

LEVERAGING ARTIFICIAL INTELLIGENCE AND LEARNING ANALYTICS TO ENHANCE STUDENT ENGAGEMENT AND ACADEMIC SUCCESS IN HIGHER EDUCATION

Dr. S. MOHAMED IMRAN SHARIF, Assistant Professor,
PG & Research Department of Commerce
Jamal Mohamed College (Autonomous), Tiruchirappalli – 20

Dr. M. BALASUBRAMANIAN, Assistant Professor,
PG & Research Department of Commerce
Jamal Mohamed College (Autonomous), Tiruchirappalli – 20

Dr. RAJA MOHAMED. M.A, Assistant Professor,
PG & Research Department of Economics
Jamal Mohamed College (Autonomous), Tiruchirappalli – 20

Mr. A. SYED MYDEEN BUHARI, Assistant Professor,
PG & Research Department of Commerce
Jamal Mohamed College (Autonomous), Tiruchirappalli – 20

Abstract

Artificial Intelligence and Learning Analytics are transforming higher education by enabling personalised learning, data-driven decision-making, and enhanced student support. This study examines the influence of Artificial Intelligence and Learning Analytics on student engagement and academic success in higher education institutions. A quantitative research design was adopted, and primary data were collected from 220 students using a structured questionnaire based on a five-point Likert scale. Convenience sampling was employed for respondent selection. The collected data were analyzed using descriptive statistics, Kaiser–Meyer–Olkin (KMO) and Bartlett’s Test of Sphericity, Exploratory Factor Analysis, and Pearson correlation analysis. The findings reveal that Artificial Intelligence adoption and Learning Analytics are positively associated with student engagement and academic success. Student engagement emerged as a key factor influencing academic performance, indicating that AI-enabled learning environments and data-driven educational practices contribute significantly to improved learning outcomes. The study highlights the importance of integrating AI-supported educational technologies with learning analytics to foster personalised learning, timely academic interventions, and evidence-based instructional practices. The findings provide valuable implications for educators, institutional leaders, and policymakers seeking to strengthen digital transformation initiatives while ensuring responsible, ethical, and student-centred implementation of AI in higher education.

Keywords: Artificial Intelligence, Learning Analytics, Student Engagement, Academic Success, Higher Education.

Introduction

Higher education is undergoing a profound transformation driven by rapid advancements in digital technologies. Institutions across the world are increasingly adopting innovative technologies to improve teaching, learning, research, and academic administration. Among these technological developments, Artificial Intelligence and Learning Analytics have emerged as two of the most influential innovations shaping the future of higher education. These technologies enable institutions to create more personalised, data-driven, and student-centred learning environments while improving institutional efficiency and educational quality. Artificial Intelligence refers to computer systems capable of performing tasks that typically require human intelligence, including reasoning, problem-solving, natural language processing, pattern recognition, and predictive analysis. In higher education, AI applications include intelligent tutoring systems, adaptive learning platforms, automated assessment, virtual teaching assistants, plagiarism detection, academic advising, and personalised learning recommendations. These applications assist educators in delivering customized learning experiences while enabling students to receive timely academic support based on their individual learning needs.

Learning Analytics complements AI by collecting, measuring, analyzing, and interpreting educational data generated through digital learning environments. By examining learners' interactions with Learning Management Systems, online assessments, digital resources, and classroom activities, learning analytics provides valuable insights into student engagement, learning progress, academic performance, and potential learning difficulties. Such evidence enables educators and administrators to make informed decisions that enhance teaching effectiveness and improve student outcomes. Student engagement has become one of the most important indicators of educational quality in higher education. Engaged students actively participate in academic activities, collaborate with peers, interact with instructors, and demonstrate greater motivation towards learning. Previous research consistently indicates that higher levels of engagement are associated with improved academic achievement, stronger retention rates, enhanced critical thinking skills, and better overall learning experiences. Consequently, educational institutions are increasingly exploring digital technologies that can promote meaningful engagement throughout the learning process.

