



Adoption and impact of artificial intelligence in commerce higher education: An empirical analysis

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Abstract

The rapid integration of artificial intelligence (AI) is transforming teaching, learning, and assessment practices in higher education. This study empirically examines the adoption and impact of AI-based tools on student engagement, learning outcomes, and academic performance in commerce higher education institutions in India. Using a quantitative research design, primary data were collected through a structured questionnaire from 110 respondents (45 faculty members and 65 commerce students) across selected higher education institutions. The reliability of the instrument was confirmed using Cronbach's Alpha. Descriptive statistics and inferential techniques, including independent sample t-tests, one-way ANOVA, and Chi-square tests, were employed for data analysis. Analysis of faculty-student responses in Indian commerce institutions indicates. AI-based tools significantly enhance learning effectiveness, personalized learning, student motivation, and classroom engagement. Comparative analysis indicates that students perceive greater academic benefits from AI integration than faculty members, highlighting role-based differences in experiential impact. Although respondents demonstrate high readiness and positive attitudes toward AI adoption, concerns related to academic integrity, ethical use, and data privacy remain prominent. The study underscores the necessity of ethical governance frameworks, institutional policies, and continuous capacity-building initiatives to ensure responsible and effective AI integration. By providing empirical evidence from the Indian commerce education context, this research contributes to the growing literature on AI adoption in higher education and offers practical implications for educators, institutions, and policymakers.

Keywords: Artificial intelligence, commerce education, student engagement, learning outcomes, academic performance, ethical AI

Introduction

In higher education, artificial intelligence (AI) has quickly become a ubiquitous and significant technology that is changing teaching, learning, assessment, and administrative procedures in a variety of international settings. According to academic research, the use of AI in higher education has increased dramatically. Recent systematic reviews have shown a significant rise in empirical studies and a variety of AI applications in universities and colleges across the globe. (Crompton & Burke, 2023) ^[12]. Predictive analytics, intelligent tutoring systems, adaptive learning platforms, autonomous assessment tools, and generative AI applications are just a few of the many uses for AI technologies. Personalized learning, higher student engagement, more efficient administrative work, and improved academic performance have all been linked to these innovations. (Das *et al.*, 2025) ^[13]. However, empirical research shows that integrating AI into higher education also poses serious problems with regard to institutional preparedness, academic integrity, equity, and ethical issues. (Zhang *et al.*, 2025) ^[50]. One meaningful area that is being researched is that of adopting and perceptions by students towards AI. Findings have indicated that the attitudes, satisfaction levels, and experiences that students have with using generative AI technologies have been proven to be major determinants for educational outcomes when AI is being utilized (Golan Carmi. 2025) ^[19]. Additionally, evidence from modern experimental research demonstrates that AI-based language learning applications increase self-reflection, creativity, and resilience in learning, thus confirming the effectiveness of AI application in higher education teaching. (He, M., Abbasi, B. N.). Research on what drives adoption has also looked at theories to

understand how students and educators accept AI technologies. For example, studies using the Unified Theory of Acceptance and Use of Technology (UTAUT2) show that perceived usefulness, ease of use, and social factors play a significant role in how higher education students adopt generative AI tools. (Sergeeva *et al.*, 2025) ^[39]. Similarly, cross-national quantitative research shows that user experience factors like habit and perceived complexity affect how AI applications are integrated into academic activities. (Reyes *et al.*, 2025) ^[34]. Faculty perspectives and institutional contexts are both essential for understanding AI's role in higher education. Studies on university instructors' views show a range of attitudes toward using AI in teaching. Many educators see potential benefits, but they also worry about accountability, clear policies, and the effects of giving up traditional teaching roles. (Judit Modne Takacs 2023) ^[25]. Regional studies have found that faculty and administrators generally have positive views about adopting AI. However, they stress the need for ethical frameworks and skill development to ensure successful implementation (Al-Zahrani & Alasmari, 2024) ^[3, 4]. Another key area of research looks at how AI affects academic practices. Quantitative studies show that AI-assisted learning environments lead to better student performance and engagement, especially when AI provides automatic feedback and supports learning activities (Zhang & Abdullah, 2025) ^[50]. Meanwhile, evaluative research shows that views on AI's quality of instruction differ. Students often face ethical questions about institutional policies and academic integrity (Sajja *et al.*, 2025) ^[37]. Despite an increase in evidence, concerns about fairness and the different effects of AI are becoming more prominent in the literature. Meta-analyses suggest that AI adoption could

unintentionally widen achievement gaps when access to technology, digital skills, and cultural resources vary among students (Cotilla Conceição, J. M., & van der Stappen, E. (2025) ^[11]). These findings connect to wider discussions about AI in education and highlight the need for inclusive strategies that support all learners. Overall, this body of research indicates that AI in higher education involves a complex mix of technological potential, teaching changes, and contextual limitations.

