Role of Artificial Intelligence in Classroom Teaching For Pre-University Students in South Bangalore

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Abstract

Artificial Intelligence is a happening topic in most of the fields which would also include Education across the globe. The role of AI has its own evolution in the field of Education in transforming the mode of teacher interaction, knowledge transfer, student engagement, classroom pedagogy and what not. This conceptual research paper examines the theoretical and practical dimensions of AI-assisted teaching in English in Pre-University (PU) classrooms in South Bangalore, Karnataka. The paper proposes an original conceptual model, the AICAT Model (Adaptive Learning, Intelligent Feedback, Collaborative Engagement, Analytical Assessment, Teacher–Student Augmentation), to map the multifaceted role of AI in this specific educational context. The paper further investigates the specific challenges that can be faced by the PU colleges in South Bangalore, including the economic diversity, linguistic differences, and infrastructural variables. AI adoption can be sensitive according to these mentioned challenges, and identifies critical, ethical concerns including data privacy, screen dependency, and the risk of academic dishonesty. The paper concludes with policy implications for Teacher Education, that can adapt and have programmes of pre-service training of AI in the field of Education.

***Keywords**: Artificial Intelligence, classroom teaching, student engagement, Pre-University education, South Bangalore, AICAT Model, personalized learning, educational technology*

1. Introduction

Artificial intelligence has been growing rapidly in each and every field for the betterment of human capabilities in their respective fields. Education is not one such field that can be hideous from adopting AI. Education which has been shaped by adding values, ethics and shaped by individuality, culture, language and the human relationships along with their

intelligence. It has evolved over the times in the era of ICT integrated training in Teacher Education. It is time for the next era in line – Artificial Intelligence.

Education at its core, is a deeply human enterprise — shaped by interpersonal relationships, multicultural, multilinguistic, and varied aspirations. Yet the twenty-first century has conceived a transformative disruptor: Artificial Intelligence. From adaptive tutoring systems and automated assessments to natural language processing tools and predictive analytics, AI is progressively redefining what it means to teach and to learn. In the Indian context, where educational equity remains a persistent challenge, the promise of AI is especially significant. It holds the potential to personalize instruction at scale, bridge language gaps, and empower teachers with data-driven insights.

South Bangalore presents a particularly rich site for studying this phenomenon. Home to institutions ranging from elite private PU colleges to under-resourced Government colleges, the region encapsulates India's educational paradoxes: high aspiration, uneven infrastructure, linguistic diversity, and intense competitive pressure centered around national entrance examinations like ICAI, NEET, CET, IELTS, TOEFL, IPMAT and CUET. For students in Classes XI and XII or the Pre-University years are also a period of critical cognitive and emotional development, making the pedagogical choices of this phase especially consequential.

This paper is a conceptual study. It does not report on empirical data collected from the field but instead synthesizes existing theoretical literature, global research findings, and contextual analysis to construct a coherent framework for understanding, implementing, and evaluating AI in PU classrooms in South Bangalore. The paper proposes the AICAT Model as its central theoretical contribution and outlines a research agenda for future empirical work and the main objective of this paper is to examine the theoretical underpinnings relevant to AI-integrated classroom teaching, identify the key dimensions through which AI can function in PU classrooms.

2. Purpose of the Study

2.1 Statement of the Problem

Despite the increase of AI-based educational tools globally, research specifically addressing their integration in the Pre-University context in Karnataka is sparse. Most existing Indian studies focus either on higher education or on K-8 schooling. Furthermore, the particular

socio-linguistic and infrastructural features of South Bangalore - including Kannada-English bilingualism, a diverse institutional landscape, and high ICAI/CET/NEET/IPMAT/CUET/TOEFL/IELTS orientation have not been systematically mapped onto AI adoption frameworks. This gap motivates the present paper.

2.2 Significance of the Study

The significance of this paper is threefold. First, it fills a lacuna in region-specific research on AI in Indian secondary education. Second, by grounding the discussion in established learning theories, it provides a principled — rather than merely technological - basis for AI integration. Third, by naming and elaborating a context-sensitive model, it offers practitioners, administrators, and policymakers a usable conceptual vocabulary for evaluating and implementing AI tools in their classrooms.