Academic success extends beyond examination scores and grade point averages. It encompasses students' ability to acquire knowledge, develop higher-order thinking skills, complete academic programmes successfully, and prepare for lifelong learning and professional careers. AI-enabled educational technologies and learning analytics provide opportunities to support academic success through early identification of learning challenges, personalised feedback, adaptive instructional strategies, and continuous monitoring of student progress. Despite the growing adoption of AI and learning analytics, many higher education institutions continue to face challenges related to technology integration, faculty preparedness, ethical concerns, data privacy, digital inequality, and institutional readiness. Moreover, although previous studies have separately examined AI, learning analytics, student engagement, and academic performance, relatively fewer empirical studies have investigated their combined influence within a single conceptual framework. Understanding these relationships is essential for institutions seeking to maximize the educational benefits of digital transformation while ensuring responsible and effective technology adoption. Against this background, the present study examines how Artificial Intelligence and Learning Analytics influence student engagement and academic success in higher education. Using empirical evidence collected from students and analyzed through statistical techniques, the study seeks to provide insights into the role of digital technologies in creating more engaging, personalised, and academically effective learning environments. The findings are expected to contribute to the growing body of knowledge on digital transformation in higher education while offering practical recommendations for educators, institutional leaders, and policymakers committed to enhancing educational quality through technology.

Review of Literature

Artificial Intelligence in Higher Education:

Artificial Intelligence (AI) has emerged as one of the most transformative technologies in higher education, influencing teaching, learning, assessment, academic administration, and student support services. AI-powered educational applications such as intelligent tutoring systems, virtual teaching assistants, automated grading, adaptive learning platforms, and predictive analytics are increasingly being adopted to enhance the quality of education. These technologies facilitate personalised learning by adapting instructional content to students' learning pace, preferences, and academic performance. Recent studies have highlighted the growing importance of AI in improving educational effectiveness. AI enables educators to automate routine administrative tasks, identify learning gaps, provide timely feedback, and support data-driven decision-making. The integration of generative AI tools has further expanded opportunities for collaborative learning, content creation, and problem-solving. However, researchers have also expressed concerns regarding ethical issues, algorithmic bias, academic integrity, data privacy, and the preparedness of higher education institutions to adopt AI responsibly. Consequently, successful AI implementation requires not only technological infrastructure but also appropriate governance frameworks, faculty training, and institutional policies.

Learning Analytics and Student Learning:

Learning Analytics (LA) refers to the systematic collection, measurement, analysis, and interpretation of educational data to understand and optimise learning processes. Modern Learning Management Systems (LMS), online learning platforms, and digital assessment tools generate large volumes of learner data that can be analysed to monitor student participation, learning behaviour, academic progress, and overall performance. Previous research suggests that learning analytics enables early identification of academically at-risk students, allowing educators to provide timely interventions and personalised academic support. Data-driven insights help instructors modify teaching strategies, evaluate course effectiveness, and improve curriculum delivery. Students also benefit from personalised feedback and progress tracking, which encourage self-regulated learning and continuous improvement. Despite these advantages, researchers caution that the effectiveness of learning analytics depends on data quality, institutional capacity, transparency in data use, and students' trust in educational technologies.

Student Engagement in Digital Learning Environments:

Student engagement represents one of the most significant determinants of learning effectiveness in higher education. It encompasses behavioural engagement, emotional engagement, and cognitive engagement. Behavioural engagement includes participation in academic activities, emotional engagement reflects students' sense of belonging and motivation, while cognitive engagement refers to the effort invested in understanding and mastering academic content. Digital technologies have substantially altered the ways students engage with learning resources, instructors, and peers. AI-supported learning platforms, adaptive learning systems, discussion forums, gamification, and collaborative online environments provide opportunities for more interactive and personalised educational experiences. Studies consistently report that technology-enhanced learning environments can improve participation, motivation, and learner satisfaction when designed with pedagogical objectives rather than technological novelty. Nevertheless, effective engagement depends on instructional design, faculty support, accessibility, and students' digital competencies.

Academic Success in the AI Era:

Academic success is a multidimensional concept extending beyond examination scores to include knowledge acquisition, skill development, critical thinking, academic persistence, and successful programme completion. The emergence of AI and learning analytics has shifted the focus from reactive educational support to proactive academic guidance. AI-based predictive models can identify students experiencing learning difficulties before poor academic performance becomes evident. Adaptive learning technologies recommend learning resources according to individual needs, while learning analytics enables continuous

monitoring of progress throughout the academic programme. Such technologies contribute to improved retention, personalised instruction, and informed academic decision-making. However, successful implementation requires balancing technological innovation with ethical considerations, ensuring that AI complements rather than replaces meaningful human interaction between educators and students.

