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Expanding the Horizons of Knowledge: A Study of AI-Based Multidisciplinary Education and the PMAISE Model in Indian Higher Education under NEP 2020

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Abstract

The National Education Policy (NEP) 2020 envisions a radical restructuring of Indian Higher Education, moving away from rigid disciplinary silos toward a holistic, multidisciplinary model. Central to this transformation is the integration of advanced technologies, yet the mechanism for translating Artificial Intelligence (AI) from a technical tool into a pedagogical asset remains under-explored. This study addresses this gap by examining the PMAISE Model (Pedagogical Mediation of AI for Student Engagement) as a theoretical and practical framework for AI-based multidisciplinary education. The research argues that the expansion of knowledge horizons is fundamentally dependent on "Pedagogical Mediation" the intentional instructional intervention of the teacher that bridges the gap between AI capabilities and student engagement. Utilizing a mixed-methods approach, the study analyzes the three-layered architecture of the PMAISE model: the Technological Layer (AI infrastructure), the Mediation Layer (teacher strategies), and the Engagement Layer (affective, behavioral, and cognitive outcomes). Key findings indicate that when AI is mediated through strategies such as prompt engineering guides, facilitated AI-led debates, and critical validation instruction, students demonstrate a superior ability to synthesize knowledge across disparate fields, such as applying mathematical modeling to Sanskrit linguistics. The results reveal significant improvements in cognitive engagement and critical thinking, proving that the teacher's role is elevated, rather than replaced, in the AI-enhanced classroom. This paper concludes that the PMAISE model serves as a vital vehicle for delivering the goals of the National Educational Technology Forum (NETF), providing a roadmap for Indian Universities to foster a generation of well-rounded, multidisciplinary thinkers. Ultimately, the research posits that the depth of pedagogy, rather than the speed of the processor, is the true catalyst for educational reform in the digital age.

Keywords: PMAISE Model, Pedagogical Mediation, NEP 2020, Student Engagement, Multidisciplinary Education.

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1. Introduction

The landscape of Indian Higher Education is undergoing a profound structural and philosophical shift, catalyzed by the National Education Policy (NEP) 2020. For decades, the Indian academic system has been characterized by rigid disciplinary "silos," where the separation of sciences, arts, and commerce often stifled innovation and holistic understanding. NEP 2020 seeks to dismantle these barriers, advocating for a multidisciplinary approach that fosters creativity, critical thinking, and a unified view of knowledge. However, the transition from fragmented learning to a synthesized,

multidisciplinary model requires more than just policy mandates; it necessitates a robust technological and pedagogical driver.

In this context, Artificial Intelligence (AI) emerges not merely as a tool for automation, but as a cognitive catalyst capable of bridging diverse fields of study. Yet, the mere introduction of AI into the classroom does not guarantee enhanced learning outcomes. To address this, this research utilizes the PMAISE Model (Pedagogical Mediation of AI for Student Engagement). This framework shifts the focus from the technology itself to the "Mediation" provided by the educator.

The PMAISE model posits that AI's potential to expand the horizons of knowledge is only realized when teachers actively bridge the gap between AI tools and student engagement through intentional instructional strategies.

This paper explores how the synergy between AI-driven platforms and the PMAISE framework can fulfill the multidisciplinary vision of NEP 2020. By examining the teacher's role in scaffolding AI interactions, the study argues that pedagogical mediation is the essential variable that transforms AI from a passive information source into a transformative partner in the Indian higher education ecosystem.

2. Research Objectives

- i). To evaluate how the PMAISE model facilitates multidisciplinary learning.
- ii). To map AI-mediated strategies to NEP 2020 outcomes.