3. Objectives of the Study

1. To examine the theoretical underpinnings relevant to AI-integrated classroom teaching.
2. To identify the key dimensions through which AI can function in PU classrooms.
3. To contextualize AI adoption within the specific socio-educational landscape of South Bangalore.
4. To propose research questions and hypotheses based on the AI integrated classroom teaching.
5. To propose the AICAT conceptual model as a framework for AI integration at the PU level.
6. To identify ethical challenges and policy implications for educators and policymakers.

4. Research Questions and Hypotheses

Artificial intelligence in classrooms is being studied from multiple angles: teacher roles, instructional practices, student motivation, and learning outcomes. Below are examples of proposed research questions (PRQs) and aligned testable proposed hypotheses (H) grounded in the field of education towards teacher roles, practices, and professional development; instructional support, and personalized/differentiated teaching; Student motivation, engagement, and learning outcomes; Perceptions, ethics, and challenges towards an integration of AI in classroom teaching. (Zhang, Zhuo Zhang, 2024)

4.1 Possible Proposed Research Questions

- PRQ1: What roles do teachers adopt when integrating AI tools (e.g., chatbots, analytics, grading systems) into classroom teaching?
- PRQ2: How does AI-supported teacher education influence teachers' classroom management, instructional design, and digital literacy?
- PRQ3: How do teachers' pedagogical beliefs and professional development shape their implementation of AI in instruction and assessment?
- PRQ4: How does AI used for personalized learning (adaptive content, feedback, analytics) change teachers' instructional strategies in K-12 classrooms?
- PRQ5: What is the role of AI in supporting differentiated instruction and inclusive classrooms?
- PRQ6: How does AI-mediated instruction (e.g., chatbots, intelligent tutoring, AI-supported discourse analysis) affect students' motivation and engagement?
- PRQ7: To what extent do AI-based tutoring, assessment, and prediction systems improve student learning outcomes?
- PRQ8: What are teachers' and students' perceptions of AI's benefits, risks, and ethical issues in classroom teaching?

4.2 Example Proposed Hypotheses

- H1: Participation in AI-focused professional development increases teachers' confidence and competence in using AI for planning, instruction, adaptability and assessment.
- H2: Teachers with stronger AI-related pedagogical knowledge (not just technical skills) are more likely to integrate AI meaningfully into classroom teaching.
- H3: AI tools in differentiated instruction classrooms increase teachers' perceived ability to meet diverse learner needs.
- H4: In AI-supported classes, higher perceived teacher support moderates the positive effect of AI tools on students' intrinsic motivation and learning outcomes.

4.3 Different Classroom-Focused AI Roles

Table 1: Key AI roles mapped to classroom proposed research questions (Ismail Celik, Muhterem Dindar, Hanni Muukkonen & Sanna Jarvela, 2022)

Focus area	Example AI role in teaching	Example linked PRQs
Planning & Instructional Material	Personalized learning, material design	PRQ1, PRQ4

Classroom management & support	Analytics, admin automation	PRQ2, PRQ4
Assessment & feedback	Automated grading, adaptive tests	PRQ3, PRQ7
Student motivation & engagement	Chatbots, interactive tools	PRQ6

This conceptual work suggests to take up empirical research to determine the rich possibilities to ask focused questions about how AI reshapes teacher roles, instructional design, motivation, and learning outcomes. The hypotheses above can be refined for specific tools, subjects, or age groups.

5. Review of Related Literature

5.1 AI in Education: Global Perspectives

Research on AI in education (AIED) has expanded considerably in the past decade. Luckin et al. (2016) provided an influential taxonomy of AIED, categorizing applications into intelligent tutoring systems (ITS), automated assessment, adaptive learning environments, and teacher support tools. Holmes, Bialik, and Fadel (2019) extended this discussion by arguing that AI should augment, not replace, the teacher — a position that finds strong resonance in the Indian PU context where the teacher-student relationship carries deep cultural significance.