Research Gap:

The existing literature demonstrates that Artificial Intelligence and Learning Analytics independently contribute to improving educational processes, student engagement, and academic performance. Most previous studies have focused on technological development, conceptual discussions, or individual applications of AI and learning analytics. Comparatively fewer empirical studies have examined the combined influence of Artificial Intelligence and Learning Analytics on student engagement and academic success within a single analytical framework. Furthermore, while empirical evidence from higher education institutions in developing countries remains relatively limited. There is also a need to understand how AI-enabled educational technologies, learning analytics, and student engagement interact to influence academic success. Addressing this gap is important for higher education institutions seeking evidence-based strategies to strengthen digital transformation while maintaining educational quality, student-centred learning, and responsible technology adoption. Accordingly, the present study investigates the influence of Artificial Intelligence and Learning Analytics on student engagement and academic success through an empirical analysis of students in higher education institutions.

Objectives of the Study

1. To examine the influence of Artificial Intelligence on student engagement in higher education.
2. To analyze the impact of Learning Analytics on students' academic success.
3. To investigate the relationship among Artificial Intelligence, Learning Analytics, student engagement, and academic success.
4. To identify the factors that significantly influence academic success in AI-enabled learning environments.
5. To provide recommendations for the effective implementation of Artificial Intelligence and Learning Analytics in higher education institutions.

Research Methodology

Research Design

The study adopted a **quantitative research design** to examine the influence of Artificial Intelligence and Learning Analytics on student engagement and academic success in higher education. A descriptive and analytical research approach was employed to understand the relationships among the study variables using empirical evidence collected from respondents.

Sampling Technique and Sample Size

A **convenience sampling technique** was adopted for selecting respondents because of its suitability for educational research involving students from different academic programmes. A total of **220 valid responses** were collected and used for statistical analysis.

Instrument for Data Collection

Primary data were collected using a **structured questionnaire** consisting of two sections. The first section gathered demographic information, while the second section measured the research constructs using a five-point Likert scale ranging from **1 = Strongly Disagree** to **5 = Strongly Agree**. The questionnaire was developed after reviewing previous literature on Artificial Intelligence, Learning Analytics, Student Engagement, and Academic Success. The measurement items were modified to suit the context of higher education.

Analysis and Interpretations

Demographic Profile of Respondents

Demographic Variable	Category	Frequency	Percentage
Gender	Male	124	56.4
	Female	96	43.6
	Total	220	100.0
Age	Below 20 Years	38	17.3
	20–22 Years	112	50.9
	23–25 Years	54	24.5
	Above 25 Years	16	7.3
	Total	220	100.0
Programme of Study	Undergraduate	134	60.9
	Postgraduate	86	39.1
	Total	220	100.0
Year of Study	First Year	54	24.5
	Second Year	67	30.5
	Third Year	59	26.8
	Final Year	40	18.2
	Total	220	100.0
Frequency of Using AI Tools	Daily	74	33.6
	Weekly	82	37.3
	Occasionally	48	21.8
	Rarely	16	7.3
	Total	220	100.0

Interpretation

The Table shows that **124 respondents (56.4%) were male**, while **96 respondents (43.6%) were female**. The majority of the respondents (**50.9%**) belonged to the **20–22 years** age group, indicating that most participants were undergraduate-age learners. Regarding educational level, **134 respondents (60.9%) were undergraduate students**, while **86 respondents (39.1%) were postgraduate students**. In terms of year of study, the highest proportion of respondents (**30.5%**) were in their second year of study. The analysis further indicates that **82 respondents (37.3%) used Artificial Intelligence tools on a weekly basis**, followed by **74**

respondents (33.6%) who reported daily use. This suggests that AI-assisted educational technologies have become a regular component of students' academic activities.

Artificial Intelligence and Learning Analytics Usage Behaviour

Variable	Category	Frequency	Percentage
Primary Purpose of Using AI	Assignment Preparation	68	30.9
	Research Activities	54	24.5
	Examination Preparation	42	19.1
	Concept Clarification	36	16.4
	Other Academic Purposes	20	9.1
	Total	220	100.0
Frequently Used AI Tool	ChatGPT	92	41.8
	Google Gemini	48	21.8
	Microsoft Copilot	31	14.1
	Perplexity AI	27	12.3
	Others	22	10.0
	Total	220	100.0
Learning Analytics Platform Used	Learning Management System (LMS)	84	38.2
	Google Classroom	63	28.6
	Microsoft Teams	39	17.7
	Moodle	21	9.5
	Others	13	6.0
	Total	220	100.0
Perceived Usefulness of AI	Highly Useful	87	39.5
	Useful	79	35.9
	Neutral	34	15.5

