedagogy to teacher competence [5]. Virtual professional learning experiences further show that teacher support and collaborative learning communities are important during technology-enabled educational change [6].

Fourth, culturally responsive pedagogy and technology integration provide theoretical support for linking IKS and digital learning. Culturally relevant pedagogy places students' cultural and community experiences within the learning process [16], [17]. TPACK highlights the need to coordinate content, pedagogy and technology [15]. Constructivist learning emphasises active knowledge construction through social interaction and reflection [18]. More recent work has explicitly explored the intersection of IKS and digital storytelling, suggesting that digital media can become a vehicle for culturally responsive learning rather than simply a delivery mechanism [14].

Taken together, these strands reveal a conceptual gap. Existing discussions frequently address IKS integration, culturally responsive pedagogy and digital education as related but separate concerns. What remains less developed is a school-level framework that specifies how knowledge bridging, pedagogical processes, digital tools, inclusion and expected learning outcomes can operate together. This paper addresses this gap by synthesising these strands into an integrated framework.

4. RESEARCH PROBLEM AND OBJECTIVES

Despite policy support for Indian rootedness, experiential learning, technology integration and holistic education, practical conceptual guidance remains limited on how school teachers can integrate IKS with digital pedagogy in an inclusive, evidence-sensitive and academically responsible manner. This paper addresses this problem through a conceptual synthesis of policy and scholarly literature.

The study has three objectives:

- To examine the policy and pedagogical rationale for integrating Indian Knowledge Systems into school education under NEP 2020 and NCF-SE 2023.
- To analyse how digital pedagogy can support contextual, experiential and inclusive engagement with IKS.
- To propose an IKS Digital Pedagogy Integration Framework that can guide teachers, teacher educators, curriculum developers and school leaders.

5. RESEARCH METHODOLOGY

The paper adopts a qualitative conceptual research design based on critical document analysis and thematic synthesis. It does not report primary data from students, teachers or schools and therefore does not make empirical claims about causal effects.

The principal sources comprise NEP 2020, NCF-SE 2023, official materials of the IKS Division, and scholarly literature concerning IKS, digital pedagogy, culturally responsive education, constructivist learning and teacher preparedness [1]–[19]. The literature was used to identify recurring concepts rather than to conduct a systematic review or meta-analysis.

The analysis proceeded in three stages. First, policy and official documents were examined for recurring principles related to Indian rootedness, local context, experiential learning, multilingualism, inclusion, holistic development and educational technology. Second, scholarly literature was thematically examined to identify opportunities and challenges concerning IKS integration, digital pedagogy, teacher preparedness and culturally responsive learning. Third, these themes were synthesised into a framework linking policy foundations, knowledge resources, pedagogical processes, digital enablement, inclusion and expected outcomes.

The framework is therefore a theoretically and policy-informed proposition. It has not yet been statistically validated or tested through a classroom intervention. Its relationships should consequently be understood as conceptual propositions that require empirical examination.

6. PROPOSED IKS DIGITAL PEDAGOGY INTEGRATION FRAMEWORK

The central contribution of the paper is the IKS Digital Pedagogy Integration Framework. The framework consists of six interrelated dimensions: (1) policy foundation, (2) knowledge bridging, (3) pedagogical process, (4) digital enablement, (5) inclusion lens and (6) expected learning outcomes. The model is intended as a flexible design framework rather than a fixed teaching method.

Policy foundation- The first layer is provided by NEP 2020 and NCF-SE 2023. It includes Indian rootedness, holistic development, experiential learning, multilingualism, interdisciplinarity, local context, inclusion and appropriate educational technology [1], [2].