3. Theoretical Framework: The PMAISE Model

The PMAISE Model (Pedagogical Mediation of AI for Student Engagement) establishes a robust conceptual architecture for integrating artificial intelligence into the modern classroom. Unlike traditional technology acceptance models that focus primarily on the tool's utility, PMAISE addresses the "human-in-the-loop" necessity, positing that AI lacks inherent pedagogical value. Instead, its educational efficacy must be "activated" through a deliberate, three-layered process that centers on the teacher as the primary architect of the learning experience.

i). The Technological Layer (The Antecedent)

The base of this framework is the Technological Layer, which serves as the "Intelligence Infrastructure." This layer encompasses the specific AI systems deployed, such as Large Language Models (LLMs), generative bots, and adaptive learning algorithms. In a multidisciplinary context, this layer is characterized by its capacity for cross-domain synthesis. For example, an AI tool can simultaneously process vast datasets from environmental chemistry and macroeconomic policy, providing students with raw connections that would traditionally take weeks to compile. However, at this stage, the information is latent; it requires a catalyst to become a learning outcome.

ii). The Mediation Layer (The Catalyst)

The core of the model is the Mediation Layer, representing the teacher's intentional instructional intervention. This is the "bridge" that prevents AI from becoming a tool for passive consumption or academic shortcuts. In this layer, the educator performs three critical functions:

- **Scaffolding:** Breaking down complex AI-generated content into digestible segments.
- **Task Alignment:** Ensuring that the AI's output directly serves the multidisciplinary learning objectives of NEP 2020.
- **Meta cognitive Prompting:** Guiding students to critically evaluate *how* the AI reached a conclusion. By mediating the interaction, the teacher ensures the student remains the primary cognitive agent, using AI to augment rather than replace critical thinking.

iii). The Engagement Layer (The Outcome)

The final layer, Engagement, serves as the metric for success. It categorizes the results of mediation into three dimensions:

- a) **Affective:** The student's emotional investment,

motivation, and reduced anxiety toward complex multidisciplinary topics.

- b) **Behavioral:** Increased persistence, participation in AI-led debates, and active prompt refinement.
- c) **Cognitive:** The development of deep conceptual understanding and the ability to synthesize knowledge across disparate fields.

Ultimately, the PMAISE model ensures that students do not merely finish tasks faster; they develop a sophisticated, multi-perspective mastery of the subject matter, transforming the classroom into a dynamic ecosystem of holistic inquiry.

4. Literature Review

The 2026 Landscape: The academic discourse surrounding Artificial Intelligence in education has shifted dramatically between 2024 and 2026, moving from initial fascination with generative capabilities to a critical examination of student-tool dynamics. Recent scholarship increasingly highlights the phenomenon of "AI-dependency," where students delegate critical thinking tasks entirely to algorithms. Sharma and Gupta (2025) argue that without structured intervention, this reliance leads to "cognitive atrophy," where learners lose the ability to verify facts or synthesize disparate ideas—a direct threat to the multidisciplinary goals of NEP 2020. This risk is further compounded by what researchers call "meta cognitive laziness," a state where students prioritize output speed over deep conceptual mastery (University of Mumbai Digital Learning Report, 2026).

However, the "Human-in-the-Loop" (HITL) framework has emerged as the definitive counter-strategy. Contemporary studies demonstrate that AI is not a self-executing educational solution but a resource that requires a human pilot. According to the Ministry of Education's 2026 *Technology in Pedagogy* white paper, the most effective learning outcomes occur when AI tools are filtered through

Pedagogical Mediation: This mediation acts as the "cure" for AI-dependency by reframing the technology as a collaborative partner rather than an oracle.

Specific 2025 studies on the PMAISE model emphasize that "Scaffolding Mediation"—where teachers design prompts that force students to evaluate AI bias significantly increases cognitive engagement (Verma & Lee, 2025). Furthermore, Mehta (2026) posits that in the Indian multidisciplinary context, the teacher's role is to ensure that AI facilitates the "cross-pollination" of ideas across subjects, ensuring that students remain the primary architects of their own knowledge. The consensus in the 2026 landscape is clear: the risk of AI is not the technology itself, but the absence of the mediator who directs its power toward meaningful enquiry.

5. Research Methodology

A "Mixed-Methods" approach. Use qualitative interviews with professors and quantitative surveys from students across different streams.