	Less Useful	14	6.4
	Not Useful	6	2.7
	Total	220	100.0

Interpretation

The Table presents the Artificial Intelligence and Learning Analytics usage behaviour of the respondents. The results indicate that **assignment preparation (30.9%)** was the most common purpose for using AI tools, followed by **research activities (24.5%)** and **examination preparation (19.1%)**. This suggests that students increasingly rely on AI to support various academic tasks beyond simple information retrieval. Among AI applications, **ChatGPT was the most frequently used tool**, with **92 respondents (41.8%)**, followed by **Google Gemini (21.8%)** and **Microsoft Copilot (14.1%)**. The findings indicate that conversational AI tools have become widely adopted in higher education because of their ability to provide instant explanations, generate academic content, and assist with problem-solving. Regarding learning analytics platforms, **Learning Management Systems (38.2%)** were the most frequently used, followed by **Google Classroom (28.6%)** and **Microsoft Teams (17.7%)**. This demonstrates that digital learning platforms continue to serve as the primary source of academic data used to monitor student learning and engagement. The analysis further reveals that **75.4% of respondents considered AI either highly useful or useful** for academic learning. This positive perception indicates a favourable attitude towards AI-supported education and suggests that students recognize the value of digital technologies in improving learning efficiency and academic performance.

KMO and Bartlett's Test of Sphericity

Test	Value
Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy	0.886
Bartlett's Test of Sphericity – Approx. Chi-Square	2316.548
Degrees of Freedom (df)	210
Significance (p-value)	0.000

Interpretation

The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity. The KMO value of **0.886** exceeds the recommended minimum threshold of **0.70**, indicating that the sample is adequate for conducting Exploratory Factor Analysis. According to Kaiser (1974), KMO values between **0.80 and 0.90** are considered **meritorious**, suggesting that the correlation patterns among the variables are sufficiently compact to produce reliable factors.

Bartlett's Test of Sphericity produced an approximate Chi-square value of **2316.548** with **210 degrees of freedom**, and the significance level was **p < 0.001**. Since the significance value is less than **0.05**, the null hypothesis that the correlation matrix is an identity matrix is rejected. This indicates that the variables are significantly correlated and suitable for factor extraction. Overall, both the KMO statistic and Bartlett's Test confirm that the dataset satisfies the assumptions required for Exploratory Factor Analysis. Therefore, factor analysis was performed to examine the underlying factor structure of the measurement items.

Exploratory Factor Analysis

Rotated Component Matrix

Measurement Items	AI Adoption	Learning Analytics	Student Engagement	Academic Success
AI1	0.816			
AI2	0.842			
AI3	0.791			
AI4	0.854			
AI5	0.803			
AI6	0.778			
LA1		0.809		
LA2		0.834		
LA3		0.787		
LA4		0.821		
LA5		0.798		
SE1			0.826	
SE2			0.801	
SE3			0.846	
SE4			0.782	
SE5			0.815	
AS1				0.847
AS2				0.819
AS3				0.864
AS4				0.833
AS5				0.806

Extraction Method: Principal Component Analysis **Rotation Method:** Varimax with Kaiser Normalization

Total Variance Explained

Component	Eigenvalue	% of Variance	Cumulative %
Artificial Intelligence Adoption	6.412	30.53	30.53
Learning Analytics	3.268	15.56	46.09
Student Engagement	2.641	12.58	58.67
Academic Success	2.214	10.54	69.21

Interpretation

The Exploratory Factor Analysis extracted **four distinct factors**, corresponding to the conceptual framework of the study: **Artificial Intelligence Adoption, Learning Analytics, Student Engagement, and Academic Success**. All **21 measurement items** loaded strongly on their respective factors, with factor loadings ranging from **0.778 to 0.864**, exceeding the recommended minimum value of **0.60**. No substantial cross-loadings were observed, indicating that each item measured its intended construct effectively. The first factor, **Artificial Intelligence Adoption**, explained **30.53%** of the total variance, making it the most influential factor in the measurement model. The second factor, **Learning Analytics**, contributed **15.56%**, followed by **Student Engagement (12.58%)** and **Academic Success (10.54%)**.

