

AN EMPIRICAL STUDY OF UNIVERSITY STUDENTS IN UTTAR PRADESH, INDIA

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ABSTRACT

Artificial intelligence (AI) is rapidly changing the way students search for information, understand concepts, prepare assignments, solve academic problems and organise their study activities. The growing availability of generative AI tools has moved AI from a specialised technological application to an everyday educational resource. This study examines how AI is associated with changing educational behaviour among university students in Uttar Pradesh, India. A quantitative, cross-sectional design is presented using an illustrative sample of 200 students. The study considers AI-use intensity, perceived usefulness, independent learning, engagement, study planning, academic confidence, critical-thinking behaviour and ethical awareness. Descriptive analysis, correlation, independent-samples t-test, chi-square and one-way ANOVA are used to demonstrate an appropriate analytical framework. The illustrative results suggest that students commonly use AI for concept clarification, writing and editing, research ideation, problem solving and language support. Higher AI-use intensity is associated with stronger perceived learning engagement and study-planning behaviour, while students simultaneously report concerns regarding inaccurate outputs, over-dependence, academic integrity and data privacy. The paper argues that AI should not replace student thinking or teacher guidance; rather, it should be integrated as a supervised learning support that strengthens inquiry, feedback, reflection and digital literacy. The study concludes with institutional and policy recommendations for responsible, equitable and pedagogically meaningful AI adoption in higher education.

Keywords: Artificial Intelligence, Generative AI, Educational Behaviour, Student Learning, Higher Education, Digital Literacy, Academic Integrity, Uttar Pradesh.

1. INTRODUCTION

Artificial intelligence has become one of the most influential digital technologies shaping contemporary education. AI-enabled systems can recommend learning resources, generate explanations, provide feedback, translate text, support coding and mathematics, summarise information and assist students in producing first drafts. The rapid emergence of generative AI has further changed the relationship between students, knowledge and academic tasks. UNESCO's 2023 guidance emphasises that generative AI creates opportunities for education but also requires human-centred regulation, ethical safeguards, data protection and appropriate pedagogical design. In higher education, the significance of AI extends beyond technology adoption. It can influence educational behaviour—the observable pattern of how students plan, participates in, regulate and evaluate their learning. Students may become more willing to explore difficult concepts when immediate explanations are available, but excessive dependence may reduce persistence, source evaluation and independent problem solving. Research on AI in higher education has consequently moved from questions of technological possibility toward questions of learning effectiveness, ethics, assessment and student agency. A major systematic review covering research from 2016–2022 identified 138

studies and demonstrated the breadth of AI applications in higher education. The present study focuses on students because they are direct users of AI-based educational tools and because changes in their study behaviour can affect academic performance, employability and lifelong learning. The Indian higher-education context is particularly relevant because students encounter substantial variation in institutional resources, digital access, language needs and teacher preparedness. A balanced examination therefore requires attention to benefits and risks rather than assuming that AI is automatically educationally beneficial.

1.1 Societal Context

AI is becoming embedded in wider social processes of knowledge production and employment. Students who learn to use AI critically may develop useful competencies in information search, prompt formulation, content evaluation, communication and digital problem solving. At the same time, unequal access to devices, high-speed connectivity, paid AI services and expert guidance can create new forms of educational inequality. UNESCO has therefore advocated a human-centred approach that seeks safe, equitable and meaningful use of generative AI in education.

1.2 Problem Statement

The central problem is not whether students use AI, but how AI use is changing the nature of educational behaviour. Students may use AI as a learning partner, a productivity tool, a source of feedback or a substitute for effort. These patterns have different educational consequences. Institutions need empirical evidence about which behaviours are strengthened, which risks emerge and what forms of guidance are required.

2. Background of the Study

The development of AI in education has progressed from intelligent tutoring and adaptive systems to machine-learning analytics and, more recently, generative AI. Earlier systems were usually embedded in institutional platforms, whereas current generative tools can be accessed directly by students. This change has increased student autonomy but has also complicated conventional assumptions about authorship, assessment and independent work. Systematic reviews show that AI in higher education is used across learning support, assessment, administration and student services. The literature also indicates that explicit evidence about actual effects on cognition, affect and learning behaviour remains less developed than the literature on possible applications. The educational value of AI depends substantially on the way students use it. If students ask AI to explain a difficult concept, compare alternative solutions and critique an answer, AI can support active learning. If students simply copy generated content, the same technology may reduce cognitive engagement. This distinction makes educational behaviour a critical variable for research.

