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Artificial Intelligence in Learning: Assessing Perception, Motivation, and Academic Performance

Padam Bahadur Lama[1]
M. Phil in Management, Assistant Professor, Saraswati Multiple Campus
Faculty of Management, Tribhuvan University, Kathmandu, Nepal
ORCID: https://orcid.org/0000-0002-1498-4480
Email: padam.lama@smc.tu.edu.np

Prem Bahadur Budhathoki[2*]
M. Phil in Management, Associate Professor, Saraswati Multiple Campus
Faculty of Management, Tribhuvan University, Kathmandu, Nepal
ORCID: https://orcid.org/0000-0002-1249-7005
Email: prem.budhathoki@mahmc.tu.edu.np

Shiva Raj Ghimire[3]
Ph. D Scholar, Assistant Professor, Saraswati Multiple Campus
Faculty of Management, Tribhuvan University, Kathmandu, Nepal
Email:Shiva.ghimire@smc.tu.edu.np
ORCID: https://orcid.org/0009-0002-7952-1097
Email: shiva.ghimire@smc.tu.edu.np

Sheetal Joshi[4]
ORCID: https://orcid.org/0009-0007-4840-5823
Freelance Researcher, Kathmandu, Nepal

**Corresponding author: Prem Bahadur Budhathoki, Email: prem.budhathoki@mahmc.tu.edu.np*

Abstract

The advancement of artificial intelligence (AI) has become an essential platform for educational institutions, learners, and countless stakeholders. The use of AI enhances learning and improves academic achievement. Thus, the purpose of this study is to investigate the impact of learners' AI perception and AI motivation on the academic performance of learners using empirical data from Kathmandu, Nepal.

This study used descriptive, causal-relational research with a deductive approach to reflect the general characteristics of respondents, assess the association between variables, and investigate the influence of predictors on response variables while testing the formulated research hypotheses. Further, this study used primary sources of data gathered from undergraduate students. In addition, cross-sectional data were collected for analysis. The convenience sampling strategy was used in this study.

A structured questionnaire of 319 was delivered to the intended respondents, and only 182 (57.05%) were usable. The study employed statistical tools, including Cronbach's alpha for reliability assessment, descriptive statistics such as frequency, percentage, mean, and standard deviation to characterise respondents' background information, correlation analysis to explore relationships between variables, and regression analysis to evaluate the impact of predictors on the outcome variable.

The study results indicated a considerable beneficial influence of learners' AI perception on academic achievement, suggesting that a good learner impression of artificial intelligence use enhances academic success. Similarly, a favourable and substantial impact of AI motivation on academic performance was identified, indicating that an encouraging perspective of learners towards adopting artificial intelligence improves their educational outcomes.

The results of this study may benefit academic institutions, policymakers, and other stakeholders in tailoring teaching and learning methods to provide appropriate learning platforms in the contemporary day. Further Research in the future might be conducted in a variety of

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geographical areas, to include more aspects that influence academic achievement and artificial intelligence.

Keywords: *academic performance, artificial intelligence, learning motivation, perception*

JEL Classification: *I20, I23, O32, O33*

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1.0 INTRODUCTION

Artificial intelligence (AI) in the contemporary period represents an innovative breakthrough in technology, aiding educational institutions and learners while disseminating essential information and innovation globally. Consequently, AI significantly enhances education via innovative learning that promotes tailored instruction, resulting in improved academic achievement. The emergence of this technology signifies enhanced learning through knowledge exploration (Li et al., 2024). Moreover, the use of AI encompasses several fields, including educational sectors, that extend personalised learning and enhanced educational possibilities for university students (Zhang & Fenton, 2024). Interestingly, an evaluation system for the academic areas is shifting to match the developing scenarios and practices of modern education (Masters et al., 2025). Moreover, AI can create suitable learning materials and develop an educational environment (Al-Zahrani & Alasmari, 2024). Additionally, enhanced student performance necessitates the inclusion of advanced AI technology into the learning process (Sun & Zhou, 2024).