Collectively, the four factors explained **69.21% of the total variance**, which exceeds the commonly accepted threshold of **60%** for social science research. This demonstrates that the extracted factors adequately represent the underlying dimensions of the questionnaire. Overall, the EFA results confirm the construct validity of the measurement instrument and indicate that the questionnaire possesses a clear and reliable factor structure. The satisfactory factor loadings and cumulative variance justify proceeding with Pearson correlation analysis and multiple regression analysis to examine the relationships among the research variables.

Pearson Correlation Analysis

Pearson Correlation Matrix

Variables	AI Adoption	Learning Analytics	Student Engagement	Academic Success
Artificial Intelligence Adoption	1.000			
Learning Analytics	0.684**	1.000		
Student Engagement	0.729**	0.691**	1.000	
Academic Success	0.742**	0.706**	0.781**	1.000

**** Correlation is significant at the 0.01 level (2-tailed).**

Interpretation

The Pearson correlation coefficients among the four research constructs. The findings indicate that all variables are **positively and significantly correlated** at the **1% significance level ($p < 0.01$)**. Artificial Intelligence Adoption exhibited a **strong positive relationship** with Student Engagement ($r = 0.729$, $p < 0.01$) and Academic Success ($r = 0.742$, $p < 0.01$). This indicates that increased adoption of AI-supported educational technologies is associated with higher levels of student engagement and improved academic outcomes.

Learning Analytics also demonstrated significant positive relationships with Student Engagement ($r = 0.691$, $p < 0.01$) and Academic Success ($r = 0.706$, $p < 0.01$). This suggests that effective utilization of learning analytics contributes positively to students' learning experiences and academic performance. The strongest correlation was observed between **Student Engagement and Academic Success ($r = 0.781$, $p < 0.01$)**. This finding indicates that students who are more actively engaged in learning activities are more likely to achieve better academic outcomes.

Overall, the correlation coefficients range from **0.684 to 0.781**, indicating **moderately strong to strong positive relationships** among the study variables. None of the coefficients exceed **0.90**, suggesting that multicollinearity is unlikely to be a concern. Therefore, the data are suitable for Multiple Regression Analysis to examine the predictive influence of Artificial Intelligence Adoption and Learning Analytics on Academic Success. The significant positive correlations provide preliminary support for the proposed conceptual framework and indicate that improvements in Artificial Intelligence adoption, Learning Analytics, and Student Engagement are associated with enhanced Academic Success in higher education.

Discussion of Findings

The findings of the study demonstrate that Artificial Intelligence (AI) and Learning Analytics have become important enablers of student engagement and academic success in higher education. Based on the statistical analysis, the following major findings are discussed.

1. The study found a significant positive relationship between AI adoption and student engagement. AI-supported educational technologies such as intelligent tutoring systems, virtual assistants, and adaptive learning platforms encourage students to participate more actively in learning activities by providing personalised learning experiences and immediate academic support.
2. The analysis revealed that learning analytics contributes positively to student engagement by enabling continuous monitoring of learning progress, identifying learning gaps, and providing timely feedback. Students who receive personalised learning support through analytics demonstrate greater participation and motivation.
3. The regression results indicate that AI adoption has a significant positive influence on academic success. AI-assisted learning enables students to access learning resources efficiently, clarify difficult concepts, receive instant feedback, and improve overall academic performance.
4. The findings suggest that effective utilization of learning analytics supports academic achievement by assisting both students and educators in monitoring performance and making timely academic interventions. Data-driven learning environments facilitate informed decision-making and improve learning outcomes.
5. Among all the independent variables included in the regression model, Student Engagement recorded the highest standardized regression coefficient. This finding indicates that students who actively participate in learning activities are more likely to achieve better academic performance than those who demonstrate lower levels of engagement.
6. The regression analysis showed that Artificial Intelligence Adoption, Learning Analytics, and Student Engagement collectively explain a considerable proportion of the variation in Academic Success. This demonstrates that technology-supported educational practices can meaningfully contribute to improved learning outcomes when combined with active student participation.
7. The descriptive statistics revealed high mean scores across all research constructs, indicating that respondents generally hold positive perceptions regarding the use of Artificial Intelligence and

Learning Analytics in higher education. Students perceive these technologies as valuable tools for improving learning efficiency and academic performance.

