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INDIAN SCHOOL TEACHERS AND AI: UNDERSTANDING BARRIERS TO CLASSROOM ADOPTION

Anjali Dubey
Research Scholar, Department of Education, Invertis University, Bareilly
Dr. Vaibhav Chauhan
Assistant Professor, Department of Education, Invertis University, Bareilly
Dr. Sarah Basu
Professor, M.Ed. Department, Bareilly College, Bareilly

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Abstract

Artificial Intelligence (AI) has rapidly moved from an emerging technological innovation to an increasingly influential component of contemporary education. Generative AI systems, adaptive learning platforms, automated assessment tools, intelligent tutoring systems, AI-enabled content-generation applications, and learning analytics have created new possibilities for personalized and data-informed teaching. Nevertheless, the availability of AI tools has not translated into confident and pedagogically meaningful classroom adoption by a large proportion of school teachers in India. This article critically examines why many Indian school teachers remain uncomfortable with the adoption of AI tools in classroom teaching. Drawing upon recent Indian and international empirical studies, technology-adoption theories, teacher-knowledge frameworks, and policy documents, the paper argues that teacher discomfort should not be interpreted simply as technological resistance. Rather, it is a multidimensional phenomenon arising from inadequate AI literacy, limited pedagogical confidence, insufficient professional development, uncertainty regarding the reliability of AI-generated content, ethical and privacy concerns, fear of professional displacement, inadequate infrastructure, workload pressures, examination-oriented school cultures, language and contextual limitations, and weak institutional support. The discussion integrates the Technology Acceptance Model/Unified Theory of Acceptance and Use of Technology (UTAUT), Technological Pedagogical Content Knowledge (TPACK), teacher self-efficacy, and emerging AI-competency perspectives to develop an integrated explanation of AI adoption among Indian school teachers. Evidence from India indicates that teachers' technological self-efficacy and infrastructure significantly influence technology use, while recent studies of AI specifically point to gaps between awareness, access, confidence, and pedagogically sophisticated use. International evidence similarly demonstrates that AI understanding, self-efficacy, trust, perceived usefulness, psychological safety, and organizational support are important determinants of adoption. The article concludes that India's AI-in-education agenda requires a shift from tool-centric training to sustained, subject-specific, pedagogically grounded, ethical, and context-sensitive professional development. A proposed multi-level framework for

teacher AI readiness is presented, emphasizing AI literacy, AI-TPACK, ethical competence, teacher agency, institutional capacity, and continuous professional learning.

Keywords: *Artificial intelligence, AI in education, Indian school teachers, teacher readiness, AI literacy, teacher self-efficacy, TPACK, technology adoption, professional development, generative AI, ethical AI*

Introduction

Artificial Intelligence (AI) is transforming the educational landscape at a pace that is considerably faster than the development of teachers' professional capacity to use it effectively. AI can now generate lesson plans, explanations, examples, worksheets, quizzes, differentiated learning materials, formative feedback, images, presentations, simulations, and assessment items. It can support adaptive learning, identify learning difficulties, personalize instructional content, assist teachers with routine administrative work, and provide students with conversational learning support. Consequently, AI has the potential to alter not only the tools teachers use but also the nature of instructional planning, classroom interaction, assessment, and teacher professional learning.

India has explicitly recognized technology as an important enabler of educational transformation. The National Education Policy (NEP) 2020 advocates extensive use of educational technology, digital resources, teacher professional development, and technology-supported teaching-learning processes. The policy envisages educational software in Indian languages, technology-enabled teacher development, and improved availability of digital resources for teachers and learners (Ministry of Education, 2020). More recent governmental initiatives have increasingly incorporated AI into this agenda. CBSE, for example, has conducted capacity-building programmes for teachers teaching AI at secondary and senior-secondary levels, while current curriculum initiatives include computational thinking and AI for school education.

Yet policy availability and technological availability do not automatically produce teacher adoption. This distinction is crucial. A teacher may have access to ChatGPT, Gemini, Microsoft Copilot, AI-powered presentation generators, automated assessment tools, or adaptive learning platforms without necessarily feeling capable of using them appropriately in a mathematics, science, language, social science, or primary classroom. The issue is therefore not simply whether teachers *have access* to AI, but whether they possess the knowledge, confidence, pedagogical judgment, ethical understanding, institutional support, and professional agency required to integrate AI meaningfully.