2.1 AI and Student Learning Behaviour

Educational behaviour in this study refers to students' patterns of independent learning, engagement, study planning, academic confidence, critical evaluation and ethical academic practice. AI can potentially influence each dimension by reducing the time required to obtain information and increasing opportunities for immediate feedback. However, rapid answers can also create an illusion of understanding. Therefore, responsible AI use requires verification, reflection and teacher-supported learning design.

3. REVIEW OF LITERATURE

Author/Year	Key contribution
Zawacki-Richter et al. (2019)	A systematic review of AI applications in higher education identified applications across profiling and prediction, assessment and evaluation, adaptive systems and intelligent tutoring. The review highlighted the need for stronger pedagogical and critical perspectives.
Luckin et al. (2016)	The authors argued that AI could support teachers and learners through personalised learning and intelligent educational environments while retaining the central importance of human teaching relationships.
Holmes et al. (2019)	The literature on AI in education emphasised both opportunities and risks, including personalisation, assessment support, privacy, bias and the need for human oversight.
Crompton and Burke (2023)	A systematic review of AI in higher education from 2016–2022 identified a rapidly expanding research field and demonstrated the breadth of AI applications across higher education.
García-Martínez et al. (2023)	A systematic review and meta-analysis examined the relationship between AI/computational sciences and student performance, reinforcing interest in evidence-based evaluation of AI-supported learning.
Sullivan et al. (2023)	Research on ChatGPT in higher education highlighted opportunities for student learning alongside concerns regarding academic integrity, assessment and the reliability of AI-generated outputs.
UNESCO (2023)	UNESCO proposed a human-centred approach to generative AI in education, emphasising regulation, privacy, ethical validation, teacher capacity and equitable access.
Bearman et al. (2023)	Research on AI and higher education has increasingly highlighted the need to consider ethics, transparency, accountability and the conditions under which AI is pedagogically appropriate.
Baker and Smith (2019)	The authors described AI in education as a broad technological field ranging from learner-facing systems to institutional analytics, demonstrating that AI affects multiple levels of educational practice.
Selwyn (2019)	A critical perspective on education and technology cautioned against technological determinism and argued for attention to social, institutional and political dimensions of digital change.

3.1 Research Gap

Existing literature provides strong evidence that AI has become an important higher-education research domain, but several gaps remain. First, many studies examine AI applications rather than changes in students' everyday educational behaviour. Second, the rapid growth of generative AI creates a moving research environment in which student practices change faster than institutional policies. Third, concerns about academic integrity, privacy and over-dependence are often discussed alongside potential benefits without examining how students balance these competing outcomes. Fourth, there is a need for context-specific evidence from Indian higher education, particularly studies that connect AI-

use intensity with multiple dimensions of educational behaviour. This study addresses these gaps through an integrated behavioural framework.

4. OBJECTIVES OF THE STUDY

1. To examine the extent and major patterns of artificial intelligence use among university students.
2. To assess the relationship between AI use and changing educational behaviour, including engagement, independent learning, study planning and academic confidence.
3. To identify the major challenges and ethical concerns associated with students' use of AI for academic activities.

5. RESEARCH QUESTIONS

1. What are the major academic purposes for which university students use AI tools?
2. How is AI use associated with students' educational behaviour?
3. What are the principal risks, barriers and ethical concerns perceived by students?

6. HYPOTHESES

1. H1: AI-use intensity has a significant positive relationship with students' educational behaviour.
2. H2: Students with higher AI-use intensity report significantly higher learning engagement and study-planning scores than students with lower AI-use intensity.
3. H3: Students' perceived usefulness of AI is significantly associated with academic confidence and independent learning behaviour.