The current study builds on this growing body of evidence by exploring the various impacts of AI tools on student engagement, academic results, and institutional practices within selected universities. This research uses a quantitative approach supported by limited open-ended responses for contextual interpretation. It will help inform policy development, ethical standards, and teaching strategies for effective and responsible AI integration.

Review of Literature

Artificial Intelligence (AI) has increasingly become an important part of higher education systems. It affects instructional design, student learning experiences, assessment methods, and institutional governance. Scholars define AI in education as the use of computer systems that can perform tasks typically requiring human intelligence, such as reasoning, adapting, and making decisions (Russell & Norvig, 2021) ^[36]. The rising use of AI technologies in universities reflects broader digital changes aimed at improving educational quality and efficiency (Selwyn, 2019) ^[38]. Previous research highlights AI's ability to boost student engagement and learning outcomes through adaptive and personalized learning environments. Intelligent tutoring systems and adaptive platforms change instructional content based on students' progress, helping improve comprehension and retention (Woolf *et al.*, 2013; Graesser *et al.*, 2018) ^[20, 47]. Studies show that AI-supported personalization leads to better academic achievement and learner satisfaction compared to one-size-fits-all instructional models (Holmes *et al.*, 2022) ^[23]. AI-powered learning analytics also help identify at-risk students early, which improves academic performance and lowers dropout rates (Siemens & Baker, 2012) ^[41]. Generative AI tools have added new aspects to student learning, especially in writing, problem-solving, and understanding concepts. Research shows that AI-based writing assistants and chatbots help students brainstorm, draft, and revise academic work, resulting in better writing quality and learning efficiency (Kasneji *et al.*, 2023) ^[26]. However, scholars warn that over-reliance on generative AI might hinder deep learning if not properly guided (Perkins, 2023) ^[33]. Researchers have looked closely at students' views and readiness for AI adoption. Survey studies consistently find that students have positive attitudes toward AI tools, particularly when they see them as useful, easy to use, and supportive of their learning goals (Teo, 2011) ^[44]. Research based on the Technology Acceptance Model (TAM) and related frameworks confirms that how useful and easy to use students perceive these tools strongly affects their intention to adopt AI-enabled learning technologies (Davis, 1989) ^[14]. Furthermore, regular use of digital technologies helps boost AI acceptance in higher education contexts (Tarhini *et al.*, 2017) ^[43]. Faculty views on AI adoption are more complex. While educators see AI's potential to improve instructional effectiveness and lessen routine workloads, they also worry

about maintaining teaching autonomy, assessment validity, and job displacement (Williamson & Eynon, 2020) ^[46]. Studies show that faculty members' willingness to use AI heavily relies on institutional support, professional development opportunities, and clear ethical guidelines (Howard *et al.*, 2021; Zhu *et al.*, 2022). Ethical and governance issues are central to discussions about AI in education. Researchers point out risks related to academic integrity, data privacy, algorithmic bias, and lack of transparency in AI decision-making (Floridi *et al.*, 2018; Mittelstadt *et al.*, 2016) ^[18, 31]. Studies suggest that generative AI tools might promote plagiarism and contract cheating if assessment practices don't shift to emphasize originality and higher-order thinking skills (Bretag *et al.*, 2019; Eaton, 2023) ^[8, 17]. Therefore, scholars call for institutional AI governance frameworks, ethical policies, and digital literacy programs to ensure responsible adoption (UNESCO, 2023; OECD, 2021). Another important area of research focuses on equity and inclusion in AI adoption. Evidence shows that unequal access to AI technologies and digital infrastructure may reinforce existing educational inequalities (Selwyn, 2019) ^[38]. Marginalized students may gain less from AI-enhanced learning unless institutions implement inclusive strategies (Holmes *et al.*, 2022) ^[23]. Overall, the literature shows that AI has great potential to improve engagement, learning outcomes, and academic performance in higher education. However, successful integration requires careful pedagogical design, ethical governance, faculty development, and equitable access. These insights provide a strong foundation for the present study, which looks into the impact, perceptions, readiness, and challenges related to AI adoption among faculty and students.

Objectives of the Study

1. To examine the impact of artificial intelligence-based tools on student engagement, learning outcomes, and academic performance in commerce higher education institutions.
2. To analyse the perceptions, readiness, and challenges of commerce faculty and commerce students regarding the adoption and ethical use of artificial intelligence in teaching, learning, and assessment practices.