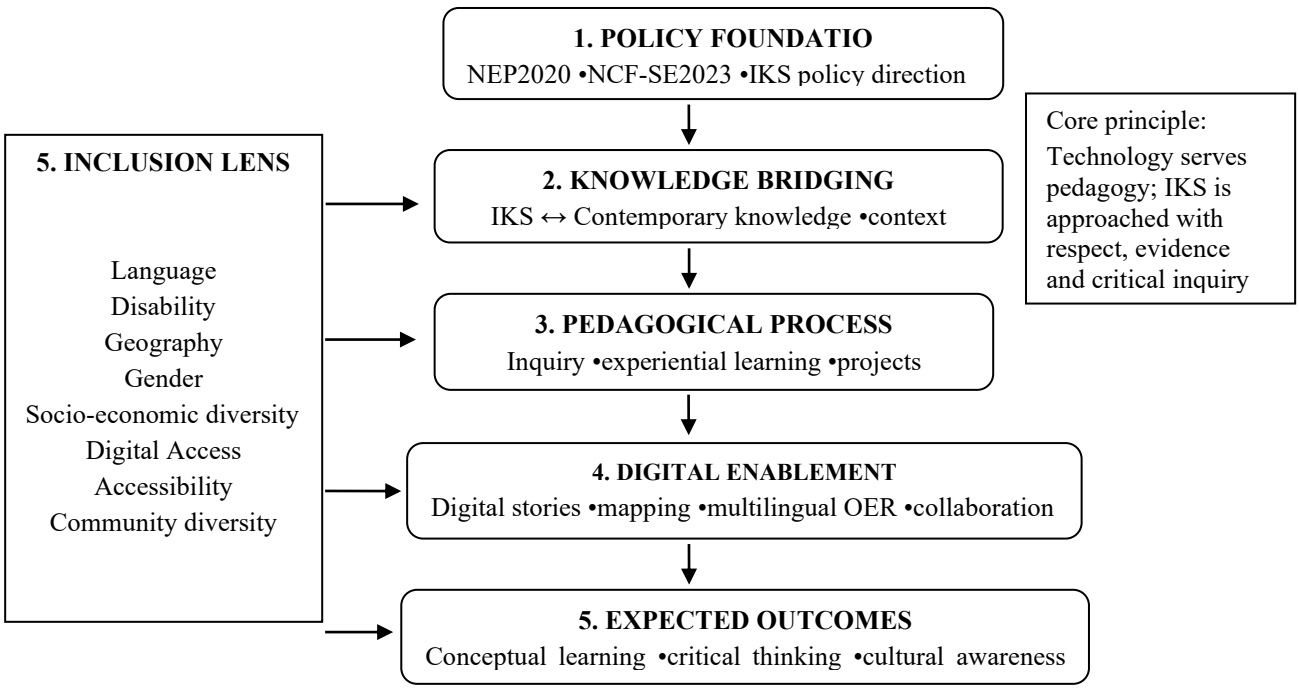


Fig. 1: Proposed IKS Digital Pedagogy Integration Framework

Knowledge bridging- The second layer establishes a deliberate relationship between IKS and contemporary disciplinary knowledge. Bridging does not mean assuming that the two are identical. Instead, teachers and learners identify meaningful connections, differences, historical contexts and evidentiary bases. A lesson on local water conservation, for example, may connect oral histories and community practices with geographical mapping, environmental science and contemporary water-management data.

Pedagogical process- The third layer transforms knowledge resources into learning experiences. Inquiry-based learning, experiential learning, project-based learning, dialogic learning, collaborative knowledge construction and reflective learning are particularly appropriate. Students may investigate a local practice, document it, compare different explanations, examine evidence and reflect on its contemporary relevance.

Digital enablement- The fourth layer positions technology as an enabler of inquiry. Digital storytelling can preserve oral narratives; digital mapping can connect knowledge with place; virtual museums and heritage resources can broaden access; multilingual resources can reduce language barriers; and collaborative platforms can support peer feedback and knowledge sharing. The principle is that technology should add pedagogical value rather than simply reproduce conventional content [4], [5], [14], [15].

Inclusion lens- Inclusion cuts across all dimensions. IKS is internally diverse, while digital access is unequal. The framework therefore requires attention to language, disability, geography, gender, socio-economic conditions, device access and connectivity. UNESCO's discussion of technology in education also cautions that technological expansion does not automatically produce equitable educational opportunities [19]. Low-bandwidth resources, offline alternatives, shared-device arrangements, accessible formats and multilingual materials should therefore be considered.

Expected learning outcomes- The model proposes six broad outcomes: deeper conceptual understanding, critical thinking, cultural and contextual awareness, ethical and value-oriented reflection, ecological awareness and learner agency. These outcomes should not be treated as automatic effects. They depend on curriculum quality, teacher facilitation, assessment, institutional support and the quality of the digital learning environment.

7. ILLUSTRATIVE CLASSROOM APPLICATIONS

The framework can be implemented across school subjects without converting IKS into a separate block of heritage content. Table 1 presents illustrative applications.

