

“Analyzing the Impact of AI-Driven Platforms on Higher Education in India: A Digital Pedagogy Approach”

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ABSTRACT:

India is home to the largest higher education system globally; hence, it is facing various challenges that are affecting its students, such as rural-urban disparities, outdated curricula, faculty deficiencies, as well as inadequate infrastructural facilities that are making its students unemployable. The NEP 2020 is a champion of technology-enabled initiatives such as SWAYAM, DIKSHA, and e-Pathshala to enhance accessibility, equity, and 21st-century skills; however, the adoption of AI is limited in various HEIs. The current research is a narrative thematic review that attempts to synthesize various studies that are related to AI-enabled platforms within HEIs in India. The research aims to fill a gap that is related to various challenges that are affecting HEIs in India, such as gaps related to pedagogical changes, students' outcomes, factors related to the adoption of AI, as well as ethical concerns. The research focuses on various aspects of AI that are related to students' engagement, learning results, feedback-related changes in teaching practices, as well as various factors related to the adoption of AI that are perceived as useful by HEIs. Using Scopus, Web of Science, and Google Scholar databases from 2010 to 2025, it combines research from around the world with research focused on India. The results show that AI enhances personalization, engagement up to 25%, and adaptive feedback. However, if not tailored to Indian context, it may result in bias, over-reliance, and escalation of already existing inequalities. Teaching practices are moving from traditional models to facilitation and AI literacy, conditioned by existing infrastructure and training challenges common in India. The socio-technical approach to understanding AIED integrates platforms, teaching practices, results, and equity. It suggests that theory-informed models are more important than tool-centric models. The implications of this research recommend that AIED models consider curricula that are AI-aware, equitable governance structures, and investments in infrastructure for low-resourced HEIs in India. The research recommendations suggest

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that longitudinal research is necessary for a more equitable society in rural India. The research contributes to the discourse of pedagogy-centric AIED by advocating for inclusive transformations that are aligned with NEP 2020.

Keywords: AI-driven marketing; digital real estate; Bangalore; residential housing; market dynamics.

Introduction

With more than 70 million students enrolled in institutions, the higher education sector in India is the world's largest, thanks to the Indian country's demographic surge. While the large number of people that are academically unserved is due to the inequitable distribution of people along the rural-urban divide, the digital divide, the socio-economic divide, and the linguistic divide, there is also a systemic set of problems. Internet and computer use in rural areas is a digital divide that is a big part of the socio-economic divide and the language divide. Further compounding the digital divide are systemic problems. The lack of funding creates a weak research infrastructure, and a poor alignment of skills results in more than 50% of the engineering graduates being considered unfit for employment. Additionally, the curriculum is outdated and not aligned with industry requirements. There is a faculty deficit in non-preeminent institutions also we see that infrastructure is an issue which amplifies the problem. Then out came the National Education Policy (NEP) 2020 which is a vision for the future of our education. It puts forth a goal of achieving 50% Gross Enrolment Ratio via flexible and multi-disciplinary courses. Technology serves as the cornerstone of NEP, which has five pillars: access, equity, quality, affordability, and accountability. The policy introduced the National Digital University, credit based Massive Open Online Courses (MOOCs), virtual labs and Open and Distance Learning (ODL) initiatives which are aimed at making education more accessible and at the same time promoting 21st century skills like critical thinking and digital literacy.

The Emergence of Digital Initiatives, MOOCs, and EdTech Platforms

In the mid-2000s India saw the introduction of digital education through the National Mission

on Education through ICT (NMEICT) which brought about MOOCs, virtual labs, and the National Digital Library. At present the primary government platforms are:

- **SWAYAM:** This MOOCs platform has over 11,000 courses, which see 12.5 million enrollments from school to postgraduate levels. Also in agreement with NEP it enables credit transfer, which in turn allows students to easily transit between offline and online learning.
- **DIKSHA:** Based on the open source Sunbird engine, it reaches out to 200 million students and 7 million teachers with multilingual and curriculum aligned e-content and also QR coded textbooks which in turn bridge language gaps in different regions.
- **e-Pathshala:** A joint effort by the Ministry of Education and NCERT which puts out hundreds of e-textbooks and thousands of multimedia contents via apps and web interfaces for flexible out of school hours learning.

However, these efforts are marred by internet shutdowns in rural areas, teachers' digital skills, and a lack of content in local languages. On the other hand, the EdTech private sector, led by giants Vedantu, Unacademy, and upGrad, has experienced explosive growth, enticing millions with test preparation, skill-building, and degree programs.

Problem Statement

Despite rapid discourse around AI in Indian higher education, three systemic problems persist:

- **Quality, inclusivity, and personalization deficits:** There are challenges in Indian Higher

Education Institutions (HEIs) to offer learner-centric, differentiated learning, and timely feedback at scale, especially in public and rural colleges.

- Fast but uneven AI adoption: AI applications are largely confined to better-equipped colleges with better infrastructure, resulting in a huge urban-rural and public-private divide in access to AI applications and digital learning environments.
- Insufficient understanding of pedagogical transformation: The current literature is more focused on adoption and attitude studies, and does not sufficiently address the transformation of pedagogy, teachers, and learning outcomes in Indian settings due to the application of AI.