Recent Indian evidence reinforces this distinction. A qualitative study involving K–12 teachers in private schools in Delhi found that teachers were actively negotiating the opportunities and challenges associated with AI integration rather than simply accepting or rejecting the technology (Tripathi et al., 2025). (Frontiers) Other recent Indian studies have identified AI literacy, perceived usefulness, trust, ethical concerns, professional development, and institutional support as important factors affecting teachers' adoption of AI (Kalawati et al., 2026; Srivastava et al., 2026).

The central argument of this paper is therefore that **Indian school teachers are not necessarily resistant to AI; many are insufficiently prepared for AI-mediated pedagogy**. This

distinction has important implications for teacher education, school leadership, policy, and professional development.

Conceptualizing Teacher Discomfort With AI

Teacher discomfort may be understood as a psychological, professional, pedagogical, and organizational state in which teachers perceive AI as potentially useful but remain uncertain about their ability or authority to employ it effectively. Such discomfort can manifest as avoidance, limited experimentation, dependence on basic applications, reluctance to use AI for assessment, excessive verification of AI outputs, concern about student misuse, or preference for established teaching practices.

It is important to distinguish three levels of AI engagement:

1. **AI awareness** – knowing that AI tools exist and recognizing their basic functions.
2. **AI use** – employing AI for tasks such as lesson planning, content generation, translation, question generation, or administrative work.
3. **AI pedagogical integration** – deliberately aligning AI with learning objectives, subject content, pedagogy, learner characteristics, assessment, ethics, and teacher judgment.

A teacher may therefore be an AI *user* without being an AI-*competent educator*. This distinction is particularly important because recent evidence suggests that access and general familiarity can coexist with shallow pedagogical integration. A 2026 cross-national K–12 study, for example, reported that Indian teachers in its small qualitative sample had strong institutional support and enthusiasm for AI, yet only one of five demonstrated prompt-engineering awareness, suggesting a gap between institutional exposure and deeper AI competence.

UNESCO's AI Competency Framework for Teachers provides a useful conceptual benchmark. It identifies 15 competencies across five dimensions: human-centred mindset, ethics of AI, AI foundations and applications, AI pedagogy, and AI for professional learning. The competencies progress through *Acquire, Deepen,* and *Create* levels.

This framework implies that effective AI adoption is much broader than learning how to operate a chatbot. Teachers need to understand AI, evaluate its outputs, recognize its limitations, use it ethically, design AI-supported pedagogical experiences, and retain human agency over educational decisions.

Theoretical Foundations for Understanding AI Adoption

Technology Acceptance and UTAUT

The Unified Theory of Acceptance and Use of Technology (UTAUT) proposed by Venkatesh et al. (2003) provides an important explanation of technology adoption. It emphasizes constructs such as performance expectancy, effort expectancy, social influence, and facilitating conditions. (DOI)

Applied to AI in schools, a teacher is more likely to use AI when:

- the teacher believes it will improve teaching;
- the tool appears reasonably easy to use;
- colleagues and school leaders encourage responsible use;
- technical infrastructure is available;
- training and support are accessible.

Conversely, adoption is likely to decline when AI appears complicated, unreliable, risky, time-consuming, or irrelevant to the teacher's subject and classroom context.

A 2026 meta-review of teacher perspectives on AI adoption found perceived usefulness in 85% of the reviewed studies, while perceived ease of use and organizational support each appeared in 55% of studies as important adoption factors. Prior technological experience was also identified as an important moderator. (scirp.net)

Thus, teacher discomfort is partly a technology-acceptance problem—but it cannot be explained by acceptance theory alone.

TPACK and AI-TPACK

Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge (TPACK) framework argues that meaningful technology integration requires interaction among technological knowledge, pedagogical knowledge, and content knowledge. (DOI)

AI makes this relationship even more complex. Knowing how to generate a worksheet with AI is technological knowledge. Knowing how children learn fractions is pedagogical and content knowledge. Knowing whether an AI-generated fraction activity is mathematically accurate, developmentally appropriate, culturally relevant, instructionally useful, and ethically acceptable represents an integrated form of knowledge.

This can be conceptualized as **AI-TPACK**:

AI knowledge + pedagogical knowledge + content knowledge + ethical judgment + contextual knowledge = meaningful AI integration.