Curricular Area	IKS Entry Point	Digital Pedagogy	Possible Learning Outcome
Science / Environmental Studies	Local water conservation, biodiversity and ecological practices	Digital mapping, photo documentation, interviews and comparative evidence review	Scientific inquiry and ecological awareness
Mathematics	Historical mathematical ideas, measurement, geometry in crafts and architecture	Interactive representation, digital portfolio and problem-solving tasks	Conceptual understanding and mathematical reasoning
Languages	Oral histories, folklore, local literature and multilingual narratives	Digital storytelling, audio archive and collaborative annotation	Language development and cultural literacy
Social Science	Local history, crafts, community institutions and knowledge practices	Digital timeline, mapping and community interview	Contextual understanding and civic awareness
Art / Work Education	Traditional crafts, music, visual traditions and design	Digital documentation, virtual exhibition and design project	Creativity, appreciation and skill development

Table 1. Illustrative applications of the proposed framework across school subjects

Science and Environmental Studies can use local water conservation, biodiversity or ecological practices as entry points. Students can combine community interviews, photographs, digital mapping and comparative evidence review to develop scientific inquiry and ecological awareness.

Mathematics can draw on historical mathematical ideas, measurement practices, geometry in crafts and architectural forms. Interactive representations, digital portfolios and problem-solving tasks can connect cultural contexts with mathematical reasoning.

Languages can use oral histories, folklore, local literature and multilingual narratives. Students can create digital stories, audio archives and collaborative annotations to strengthen language development and cultural literacy.

Social Science can incorporate local histories, community institutions, crafts and knowledge practices. Digital timelines, maps and community interviews can strengthen contextual understanding and civic awareness.

Art and Work Education can use traditional crafts, music, visual traditions and design practices. Digital documentation, virtual exhibitions and design projects can support creativity, appreciation and skill development.

Across all subjects, teachers should maintain three safeguards: source verification, critical comparison and ethical community engagement. Students should distinguish between historical evidence, community knowledge, philosophical interpretation and scientific claims. Community members who contribute knowledge should be approached with informed consent, appropriate attribution and respect for ownership and representation [3], [11], [13].

8. CHALLENGES AND CRITICAL CONSIDERATIONS

Superficial integration- A major risk is tokenism. If IKS appears only through festivals, isolated historical facts, quotations or decorative activities, its pedagogical potential remains limited. Integration should instead occur through concepts, inquiry, evidence and classroom processes [7], [8].

Teacher preparedness- Teachers require both content familiarity and pedagogical confidence. A teacher may be comfortable with a digital platform but uncertain about the reliability or context of a traditional knowledge claim; another may know a local tradition but have limited experience with digital documentation. Professional development should therefore combine IKS literacy, digital pedagogical competence, source evaluation and culturally responsive teaching [4]–[6], [11].

Epistemological and evidentiary questions- Responsible IKS education should distinguish among historical evidence, community knowledge, philosophical interpretation, scientific claims and contemporary reconstruction. Students should be encouraged to ask what evidence supports a claim, under what conditions it may apply and what its limitations are. This protects IKS integration from both uncritical glorification and dismissive rejection [11], [12].

Diversity and representation- Indian knowledge traditions are regionally, linguistically and socially diverse. A framework that presents one tradition as universally representative may reproduce exclusion. Curriculum developers should therefore use multiple regional and community sources and avoid treating a single tradition as synonymous with Indian knowledge.

Digital divide and accessibility- Digital integration may widen inequality when activities assume continuous connectivity, personal devices or high levels of digital literacy. Offline alternatives, shared devices, downloadable resources and accessible formats are therefore essential [19].

Ethical use and intellectual property- Digital documentation raises questions about consent, attribution, ownership and possible commercial use. Recording a community practice does not automatically transfer ownership of that knowledge to the student or school. Ethical guidance is needed for interviews, photographs, audio/video recordings and online publication [3], [13].

9. DISCUSSION

The proposed framework suggests that IKS and digital pedagogy should be understood as complementary rather than oppositional. IKS can provide contextual, cultural and experiential resources for learning, while digital pedagogy can provide new ways of documenting, representing, comparing and communicating those resources. The educational value emerges from their interaction and from the professional judgement of teachers.

This argument also expands the meaning of digital inclusion. Inclusion should not be limited to access to devices and connectivity. Learners also need opportunities to encounter culturally relevant knowledge and to participate as knowledge producers. A student who documents a local ecological practice, verifies information, maps its location, compares it with contemporary science and presents an evidence-based conclusion is engaging in a richer form of digital learning than a student who simply watches a recorded lecture. This orientation is consistent with the broader principle that technology should serve educational purposes rather than determine them [15], [19].