Rationale and Significance

AI-driven platforms have intelligent tutoring capabilities, ability to offer personalized learning paths, and feedback mechanisms that utilize analytics. Such capabilities can increase engagement and outcomes while reducing the burden on teachers (Onesi-Ozigun et al., 2024). Yet, AI has the potential to widen existing gaps and compromise academic integrity if equity, ethics, faculty capacity, and institutional preparedness are not carefully considered (Adamakis & Rachiotis, 2025; Saúde et al., 2024). Based on digital pedagogy, a targeted review of India is required to:

- Aggregate fractured evidence on AI's impact on engagement, outcomes, and feedback;
- Clarify how AI tools are transforming teaching practices and roles;
- Identify adoption drivers and barriers specific to Indian HEIs;
- Illuminate emerging equity, inclusion, and ethical challenges and responses.

Objectives of the Study

Following these gaps, this paper pursues four objectives:

1. To explore the effect of AI-based platforms on student engagement, learning outcomes, and feedback procedures in HEIs.

2. To examine the transformation of teaching practices and digital pedagogy in HEIs due to the application of AI.
3. To investigate the elements which foster and hinder adoption of AI platforms, including perceived utility, risk perception, institutional support, and AI self-efficacy.
4. To examine ethical, equitable and inclusive issues in AI-supported higher education, such as the digital divide, data privacy, and academic integrity.

Research Questions

Thus, the following research questions guide the study:

- **RQ1:** What impact do AI-driven platforms have on student engagement, learning outcomes, and feedback in Indian higher education?
- **RQ2:** In what ways are AI tools reshaping teaching practices and the digital pedagogy of Indian HEIs?
- **RQ3:** What individual and institutional factors drive or hinder adoption of AI platforms in India's higher education?
- **RQ4:** What equity, inclusion, and ethical concerns arise in the deployment of AI in Indian HEIs, and how are they being addressed?

Literature Review

The international education sector is experiencing a paradigm shift from traditional, inflexible, and standardized lectures to "smart" learning environments driven by AI. Big data, machine learning, and AI enable hyper-personalized learning, adapting to the pace of learners, their learning style, and learning gaps, such as minute-by-minute adaptation in Duolingo or Coursera's recommendation systems. Literature reviews (UNESCO, 2023) indicate that adaptive learning has its roots in the 1990s and received massive impetus with the COVID-19 online transition.

Smart learning environments, flexible cloud-based platforms, apply analytics to provide real-

time feedback, engagement analytics, and predictive analytics. The intelligent tutoring systems used by edX and Canvas in the US and Europe increase completion rates by 15–25% and are just as effective as human tutors. However, there are challenges and risks, such as violations of data privacy (GDPR violations), rising inequalities due to biased AI (facial recognition software that does not work well on diverse skin tones), and the digital divide that leaves low-tech learners behind.

AI in Indian Higher Education: Emerging Evidence

India appears as a key contributor in AI for online learning and distance education, alongside China and the USA (Aljarrah et al, 2021; Bhutoria, 2022; Dogan et al., 2023). A cross-country review of personalized education in the USA, China and India finds strong EdTech and AI-driven personalization growth, while also reporting data privacy, digital resource constraints, and affordability as major impediments to everyday use (Bhutoria, 2022). Systematic review of AI in India's inclusive education shows potential for personalized and assistive technologies to support diverse learners but notes persistent barriers: linguistic diversity, uneven infrastructure, and the need for robust policy frameworks and context-specific design (Gupta & Kaul, 2024). Similar themes of fast paced AI adoption, skill deficiencies, and the lack of well-designed and tested curricula (Adel, 2024; Bond et al., 2024) are echoed in regional and sector-specific reviews (e.g., smart education in Industry 5.0, ethical AI readiness in the pharmaceutical sector).

Core Constructs and Relationships

- AI-based platforms impact digital pedagogy by offering personalization opportunities, automating repetitive tasks, learning analytics, and new forms of interaction and assessment (Strielkowski et al., 2024).
- How the relationship between AI capabilities, and engagement and learning outcomes of students is mediated by digital pedagogy practices (e.g., blended/online design, adaptive pathways, formative feedback, interaction structures) (Hinojo-Lucena et al., 2019).
- Student engagement is a proximal outcome of well-designed AI-supported pedagogy (more timely feedback, adaptive challenge, self-regulation support) which in turn influences learning achievement and advancement (Vieriu & Petrea, 2025).
- All these relationships are moderated by inclusivity/equity conditions (infrastructure, digital skills, institutional support, affordability, language, and accessibility features), which determine the extent to which AI-supported pedagogy benefits students (Saha et al., 2021).
- Technology acceptance factors (perceived usefulness, ease of use, trust, ethical concerns) among teachers and students further condition adoption and depth of pedagogical integration and depth of pedagogical integration (Hinojo-Lucena et al., 2019).