Next, academic performance is a critical dimension of the educational sector that demonstrates the success of entire institutions and achievement of higher educational goals, fundamentally assessed through test scores, grades of students, and accomplishment of academic requirements, as depicted by academic performance terminology (Liem, 2019). Furthermore, academic performance reveals the relevance of performance and the usage of AI to increase it, influencing career success (Mappadang et al., 2022). Similarly, AI is advantageous for educators and learners, providing advantages for customised and tailored learning and resources (Seo et al., 2021). Particularly, artificial intelligence enhances traditional assessment methods by facilitating continuous performance review, providing rapid feedback to learners, and identifying areas for development, hence demonstrating the need for AI integration (Al-Zahrani, 2024).

Additionally, Students' perceptions of accepting artificial intelligence in academic settings are complex, including both curiosity and anxiety. Fundamentally, learners accept AI, thinking it is a beneficial technology (Frechette, 2024). The evidence indicates that 92 per cent of students in the UK pursuing higher education accept AI, recognising the benefits it provides in explaining, drawing conclusions, and developing unique concepts for learners (HEPI, 2025). Moreover, managing and explaining sensory sources of information in order to get an understanding of the world is the process known as perception (Goldstein & Brockmole, 2009; Lama & Hamal, 2022). Thus, the sensory organs are responsible for identifying and explaining the surrounding environment, which helps students build a knowledge of how perception is connected to perception (Chucks et al., 2015). This technique is influenced by several components, including prior experiences, cultural background, and other aspects that shape perception. Such perception, when aligned with AI adoption, positively impacts academic achievement (Gibson, 1986).

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Further, learner motivation encompasses the many inner and extrinsic factors that inspire, enhance, and sustain learners' engagement in academic pursuits (Ryan & Deci, 2020). This encompasses the motivation, engagement, and goals that drive students to participate in and commit to academic learning (Schunk et al., 2021). In addition, motivation influences the learning attitude, route, and perseverance of learning, demonstrating a vital role in achieving educational success and human growth (Zusho et al., 2021). The use of artificial intelligence in fostering learning motivation substantially enhances educational achievement by influencing student engagement and adopting suitable learning mechanisms (Lei et al., 2024). To establish a standard for educational performance, a variety of motivating elements, including both external and internal drive, are essential. Additionally, students' interest in implementing artificial intelligence is piqued by internal motivating factors, which in turn encourage them to value the outcomes of their academic efforts. External motivating factors also encourage students to achieve academic performance continuously and sustainably.
(Wu et al., 2022).

A massive study in the area of AI related to the academic sector has been completed. However, there is a study deficit in evaluating learners' perceptions of AI and the relationship between motivation and educational success. Therefore, this study intends to evaluate the impact of learners' perceptions of AI adoption and motivation on academic achievement in the Nepalese environment, since past research has lacked significant experiments. Furthermore, insufficient studies have been undertaken, and further studies are needed to investigate the elements influencing academic achievement. Thus, this study investigates the following research questions: Is there a link between learners' perceptions of adopting AI and academic performance? Does learners' ambition to use AI help them do better academically? Is there an effect of AI adopting perception and motivation on academic performance? Further, to answer these research inquiries, this study has established research objectives: To evaluate the correlation between learners' perceptions of adopting AI and their academic achievement and to investigate the correlation between learners' motivation for embracing AI and their academic success. To investigate how learners' perceptions and motivations influence the adoption of artificial intelligence and its impact on academic achievement.

2.0 MATERIALS AND METHODS

2.1 AI Perception of Learner and Academic Performance

Learners' perspective encompasses their feelings and interpretations of many aspects of experiences acquired throughout the educational and learning process, which facilitates the development of effective communication, curiosity, and autonomy (Ferheen Bukhari & Basaffar, 2019). Moreover, exchanging knowledge and several emotions linked with learners are major drivers of how their curiosity motivates them to embrace artificial intelligence and improve their academic achievement (Kumaravadivelu, 2006; Naresh & Reddy, 2015). Further, the perception of the learner encompasses their experience with comprehension and the explanation of academic emotions.

As a result, learners' perceptions have a significant impact on learning concepts and student engagement. Previous research found a strong correlation between learners' perceptions of assessment methodologies and learning attitudes, as well as their stimulation (Gijbels & Dochy, 2006). Moreover, the academic accomplishment of students is favorably impacted by their impression of AI and the learning environment fostered inside academic institutions (Lizzio et al., 2002).