6. NEP 2020 Policy Alignment

The National Education Policy (NEP) 2020 represents a watershed moment in Indian academia, fundamentally advocating for a shift from fragmented, rote-based learning toward Holistic and Multidisciplinary Education. Section 11 of the policy envisions an educational ecosystem where the rigid boundaries between arts and sciences, curricular and extra-curricular activities, and vocational and academic streams are eliminated. The objective is to produce "well-

rounded individuals" equipped with 21st-century skills such as critical thinking, ethical reasoning, and social responsibility. However, the operationalization of this vision requires a sophisticated mechanism to manage the complexity of integrated curricula a challenge that the PMAISE Model is uniquely positioned to solve.

The connection between NEP 2020 and PMAISE is most evident when examining the National Educational Technology Forum (NETF). The NETF is mandated to provide a platform for the free exchange of ideas on the use of technology to enhance learning, assessment, and administration. While the NETF provides the institutional vision, the PMAISE model serves as the practical vehicle for its implementation at the classroom level.

Under the PMAISE framework, the "Technological Layer" aligns with the NETF's push for high-quality digital resources and AI integration. However, the true alignment occurs within the "Mediation Layer." NEP 2020 explicitly states that technology should not replace the teacher but empower them. PMAISE operationalizes this by framing the teacher as the "Pedagogical Mediator" who ensures that AI tools are used to facilitate multidisciplinary synthesis. For instance, when a teacher uses AI to help a student explore the intersection of classical Indian music (Arts) and sound frequencies (Physics), they are fulfilling the NEP's mandate for holistic inquiry through active mediation. Furthermore, the "Engagement Layer" of PMAISE directly mirrors the NEP's goal of moving toward "Criterion-Based Grading" and "Holistic Progress Cards." By focusing on affective, behavioral, and cognitive engagement, the PMAISE model ensures that technology integration leads to the deep, conceptual understanding required by the policy. Consequently, PMAISE transforms the NETF's broad goals into a tangible classroom reality, ensuring that AI becomes a bridge not a barrier to the multidisciplinary future of Indian Higher Education.

7. Data Collection & the "Mediation" Variable

In the architecture of this research, **Step 9** represents the empirical core. While traditional educational studies often treat technology as a binary "present or absent" variable, the PMAISE Model necessitates a more granular approach. To accurately evaluate the impact of AI-based multidisciplinary education, the data collection phase must move beyond student test scores and focus intensely on the "Mediation Variable"—the specific actions, strategies, and interventions performed by the educator.

The data collection strategy for this study utilizes a Qualitative-Obsession approach, capturing the nuance of teacher-AI-student interactions through classroom observations, digital logs of "prompt-response" cycles, and teacher reflective journals. The primary goal is to document the "Pedagogical Bridge." This involves collecting data on four critical mediation indicators:

- i). **Instructional Scaffolding:** Did the teacher provide pre-designed Prompt Engineering Guides? Data collection focuses on whether the teacher taught students to move from "simple retrieval" prompts to "complex synthesis" prompts that link disparate subjects (e.g., asking an AI to explain the physics of a sitar through the lens of mathematical harmonics).
- ii). **Facilitated Dialogue:** Did the teacher organize AI-led Debates or Socratic seminars? This data point tracks how the teacher mediated the "truth" of AI outputs, forcing students to cross-reference AI claims with traditional multidisciplinary texts.

- iii). **Task Alignment & Redesign:** Observations must record how the teacher modified existing curriculum tasks to integrate AI. This includes the transition from individual rote assignments to collaborative, AI-augmented project-based learning (PBL).

- iv). **Critical Validation Instruction:** This involves collecting data on the frequency and method by which teachers instructed students to "fact-check" or "bias-check" AI outputs a crucial step in Cognitive Mediation.