Adaptive learning platforms such as Carnegie Learning and Knewton have demonstrated measurable gains in student performance in STEM subjects (VanLehn, 2011). More recently, the emergence of large language models (LLMs) such as GPT-4 has opened new possibilities for natural language interaction in classrooms - including explaining complex concepts, generating practice questions, and providing writing feedback - capabilities directly relevant to the English language component of the Karnataka PU curriculum.

5.2 AI in Indian Educational Contexts

In India, EdTech platforms such as BYJU'S, Vedantu, and Khan Academy (in its localized form) have achieved widespread penetration, particularly for competitive exam preparation. Studies by Kumar and Jain (2021) and Sharma et al. (2022) note that while urban students benefit significantly from these AI-enhanced platforms, rural and semi-urban students remain constrained by device access and bandwidth limitations. Critically, most Indian studies treat AI adoption as a student-facing phenomenon, overlooking its potential to empower and support teachers.

The National Education Policy (NEP) 2020 explicitly endorses the integration of technology in teaching and learning, calling for "use of technology in improving teaching-learning processes" and emphasising the need for digital literacy among both teachers and students (MHRD, 2020). Central to this strategy is democratising technology—ensuring AI tools and digital platforms reach remote villages, tribal areas, and underserved communities, bridging the digital divide. This comprehensive approach aligns with the **Viksit Bharat 2047** vision, positioning India as an inclusive global AI leader. (PIB - Press Information Bureau, 2026). This policy impetus provides a formal institutional framework within which the present paper's recommendations can be located.

5.3 Pre-University Education in Karnataka: Context and Challenges

Karnataka's Pre-University education system, overseen by the Department of Pre-University Education (DPUE), serves approximately 1.2 million students annually across science, commerce, and humanities streams. South Bangalore, encompassing jurisdictions such as Jayanagar, Banashankari, JP Nagar, Yelachenahalli, BTM Layout, Bannerghatta Road, Koramangala, and Hulimavu, hosts a diverse array of government, aided, and private PU colleges. The student body is linguistically diverse, with significant numbers of Kannada-medium background students enrolled in English-medium colleges - a transition that generates persistent comprehension and expression challenges.

The two-year PU curriculum culminates in board examinations that are high-stakes both in themselves and as gateways to undergraduate admission. This examination-driven culture shapes pedagogy significantly: teaching tends to be content-heavy and assessment-focused, leaving limited space for exploratory or inquiry-based learning. AI tools that can personalize exam preparation, provide instant feedback, and free teacher time for deeper mentoring therefore hold particular promise in this context.

6. Theoretical Framework

This paper draws on three interlocking theoretical traditions to ground its analysis of AI in PU classrooms.

6.1 Constructivism: By Vygotsky and Piaget

Constructivist theory states that learners actively construct knowledge through experience rather than passively receiving it (Piaget, 1952). Vygotsky's (1978) concept of the Zone of Proximal Development (ZPD) — the gap between what a learner can do independently

and what they can achieve with support — is especially relevant to AI integration. Adaptive AI systems can function as dynamic scaffolds, continuously modulating the level of challenge and support to maintain learners within their ZPD. In a PU classroom where one teacher may face sixty or more students with varying levels of prior knowledge, AI-enabled scaffolding represents a practical solution to an otherwise intractable pedagogical challenge.

6.2 Connectivism: By Siemens and Downes

Connectivism (Siemens, 2005; Downes, 2012) argues that in a networked digital age, learning is not confined to the individual mind but is distributed across people, organizations, and technological systems. Knowledge resides in connections, and the capacity to navigate and form those connections is itself a core competency. AI tools — from intelligent search to recommendation algorithms to collaborative platforms — embody connectivism principles by linking students to relevant information, peers, and experts across the globe. For PU students in South Bangalore, this means access to world-class explanations, diverse problem sets, and global academic conversations that would otherwise be inaccessible.