Similarly, further studies demonstrated a beneficial impact of artificial perception on academic achievement among university students (Shahzad et al., 2024). Additionally, students and mentors have a favourable opinion of AI, which enhances academic success by enabling personalised learning experiences (Ai-Badi et al., 2022). Additional studies indicated that students engaged in self-exploratory learning using technology-based platforms, along with a favourable view, had a positive correlation with their academic achievement (Lacuesta, 2024). Exciting research has demonstrated that exploring AI adoption in perception can stimulate

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academic performance, as artificial intelligence platforms offer opportunities for comfortable learning in inquiry and evaluation procedures, ultimately leading to improved academic performance (Zia et al., 2024).

2.2 Learners' AI Motivation and Academic Performance

Learners' AI motivation is a combination of internal and external variables that drive the artificial intelligence decision-making system and the ambition to learn. Thus, motivation for AI is enhanced by a positive attitude toward AI adoption (Oudeyer et al., 2007). The prior study results indicated a key function of artificial intelligence motivation among university students (Yurt & Kasarci, 2024). Several of the investigations illustrated a challenging environment in which AI adopts motivation (Sukirno & Bagdauletov, 2024).

Moreover, AI motivation has been demonstrated to promote academic achievement via beneficial learning (Leonardo et al., 2024). Another finding of a prior study demonstrated that intrinsic motivation related to artificial intelligence improves performance (Lin et al., 2021). The incentive provided by artificial intelligence enhances the study and information acquisition experiences, fostering positive cognition among students and enhancing their engagement with AI use (Sun & Zhou, 2024).

Moreover, the positive emotional aspect of AI enhances learning mechanisms, hence improving academic performance and yielding superior results. Consequently, AI-driven learning, characterised by enhanced motivation, fosters more student engagement and provides an enjoyable educational environment, resulting in superior academic achievement (Baillifard et al., 2024). More evidence highlighted that a greater degree of motivation employing artificial intelligence promotes tailored learning behaviour, bringing improvement in academic achievement and extending adaptive assistance to students (Lito & Mallillin, 2024; Zakaria et al., 2024).

Compelling evidence has emerged indicating that students using artificial intelligence, particularly those enrolled in physics courses, are achieving commendable results in their academic endeavours (Beltozar-Clemente & Diaz-Vega, 2024). Artificial intelligence enhances student motivation, ultimately resulting in improved academic outcomes (Gao et al., 2024).

2.3 Academic Performance

Academic performance includes quantifiable results of learners within an educational setting, evaluated by standardised scores, grades, completion trends, and other assessment indicators (Richardson et al., 2012). Moreover, academic success is a multifaceted construct influenced by several variables, extending beyond cognitive dimensions to include motivational and social elements (Bernal-Morales et al., 2018). Grades evaluate academic achievement but might benefit from including qualitative aspects (Ariza et al., 2020). This educational performance is impacted by individual beliefs and perceptions, including motivation linked with intended achievement (Theobald, 2021). Therefore, the elements influencing academic achievement include emotional and cognitive preferences, as well as individual and collective learning patterns. Following a study of prior material, the following hypotheses have been established:

H_1: There is a positive and significant influence of learners' AI perception on academic performance

H_2: There is a positive and significant influence of AI motivation on academic performance

2.4 Research Framework

The research framework provides a basis for the study, offering guidelines and demonstrating the coherence of research topics, methodology, and perspectives. This framework illustrates the current literature and assumptions and delineates the trajectory for the study

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(Maxwell, 2013). Thus, this study used learners' perceptions and artificial intelligence motivation as independent factors, with the academic achievement of learners as the dependent variable.