The framework has implications for teacher education. Pre-service and in-service programmes can include local knowledge documentation, digital storytelling, source evaluation, multilingual digital resources, project design and ethical community engagement. Teacher educators can model how an IKS-related topic can be transformed into a multidisciplinary learning experience. Recent literature on teacher preparedness and IKS integration reinforces the importance of this capacity-building dimension [4], [6], [11], [12].

At the curriculum level, the framework supports a move from content addition to pedagogical integration. Rather than creating separate units for every knowledge tradition, curriculum designers can identify authentic connections within mathematics, science, languages, social science, arts, vocational learning and environmental education. This approach is more sustainable because IKS becomes part of disciplinary inquiry rather than an isolated heritage component.

At the policy and institutional levels, implementation requires more than policy statements. Schools need quality-assured resources, teacher support, leadership, appropriate infrastructure, community partnerships and mechanisms for evaluating implementation. The policy environment created by NEP 2020, NCF-SE 2023 and the IKS Division provides a foundation, but systematic classroom-level evaluation remains necessary [1]–[3].

10. IMPLICATIONS FOR STAKEHOLDERS

Teachers: use local contexts as starting points for inquiry, verify sources, encourage comparison and reflection, and select digital tools only when they strengthen learning.

Teacher educators: develop IKS literacy, digital pedagogical competence, source-evaluation skills and culturally responsive teaching capacity.

Curriculum developers: integrate diverse regional and community knowledge through interdisciplinary learning rather than isolated heritage content.

School leaders: support teacher collaboration, community participation, digital access and professional learning.

Policymakers: facilitate quality-assured multilingual resources, ethical guidance for community knowledge, teacher-development programmes and mechanisms for evaluating implementation.

Researchers: move beyond conceptual discussion toward classroom-based intervention studies, comparative studies and longitudinal research on learner outcomes.

11. PROPOSED RESEARCH AGENDA

The framework generates several directions for empirical research. First, intervention studies can test whether IKS-integrated digital lessons influence student engagement, conceptual understanding, cultural awareness, ecological attitudes or critical-thinking skills. Second, mixed-methods studies can examine how teachers interpret IKS and how students experience culturally contextualised digital learning. Third, comparative research can investigate implementation across rural and urban schools, linguistic regions and different stages of schooling. Fourth, researchers can operationalise the framework into measurable dimensions such as teacher readiness, quality of digital resource design, degree of IKS integration, learner participation, inclusiveness and learning outcomes.

Future empirical work should also pay particular attention to accessibility for learners with disabilities and students in low-connectivity contexts. Longitudinal studies would be useful for determining whether culturally responsive IKS integration produces sustained changes in learning, identity, values and critical thinking. Such research would help distinguish promising practices from assumptions and would provide evidence for refining the proposed framework.

12. LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

The paper has four principal limitations. First, it is conceptual and does not report primary data from teachers or students. Second, the framework is derived from policy analysis and literature synthesis and therefore represents a theoretically informed model rather than an empirically validated intervention. Third, the diversity of Indian Knowledge Systems makes comprehensive representation impossible within a single paper. Fourth, digital infrastructure, teacher capacity and school conditions vary substantially across India, so implementation cannot be assumed to be uniform.

These limitations do not invalidate the framework; rather, they define its present status as a conceptual contribution. Empirical validation is necessary before claims about effectiveness, learning outcomes or scalability can be made.

13. CONCLUSION

The integration of Indian Knowledge Systems into school education under NEP 2020 presents an important opportunity to make learning more contextual, culturally meaningful and holistic. However, the success of this agenda depends on how integration is conceptualised and enacted. Simply inserting traditional facts into textbooks or attaching digital technology to existing lessons is unlikely to produce meaningful pedagogical change.

This paper proposed an IKS–Digital Pedagogy Integration Framework connecting policy foundation, knowledge bridging, pedagogical process, digital enablement, inclusion and expected learning outcomes. Its central proposition is that IKS and contemporary knowledge should enter into a constructive, evidence-sensitive dialogue. Digital tools can support this dialogue by making local knowledge visible, documenting community practices, enabling multilingual participation and facilitating inquiry across physical and virtual spaces. At the same time, technology should remain subordinate to sound pedagogy, and IKS should be approached with both respect and critical examination.

A culturally responsive school does not require learners to choose between tradition and modernity. It can enable them to understand where knowledge comes from, how it is transmitted, how claims can be examined, and how different forms of knowledge may contribute to contemporary problems. In this sense, meaningful integration of IKS with digital pedagogy can contribute to a more plural, reflective and context-sensitive future for Indian school education.

CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

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