6.3 Personalized Learning Theory

Personalized Learning (Bray and McClaskey, 2015) holds that optimal educational outcomes are achieved when instruction is tailored to the individual learner's pace, style, interests, and readiness. This learning however can be utilized at the best to an approximation in a traditional classroom instruction which not only has a fixed syllabi but a limited teacher time. Moreover, AI can be of useful with respect to tracking individual progress, identifying misconceptions, generating targeted practice, and adjusting content complexity in real time. This helps directly in a stressful, pressurized PU environment transform into more effective and less stressful for the students during their exam preparation.

6.4 Synthesis: Why These Three Theories?

The three frameworks address AI integration at three levels: the individual cognitive level (constructivism), the social-networked level (connectivism), and the systemic institutional level (personalized learning). The AICAT Model proposed in Section 7 is designed to be coherent with all three perspectives, ensuring that AI integration is simultaneously cognitively meaningful, socially connected, and institutionally viable.

7. Proposed Methodology

The study worked diligently was to explore how artificial intelligence contributes to education thoroughly. I accessed a range of prominent digital repositories and databases to search the relevant literature. Particularly, Springer, Science Direct, Wiley, MHRD, and NEP 2020 were targeted to search the relevant literature. I also used Google Scholar and Google to make sure that I didn't miss any important information. (Firas Almasri, 2024)

8. The AICAT Model: A Proposed Conceptual Framework

Building on the theoretical foundations and dimensional analysis outlined above, this paper proposes the AICAT Model as a structured conceptual framework for understanding and implementing AI in PU classrooms. The model comprises five sequential and interconnected stages:

Stage A — Adaptive Learning: AI systems analyze each student's prior knowledge, learning pace, and preferred modality to deliver content at the appropriate level of complexity. This stage is grounded in constructivist principles of scaffolding and ZPD.

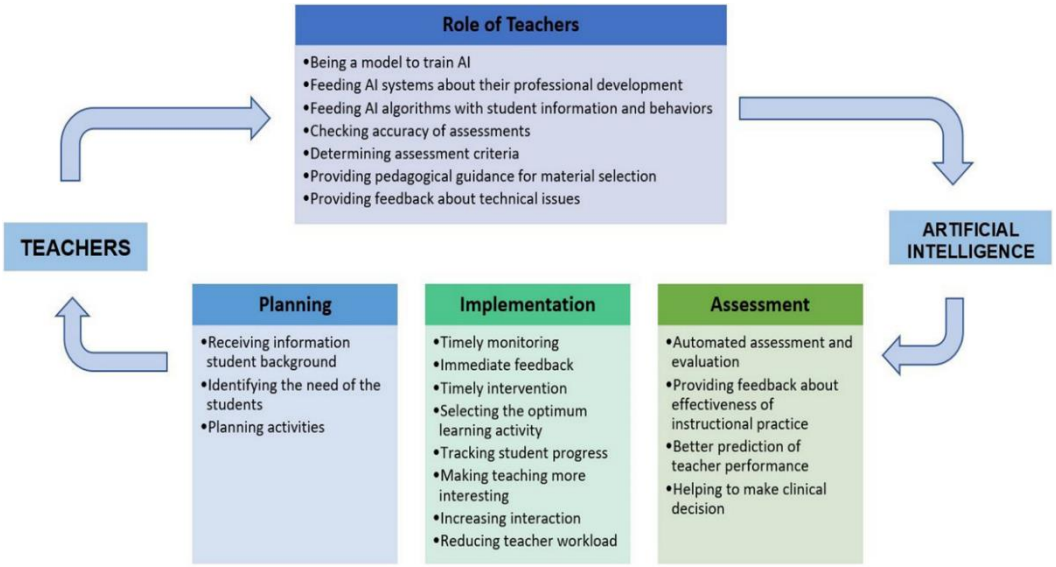
Stage I — Intelligent Feedback: Students receive immediate, specific, and actionable feedback on their responses through AI-powered assessment tools. Feedback is not merely correctional but explanatory, helping students understand why an answer is incorrect and what conceptual revision is needed.