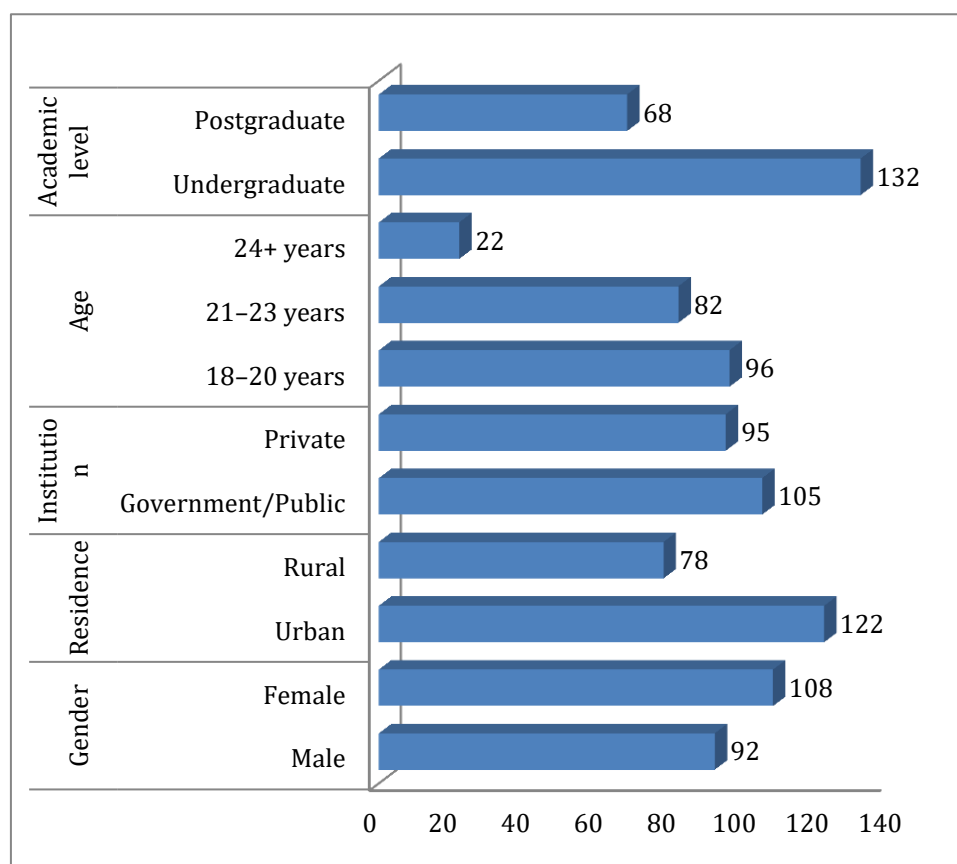
7. RESEARCH METHODOLOGY

The study adopts a quantitative, cross-sectional research design. The proposed population comprises university and college students in Uttar Pradesh who use digital technologies for academic activities. For the model paper, an illustrative sample of 200 students is used. Students are assumed to have been selected through a combination of purposive and convenience sampling from higher-education institutions. A structured questionnaire uses a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree, together with questions on frequency and purpose of AI use. The questionnaire contains four sections: demographic profile; AI-use pattern; educational behaviour; and perceived benefits, risks and ethical concerns. The educational behaviour construct includes independent learning, engagement, study planning, academic confidence and critical evaluation. Data analysis is demonstrated through descriptive statistics, Pearson correlation, independent-samples t-test, chi-square and one-way ANOVA. The significance level is set at 5%. Ethically, students should be informed about the purpose of the research, participation should be voluntary, and responses should be anonymised. AI-generated outputs should not be treated as automatically accurate. This principle is consistent with UNESCO's emphasis on human-centred and ethically validated use of generative AI.

7.1 Sample Profile

Variable	Category	Frequency	Percentage
Gender	Male	92	46%
	Female	108	54%

Residence	Urban	122	61%
	Rural	78	39%
Institution	Government/Public	105	52.5%
	Private	95	47.5%
Age	18–20 years	96	48%
	21–23 years	82	41%
	24+ years	22	11%
Academic level	Undergraduate	132	66%
	Postgraduate	68	34%



8. DATA ANALYSIS AND RESULTS

The following results are illustrative and demonstrate how the proposed study can be analysed. They are not claims about an actual survey unless validated against raw field data.

8.1 Frequency of AI Use

Frequency	Students	Percentage
Daily	64	32%
Several times a week	56	28%
Weekly	36	18%