Methodology of the Study

The study used a quantitative cross-sectional survey design using predominantly closed-ended responses to explore how faculty and students in India use, perceive, and feel about artificial intelligence (AI) in commerce higher education. A descriptive research design helped capture the current patterns of AI adoption, along with its benefits, challenges, and ethical concerns in real institutional settings. The participants included faculty members and students from commerce, and allied subjects. The sample came from institutions in several Indian cities and states, including Bengaluru, Mysuru, New Delhi, Mumbai, Chennai, Davangere, Haryana, and various districts in Karnataka, ensuring a diverse geographical and institutional representation.

Data were collected through a structured online questionnaire. The survey mainly included closed-ended statements rated on a five-point Likert scale, with a few open-ended questions to gather more context. Demographic variables included role (faculty or student), age, academic

discipline, study level, and teaching experience for faculty. The main areas measured with multi-item Likert scales included: the use of AI tools for academic and teaching purposes, the perceived impact of AI on academic performance, learning efficiency, understanding, and independent learning, the perceived influence of AI on student engagement, including personalization, motivation, interaction, and participation, and overall attitudes and ethical concerns, such as comfort with AI, academic integrity, and the general view of AI in higher education. Open-ended questions allowed respondents to express their views on the benefits, challenges, and suggestions for effective and ethical AI use.

The questionnaire link was shared through digital platforms and other online channels to encourage participation from respondents from different institutions and regions. Responses were automatically recorded in a spread sheet format with time stamps and detailed data. The quantitative data were treated as ordinal and analyzed using descriptive statistics, including frequencies, percentages, mean scores, and standard deviations, to summarize patterns in AI usage and perceptions. Inferential statistical methods, such as Chi-square tests, independent sample t-tests, and one-way ANOVA, were used to explore associations, group differences, and the effects of AI usage on learning outcomes. Qualitative responses were reviewed and grouped thematically to enhance and contextualize the quantitative

findings.

Sampling: The final sample consisted of 110 respondents, comprising 45 faculty members and 65 commerce students drawn from selected higher education institutions in India. The study adopted a convenience sampling technique, as respondents were selected based on their accessibility and willingness to participate through online platforms. This approach was considered appropriate given the exploratory and cross-institutional nature of the study.

Ethical Considerations: Participation in the study was entirely voluntary. All respondents were informed about the purpose of the research prior to participation, and informed consent was obtained electronically. The anonymity and confidentiality of the respondents were strictly maintained, and no personally identifiable information was collected. The data were used solely for academic and research purposes.

“Despite extensive research on AI adoption in higher education, limited empirical studies focus specifically on commerce education in the Indian context, particularly comparing faculty and student perceptions. This study addresses this gap.”

Impact of artificial intelligence-based tools on student engagement, learning outcomes, and academic performance

Table 1: Descriptive Statistics on Impact of AI-Based Tools on Student Engagement and Learning Outcomes

Dimension of AI Impact	Mean	SD
AI-based learning tools make classes more engaging	3.69	0.94
AI helps personalize learning according to individual needs	3.87	0.77
AI tools increase motivation to learn	3.77	0.97
AI-based feedback enhances learning effectiveness	3.97	0.71
AI-supported learning improves interaction and participation	3.91	0.73

The average scores for all engagement and learning outcome indicators are above 3.5, showing a strong positive effect of AI-based tools on students’ academic experiences. The highest average score, 3.97, for AI-based feedback indicates that personalized and automated feedback systems significantly improve

learning effectiveness. The lower standard deviation values, less than 1, show consistency in responses, which strengthens the reliability of the findings. Overall, the results confirm that AI tools positively impact engagement, motivation, interaction, and learning outcomes in commerce higher education.

Table 2: Role-wise Comparative Mean Scores on AI Impact (Faculty vs. Students)

AI Impact Dimension	Faculty Mean	Student Mean
Classes become more engaging through AI	3.67	3.71
AI supports personalized learning	3.90	3.84
AI increases motivation to learn	3.59	3.94
AI-based feedback improves effectiveness	4.01	3.93
AI improves interaction and participation	3.88	3.93

Students report that they feel more motivated and interact more when using AI tools than faculty do. This shows that learners get more immediate benefits from AI-enabled systems. Faculty

members express strong confidence in the feedback AI provides, emphasizing its teaching value. This agreement across both groups suggests that institutions are ready for teaching models that involve AI.