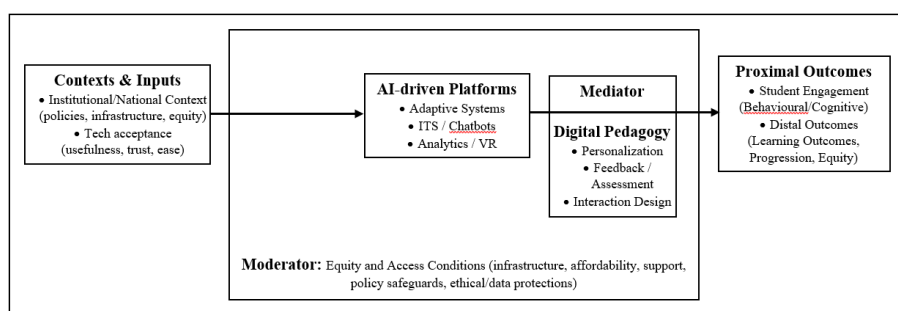


Figure 1: Conceptual Framework linking AI, pedagogy, engagement and equity

Table 1: Overview of Conceptual elements

Element	Brief Role in Study	Citations
AI-driven platforms	Technological input enabling personalization and analytics	Zawacki-Richter et al., 2019; Strielkowski et al., 2024
Digital pedagogy	Mediating teaching-learning design and practices	Hinojo-Lucena et al., 2019; Zawacki-Richter et al., 2019
Student engagement	Proximal behavioural/cognitive/affective outcome	Vieriu & Petrea, 2025; Strielkowski et al., 2024
Inclusivity/equity	Moderator shaping who benefits and how	Saha et al., 2021; Navani, 2020
Technology acceptance	Condition for depth and quality of adoption	Hinojo-Lucena et al., 2019; Vieriu & Petrea, 2025

Theoretical Frameworks

- **Technology Acceptance and Adoption Models:** Models such as the Technology Acceptance Model and related adoption frameworks emphasize perceived usefulness, ease of use, and contextual support as key predictors of educators' and students' uptake of AI tools (Hinojo-Lucena et al., 2019; Joshi et al., 2021). Studies on Web 2.0, analytics and chatbots in Indian HEIs similarly highlight awareness, attitudes, infrastructure and risk perceptions as adoption drivers and barriers (Singh, 2018; Ranjan et al., 2013).
- **Digital Pedagogy / Learning Design Perspectives:** AI in education is most powerful when aligned with student-centred, outcomes-oriented pedagogy, including blended and online models, adaptive learning, and data-informed feedback loops. Systematic reviews stress a current lack of explicit pedagogical theory in AIED and call for design-based and learning-theory-informed work (Zawacki-Richter et al., 2019).
- **Equity, Access and Sustainable Education Frameworks:** Indian higher education faces expansion with persistent inequities in quality and learning outcomes for first-generation and disadvantaged learners (Kaur, 2021; Navani, 2020). AI and digital initiatives are framed as tools for sustainable, transparent and more equitable education, but also raise concerns about digital divides, affordability

and data ethics (Ellikkal & Rajamohan, 2025; Sahoo et al., 2021).

AI Platforms, Engagement, Learning Outcomes, and Feedback: Across settings, AI-driven platforms regularly demonstrate quantifiable improvements in performance and engagement. In higher education, an AI-based adaptive learning platform improved grades and engagement by roughly 25% when compared to traditional instruction, with strong statistical significance. Students expressed greater satisfaction as a result of timely feedback and personalized learning pathways (Naseer et al., 2024). Similar work on AI-enabled mobile learning in universities revealed increased motivation, critical thinking, and practical skills with AI integration into everyday classroom practices (Guo et al., 2025).

According to systematic reviews, AI applications in higher education fall into four categories: intelligent tutoring, adaptive systems, assessment/evaluation, and profiling/prediction. These applications allow for extensive support and ongoing feedback (Lin et al., 2023; Dogan et al., 2023). In Indian context, AI tools improved student performance in Lucknow's HEIs, mediating institutional gains and improving learning and results (Marwah & Gupta, 2024). Reviews of personalized AI education in the US, China, and India attest to its effectiveness in path optimization, content customization, and early problem detection (Bhutoria, 2022).

Transformation of Teaching and Digital Pedagogy:

According to the majority of international reviews, the true potential of AI is not the automation of teaching, but the enrichment of teachers, as well as the facilitation of new pedagogical models. For instance, AI can free teachers from basic grading and feedback, so they can concentrate on empathic, higher-order teaching, as well as dialogic learning (Zawacki-Richter et al., 2019). Additionally, AI tools, as used in mobile and blended learning, can facilitate data-driven instructional design, adaptation of learning content, as well as promotion of active, student-centred learning strategies (Guo et al., 2025). However, the literature frequently points out that educational research on AI is often dominated by computer science viewpoints and has little connection to pedagogical theory. The majority of research on AI in online and remote learning focuses on the use of algorithms, recognitions, and predictions, with little consideration for the theory-driven transformations of pedagogical processes or the roles of the teachers themselves (Dogan et al., 2023).

Empirical research on India is still in nascent stage, the study on Lucknow HEI found that students have a very favorable opinion of AI tools and that they expected a transformative impact on teaching and administration (Marwah & Gupta, 2024). According to a systematic review of AI in inclusive education in India, although AI has the potential for personalized learning for variety of learners, still there is a need for teacher preparedness and pedagogical models that are contextual (Gupta & Kaul, 2024). These findings underline the gaps that the present study has highlighted: the literature has only started to describe the pedagogical transformation in Indian HEIs; it has not thoroughly theorized or measured it.