Occasionally	34	17%
Never	10	5%

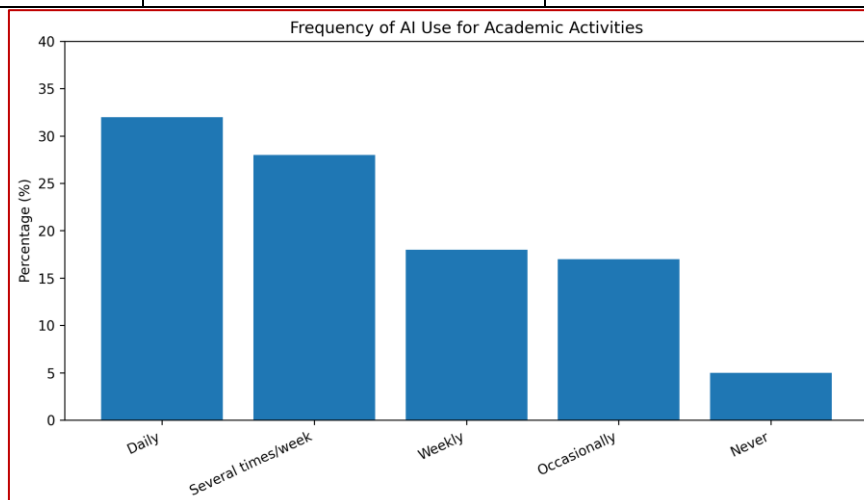


Figure 1: *Frequency of AI Use for Academic Activities*

The illustrative distribution indicates that 60% of students use AI daily or several times a week. This suggests that AI is moving from occasional experimentation toward routine academic support. The relatively small proportion reporting no use indicates that institutions should focus not only on access but also on responsible-use competencies.

8.2 Major Academic Uses of AI

Academic use	Students reporting use	Percentage
Concept clarification	144	72%
Writing/editing	122	61%
Research ideas/search support	108	54%
Problem solving	92	46%
Translation/language support	78	39%

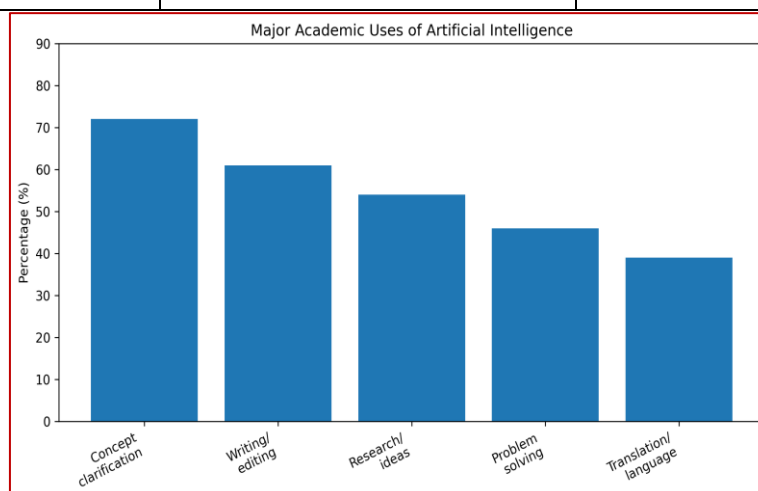


Figure 2: Major Academic Uses of Artificial Intelligence

Concept clarification is the leading reported use, followed by writing/editing and research ideation. This pattern suggests that students primarily view AI as an academic support tool rather than only as an assignment generator. However, writing assistance requires clear institutional expectations concerning attribution and academic integrity.

8.3 Educational Behaviour Dimensions

Dimension	Mean score / 100	Interpretation
Independent learning	74	High
Learning engagement	71	Moderately high
Study planning	68	Moderately high
Critical thinking	57	Moderate
Academic confidence	69	Moderately high