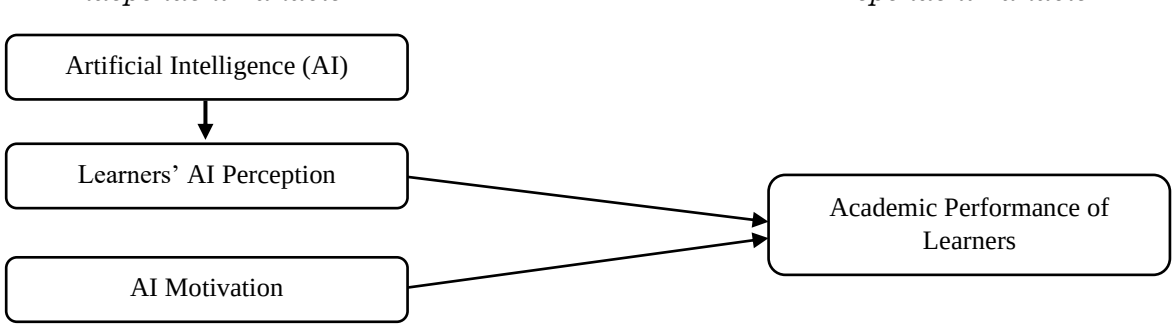

Figure 1. Research framework

Source: (Caratiquit & Caratiquit, 2023; Mallillin, 2024)

Figure 1 shows a research framework that figuratively represents the independent, dependent, and other study factors. These frameworks give structure and assistance for conducting good research investigations. As a result, learners' perceptions and AI motivation are independent factors, with learners' academic success as the dependent variable. According to the research framework, the study aimed to investigate the impact of combining artificial intelligence (AI) with perception and motivation on student academic achievement.

3.0 METHODOLOGY

3.1 Research Approach

The research aimed to evaluate the impact of artificial intelligence, namely AI perception and motivation, on the academic performance of undergraduate students in Kathmandu, Nepal. To attain the research aims and address the study's issue, this survey used a descriptive and causal-relational research design. Furthermore, the descriptive study method was used to represent the broad background information of respondents, exposing the total information of participants (Bradshaw et al., 2017). Additionally, Causal-relational research designs are essential for investigating the causal relationship between predictor and response variables (Brewer & Kubn, 2010).

3.2 *The Study Population and Sample*

The study's population is the total number of things or persons from whom a sample may be selected. The study's population consisted of undergraduate students in Kathmandu, Nepal, pursuing BBA programs. A total of 319 structured questionnaires were delivered to the intended respondents, with the researcher receiving 182 (57.05 per cent) usable survey questionnaires. To acquire primary data, the research used convenience sampling. This research gathered cross-sectional data for analysis.

3.4 The Study Tool

Survey design was employed through the administration of questionnaires to identify the specific characteristics of participants, which was deemed an effective method for collecting data relevant to the research topic. A questionnaire was used as the tool for data collection. The questionnaire was categorised into three primary sections: a cover letter, basic background information, and a structured questionnaire for gathering respondents' opinions. The cover letter section was included to clarify the study's objective. The fundamental backdrop included the inquiries used to gather personal information, including age, gender, and other demographic details. The research questions aimed to gather information pertinent to the study issue. A self-

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administered structured questionnaire including multiple-choice questions, single-choice questions, and a Likert scale (ranging from strongly disagree to agree strongly) was devised. The features of the Likert scale were modified linguistically from previous research. The instrument we devised is both trustworthy and valid since it centres on questions that are directly linked and pertinent to the study's subject.

3.5 Statistical Treatment Methods

The survey used a descriptive and causal-relational research methodology to investigate the research questions and evaluate the study's hypothesis using JAMOVI 2.6.13 software. The Cronbach's alpha coefficient was evaluated for each research variable to assess internal consistency in the reliability test. This research used descriptive statistics, using frequency and percentage to delineate the demographic features of respondents. This research produced a correlation matrix to evaluate the relationship between independent and dependent variables. The research used linear regression analysis to assess the influence of AI on students' academic achievement. Additionally, both descriptive and inferential analyses were conducted for data examination.