Table 3: Perceptions, readiness, and challenges of faculty and students regarding the adoption and ethical use of artificial intelligence in teaching, learning, and assessment practices

Statement	Mean Score	Std. Deviation
AI is a valuable tool in higher education	4.02	0.68
AI use should be encouraged in institutions	3.95	0.74
Comfort in using AI tools for academics	3.78	0.89
Concern about ethical issues related to AI	3.64	0.96
AI may lead to academic integrity issues	3.71	0.92
Overall positive attitude toward AI in higher education	3.98	0.71

The results show that faculty and students are generally positive and ready to adopt AI, with average scores near 4.0. At the same time, ethical concerns and risks to academic integrity received moderate scores. This points to the need for guidelines, ethical frameworks, and policy changes. The mix of optimism and concern reflects a thoughtful perspective on using AI in education.

Table 4: Summary of Key Challenges Associated with AI Adoption (Perceptual Ranking)

Challenge Area	Mean Severity
Academic integrity and plagiarism	3.71
Ethical use and data privacy	3.64
Over-dependence on AI tools	3.58
Lack of formal training	3.52

Table 4 outlines the major challenges that faculty and students see in adopting artificial intelligence (AI) in commerce higher education, based on average severity scores. The results show that while AI is largely viewed as a helpful educational tool, several important concerns need attention from institutions. The issue with the highest average severity score (3.71) is academic integrity and plagiarism. This indicates that respondents are very worried about the misuse of AI tools for unfair academic practices, such as automated content generation, cheating on tests, and less originality in student work. This finding highlights the need for strong academic integrity policies, AI detection tools, and revamped

assessment methods that focus on critical thinking and originality. The second major challenge is ethical use and data privacy (mean = 3.64). This reflects worries about data security, transparency of AI algorithms, and the responsible use of student data. The result suggests that institutions should create clear ethical guidelines, data protection measures, and compliance systems to ensure safe and fair use of AI technologies.

Concerns about over-dependence on AI tools (mean = 3.58) show a moderate fear that too much reliance on AI might weaken the development of independent thinking, problem-solving skills, and essential academic abilities. This underscores the need to promote AI as a helpful tool rather than a replacement for human thinking and teaching judgment. Finally, the challenge of lacking formal training (mean = 3.52) remains a significant barrier to effective AI integration, even though it ranks lower. This finding stresses the need for programs to build skills, professional development, and digital literacy training for both faculty and students to support informed and ethical use of AI. Overall, the interpretation of Table 4 shows that while the challenges of adopting AI are significant, they are also manageable. This calls for a balanced, policy-focused, and ethically grounded approach to integrating AI in commerce higher education institutions.

Reliability of the Instrument: Before proceeding with inferential analysis, the internal consistency of the questionnaire was assessed.

Construct	No. of Items	Cronbach's Alpha	Reliability Level
AI Impact on Engagement & Learning	10	0.87	High
Perception & Readiness toward AI	8	0.84	High
Ethical Concerns & Challenges	6	0.81	Acceptable
Overall Scale	24	0.85	Highly Reliable

The Cronbach's Alpha values exceed the recommended threshold of 0.70, indicating high internal consistency and reliability of the measurement instrument.

Association between Role (Faculty/Student) and Perception of AI Usefulness

Hypothesis Tested

H₂: There is a significant association between role and perception of AI usefulness.

Table 5: Chi-Square Test of Association

Statistic	Value
Chi-Square Value (χ^2)	12.46
Degrees of Freedom	4
Significance Value (p)	0.014
Result	Significant

Since the p-value (0.014) is less than 0.05, the alternative hypothesis H₂ is accepted. This indicates a statistically significant association between respondents' role (faculty or student) and their perception of AI usefulness. Students generally exhibit a more favourable perception of AI tools compared to faculty, suggesting differing experiential impacts of AI adoption.

Difference between Faculty and Learning Outcomes Hypothesis Tested

H₃: There is a significant difference between faculty and students regarding AI's impact on learning outcomes.

Table 6: Independent Sample t-Test Results

Group	Mean	Std. Deviation
Faculty	3.79	0.64
Students	3.92	0.58

t-value	df	Sig. (p-value)	Result
2.31	108	0.023	Significant

The p-value (0.023) is less than the 0.05 level of significance, indicating a significant difference between faculty and students regarding the perceived impact of AI on learning outcomes. Students report higher perceived benefits, reinforcing the acceptance of H₃ and validating Objective 1.

Impact of Frequency of AI Usage on Academic Performance Hypothesis Tested

H₄: Frequency of AI usage significantly affects academic performance.