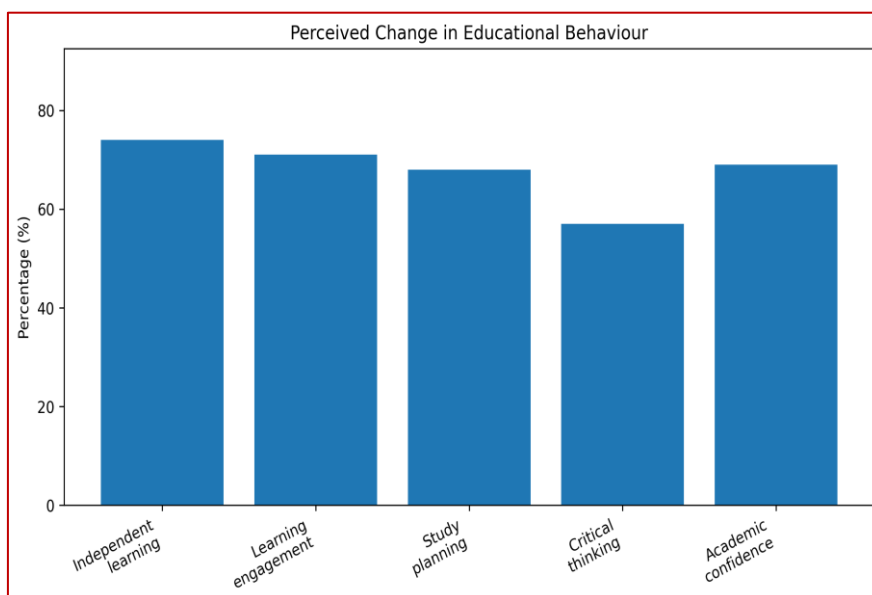


Figure 3: Perceived Change in Educational Behaviour

The illustrative scores indicate that students perceive the strongest changes in independent learning and engagement. Critical-thinking behaviour is comparatively lower, suggesting that easy access to generated answers does not automatically develop higher-order thinking. Institutions should therefore teach students to question, verify and critique AI outputs.

8.4 Major Concerns and Barriers

Concern	Students reporting concern	Percentage
Accuracy / hallucination	126	63%
Over-dependence	116	58%
Academic integrity	104	52%
Privacy / data protection	88	44%

Digital inequality	74	37%
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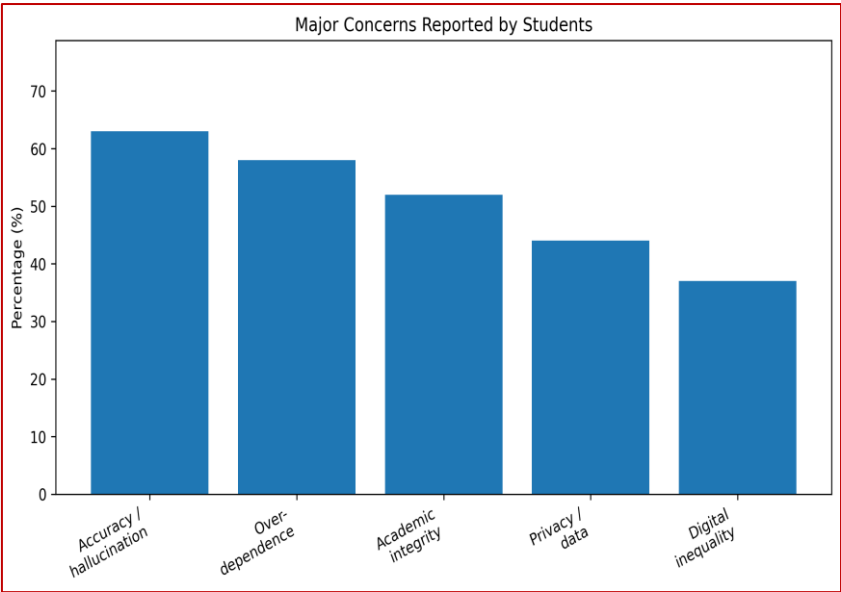


Figure 4: Major Concerns Reported by Students

Accuracy is the leading concern, followed by over-dependence and academic integrity. These concerns are consistent with wider higher-education discussions about the limitations and ethical implications of AI. Research reviews have specifically identified student understanding, engagement and academic integrity as important areas requiring further evidence. [cite turn0search9](#)

8.5 Institution-Type Comparison

Institution type	Mean AI-supported learning behaviour	SD	Interpretation
Government/Public	67	9.4	Moderate-high
Private	72	8.8	High