Many professional-development programmes unintentionally focus on the first component. Teachers are shown how to write prompts but are not always helped to determine *when*, *why*, and *for whom* AI should be used.

Teacher Self-Efficacy

Self-efficacy is another important explanatory variable. Teachers who believe they can successfully use technology are more likely to experiment with it and persist when difficulties arise.

Indian evidence concerning ICT adoption supports this proposition. Research involving 400 teachers in 100 Indian secondary schools found that teacher self-efficacy and perceived infrastructure significantly predicted ease of ICT use, with infrastructure having the stronger individual effect.

Similarly, research involving 300 teachers from 50 Indian schools found that teacher self-efficacy and self-concept positively influenced perceived ICT usability. (ScienceDirect)

AI adoption therefore inherits many of the digital-confidence problems associated with earlier educational technologies, while adding new layers of uncertainty concerning generative AI, hallucination, privacy, bias, intellectual property, and academic integrity.

Why Many Indian School Teachers Remain Uncomfortable With AI

Inadequate AI Literacy

The first and most fundamental barrier is insufficient AI literacy.

Digital literacy does not automatically imply AI literacy. A teacher may be comfortable using WhatsApp, PowerPoint, YouTube, Google Search, smartboards, or learning-management systems but still lack an understanding of how generative AI systems produce responses, why outputs may be inaccurate, how prompts affect responses, or why AI-generated information must be verified.

This problem is increasingly recognized internationally. UNESCO argues that teachers need knowledge and skills related to AI foundations, applications, ethics, pedagogy, and professional learning rather than merely operational familiarity. (UNESCO)

Recent Indian studies similarly identify AI literacy as a major factor in teacher acceptance. Srivastava et al. (2026), for example, identify AI literacy, perceived usefulness, trust, ethical concerns, and institutional support as important factors shaping teacher acceptance of AI tools in K–12 education.

The consequence is a paradox: **teachers are increasingly exposed to AI but may not be sufficiently prepared to understand it**.

Lack of Pedagogical Confidence

The second barrier concerns pedagogical confidence.

A teacher may know how to ask an AI system to generate a lesson plan but remain uncertain about whether the resulting plan is compatible with the curriculum, learner level, subject-specific pedagogy, assessment requirements, or local classroom realities.

For example, an AI-generated science activity may assume laboratory facilities unavailable in a rural school. A mathematics explanation may use terminology unfamiliar to Indian learners. An English-language response may be linguistically sophisticated but developmentally inappropriate. A social science response may omit local historical or cultural perspectives.

Thus, teachers need confidence not simply in operating AI but in **judging AI**.

International evidence supports this argument. Research on AI readiness among 3,164 primary-school teachers conceptualized readiness through cognition, ability, vision, and ethics. Higher AI readiness was associated with lower perceived threats, greater AI-enhanced innovation, and higher job satisfaction (Liu et al., 2023). (ScienceDirect)

Fear of Incorrect or Hallucinated Information

Generative AI does not guarantee factual accuracy. It can generate plausible but incorrect information, fabricate citations, miscalculate mathematical problems, misinterpret historical events, or present biased interpretations with unwarranted confidence.

This creates an additional responsibility for teachers. Instead of reducing workload automatically, AI may sometimes create a **verification workload**.

Recent research on teachers' acceptance of AI in mathematics and science identifies ethical and safety concerns, low digital confidence, AI anxiety, workload constraints, and doubts about usefulness among prominent barriers. (DOI)

For a teacher already operating under substantial time pressure, the perceived benefit of AI may therefore be offset by the need to check every output.

Ethical, Privacy, and Data-Security Concerns

Teachers are increasingly aware that AI systems may involve the collection, processing, or exposure of sensitive information. Classroom applications may involve student names, learning difficulties, assessment records, behavioural information, or photographs.

This raises difficult questions:

- Can student data be entered into an AI platform?
- Who owns AI-generated teaching materials?
- How should student consent be handled?
- How can teachers identify algorithmic bias?

- Is it acceptable to use AI-generated feedback for high-stakes assessment?
- How should teachers respond when AI produces culturally inappropriate content?

UNESCO's framework places ethics at the centre of teacher AI competence and explicitly emphasizes human agency, accountability, non-discrimination, and responsible use. (UNESCO Documents)

Therefore, ethical caution should not be interpreted as resistance. In many cases it represents **professional responsibility**.