Table 1. Cronbach's Alpha Test Results for Reliability

Variables	**Item**	**Cronbach's α**
AI Perception	8	0.801
AI Motivation	5	0.823
Academic performance	6	0.808
Overall	3	0.865

Authors' computation using JAMOVI 2.6.13 software

Table 1 describes the influence of AI on education, which is made up of students' perceptions and motivations toward AI-based technologies, as well as the reliability assessment, especially the scale's Cronbach's alpha. A high degree of internal consistency between the items in the measuring scale is indicated by a Cronbach's alpha of 0.865. The "good reliability" range (usually between 0.8 and 0.9) is occupied by a rating of 0.865. All variables and items maintained a Cronbach alpha value greater than 0.60, indicating the statements' internal consistency and stability.

Table 2. Normality test

Normality Test (Shapiro-Wilk)

Statistic	p
0.996	0.894

Authors' computation using JAMOVI 2.6.13 software

Table 2 displays the findings of the Shapiro-Wilk test performed on the research's data collection. The Shapiro-Wilk test findings show that all of the p-values it generates are higher than 0.05, suggesting that the scores are distributed normally. Given that the data's statistic (W) value of 0.996 is so close to 1, it reflects that the data is distributed normally. The p-value for this W statistic is crucial, just as it is for any other Shapiro-Wilk test (Shapiro & Wilk, 1995). The null hypothesis cannot be rejected if the p-value exceeds the significance threshold, which is typically 0.05. This indicates that there is not enough evidence to conclude that the data substantially deviates from normalcy. Therefore, the result's p-value of 0.894 indicates that the data is about regularly distributed.

The Model Specification

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The study's estimated model assumes that several AI-related factors affect students' academic achievement. Students' perceptions and motivations about AI also affect their academic success. Therefore, the following is the study's model:

$AP = \alpha + \beta_1 LAIPR + \beta 2\ AIM + ei$..... (1)

Where,
AP = Academic Performance
LAIPR = Learners' Artificial Intelligence Perception
AIM = Artificial Intelligence Motivation
Ei = Error Term

4.0 RESULTS AND DISCUSSIONS

4.1 Descriptive Statistics

Table 3. Demographic Information of the Participants

Variables	Classification	Frequency	Percentage
Gender	Male	89	48.9
	Female	93	51.1
	Total	182	100
Age group	Below 20	89	48.9
	21-30	91	50.0
	Above 31	2	1.1
	Total	182	100
Educational level	Bachelor	182	100
	Total	182	100
AI Experience	None	9	4.9
	Not much	118	64.8
	Enough	55	30.2
	Total	182	100

Authors' computation using JAMOVI 2.6.13 software

Table 3 illustrates that the survey had 182 respondents, of whom 89 (48.90 per cent) were male and 93 (51.10 per cent) were female. The analysis of replies reveals a gender distribution, with females being the majority of respondents at 51.10 per cent, while men account for 48.90 per cent. Likewise, the majority of responders were aged between 21 and 30, at 91 (50 per cent), while those under 20 years of age accounted for 48.9 per cent in total. The age group over 31 included the fewest participants, accounting for 1.10 per cent of those surveyed. All participants, in terms of educational attainment, were from a bachelor's level (182, 100 per cent). A total of 118 (64.8 per cent) of individuals reported experiencing an uncommon event. Individuals who indicated sufficient experience constitute 55 (30.2 per cent) overall. The experience of the least responders was 9 (4.9 per cent) overall.

4.2 Correlation Analysis

The coefficients of correlation between the independent factors and the dependent variables of the students who responded to the survey in Kathmandu are reflected in the correlation analysis. The perceptions and learning motivations of students about artificial intelligence are independent factors. Specifically, the academic performance of the pupils is the dependent variable.

Table 4. Correlation Analysis

Variables	Mean	SD	LAIPR	AIM	AP
LAIPR	3.57	0.685	1.000		
AIM	3.50	0.679	0.678***	1.000	
AP	3.40	0.606	0.704***	0.673***	1.000

Authors' computation using JAMOVI 2.6.13 software

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*Note. * p < .05, ** p < .01, *** p < .001*

(LAIPR = Learners' artificial intelligence perception, AIM = Artificial intelligence motivation, and AP = Academic performance)

Table 4 elucidates the correlation between perception, motivation, and academic success in undergraduate students. The mean ratings for perception (3.57), motivation (3.50), and academic success (3.40) show that students often evaluate these elements favorably on a scale. At the same time, the standard deviations (between 0.606 and 0.685) reflect a modest degree of variability in answers. The correlation matrix indicates robust positive associations among all three variables. The correlation between students' impression of AI and their motivation toward AI is significant (r = 0.678), as is the correlation with academic achievement (r = 0.704).