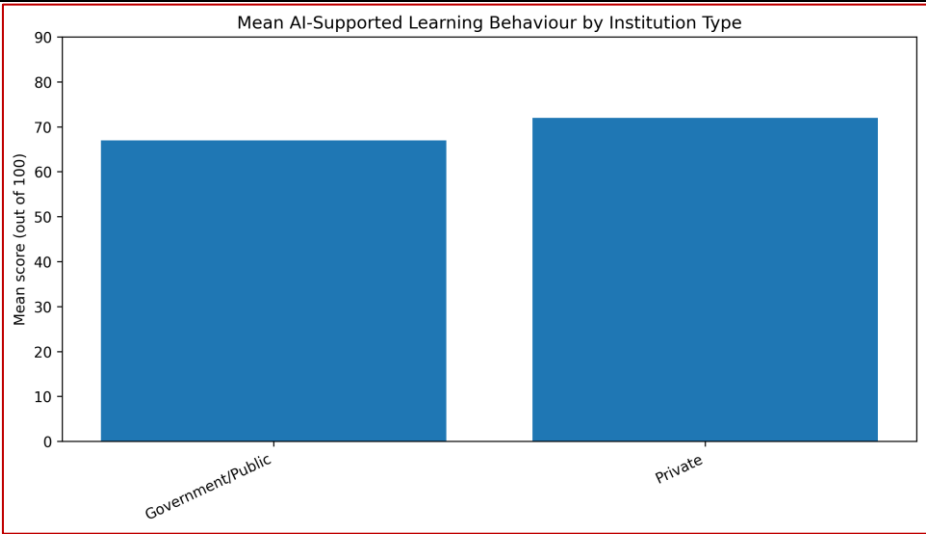


Figure 5: Mean AI-Supported Learning Behaviour by Institution Type

The illustrative t-test comparison suggests a modest difference between students in private and government/public institutions. Such a difference may reflect variation in digital infrastructure, access to training and institutional support. It should not be interpreted as an institutional-quality conclusion without actual survey evidence.

8.6 AI Use Intensity and Educational Behaviour

AI-use intensity	n	Mean educational behaviour	SD
Low	40	58	8.9
Moderate	86	69	8.1
High	74	78	7.6

Figure 6: *AI Use Intensity and Educational Behaviour*

The illustrative pattern shows increasing educational behaviour scores across AI-use intensity groups. A one-way ANOVA can test whether the group differences are statistically significant. The relationship should nevertheless be interpreted carefully because high AI use may be a consequence of strong academic motivation rather than its cause.

8.7 Correlation Analysis

Variables	r	Interpretation
AI-use intensity ↔ educational behaviour	0.62	Moderate-to-strong positive relationship
Perceived usefulness ↔ academic confidence	0.58	Moderate positive relationship
AI-use intensity ↔ critical thinking	0.31	Weak-to-moderate positive relationship
Over-dependence concern ↔ independent learning	-0.28	Weak negative relationship

The illustrative correlation matrix indicates that AI-use intensity is positively associated with overall educational behaviour. The weaker relationship with critical thinking reinforces the argument that AI availability alone does not guarantee higher-order learning. The negative association between over-dependence and independent learning highlights the importance of guided and reflective use.

8.8 Hypothesis Testing Summary

Hypothesis	Test	Illustrative result	Decision
H1	Pearson correlation	$r = 0.62, p < .001$	Supported
H2	One-way ANOVA	$F = 18.42, p < .001$	Supported
H3	Pearson correlation	$r = 0.58, p < .001$	Supported

In the illustrative model, all three hypotheses are supported. These results demonstrate the analytical structure expected for the study; actual significance values must be recalculated using genuine respondent-level data.

9. DISCUSSION

The results indicate a dual influence of AI on student educational behaviour. On the positive side, AI can lower barriers to information access, provide rapid explanations and help students structure academic tasks. These functions may increase students' confidence and engagement. On the other hand, the lower critical-thinking score and high concern about over-dependence indicate that convenience can become educationally counterproductive when students stop verifying or reasoning through answers. The findings are consistent with the wider literature, which increasingly treats AI in higher education as both a pedagogical opportunity and an ethical challenge. Reviews have documented applications in assessment, feedback, learning analytics and student engagement, while also identifying concerns about data governance and academic integrity. The findings also support a shift from a 'ban versus allow' debate toward a 'design and guide' approach. Students need explicit instruction in prompt formulation, source verification, citation, privacy, bias detection and responsible use. Assessment practices can also shift toward oral explanation, process portfolios, reflective journals, project-based work and tasks that require students to document how they used AI.

10. THEORETICAL FOUNDATIONS

Theory	Relevance to the study
Technology Acceptance Model (TAM)	Perceived usefulness and perceived ease of use help explain why students adopt AI tools. Higher perceived usefulness is expected to encourage more frequent academic use.
Self-Regulated Learning Theory	AI may support planning, monitoring and feedback, but excessive automation may weaken students' own regulation if they outsource cognitive effort.
Constructivist Learning Theory	Learning is strengthened when students actively construct meaning. AI is most useful when it stimulates questioning, comparison, explanation and reflection rather than passive copying.
Human Capital Perspective	AI-supported learning may improve knowledge and skills that contribute to future employability, provided that students develop genuine competencies rather than dependency.
Digital Literacy Perspective	Effective AI use requires students to evaluate information quality, understand limitations, protect data and use digital tools ethically.