Drivers and Barriers: Across settings, perceived usefulness and value are dominant predictors of intention to use AI tools. A large survey of university students found that perceived usefulness, enjoyment, and cost shaped perceived value of ChatGPT for learning, which strongly predicted use intention, while perceived risk had

no significant effect. Al-Abdullatif & Alsubaie (2024) state that although it did not directly alter intention to use, AI literacy increased students' capacity to identify benefits and usefulness, indicating that literacy influences perceptions rather than just behavior.

The systematic and narrative reviews categorized challenges into user, technological, operational, environmental, and ethical dimensions. Ali et al. (2024) and Ng et al. (2023) list lack of technical knowledge among faculty staff, low self-efficacy related to AI, training needs, and worries about losing control over instructional procedures as some of the obstacles. According to Aldosari (2020) and Chaudhry & Kazim (2021), teachers often face challenges related to the lack of frameworks to understand what competent pedagogical practices related to AI look like. This limits the transformative potential of AI and only allows for convenience-oriented use (e.g., grading) rather than changing the way learning is designed.

Infrastructure gaps are highlighted by studies in Indian context showcasing that adoption flourishes in well-resourced institutions but fails in public and rural HEIs because of inadequate devices, connectivity, and support (Gupta & Kaul, 2024; Marwah & Gupta, 2024).

Ethics, Equity, Inclusivity, and the Digital Divide:

Ethical risks like data privacy violations, opaque algorithms, bias in training data, academic integrity concerns, and over-reliance causing reduced critical thinking or "cognitive debt" are being highlighted by recent reviews. Students and faculty appreciate AI's feedback and productivity gains but also voice concerns over privacy, misinformation, and dependence on AI outputs (Saúde et al., 2024).

The digital divide appears in two forms: (a) global and national disparities in infrastructure and AI access, and (b) within-country inequities linked to socio-economic status, disability, and language (Dogan et al., 2023). In India, a systematic review of AI in inclusive education finds that uneven technological infrastructure, linguistic diversity, and heterogenous learning environments constrain inclusive implementation, especially in

rural and government institutions (Gupta & Kaul, 2024). Reviews on personalized education in India, China, and the US also caution that data privacy, resource availability, and cost can restrict the extent of personalization by AI and run the risk of exacerbating already-existing disparities (Bhutoria, 2022).

Synthesis of the literature highlights a gap that is directly related to the study's problem statement:

- Limited empirical work on Indian HEIs, particularly public and rural institutions, and limited comparative evidence on AI-supported versus traditional pedagogy in this context.
- Insufficient theory-informed analysis of pedagogical transformation—how AI

reshapes classroom interaction, assessment cultures, and teacher identity in India.

- A need to model drivers and barriers (perceived utility, risk, institutional support, AI self-efficacy) specifically for Indian students and faculty, building on global constructs but validating them locally.
- Underdeveloped frameworks for ethical, equitable, inclusive AI in Indian higher education that simultaneously address infrastructure gaps, language diversity, data governance, and academic integrity.

These gaps justify a targeted, pedagogy-centred review for the Indian context.

Table 2: Thematic clustering of AI-in-HE research relevant to Indian digital pedagogy

Theme	What the Literature Shows	Relevance to India/Digital Pedagogy	Citations
Personalization & outcomes	AI platforms boost grades, engagement, satisfaction; enable adaptive feedback at scale	Supports objective 1: measuring effects on learning and feedback in Indian HEIs	(Bhutoria, 2022; Marwah & Gupta, 2024)
Pedagogical transformation	AI augments, not replaces, teachers; current work weakly linked to pedagogy theory	Justifies exploring how Indian teaching practices and roles are changing	(Ng et al., 2023; Chaudhry & Kazim, 2021)
Adoption drivers/barriers	Perceived usefulness/value, AI literacy, training, infrastructure, institutional support are critical	Informs modelling of facilitators/inhibitors in Indian HEIs	(Ali et al., 2024; Dogan et al., 2023; Joshi et al., 2021)
Ethics & equity	Risks around privacy, bias, integrity, digital divide; need for governance and AI literacy	Aligns with objective 4: ethical, inclusive AI in a highly unequal system	(Popenici & Kerr, 2017; Strielkowski et al., 2024)

Research Methodology

Research Design: In order to synthesize a rapidly developing, methodologically diverse body of work on AI-driven platforms and digital pedagogy in higher education, this chapter uses a narrative/thematic review design with aspects of a scoping review. The emphasis is on the integration of the empirical and conceptual research that provides insights into the Indian scenario with appropriate international comparisons.

The primary search was carried out in the Scopus database, with additional searches in the Web of Science (WoS) and Google Scholar databases for recent and high-impact research articles and chapters. Keywords and Boolean combinations included: “artificial intelligence” OR “AI-driven” OR “generative AI” AND “higher education” OR “universit*” OR “tertiary” AND “India” OR “Indian” (for contextual focus) AND “student engagement” OR “learning outcomes” OR “personalized learning” OR “digital pedagogy” OR “inclusive education” OR “equity” OR “academic integrity” OR “data privacy”.