Stage C — Collaborative Engagement: AI facilitates peer collaboration through intelligent grouping algorithms that match students with complementary knowledge gaps and strengths. Collaborative problem-solving, mediated by AI platforms, reflects connectivism principles of distributed cognition.

Stage A — Analytical Assessment: Continuous formative assessment data is aggregated and analyzed by AI to produce individual learning trajectories, class-level heat maps of performance, and early warning indicators for at-risk students. This data is made accessible to teachers in actionable dashboards.

Stage T — Teacher–Student Augmentation: The culminating stage reimagines the teacher-student relationship in an AI-mediated environment. Teachers, freed from routine tasks and armed with rich data, invest their time in higher-order mentoring, emotional support, and the cultivation of critical and creative thinking. AI augments but never supplants this human dimension.

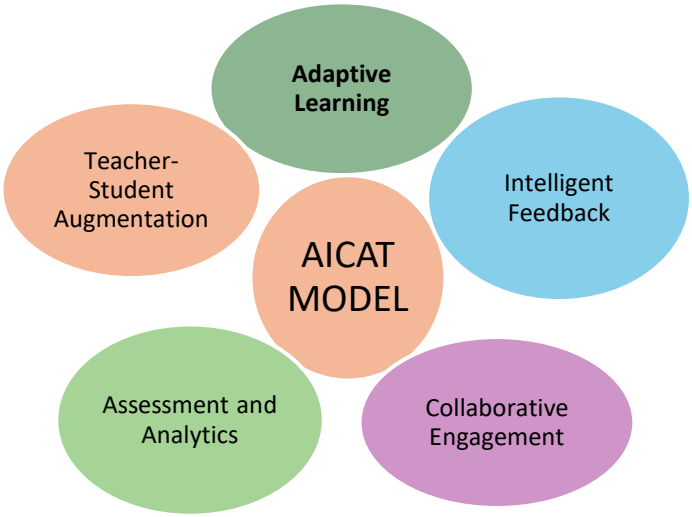
Figure 1: Advantages of AI and teacher roles in AI research (Ismail Celik, Muhterem Dindar, Hanni Muukkonen & Sanna Jarvela, 2022).



8.1 Visualising the AICAT Model

The AICAT Model can be visualised as a cyclical, iterative loop rather than a strictly linear sequence. Adaptive learning feeds data into intelligent feedback; feedback informs collaborative groupings; collaborative outcomes are captured in assessment analytics; and analytics guide teacher actions that, in turn, reshape the adaptive learning parameters for the next cycle. This cyclical architecture ensures that the model is responsive to real classroom dynamics rather than a static prescription.

Figure 2: The cyclical process of AICAT Model that could be adopted to integrated AI in classroom teaching.



8.2 Contextualization of the AICAT Model for South Bangalore

The application of the AICAT Model in South Bangalore requires sensitivity to several local variables. The Adaptive Learning stage must account for Kannada–English bilingualism by privileging AI tools with robust multilingual functionality.

The Intelligent Feedback stage must be calibrated to the high-stakes examination culture, ensuring that feedback is both formatively valuable and examination-relevant.
The Collaborative Engagement stage must navigate the socioeconomic heterogeneity of South Bangalore classrooms, where some students possess personal devices and reliable internet while others do not.

The Assessment and Analytics stage must be aligned with Karnataka PU Board examination formats, which differ from the multiple-choice paradigm dominant in Western AIED research. Finally, the Teacher–Student Augmentation stage must respect the cultural centrality of the guru-shishya tradition in Karnataka, positioning AI unambiguously as a tool that deepens rather than displaces this relationship.

Table 2: A table consisting of proposed population, proposed samples. (Ismail Celik, Muhterem Dindar, Hanni Muukkonen & Sanna Jarvela, 2022)

Element	Concrete Choice (Example)
Population	Grade 7–12 classes using AI in Core subjects / Languages
Sampling Unit	Intact classes across 3 schools or 3 Pre-university colleges (cluster sampling)
Student Sample	~300–500 students, balanced intervention/control
Teacher Sample	25 – 50 teachers using AI tools in class

An AICAT-based empirical design can (a) treat AI-using classrooms as the main population, sampling intact classes and their teachers, or (b) focus on teachers as the population, sampling across institutions. Sample sizes in the 300–500 learner or 200–400 teacher range, with multi-cluster and stratified sampling, are consistent with recent AI-in-education studies and support robust analysis of AI's classroom roles.