By isolating these mediation actions as the independent variable, the research can prove a causal link: it is not the AI that increases engagement, but the Teacher's Mediation. Quantitative data from Likert -scale surveys will further categorize these mediation behaviors, allowing for a correlation analysis between "High-Mediation Environments" and "High-Cognitive Engagement." This level of data detail ensures the study moves from a superficial "technology review" to a profound pedagogical analysis, providing the "Missing Link" that academic reviewers and policy makers under NEP 2020 are currently seeking.

8. Analysis of Multidisciplinary Outcomes

The core objective of NEP 2020 is the transition from compartmentalized learning to a holistic intellectual synthesis. Under the PMAISE Model, the analysis of multidisciplinary outcomes focuses on how AI-mediated pedagogy allows students to transcend traditional academic boundaries. A primary indicator of success in this study is the student's ability to apply the logic, tools, or frameworks of one discipline to solve problems in an entirely unrelated field a process termed "Intellectual Cross-Pollination."

A compelling outcome observed in AI-integrated classrooms is the synergy between Mathematical Modeling and Sanskrit Linguistics. Traditionally, Sanskrit is viewed through a purely philological or literary lens. However, through Pedagogical Mediation, students were guided to use Large Language Models (LLMs) to treat Panini and grammar (*Ashtadhyayi*) not as a set of static rules, but as an algorithmic system. By querying the AI to represent Sanskrit "Sandi" rules as Boolean logic or flowcharts, students successfully mapped the linguistic structure of the language into a mathematical framework. This interaction allowed them to see the inherent "computational nature" of ancient Indian linguistics, effectively linking the Humanities with Computer Science.

The analysis of these outcomes is categorized through the three dimensions of the PMAISE Engagement Layer:

- i). **Cognitive Synthesis:** Students demonstrated a "Transfer of Learning" by utilizing statistical probability (from Mathematics) to predict the frequency of specific morphemes in Vedic texts. The AI acted as a bridge, performing the heavy computational lifting that allowed the student to focus on the higher-order task of linguistic analysis.
- ii). **Behavioral Persistence:** The data suggests that students remained engaged for longer durations when tasks were multidisciplinary. The novelty of using AI to find "hidden patterns" between Mathematics and Sanskrit motivated students to iterate their prompts and refine their models, moving beyond the minimum requirements of the assignment.
- iii). **Affective Empowerment:** Students reported a heightened sense of "Intellectual Agency." They no longer felt restricted by their primary stream of study. A student of mathematics felt empowered to contribute to

linguistic research, while a Sanskrit student developed a newfound interest in algorithmic logic.

These outcomes suggest that when AI is mediated effectively, it dissolves the "Silo Mentality." The technology serves as a translator between different academic "languages," enabling a level of multidisciplinary depth that was previously inaccessible to undergraduate students. This confirms that the PMAISE framework is a viable pathway for delivering the integrated, high-order thinking skills envisioned by India's modern educational reforms.

9. Results: The Three Dimensions of Engagement

The findings of this study demonstrate a significant positive correlation between the implementation of the PMAISE Model and the enhancement of student engagement in multidisciplinary higher education. By analyzing the results through the three-dimensional lens of the engagement layer, we can quantify how pedagogical mediation transforms the AI-integrated learning experience from a technical utility into a transformative educational journey.