Searches focused on the period of rapid growth in AI in education (approximately 2010 onward, with emphasis on 2016–2025 to capture GenAI and adaptive learning developments), consistent with recent state-of-the-art and scoping reviews (Dogan et al., 2023; Fu et al., 2024; Kamalov et al., 2023).

Inclusion criteria:

- Empirical and review studies focused on AI applications in education at any level (with emphasis on higher education and online/distance learning);
- Studies addressing at least one of the following: student engagement/outcomes, teaching practices, adoption drivers/barriers, or equity/ethics;
- India-focused studies and global work with clear implications for the Indian higher education context.

Exclusion criteria:

- Non-peer-reviewed sources (blogs, opinion pieces) unless providing essential policy context;
- General EdTech studies without specific AI components;
- Purely technical AI or algorithmic papers with no explicit educational context;
- Duplicates and non-English sources.

Screening and Selection:

Following an adapted multi-stage process (Alotaibi, 2024; Ali et al., 2024; Coppin, 2025):

1. Initial identification made through keyword searches;
2. Filtering by document type, year, and language;
3. Title and abstract screening was done to remove irrelevant items;
4. Full-text review done for thematic relevance and quality;
5. Backward and forward citation chasing of key reviews and seminal papers was used to identify additional relevant studies (Ali et al., 2024; Bhutoria, 2022; Zawacki-Richter et al., 2019; Fu et al., 2024).

Data Extraction and Thematic Synthesis

A data extraction template captured:

- Bibliographic details (year, country, level/sector, AI type);
- Study design and methods (quantitative, qualitative, mixed, review, bibliometric);
- Focal outcomes (learning, engagement, competencies, adoption, ethics, inclusion);
- Key findings and author-reported implications.

For thematic synthesis, a thematic analysis approach was used:

1. Familiarization: Repeated reading of full texts and extracted summaries were done to gain an overall sense of the database, as recommended for thematic and narrative synthesis (Naseer et al., 2024; Fu et al., 2024).
2. Initial coding: Inductive coding of meaningful units (e.g., sentences/paragraphs) into provisional codes such as “personalized learning benefits”, “teacher workload reduction”, “privacy concern”, “infrastructure barrier”, “AI literacy needs” (Salih et al., 2024; Fu et al., 2024).
3. Theme development: Codes were iteratively grouped into higher-order themes that are aligned with the four objectives of the paper:
 - Student engagement and learning outcomes
 - Teaching practices and digital pedagogy
 - Adoption drivers and barriers
 - Equity, inclusion, and ethical issues

This process mirrors inductive thematic development used in large-scale AIED meta-reviews and qualitative components of AI-enabled learning studies (Saúde et al., 2024; Fu et al., 2024).

4. Review and refinement: Themes were refined to ensure internal coherence and external distinctiveness, comparing them against prior syntheses in AI in higher education, online learning, and inclusive education (Dogan et al., 2023; Zawacki-Richter et al., 2019; Fu et al., 2024).

Wherever feasible, sub-themes (such as, “AI-supported formative assessment”, “GenAI and academic integrity”, “India-specific infrastructural constraints”) were realized to capture contextual nuances.

Although formal risk-of-bias scoring is not typical for narrative/thematic reviews, several strategies were used to enhance credibility and transparency:

- Empirical studies were read alongside systematic reviews, scoping reviews, and bibliometric analyses to balance single-context findings with broader patterns.
- Greater interpretive weight was given to higher-quality systematic reviews and meta-reviews; empirical studies with clear design and robust analysis.
- Themes were treated as interpretive constructions rather than objective categories, consistent with reflexive thematic analysis; coding decisions were iteratively revisited in light of new readings and cross-study comparisons.

Narrative Synthesis and Thematic Structuring

The final step involved weaving the coded evidence into a structured narrative:

- Findings were organized under the four pre-specified themes. Within each, evidence from different study types and contexts (including India where available) was juxtaposed to surface convergences, contradictions, and gaps.
- Particular attention was paid to continuity and change over time (e.g., pre- and post-GenAI); cross-context patterns (e.g., similarities and

differences between India, US, China, and other regions); implications for practice, policy, and future research.

This approach enables a rich, conceptually integrated account of AI in education that extends beyond what purely quantitative or protocol-driven systematic reviews can provide, while still grounded in explicit, reproducible methodological steps.

Results

Across the corpus, AI in education research has expanded rapidly from the late 2000s to 2025, with clear surges after 2016 and again with the rise of GenAI from 2022 onward (Dogan et al., 2023; Zawacki-Richter et al., 2019; Popenici & Kerr, 2017; Fu et al., 2024). Reviews and meta-reviews draw on large samples (e.g., 146 HE AIED papers 2007–2018; 276 AI-in-online-learning papers; 126 systematic reviews in AIED; 69 ChatGPT-in-education papers) (Ali et al., 2024; Dogan et al., 2023; Zawacki-Richter et al., 2019). Individual empirical studies typically involve university students in STEM or language courses, with mixed-methods or survey designs (Saúde et al., 2024; Guo et al., 2025; Joshi et al., 2021).