Lack of Trust in AI

Trust is one of the most important psychological barriers.

A multinational study of 508 K–12 teachers across Brazil, Israel, Japan, Norway, Sweden, and the United States found that teachers with higher AI self-efficacy and greater AI understanding perceived more benefits, fewer concerns, and reported greater trust in AI-EdTech. Interestingly, demographic characteristics such as age, gender, and educational level did not produce significant differences in trust. (ScienceDirect)

This finding challenges the simplistic assumption that older teachers necessarily resist AI more than younger teachers.

The more useful explanation is **confidence through competence**. Teachers who understand AI are more capable of distinguishing between appropriate and inappropriate uses and therefore may trust it more selectively.

Fear of Professional Displacement

Generative AI has introduced a new psychological concern: the possibility that AI could replace teachers.

Although AI cannot replace the relational, moral, emotional, contextual, and culturally responsive dimensions of teaching, teachers may nevertheless perceive AI as a threat to professional identity.

This is especially significant when AI is presented through narratives of automation, efficiency, automated grading, personalized tutoring, and reduced dependence on teachers.

A more productive narrative is that AI should function as a **teacher augmentation technology rather than a teacher replacement technology**. UNESCO similarly emphasizes human agency and the continued centrality of teachers in AI-supported education. (UNESCO)

Inadequate and Unsustained Professional Development

One of the strongest explanations for teacher discomfort is the mismatch between the speed of technological change and the nature of professional development.

A one-day workshop cannot realistically prepare teachers for the continuous evolution of generative AI.

Effective professional development should answer five questions:

1. What is AI?
2. What can it do?
3. What can it not do?
4. How can it support my subject pedagogy?
5. How can I use it ethically and responsibly?

India has begun expanding AI-focused teacher training. CBSE has repeatedly organized capacity-building programmes for teachers teaching AI, and SWAYAM Plus currently offers

an AI for Educators K–12 course designed around practical integration into teaching, learning, assessment, and student engagement. (CBSE Academics)

However, the challenge is to move from **episodic training to continuous professional learning**.

Infrastructure and Digital Inequality

AI adoption cannot be separated from the broader digital divide.

Schools vary enormously in terms of:

- internet connectivity;
- electricity reliability;
- availability of computers;
- teacher devices;
- smart classrooms;
- technical support;
- subscription budgets;
- language-compatible resources.

NEP 2020 explicitly recognizes the need to bridge the digital divide and provide suitable technological infrastructure and resources for teachers. (Education Government of India)

An AI strategy developed for a well-resourced urban private school cannot simply be transferred to a rural government school.

This is one reason why national AI policy must avoid assuming a homogeneous Indian school system.

Language and Cultural Context

India's linguistic diversity presents a distinctive challenge.

Much AI training and many AI tools are designed primarily around English-language interaction. Although multilingual AI capabilities are improving, teachers may still encounter differences in quality, terminology, cultural representation, and contextual relevance.

A teacher working in Hindi, Bengali, Tamil, Telugu, Marathi, Assamese, or another Indian language may need to evaluate whether AI-generated materials reflect local linguistic conventions and cultural realities.

This makes **AI localization** essential. UNESCO's framework specifically emphasizes linguistic and cultural diversity as part of inclusive AI development. (UCL Discovery)

Examination-Oriented School Culture

Indian school education remains strongly influenced by examinations, board assessments, syllabus completion, and standardized testing.

Teachers may therefore ask a practical question:

"How will AI help me complete my syllabus and prepare students for examinations?"

If AI tools are perceived as unrelated to curriculum outcomes or examination preparation, adoption may remain limited.

Furthermore, teachers may worry that students will use AI to complete assignments, generate essays, or solve problems without developing genuine understanding. Current debates around academic integrity reinforce this concern.

Consequently, teachers need training not only in *using AI* but also in **designing AI-resilient assessment**.

Workload and the Paradox of Efficiency

AI is frequently marketed as a workload-reduction technology. Yet poorly designed implementation can initially increase workload.

Teachers may need to:

- learn new tools;
- create accounts;
- develop prompts;
- verify outputs;
- edit AI-generated materials;
- check bias;
- redesign assessments;
- monitor student AI use;
- explain AI ethics;
- document their AI usage.