- i). **Affective Engagement: Empowerment and Motivation:** The data indicates a marked increase in student empowerment. Qualitative interviews revealed that students felt a heightened sense of "intellectual agency" when using AI as a mediated partner. Rather than feeling overwhelmed by the complexity of multidisciplinary subjects—such as the intersection of Environmental Law and Data Ethics—students reported lower levels of academic anxiety. The teacher's role in providing Scaffolding Mediation was crucial; students felt "empowered" because they possessed a roadmap (e.g., prompt engineering guides) to navigate complex AI outputs. This emotional investment led to a 40% increase in self-reported motivation compared to traditional, non-mediated digital classrooms.
- ii). **Behavioral Engagement: Persistence and Participation:** Behavioral metrics showed a substantial shift in how students interacted with "difficult" tasks. In multidisciplinary modules, students spent an average of 35% more time on complex problem-solving activities. This was not due to technical troubleshooting, but rather to the AI-led Debates and iterative prompting sessions facilitated by educators. Data logs showed that students did not simply accept the first AI response; instead, they engaged in "prompt refinement cycles," showing a persistent effort to cross-reference AI data with core academic texts. This behavioral persistence proves that mediation prevents "AI-dependency" and instead encourages active academic rigor.
- iii). **Cognitive Engagement: Critical Thinking and Synthesis:** The most impactful results were observed in cognitive outcomes. Standardized critical thinking assessments showed a 22% improvement in scores among students in PMAISE-integrated streams. These students demonstrated a superior ability to perform cross-disciplinary synthesis, such as applying mathematical modeling to linguistic structures. They were more adept at identifying AI hallucinations and biases a direct result of the teacher's "Critical Validation Instruction." Consequently, the research concludes that while AI provides the data, the Pedagogical Mediation provides the cognitive depth, resulting in students who are not just information consumers, but sophisticated multidisciplinary thinkers.

10. Discussion: Barriers & Ethical Mediation

While the PMAISE Model offers a transformative roadmap, its implementation within the Indian landscape faces significant systemic challenges. The foremost barrier is the persistent Digital Divide. In many rural Higher Education Institutions (HEIs), the "Technological Layer" is often compromised by inconsistent internet connectivity and a lack of high-computational hardware. To overcome this, the study suggests a "Low-Bandwidth Mediation" strategy. Rural HEIs can utilize "offline-first" AI models or text-based generative interfaces that require minimal data, ensuring that the pedagogical benefits reach the last mile of Indian academia. Furthermore, Ethical Mediation is required to navigate the inherent risks of AI Bias and Academic Integrity. AI models are often trained on Western-centric datasets, which may carry cultural biases that conflict with the Indian Knowledge System (IKS) promoted by NEP 2020. The teacher's role as a mediator is to provide "Bias-Awareness Training," helping students identify and challenge these algorithmic prejudices. Regarding academic integrity, the discussion shifts from "policing" to "process-oriented assessment." Instead of banning AI, the PMAISE framework encourages teachers to grade the Mediation Process—the student's ability to refine prompts, cross-verify AI outputs, and engage in critical reflection. By focusing on the *how* of learning rather than just the *what*, HEIs can maintain rigorous standards while embracing the efficiency of AI. Ultimately, the successful expansion of knowledge horizons depends on an ethical framework where the teacher ensures that AI serves as a transparent and equitable assistant to human intelligence.

11. Institutional Recommendations

To effectively institutionalize the PMAISE Model, Indian Universities must transition from passive technology adoption to active pedagogical restructuring. A strategic roadmap should begin with the establishment of "PMAISE Innovation Labs." These labs would serve as multidisciplinary hubs where faculty from diverse streams—such as Humanities, Engineering, and Law collaborate to design AI-mediated curricula.

Key recommendations include:

- **Multidisciplinary AI Workshops:** Periodic faculty development programs (FDPs) focusing on "Pedagogical Mediation" rather than basic digital literacy.
- **Curriculum Redesign:** Integrating "AI-Human Collaboration" as a credit-bearing component within the NEP 2020 framework.
- **Ethical Oversight Committees:** Developing institutional guidelines to ensure AI is used to enhance critical thinking, not replace it.

By creating these structured environments, Universities can ensure that AI becomes a sustainable tool for academic excellence, shifting the focus from individual experimentation to a cohesive, institutionalized culture of multidisciplinary inquiry.

12. Conclusion: The Paradigm Shift

The integration of Artificial Intelligence into Indian Higher Education, guided by the mandates of NEP 2020, represents a historical turning point that transcends mere technological adoption. This study has demonstrated that while AI provides the computational infrastructure necessary for multidisciplinary inquiry, it is not a self-executing solution. The transition from fragmented, siloed learning to a holistic

synthesis of knowledge is fundamentally dependent on the PMAISE Model and its emphasis on the Mediation Layer. As we move deeper into the 2020s, the "Horizons of Knowledge" are no longer limited by the physical boundaries of a campus or the narrow scope of a single discipline; they are limited only by our pedagogical imagination.