Geographically, research is concentrated in China, the US and Europe, but India is a leading contributor in AI for online/distance education and personalized learning. Two systematic reviews explicitly focus on India: AI in inclusive education, and personalized education in the US–China–India triad (Gupta & Kaul, 2024; Bhutoria, 2022). Recent perception work also reports data from Indian higher-education students (Joshi et al., 2021).

Table 3: Core reviews summarizing AI in education research

Focus	Scope & methods	Main emphasis	Citations
AI in HE (2016–2022)	138 AIED-HE primary studies; PRISMA systematic review	Uses (assessment, prediction, AI assistants, ITS, managing learning)	(Crompton & Burke, 2023)
AI in HE (2007–2018)	146 HE studies; systematic review	Four application areas; disciplinary/method trends	(Zawacki-Richter et al., 2019)

Meta-review AI in HE	66 secondary studies (2018–2023); meta-systematic review	Ethics, methodological rigour, gaps	(Bond et al., 2024)
AI in distance/online learning	276 empirical studies (1999–2022); bibliometric + text mining	Online/remote learning, data mining, adaptive learning	(Dogan et al., 2023)
Global AIEd reviews (PreK–HE)	126 review articles (2014–2023); scoping meta-review	Teaching, learning, administration themes; bibliometrics	(Chen et al., 2020)
Personalized education (US/China/India)	353 AI–personalization papers (2019–2021)	Personalized learning, EdTech growth, challenges	(Bhutoria, 2022)

Theme 1: Student Engagement and Learning Outcomes

Across contexts, AI-enabled systems—adaptive platforms, intelligent tutoring, AI-based mobile learning, and GenAI tools—are generally associated with improved engagement, achievement, and perceived learning quality. Experimental and quasi-experimental work reports substantial gains (e.g., ~25% increase in grades and engagement using an AI-driven adaptive platform vs traditional instruction) and higher motivation in AI-supported groups (Guo et al., 2025; Naseer et al., 2024). Survey and mixed-methods studies indicate that students experience more personalized learning, better feedback, and higher satisfaction in AI-enhanced environments (Salih et al., 2024; Joshi et al., 2021).

Reviews of personalized education conclude that AI successfully tailors content to learning needs, habits and abilities, guiding learners into optimized paths in the US, China, and India alike (Bhutoria, 2022). Bibliometric and thematic syntheses of adaptive learning show a long-term rise in AI-driven personalization, especially post-COVID digitalization (Dogan et al., 2023; Popenici & Kerr, 2017; Strielkowski et al., 2024).

However, findings also show risks and mixed effects: concerns about over-reliance on AI, reduced critical thinking, “cognitive debt,” and shallow understanding when AI is used uncritically (Vieriu & Petrea, 2025; Fu et al., 2024). GenAI studies highlight both enhanced productivity and feedback and fears that writing, problem-solving, and originality may decline

without explicit pedagogical scaffolding (Kamalov et al., 2023).

In India-based perception studies, most students report that AI tools help them learn more effectively and improve learning quality, but express relatively low trust in AI-generated information and worry about loss of human interaction and over-dependence (Joshi et al., 2021).

Overall, evidence points towards net positive effects on engagement and performance when AI is combined with clear learning objectives and human guidance, but emphasizes the need to guard against automation-driven disengagement and erosion of higher-order skills (Bhutoria, 2022; Saúde et al., 2024).

Theme 2: Changes in Teaching Practices and Digital Pedagogy

Across reviews and empirical work, AI is reshaping teaching by:

- Automating or augmenting assessment, grading, and feedback through AI-supported evaluation, analytics, and GenAI-assisted marking (Dogan et al., 2023; Zawacki-Richter et al., 2019).
- Enabling adaptive and data-informed pedagogy, where teachers use system analytics to identify at-risk students, tailor activities, and redesign curricula (Naseer et al., 2024; Strielkowski et al., 2024).
- Shifting instructor roles toward designers, facilitators and orchestrators

of AI-mediated learning experiences, rather than sole content deliverers (Popenici & Kerr, 2017; Chaudhry & Kazim, 2021).

Systematic reviews of AIED in HEIs identify four dominant application areas—profiling/prediction, assessment, adaptive/personalization, and intelligent tutoring—largely designed and evaluated from a technological rather than pedagogical standpoint, with limited explicit theorization of learning (Zawacki-Richter et al., 2019; Fu et al., 2024). High-level syntheses of GenAI in HE stress the emerging centrality of AI literacy, prompt design, and critical engagement as essential new elements of pedagogical practice (Adamakis & Rachiotis, 2025; Salih et al., 2024).

In settings such as India, personalized education reviews indicate that teachers are taking up roles as supervisors of AI guided learning, utilizing analytics to cater to diverse learners while at the same time offering human mentorship (Bhutoria, 2022). The inclusive education review for India highlights that effective AI supported pedagogy has to be tailored to cater to different languages, heterogeneous classrooms, and inclusive practices requiring significant training for teachers (Gupta & Kaul, 2024).