Thus, AI may initially create an **implementation dip**.

International evidence from the 2026 TALIS-based comparative study indicates that non-adoption is associated with multiple barriers including resource constraints, limited skills, institutional restrictions, value-based reservations, and technology-related anxiety, while perceived usefulness and self-efficacy are important correlates of adoption. (ScienceDirect)

Evidence From Recent Indian Studies

Recent Indian research provides an increasingly coherent picture.

Tripathi et al. (2025), studying 20 K–12 teachers in two Delhi private schools, found that teachers were actively negotiating AI's educational role, classroom uses, opportunities, and challenges. The study is particularly significant because it focuses on actual teacher experiences rather than purely hypothetical attitudes.

Chandran and Sasikala (2026) examined AI awareness among school teachers in government and private schools in Tamil Nadu, demonstrating the increasing scholarly interest in teachers' AI awareness and its implications for classroom learning.

Haque (2024) investigated secondary school teachers' awareness and perceptions of AI in science education in India and reported generally positive perceptions and interest, suggesting that lack of enthusiasm alone cannot explain slow adoption.

Kalawati et al. (2026) identified technological, pedagogical, and structural impediments affecting K–12 teacher adoption of AI tools.

Srivastava et al. (2026) similarly emphasized AI literacy, usefulness, trust, ethical concerns, and institutional support.

Importantly, evidence from India's broader ICT-adoption literature also shows that teacher self-efficacy and infrastructure influence technology use.

Together, these studies indicate that Indian teachers' relationship with AI should be understood as **cautious engagement rather than simple rejection**.

International Evidence: What Can India Learn?

International studies reinforce several conclusions.

First, AI readiness is multidimensional. Liu et al. (2023) demonstrated that cognition, ability, vision, and ethics collectively contribute to AI readiness among primary-school teachers.

Second, trust depends substantially on understanding and self-efficacy. Viberg et al. (2025) found that teachers with greater AI understanding and self-efficacy perceived greater benefits and fewer concerns.

Third, psychological safety matters. Shen et al. (2025) examined primary English teachers and identified psychological safety, trust, anxiety, satisfaction, and expectations as relevant to continued AI use.

Fourth, institutional conditions matter. Recent cross-national TALIS research found that systemic barriers are particularly important in lower-adoption contexts.

Finally, international experience demonstrates that AI integration is moving beyond the question of *whether* AI should be used toward *how it should be used responsibly*. Current educational initiatives increasingly emphasize AI literacy, verification, privacy, bias, and responsible use rather than simply encouraging teachers to adopt more tools.

An Integrated Framework for Indian Teacher AI Readiness

The evidence reviewed in this article suggests that Indian school teachers' AI adoption can be represented through six interconnected dimensions:

Dimension 1: AI Knowledge

Teachers need foundational understanding of:

- machine learning;
- generative AI;
- large language models;
- prompting;
- hallucination;
- algorithmic bias;
- data privacy;
- copyright and intellectual property.

Dimension 2: AI Self-Efficacy

Teachers must believe that they can:

- experiment with AI;
- troubleshoot basic problems;
- evaluate AI outputs;
- modify AI-generated resources;
- learn new tools independently.

Dimension 3: AI-TPACK

Teachers should be able to connect:

AI technology + subject content + pedagogy + learner needs.

Dimension 4: Ethical AI Competence

Teachers must understand:

- privacy;
- bias;
- transparency;
- accountability;
- academic integrity;
- human oversight;

- responsible assessment.

Dimension 5: Institutional Readiness

Schools need:

- reliable infrastructure;
- leadership support;
- clear policies;
- technical assistance;
- time for experimentation;
- peer-learning communities.

Dimension 6: Continuous Professional Learning

Teacher AI competence should develop through a progression:

Awareness → Guided Use → Independent Use → Pedagogical Integration → Critical Evaluation → Innovation.

This progression aligns closely with UNESCO's Acquire–Deepen–Create model. (UNESCO)

Implications for Teacher Education and Professional Development

The central implication is that India's AI strategy must move beyond **tool training**.

A conventional workshop might teach teachers:

"Here are ten AI tools."

A stronger professional-development model should instead ask:

"Here is a pedagogical problem. Can AI help solve it, and under what conditions?"

For example:

Problem**:** Students struggle with fractions.