A robust AICAT-style methodology should: (1) start from data-informed awareness of learners, (2) embed AI thoughtfully into lesson design, (3) structure explicit teacher–AI collaboration, (4) use AI to transform personalization and dialogue, and (5) close the loop with continuous AI-supported assessment and ethical, human-centered reflection.

9. Contextual Variables: The South Bangalore Landscape

Any framework for AI integration that ignores its context of application risks becoming prescriptive in ways that are locally irrelevant or actively harmful. The following contextual variables are particularly salient for South Bangalore PU education.

9.1 Socioeconomic Diversity

South Bangalore encompasses both affluent localities — Jayanagar, Koramangala, JP Nagar, Yelachenahalli - and more economically mixed areas such as BTM Layout, Bannerghatta Road, and Hulimavu. Government PU colleges in the region serve predominantly first-generation learners for whom personal devices and broadband access cannot be assumed. Any AI integration framework must therefore include provisions for shared device models, offline functionality, and institutional Wi-Fi infrastructure.

9.2 Digital Infrastructure

While South Bangalore benefits from relatively robust urban digital infrastructure compared to rural Karnataka, significant disparities exist between private and government institutions. Smart classrooms, projectors, and computer labs - prerequisites for many AI applications are standard in private colleges but unevenly distributed in government and aided colleges. Effective AI integration must therefore begin with an infrastructure audit and a phased implementation plan that does not create or deepen the digital divide.

9.3 Language Context

The linguistic landscape of South Bangalore PU classrooms is complex. A substantial proportion of students arrive from Kannada-medium schooling backgrounds and face significant challenges in comprehending English-medium instruction. AI tools with Kannada language support - including Kannada-to-English explanation modules, bilingual vocabulary builders, and code-switched practice questions - have particular value in this context. The Karnataka PU English syllabus itself, which includes canonical literary texts, can be enriched through AI-powered annotation and comprehension support.

9.4 Examination Pressure and Entrance Test Exam Orientation

The dominant educational imperative for PU students in South Bangalore is success in the Karnataka Common Entrance Test (CET), for science students, in NEET (National Eligibility cum Entrance Test), CUET (Common University Entrance Test), IPMAT (Integrated Programme in Management Aptitude Test), IELTS (International English Language Testing System), and TOEFL (Test of English as a Foreign Language). This high-stakes examination culture shapes how students, parents, and teachers evaluate any pedagogical tool: its value is judged primarily by its impact on examination scores. AI tools that demonstrably improve CET/NEET/CUET/IPMAT/IELTS/TOEFL preparation - through adaptive question banks, performance analytics, and targeted revision - are likely to gain rapid adoption. However, this examination-centric framing also risks reducing AI's richer pedagogical potential to a sophisticated drilling machine.

9.5 Teacher Readiness and Digital Literacy

The effectiveness of any AI integration initiative is ultimately determined by teacher adoption. PU teachers in South Bangalore vary considerably in their digital literacy, their familiarity with AI tools, and their willingness to modify established pedagogical practices. Younger teachers with recent training may be more receptive, while experienced teachers with established methods may require more sustained professional development and institutional support. A successful AI integration policy must invest as heavily in teacher capacity-building as in technology procurement.

10. Implications and Recommendations

10.1 For Students

When integrated thoughtfully, AI offers PU students in South Bangalore the prospect of genuinely personalized, self-paced learning that is responsive to their individual knowledge states and examination goals. Beyond academic performance, AI tools that provide immediate, constructive feedback can reduce examination anxiety and build self-efficacy. Students must, however, be explicitly educated in the responsible, critical use of AI - understanding its capabilities, limitations, and ethical boundaries.