This suggests that students with a favourable perspective are more inclined to be motivated and achieve superior academic results. Motivation is significantly correlated with academic achievement (r = 0.673), indicating that motivated students often get superior academic results. These correlations are statistically significant, indicating that the links are substantive and not attributable to random chance. This underscores the need to cultivate favourable impressions and a desire to improve students' academic achievement.

4.3 Regression Analysis

Regression analysis determines the impact of an independent variable on a dependent variable. Regression analysis determines the effect of an independent variable on a dependent variable. This research used regression analysis to ascertain the impact of students' AI perceptions and learning motivation on their academic achievement. The factors influencing students' academic success include their perceptions and drive to study AI.

Table 5: Regression Analysis

Regression	Estimate	SE	t	p	VIF
LAIPR	0.823	0.1716	4.80	<.001	
LAIPR	0.406	0.0593	6.85	<.001	1.85
AIM	0.323	0.0597	5.41	<.001	1.85

Authors' computation using JAMOVI 2.6.13 software

(LAIPR = Learners' artificial intelligence perception, AIM = Artificial intelligence motivation, and AP = Academic performance)

This regression study investigates the impact of Perception and Motivation on the dependent variable. The intercept of 0.823 indicates the baseline value of the result when both predictors are zero, accompanied by an accurate estimate (SE = 0.1716) and robust significance (t = 4.80, p < 0.001). The coefficient for Perception (0.406) indicates that a one-unit increase results in a 0.406 increase in the outcome, with Motivation held constant. This impact is exact (SE = 0.0593) and statistically significant (t = 6.85, p < 0.001). A VIF of 1.85 indicates there is no case of multicollinearity. Likewise, Motivation has a positive influence, shown by a coefficient of 0.323, indicating that a one-unit increase elevates the result by 0.323, provided that Perception stays unchanged. The effect is precise (SE = 0.0597) and very significant (t = 5.41, p < 0.001), accompanied by a low VIF (1.85).

Perception and Motivation are both substantial and independent predictors of the dependent variable, namely, students' academic success. Moreover, their low VIF values suggest that the predictors do not exhibit multicollinearity in explaining variance, hence enhancing the model's robustness. The elevated t-values and reduced p-values indicate that both correlations are markedly significant and improbable to arise by coincidence. The model indicates that improving Perception and Motivation may significantly and favourably impact students' academic performance, with Perception exerting a somewhat greater influence than Motivation. The regression model is presented below:

$$AP = 0.823 + 0.406LAIPR + 0.323AIM + ei \quad (2)$$

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4.4 Hypothesis Test

Table 6 presents the hypothesis test of the research. The research tested three hypotheses on the links between various characteristics of artificial intelligence (AI) tools and student academic performance, specifically examining how students' perceptions and learning motivation towards AI-based tools influence academic outcomes. The findings for each hypothesis indicated a significant association, demonstrating that the study yielded sufficient statistical evidence to accept the research hypotheses. The methodologies used for hypothesis testing were correlation and regression analysis. Correlation analysis assesses the magnitude and orientation of the link between variables (e.g., perception and academic achievement). Regression analysis evaluates the predictive connection, demonstrating the extent to which one variable (such as perception or motivation) may elucidate or forecast differences in another (academic achievement). Consequently, our data indicate robust, statistically significant correlations between AI technologies and several facets of students' academic achievement.

Table 6: Summary of Hypothesis Test

Hypothesis	Results
H_1: There is a positive and significant influence of learners' AI perception on academic performance	Accepted
H_2: There is a positive and significant influence of AI motivation on academic performance	Accepted

4.5 Discussion

The comprehensive investigation delved deeply into the myriad factors improving the academic performance of the youth, specifically focusing on students who were using Artificial Intelligence for different purposes, with an emphasis on variables related to Artificial Intelligence (AI). The purpose of the study was to assess academic achievement by taking into account several different characteristics. According to the research results, there is a positive and considerable effect that learners' perceptions of artificial intelligence have on their academic achievement.