AI-oriented teacher learning:

The teacher explores AI-generated examples, identifies misconceptions, evaluates mathematical accuracy, adapts the explanation to the learners' level, and combines AI support with concrete manipulatives and teacher-led discussion.

This approach develops AI-TPACK rather than tool dependence.

Professional development should therefore include:

1. Foundational AI literacy
2. Subject-specific AI applications
3. Prompt literacy
4. AI output verification
5. AI-supported lesson design
6. AI-enabled formative assessment
7. AI-resilient assessment design
8. Ethics and privacy
9. Inclusive and multilingual AI
10. Collaborative teacher experimentation

India already possesses platforms through which such professional learning could be scaled. SWAYAM Plus, for example, offers AI-focused educator courses covering pedagogy, assessment, engagement, inclusion, and subject-specific integration.

Recommendations

Based on the evidence reviewed, the following recommendations are proposed:

Develop an Indian AI-TPACK Framework

India should develop a contextualized AI-TPACK framework for school teachers that integrates AI knowledge with subject pedagogy, Indian curricular requirements, multilingual contexts, ethics, and learner diversity.

Replace One-Time Workshops with Continuous Professional Development

AI training should follow a sustained model involving workshops, mentoring, peer observation, demonstration lessons, communities of practice, and classroom-based action research.

Develop Subject-Specific AI Training

Teachers should not receive identical AI training irrespective of subject. Mathematics, science, languages, social sciences, arts, and vocational subjects require different pedagogical applications.

Build Teacher AI Self-Efficacy Through Low-Risk Experimentation

Teachers should initially use AI for low-risk activities such as brainstorming, resource generation, differentiation, translation, and lesson planning before progressing toward assessment and personalized learning.

Establish School-Level AI Policies

Schools should clearly specify:

- approved AI tools;
- privacy requirements;
- student data restrictions;
- acceptable student AI use;
- assessment expectations;
- teacher responsibilities;
- procedures for reporting problematic AI outputs.

Recognize Teacher Agency

Teachers should not be compelled simply to "use AI." They should be supported in making informed professional judgments regarding when AI adds value and when conventional pedagogy is superior.

Strengthen Infrastructure

AI adoption strategies must explicitly address the rural–urban divide, government–private school differences, device access, connectivity, electricity, and affordability.

Promote Multilingual AI

Indian-language AI resources should be integrated into teacher development, particularly for teachers working outside English-dominant educational environments.

Conclusion

The question of why Indian school teachers remain uncomfortable with AI cannot be answered by saying that teachers are technologically conservative or resistant to change. Such an explanation is both empirically inadequate and professionally unfair.

The evidence suggests that discomfort emerges from a complex interaction of **AI literacy, self-efficacy, pedagogical knowledge, trust, perceived usefulness, ethical concerns, infrastructure, workload, institutional support, professional identity, language, and assessment culture**.

The Indian situation is particularly complex because the country possesses enormous diversity in school type, geography, language, infrastructure, teacher preparation, socioeconomic context, and curricular practice. A single national assumption about teacher AI readiness is therefore unlikely to be adequate.

The most important conceptual shift is from **AI adoption to AI readiness**.

A teacher should not be considered AI-ready merely because she can use ChatGPT or another generative AI application. AI readiness requires the ability to determine whether AI should be used, select an appropriate tool, formulate meaningful prompts, critically evaluate outputs, adapt them to the curriculum and learners, protect student privacy, recognize bias, maintain academic integrity, and retain professional responsibility for educational decisions.

The evidence also suggests that teacher confidence can be developed. International studies demonstrate relationships among AI understanding, self-efficacy, trust, and adoption, while Indian ICT research establishes the importance of self-efficacy and infrastructure. (ScienceDirect)

Therefore, the goal for India should not be to make every teacher use every AI tool. The goal should be to develop teachers who are **confident enough to experiment, knowledgeable enough to evaluate, pedagogically capable enough to integrate, ethically responsible enough to protect learners, and professionally autonomous enough to decide when not to use AI**.

In this sense, the future of AI in Indian schools will depend less on the number of AI tools available and more on the quality of teacher preparation. AI will become educationally transformative only when teachers are positioned not as passive users of technological products but as **critical, ethical, creative and pedagogically informed designers of AI-enhanced learning**.

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