While the technology holds promise, various reviews conclude that AI interventions tend to be poorly linked to educational theory and pedagogy, and frequently prioritize performance outcomes over deeper learning and socio-emotional development (Dogan et al., 2023; Zawacki-Richter et al., 2019; Fu et al., 2024).

Theme 3: Adoption Drivers and Barriers

Evidences point to a complicated mix of motivations and constraints shaping AI adoption in education.

Key drivers include:

- Perceived gains in efficiency and workload reduction (automated grading, administrative support) (Ali et al., 2024; Dogan et al., 2023; Zawacki-Richter et al., 2019).

- Desire for personalization and improved learner support, especially in large-enrolment and online settings (Guo et al., 2025; Strielkowski et al., 2024; Fu et al., 2024).
- Institutional and policy pushes toward innovation, competitiveness, and preparing students for an AI-mediated workforce (Bhutoria, 2022; Adamakis & Rachiotis, 2025; Kamalov et al., 2023).

The interconnected user, operational, environmental, technological, and ethical dimensions comprise the main obstacles. An extensive analysis of ChatGPT and AI challenges categorizes problems into five domains, including user training and resistance, infrastructural needs, resource availability, system dependability, and ethical issues (bias, privacy, integrity), and offers solutions for strategic responses (faculty development, customized tools, governance) (Alhumaid et al., 2022; Ali et al., 2024).

Scoping meta reviews and smart education syntheses highlight digital divides, infrastructural needs, teacher training, and unclear policies as ongoing challenges in AI adoption (Adel, 2024; Ng et al., 2023; Fu et al., 2024). Reviews of GenAI adoption identified academic integrity, usage uncertainty, and development of AI tools were found to be new obstacles towards confident integration (Salih et al., 2024; Saúde et al., 2024).

India-specific evidence reflects similar global picture, but with sharper structural constraints. The US–China–India personalization review identifies affordability, limited digital resources, and accessibility as major barriers to everyday use of AI-driven personalization, alongside concerns about data privacy and regulatory readiness (Bhutoria, 2022). The inclusive education review for India highlights linguistic diversity, rural–urban differences in connectivity, and heterogeneous school resources as key contextual barriers that affect AI's reach to marginalized learners (Gupta & Kaul, 2024). Perception studies in Indian higher education settings identify low AI literacy, reliance on self-learning,

and fear of job displacement and skill redundancy among teachers and students (Joshi et al., 2021).

The strongest support for adoption can be found in areas where infrastructure, training, and policy support are in place; areas where these are absent, as in many of the low-resource institutions and regions, support for AI is fragmented, tool-based, and vulnerable to unequal deployment (Adel, 2024; Ng et al., 2023).

Theme 4: Equity, Inclusion, and Ethical Issues

The literature always presents AI in education as having conflicting views on equity and ethics: while it can improve inclusion and personalization, it also poses risk of new forms of misconduct, surveillance, and exclusion (Vieriu & Petrea, 2025; Popenici & Kerr, 2017; Chaudhry & Kazim, 2021).

On the brighter side, reviews and case-based syntheses highlight AI's ability to:

- Provide personalized and assistive support for learners with diverse needs through adaptive content, intelligent tutoring, and accessibility tools (Dogan et al., 2023; Guo et al., 2025; Fu et al., 2024).
- Support early identification of learning difficulties and tailored interventions, potentially narrowing achievement gaps (Naseer et al., 2024; Kamalov et al., 2023).
- Enhance inclusive administrative processes (e.g., flexible scheduling, targeted resource allocation) in systems committed to equity (Chaudhry & Kazim, 2021; Adel, 2024).

These tensions are quite noticeable in India. Bhutoria (2022) cautions by highlighting the US-China-India personalization reviews that concerns of privacy, affordability, and digital infrastructure may create huge disparities in access to AI-enhanced learning, mainly in rural/low-income communities. Despite appreciating the benefits of AI, perception studies in Indian universities show that students are aware of the potential risks of AI, such as the loss of privacy, over-reliance on AI, and the loss of human interactions (Joshi et al., 2021).

In the case of India or similar contexts, the evidence points to the importance of ensuring that the educational benefits of AI are achieved through a sensitive integration that involves localized design (e.g., languages, infrastructure), strong policy frameworks, and ongoing investment in both teacher and learner literacy.

Discussion

The synthesis across themes demonstrates that in the higher education sector, AI is a socio-technical learning ecosystem rather than a neutral technology. The results from the themes are all in line with the objectives of the literature review. For instance, AI leads to improvement in student engagement and performance, though it also creates fresh challenges of over-reliance, dishonesty, and cognitive offloading (Bhutoria, 2022; Guo et al., 2025; Naseer et al., 2024). While institutional adoption is mediated by infrastructure, training, governance, and ethics, AI at the teaching level speeds up the transition from teacher as content deliverer to teacher as designer, facilitator, and AI literacy mentor (Dogan et al., 2023; Zawacki-Richter et al., 2019; Fu et al., 2024).

Equity and ethics emerge not as peripheral but as structuring conditions: AI's benefits are realized only where socio-technical, infrastructural, and policy contexts support inclusive, transparent, and accountable integration, especially in countries like India with linguistic and digital diversity (Adel, 2024; Strielkowski et al., 2024; Fu et al., 2024).