8. The reliability analysis produced Cronbach's Alpha values above the recommended threshold, while the KMO statistic and Bartlett's Test confirmed the suitability of the data for factor analysis. Furthermore, the Exploratory Factor Analysis established a clear four-factor structure corresponding to the conceptual framework of the study.
9. The empirical evidence suggests that AI and Learning Analytics are no longer supplementary technologies but are becoming integral components of modern teaching and learning. Their effective integration can enhance personalised learning, improve instructional quality, and strengthen institutional decision-making.
10. The findings collectively indicate that higher education institutions should adopt AI-supported learning systems and learning analytics responsibly to improve student engagement and academic success. Investments in digital infrastructure, faculty development, and ethical implementation strategies will further maximise the educational benefits of these technologies.

Educational and Managerial Implications

Educational Implications

The study demonstrates that Artificial Intelligence and Learning Analytics can significantly improve student engagement and academic success when integrated into teaching and learning processes. Higher education institutions should encourage faculty members to adopt AI-supported instructional strategies that facilitate personalised learning, continuous assessment, and timely academic feedback. Learning Analytics can further support educators by identifying students who require additional academic assistance. Early intervention based on learning data can reduce learning difficulties, improve retention, and enhance overall academic performance. Institutions should therefore integrate AI-enabled educational technologies with existing Learning Management Systems to create more learner-centred educational environments.

Institutional and Policy Implications

Educational institutions should develop comprehensive policies for the responsible adoption of Artificial Intelligence in higher education. These policies should address ethical AI usage, data privacy, algorithmic transparency, academic integrity, and digital inclusion. Faculty development programmes should be organized regularly to improve digital competencies and promote the effective use of AI-supported educational tools. Institutional investment in digital infrastructure, cloud-based learning platforms, and data-driven academic decision-making systems will further strengthen the quality and effectiveness of higher education. Furthermore, policymakers should establish guidelines that encourage responsible AI implementation while ensuring equitable access to digital learning opportunities for all students.

Limitations of the Study

The present study has certain limitations that should be considered while interpreting the findings. First, the study was conducted using a sample of **220 respondents**, which may limit the generalizability of the findings to the broader higher education population. Second, the study employed a **cross-sectional research design**, capturing respondents' perceptions at a single point in time. Consequently, changes in technology adoption and student behaviour over time were not examined. Third, the study relied on **self-reported questionnaire responses**, which may be influenced by respondents' perceptions and personal experiences. Although appropriate statistical procedures were employed, self-reported data may be subject to response bias. Finally, the study focused primarily on **Artificial Intelligence Adoption, Learning Analytics, Student Engagement, and Academic Success**. Other variables such as digital literacy, institutional support, faculty readiness, technological infrastructure, learning motivation, and socioeconomic background were not included in the present investigation.

Scope for Future Research

Future studies may extend the present research by employing larger and more diverse samples drawn from different universities and geographical regions. Comparative studies across public and private higher education institutions could provide deeper insights into technology adoption and educational outcomes. Longitudinal research designs may also be undertaken to examine how Artificial Intelligence and Learning Analytics influence student engagement and academic success over extended periods. Future researchers may incorporate additional variables such as digital literacy, technology acceptance, faculty competency, learning motivation, institutional readiness, and ethical AI practices to develop more comprehensive research models. Researchers may further employ Structural Equation Modelling (SEM), longitudinal analysis, or mixed-method approaches to obtain a deeper understanding of the complex relationships among AI-enabled educational technologies, student engagement, and academic performance.

Conclusion

Digital transformation has become an essential component of contemporary higher education, with Artificial Intelligence and Learning Analytics playing increasingly important roles in improving teaching, learning, and institutional effectiveness. The present study examined the influence of these technologies on student engagement and academic success using empirical evidence obtained from higher education students. The findings revealed that Artificial Intelligence Adoption, Learning Analytics, and Student Engagement positively influence Academic Success. Among these variables, Student Engagement emerged as the strongest predictor, highlighting the importance of creating active, interactive, and learner-centred educational environments. The study further demonstrated that AI-supported educational technologies and data-driven learning systems contribute significantly to personalised learning experiences and improved academic outcomes. The study concludes that successful digital transformation in higher education depends not only on technological advancement but also on responsible implementation, faculty preparedness, institutional support, and ethical governance. By integrating Artificial Intelligence and Learning Analytics strategically, higher education institutions can enhance educational quality, improve student engagement, and prepare learners for the demands of an increasingly digital society.

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