10.2 For Teachers

AI does not diminish the teacher's role; it redefines it. Teachers who embrace AI-assisted pedagogy can redirect their energy from routine instruction and assessment to the

dimensions of education that remain irreducibly human: motivating, mentoring, modelling intellectual curiosity, and attending to students' emotional needs. Institutions must support this transition through sustained professional development, not merely one-off workshops on specific tools.

10.3 For Institutions

PU colleges in South Bangalore should conduct AI readiness assessments covering infrastructure, teacher capacity, and student access before committing to specific tools or platforms. A phased, pilot-based approach — beginning with a single subject or a single use case (such as automated formative assessment) before scaling — is likely to produce more sustainable outcomes than wholesale adoption. Institutions should also establish AI ethics committees that include teacher, student, and parent representatives.

10.4 For Policymakers

SOAR Initiative - The Ministry of Skill Development and Entrepreneurship launched SOAR (Skilling for AI Readiness) to build AI awareness and skills for classes 6-12 students and educators. Program includes three 15-hour student modules and one 45-hour "AI for Educators" teacher module. (PIB - Press Information Bureau, 2026). The educators or the common public are unaware of such programmes initiated by the Ministry of Skill Development and Entrepreneurship. Moreover, the module trains teachers to understand AI curriculum and pedagogy, use AI tools effectively in classrooms, promote inclusivity for diverse learners, create educational AI projects, and teach responsible AI ethics (PIB - Press Information Bureau, 2026). This could be implemented drastically only when this is a part of teacher education curriculum which would enhance the teachers' professional competency that may reflect through their pedagogical practices in the classroom and the students are definitely benefitted to learn effectively.

The Karnataka Department of Pre-University Education should improvise a comprehensive AI Integration Policy for PU colleges that addresses: minimum infrastructure standards for AI-enabled classrooms; guidelines for EdTech vendor selection with emphasis on data privacy compliance; a framework for AI-aligned teacher professional development; and protocols for monitoring and evaluating the impact of AI tools on student outcomes, equity, and well-being. The policy should explicitly acknowledge the linguistic diversity of the state and mandate multilingual functionality as a condition of approval for AI tools used in Karnataka PU colleges.

11. Research Variables for Future Empirical Study

This conceptual paper lays the groundwork for empirical research. Future studies operationalizing this framework should consider the following variable structure:

11.1 Independent Variable

Integration of AI tools in classroom teaching at the School or PU level.

11.2 Dependent Variables

- Student academic performance (formative and summative assessment scores)
- Student engagement and motivation (measured through validated instruments)
- Teacher effectiveness and instructional satisfaction
- Learning outcomes in specific subjects (English, Physics, Biology, Commerce)

11.3 Moderating Variables

- Type of institution (government / aided / private unaided)
- Subject stream (Science / Commerce / Humanities)
- Student's prior digital exposure and device ownership
- Teacher's digital literacy level
- Language background (Indian language medium vs. English-medium prior schooling)

12. Conclusion

This paper has argued that the role of AI in classroom teaching for Pre-University students in South Bangalore is neither a simple technological question nor a distant theoretical possibility - it is an immediate pedagogical and policy challenge that demands principled, contextually grounded engagement. Drawing on constructivism, connectivism, and personalized learning theory, and translating these frameworks into the five-stage AICAT Model, the paper has offered a structured way of thinking about how AI can serve students, teachers, and institutions in this specific setting.

The promise of AI in PU classrooms is real: more personalized instruction, more efficient assessment, more empowered teachers, more connected learners. But that promise will only be realized if integration is thoughtful, equitable, and ethically grounded. South Bangalore's educational landscape — with its diversity, its aspirations, and its contradictions — is precisely the kind of context in which the difference between thoughtless technology adoption and principled AI integration will be most clearly visible, and most consequential.

The study provides a novel contribution of AI in education. This paper invites researchers, educators, and policymakers to take up the empirical and practical work that the conceptual framework here has tried to make more legible. The classroom of the twenty-first century PU student in South Bangalore deserves no less than our best collective thinking.

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