This discovery is consistent with the findings of research that was conducted in the past (Fazil et al., 2024). The findings of prior research show that there is a strong connection between the perceptions of learners in relation to the methods of assessment and approaches to learning, as well as their stimulation (Gijbels & Dochy, 2006). Moreover, both the students' perceptions of their own willingness to embrace artificial intelligence (AI) and the learning environment that is fostered in educational institutions have a favourable impact on the academic performance of pupils (Lizzio et al., 2002).

Similarly, in terms of academic achievement, the research outcomes demonstrated that artificial intelligence (AI) motivation has a positive and substantial influence. The conclusion is consistent with the findings of research that was conducted in the past (Altememy et al., 2023; Caratiquit & Caratiquit, 2023). Findings from prior studies have shown that artificial intelligence perception with motivation has a significant effect on the students attending universities (Yurt & Kasarci, 2024). Additional evidence shows that a better level of motivation via the use of artificial intelligence facilitates the development of individualised learning behaviours, which in turn leads to an increase in academic performance and provides students with opportunities for adaptive assistance (Lito & Mallillin, 2024; Zakaria et al., 2024).

5.0 CONCLUSIONS

The purpose of this research was to investigate the impact that artificial intelligence perception and artificial motivation have on academic achievement. In order to verify the established hypotheses of the study, the researchers utilized statistical methods such as the Shapiro-Wilk test, Cronbach's alpha, frequency, percentage, correlation, and regression. These methods were utilized in order to address the research questions and accomplish the purpose of the study, which was to evaluate the nature of the relationship between students' perceptions and motivations regarding artificial intelligence and students' academic performance.

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Specifically, the outcomes of the research demonstrated that students' perceptions of artificial intelligence (AI) had a favorable and substantial impact on their academic performance. Support for the hypothesis (H1) is provided by the findings of the investigation. As a result, it can be stated that the use of AI technologies has a remarkable influence on the academic performance of learners. In light of the findings of the investigation, hypothesis (H2) is being supported. Students' perceptions of artificial intelligence (AI) have been shown to have a favorable and substantial influence on students' academic achievement, as well. Therefore, it can be inferred that students' academic performance is significantly impacted in a good way by their learning motivation with regard to artificial intelligence (AI). For the most part, it has been determined that the perceptions of students, as well as their learning motivations and their use of artificial intelligence (AI)-based technologies, have a favorable and substantial association with the academic achievement of students.

In summary, The results indicated that artificial intelligence had a good correlation with pupils' academic achievement. The use of Artificial Intelligence in educational environments has shown considerable promise to improve students' academic achievement. In conclusion, tackling the difficulties related to AI may benefit academic learners, and other fields, eventually enhancing results, especially in preparing students for an increasingly digital landscape. This study's findings will serve as a resource for educators, educational institutions, and governmental entities, promoting the use of AI-based technologies in teaching and learning processes. Nonetheless, the study is not without drawbacks. The study was conducted largely utilizing cross-sectional data, using a limited number of variables, and a small sample size derived from non-probability sampling, namely convenience sampling, with restricted inferential analysis focused mostly on a quantitative approach. Future studies may occur in several situations, including other significant aspects that affect students' academic achievement.

Author Contribution

Conceptualization: P.B.L., P.B.B., S.J.: methodology: P.B.L., P.B.B., S.J; project administration: P.B.L., P.B.B., S.R.G., S.J; software: P.B.L., P.B.B., S.J; validation: P.B.L., P.B.B., S.R.G., S.J.; formal analysis: P.B.L., P.B.B., S.R.G., S.J; investigation: P.B.L., P.B.B., S.R.G., S.J ; resources: P.B.L., P.B.B., S.J.; data curation: P.B.L., P.B.B. ; writing-original draft preparation: P.B.L., P.B.B., S.J.; writing-review and editing: P.B.L., P.B.B., S.R.G., S.J., visualization: P.B.L., P.B.B.; supervision: P.B.B.; funding acquisition: P.B.L., P.B.B., S.R.G:-

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