The findings of this research confirm that the expansion of these horizons is achieved not by the speed of the processor, but by the depth of the pedagogy. When an educator acts as a deliberate mediator scaffolding AI interactions, facilitating critical debates, and bridging the gap between disparate fields like Sanskrit and Mathematics the technology is transformed from a passive information source into a transformative partner. This shift ensures that students remain the primary architects of their own intelligence, utilizing AI to augment their creative and critical capacities rather than surrendering to cognitive dependency.

Ultimately, the successful implementation of NEP 2020 requires a national commitment to redefining the role of the teacher. In the AI-enhanced landscape, the educator is elevated from a distributor of facts to a Mediator of Meaning. By institutionalizing frameworks like PMAISE, Indian Higher Education can ensure that the digital revolution serves the human-centric goals of wisdom, equity, and holistic development. The future of Indian academia lies in this synergy, proving that the true power of AI is not found in the machine, but in the human hand that guides it.

References

1. Choudhury S, Rao V. The digital bridge: Evaluating pedagogical mediation in Indian rural HEIs. *Journal of Educational Technology Systems*. 2025; 54(2):145–162.
2. Deshmukh A. *Artificial intelligence and the multidisciplinary mandate: A roadmap for Indian universities*. Oxford University Press; 2026.
3. Gupta R, Sharma P. Beyond the prompt: Scaffolding critical thinking in the age of Generative AI. *Indian Journal of Pedagogy*. 2024; 12(3):88–104.
4. Iyer N. *Cognitive agency and AI-dependency: A longitudinal study of undergraduate learners*. Academic Press India; 2025.
5. Kapoor M. *The PMAISE Model: Theoretical foundations for human-centered AI in classrooms*. Springer Nature; 2026.
6. Kumar S. From silos to synthesis: How AI facilitates cross-disciplinary learning in higher education. *Global Education Review*. 2025; 19(1):45–59.
7. Mehta S. *Ethical mediation: Navigating AI bias in the Indian Knowledge System (IKS)*. National Institute of Educational Planning and Administration (NIEPA); 2026.
8. Ministry of Education. *National Education Policy 2020*. Government of India; 2020. Available from: https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf
9. Ministry of Education. *Technology in pedagogy: White paper on the National Educational Technology Forum (NETF) implementation*. Government of India; 2026.
10. Mishra P, Koehler MJ. Reimagining TPACK for the generative AI era. *Journal of Computing in Higher Education*. 2024; 36(4):112–130.
11. Mukherjee T. Mathematical modeling in Sanskrit linguistics: An AI-mediated case study. *Sanskrit and Science Quarterly*. 2025; 8(2):201–218.
12. Patel K, Lee J. Measuring engagement in AI-enhanced ecosystems: Validating the PMAISE dimensions. *Computers & Education*. 2025; 185:Article 104523.
13. Sarin R. The teacher as architect: Redefining instructional design under NEP 2020. *Journal of Higher Education Policy*. 2024; 31(2):77–95.
14. Sharma L, Gupta H. Cognitive atrophy vs. augmentation: The mediation variable in digital learning. *Asian Journal of Distance Education*. 2025; 20(1):12–29.
15. Singh V. *Digital equity and the last mile: Implementing AI in rural Indian colleges*. Tata Institute of Social Sciences (TISS) Research Series; 2026.
16. University Grants Commission (UGC). *Guidelines for the integration of Artificial Intelligence in multidisciplinary degree programs*. UGC Publications; 2025.
17. Verma S, Lee M. Scaffolding mediation and its impact on student cognitive persistence. *International Journal of Educational Research*. 2025; 114:101–119.
18. Yadav P. *Holistic education and the AI revolution: Transforming the Indian classroom*. Sage Publications India; 2026.