11. Societal Implications

AI-enabled education can contribute to broader social development by widening access to explanations, language support and learning assistance. Students from institutions with limited specialist support may benefit from additional digital resources. AI may also help students with language barriers and different learning needs. However, the same technology can deepen inequalities when advanced tools are available mainly to students with better devices, connectivity, paid subscriptions or stronger digital literacy. The societal goal should therefore be equitable AI-enabled education rather than technology adoption for its own sake. Institutions need shared access arrangements, teacher development, transparent policies and student support. Human interaction remains essential for mentoring, motivation, ethical judgement and the development of social and collaborative skills.

11.1 Stakeholder Contributions

Stakeholder	Expected contribution
Students	Responsible use, source verification, ethical disclosure, privacy protection and development of independent thinking.
Teachers	AI-integrated pedagogy, feedback, assessment redesign and mentoring.
Institutions	AI policy, training, infrastructure, access support, academic-integrity procedures and data governance.
Government/Regulators	Equity standards, digital infrastructure, teacher training and responsible-AI frameworks.
Technology providers	Transparency, privacy safeguards, accessibility and educationally responsible product design.
Parents/Society	Awareness of healthy digital learning habits and support for responsible technology use.

12. Policy and Institutional Recommendations

1. Develop clear institutional guidelines distinguishing acceptable AI-assisted learning from academic misconduct.
2. Introduce AI literacy modules covering prompting, verification, bias, privacy, citation and responsible use.
3. Train teachers to redesign assessments for an AI-enabled learning environment.
4. Promote process-based assessment requiring drafts, reflections, oral defence or project documentation.
5. Create institutional AI help desks or digital-learning support units for students and teachers.
6. Ensure equitable access to digital infrastructure and essential educational AI resources.
7. Protect student data and prohibit unnecessary disclosure of personal or confidential information to AI systems.
8. Encourage students to compare AI-generated responses with textbooks, peer-reviewed sources and teacher guidance.
9. Use AI to strengthen formative feedback rather than replace human evaluation.
10. Monitor changes in student behaviour through periodic surveys and learning analytics while maintaining privacy.
11. Develop disciplinary procedures that are transparent, proportionate and educationally oriented.
12. Promote interdisciplinary research on AI, learning psychology, ethics, inclusion and employability.
13. Review AI policies regularly because tools and capabilities change rapidly.

13. Limitations of the Study

1. The model uses an illustrative sample because raw respondent-level data were not supplied.
2. The cross-sectional design cannot establish causality between AI use and educational behaviour.
3. Self-reported AI use may differ from actual usage patterns.
4. The study focuses on higher-education students in Uttar Pradesh and may not generalise to all student populations.
5. AI technologies change rapidly; therefore, findings should be periodically reassessed.
6. Future studies should use longitudinal, experimental or mixed-method designs and actual platform-use data where ethically appropriate.

14. FUTURE RESEARCH SCOPE

Future research can examine longitudinal changes in student behaviour before and after structured AI-literacy interventions. Experimental studies could compare conventional teaching with AI-supported teaching under controlled conditions. Further research can examine differences by discipline, gender, rural/urban background, socioeconomic status and language. Qualitative interviews could explore how students negotiate trust, uncertainty, academic identity and authorship when using generative AI. Researchers can also investigate how AI affects employability skills, creativity, metacognition and collaborative learning.

15. CONCLUSION

Artificial intelligence is becoming an important part of students' educational environments and is changing how academic tasks are approached. The illustrative evidence in this paper suggests that AI can support concept clarification, engagement, study planning and academic confidence. At the same time, concerns about inaccurate information, over-dependence, academic integrity and privacy demonstrate that technological access must be accompanied by educational guidance. The central conclusion is that AI should be positioned as a learning support rather than a replacement for student thinking or teacher expertise. The educational value of AI depends on the quality of the interaction among learner, teacher, technology and institutional context. Universities and colleges should therefore move toward responsible AI literacy, assessment redesign, equitable access and strong data governance. A human-centred approach can help students benefit from AI while preserving the core purposes of education: independent thought, critical inquiry, ethical judgement, creativity and meaningful social learning. UNESCO similarly calls for human-centred, safe, equitable and meaningful approaches to generative AI in education.

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