These patterns support a conceptual framework in which AI co-configures learning outcomes, pedagogy, adoption trajectories, and equity through continuous human-machine negotiation, rather than acting as a simple independent variable.

Theoretical Implications

This review offers significant improvements while criticizing a-theoretical, tool-centric AIED approaches.

- Transition from "AI as tool" to "AI as socio-technical actor" that shapes agency and roles.

- Revise learning theories to account for "cognitive debt" and meta-cognition in AI-mediated cognition.
- Expansion of adoption models (like TAM/TOE) to incorporate governance, ethics, and literacy.

Practical Implications

- Institutional Governance: Investment in infrastructure, particularly in low-resource Indian HEIs; adoption of clear AI policies on data, integrity, and transparency.
- Faculty and Curriculum: Redesigning of curriculum with AI-aware assessments that

prioritize human skills; offer technical, ethical, and inclusive AI literacy training.

- Inclusive Practice: To prevent from intensifying already-existing disparities, AI solutions for inclusive education, especially in India, must be localized (languages, content, and devices) and co-designed with educators and students. Bias audits, privacy safeguards, and student/teacher input in technology choices should all be addressed by institutions' ethics review and support systems for AI deployments.

HEIs can only benefit from AI when it is in line with governance, capacity, and pedagogy.

Table 4: Priority institutional levers for responsible AI integration

Lever	Priority actions in light of findings	Citations
AI literacy	Mandatory training for staff/students; embed in curricula	(Guo et al., 2025; Ng et al., 2023; Fu et al., 2024)
Assessment redesign	Authentic, process-based, AI-aware tasks	(Ali et al., 2024; Adamakis & Rachiotis, 2025; Kamalov et al., 2023)
Equity & inclusion	Localized tools, targeted support, infrastructure in low-resource settings	(Gupta & Kaul, 2024; Dogan et al., 2023; Joshi et al., 2021)
Governance	Clear policies on use, privacy, integrity, data	(Ali et al., 2024; Dogan et al., 2023; Adamakis & Rachiotis, 2025)

Future Research Implications:

This synthesis highlights key gaps across conceptual, methodological, contextual, and outcome dimensions.

- Conceptual Foundations: Create definitions of AI/AIEd that are relevant to education, differentiating "education for AI" from "AI for education"; develop theories on AI-mediated ethics, governance, and cognition.
- Methodological Advancements: Conduct comparison studies between AI and conventional pedagogies, evaluating higher-order skills and socio-emotional outcomes; adopt longitudinal, mixed-methods, design-based research over brief pilots.

- Diverse Contexts: For adoption, equity, and localization, concentrate on Global South/low-resource regions like rural India; investigate underrepresented groups (such as adjunct teachers and students with disabilities) in the face of injustices.
- Important Results: Examine how AI affects ethics, creativity, critical thinking, and teacher identity and duties beyond academic success.

Conclusion

The goal of this chapter is to synthesize that how AI is changing the teaching-learning process and the governance of HEIs, especially on the concepts of personalization, student experience, teaching-learning process, and equity. The

chapter is a culmination of systematic reviews, bibliometric studies, empirical trials, and perception studies carried out in diverse regions of the globe, including a focused study on the country of India. (Gupta & Kaul, 2024; Bhutoria, 2022; Dogan et al., 2023; Zawacki-Richter et al., 2019; Popenici & Kerr, 2017; Guo et al., 2025; Joshi et al., 2021).

The overall trend of AI applications, when integrated into cohesive pedagogical designs was that they consistently improved engagement, learning outcomes, and perceived quality of learning, particularly through adaptive platforms and intelligent tutoring systems (Bhutoria, 2022; Dogan et al., 2023; Naseer et al., 2024; Guo et al., 2025).

The primary contribution of this chapter is the integration of traditional AIED, GenAI, and India-specific work into a socio-technical view of AI in higher education. It highlights that the outcomes depend on how organizations, educators, and policymakers match technology with pedagogy, ethics, and context (Zawacki-Richter et al., 2019; Chaudhry & Kazim, 2021; Ng et al., 2023). The final call is for higher education systems to shift from ad hoc, tool-driven adoption to deliberate, theory-based, and justice-focused AI integration.

Limitations

Several limitations qualify the scope and interpretation of this review:

- Database and publication bias: Like many AIED reviews, the synthesis draws primarily on articles of peer-reviewed journal indexed in major databases such as, Scopus and WoS, omitting conference proceedings, books, grey literature, and non-indexed regional work.
- Language constraints: Most large-scale reviews included only English-language publications, excluding potentially important research in local languages, mainly from the Global South.
- Time-bounded evidence in a fast-moving field: GenAI research is growing rapidly; several systematic reviews note that any snapshot gets quickly out of date as tools, policies, and practices evolve.
- Conceptual ambiguity: Persistent inconsistencies in how “AI” and “AIED” are defined mean some relevant work may be missed or not properly categorized, and comparisons across studies are imperfect.

These limitations point to the need for ongoing, iterative synthesis and more diverse evidence bases.

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