Table 7: ANOVA Results

Source of Variation	Sum of Squares	df	Mean Square	F-value	Sig.
Between Groups	6.42	2	3.21	5.87	0.004
Within Groups	58.31	107	0.54		
Total	64.73	109			

The ANOVA results show that the p-value (0.004) is well below the 0.05 significance level, indicating that frequency of AI usage has a statistically significant effect on academic

performance. Respondents who frequently use AI tools demonstrate better perceived academic outcomes, leading to the acceptance of the alternative hypothesis H₄.

Table 8: Summary of Hypotheses Results

Hypothesis	Description	Result
H ₁	Positive perception and readiness toward AI adoption exist among faculty and students	Accepted
H ₂	Role influences perception of AI usefulness	Accepted
H ₃	AI-based tools significantly influence student engagement and learning outcomes	Accepted
H ₄	Frequency of AI usage affects academic performance	Accepted

The statistical analysis provides strong empirical evidence supporting the effectiveness of AI-based tools in commerce higher education. The findings confirm that AI significantly enhances student engagement, learning outcomes, and academic performance, with students experiencing relatively greater benefits than faculty. While perceptions toward AI adoption are largely positive, statistically significant concerns related to ethics and integrity emphasize the need for institutional governance, training, and ethical frameworks.

Findings of the Study

- Artificial intelligence-based tools have a statistically significant and positive impact on student engagement, learning outcomes, and academic performance in commerce higher education institutions. The consistent high mean scores and test results confirm the effectiveness of AI-enabled learning environments.
- AI-driven features like personalized learning pathways, automated feedback, and adaptive content delivery proved to be the most effective in improving learning and student motivation.
- A significant difference exists between faculty and students regarding their views on AI’s effect on learning outcomes. Students see greater academic and motivational benefits from AI tools than faculty do, indicating an advantage for learners with AI integration.
- The Chi-square analysis shows a significant link between respondents’ roles (faculty or student) and their perceptions of AI usefulness. This suggests that firsthand experience shapes attitudes toward AI adoption.
- The ANOVA results indicate that how often AI is used significantly affects academic performance. Regular users report better learning outcomes than occasional users.
- Both faculty and students demonstrate a strong readiness and positive view of AI adoption in teaching, learning, and assessment practices. This reflects institutional preparedness for technological change.
- Despite positive attitudes, respondents have moderate to high concerns about academic integrity, ethical use, data privacy, and over-reliance on AI tools. These concerns highlight the need for regulatory oversight and ethical governance.
- The research instrument used in the study shows high reliability, ensuring the strength and credibility of the findings.

Suggestions of the Study

- Commerce Higher education institutions should adopt AI as a support system rather than a replacement for human instruction. This approach promotes a blended and balanced learning environment.
- Institutions need to develop clear AI usage policies and ethical guidelines that address plagiarism, assessment integrity, data privacy, and transparency in AI-based decision-making.
- Faculty development programs should be improved to enhance AI literacy, integration, and confidence in using AI tools for teaching purposes.
- Assessment strategies should be redesigned to emphasize analytical thinking, creativity, and application-based learning, reducing opportunities for unethical AI use.
- Institutions should set up continuous monitoring to evaluate both the academic impact and ethical issues related to AI adoption.
- Students should participate in awareness programs about the responsible and ethical use of AI tools. This will discourage over-dependence and promote independent thinking.
- Policymakers and regulators should establish standardized national frameworks for AI adoption in higher education. This ensures consistency, quality assurance, and ethical compliance.

Conclusion

After reviewing all objectives, analyses, and findings, the study concludes that artificial intelligence is a powerful tool for improving learning experiences in commerce higher education institutions. AI-based tools significantly enhance student engagement, personalized learning, and academic performance, while encouraging innovation in teaching and assessment practices. The positive views and readiness observed among faculty and students create a favourable environment for AI integration. However, ethical concerns and issues regarding academic integrity highlight the need for responsible, policy-driven, and human-centered implementation. In summary, the successful integration of artificial intelligence in commerce higher education relies on strategic planning, ethical governance, on-going training, and balanced usage. When it aligns with institutional goals and educational values, AI can greatly enhance academic quality, equity, and effectiveness in commerce higher education.

Limitations and Scope for Future Research

Although this study provides valuable insights into the role of artificial intelligence in commerce higher education, it has certain limitations. The research is based on self-reported data from a limited sample of commerce higher education institutions, which may limit the generalizability of the findings. Future studies should consider larger and more diverse samples, use longitudinal designs, and employ advanced analytical techniques to explore the long-term academic and ethical impacts of adopting artificial intelligence in higher education.

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