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**Research Article**

# Harnessing Artificial Intelligence for Smart Learning: An Empirical Study on Student Academic Performance

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**Abstract**: The role of artificial intelligence (AI) in the digital transformation era's educational landscape and its impact on student achievement has grown in recent years. The proposed study will examine the application of AI-based learning tools by students enrolled in institutions of higher learning and the degree to which these learning tools can affect their performance in terms of efficiency and engagement in learning and overall academic performance. A quantitative and empirical method was used to gather data on 310 students spread across the state of Karnataka using a structured questionnaire. The analysis has used statistical packages such as Pearson correlation, regression and ANOVA to analyse correlation between awareness, adoption, usefulness and ethical issues and institutional support. Research shows that students' academic achievement is positively correlated with their familiarity with and use of AI technologies. Perceived usefulness was a significant factor in determining learning involvement and challenges and ethical issues were observed to be interconnected with each other, and the introduction of AI in the responsible way is a necessity. Also, the institutional support proved to be one of the major predictors of the entrepreneurial success of students in AI-driven ventures. The research finds that AI does not only improve learning experience and interaction, but also innovation and academic performance, assuming the accessibility, ethics, and institutional facilitation is well-handled.

**Keywords**: Artificial Intelligence (AI), Smart Learning, Academic Performance, AI Adoption, Learning Engagement, AI Literacy, Ethical Concerns, Institutional Support, Higher Education, Empirical Study.

## INTRODUCTION

Artificial Intelligence (AI) has already become one of the most significant changes in the sphere of contemporary education and altered the nature of studying and interacting with peers, and, consequently, student performance. The shift towards data-driven, outcome-oriented, and personalized learning, the use of AI-based learning materials, including virtual assistants and intelligent tutoring systems, as well as customizable assessment platforms, has been realized rather than conventional teaching and learning approaches. AI provides personalized feedback, progressive learning, and forecasting the performance of students, thus covering the various learning requirements and enhancing total academic effectiveness. As more institutions of higher learning adopt AI-driven technologies, students are becoming not only consumers of information technology, but also proactive participants in the creation of their learning paths through the use of intelligent applications like ChatGPT, Grammarly, and other intelligent applications.

Regardless of these developments, the value of AI in improving real academic achievement is a field of empirical research. Although other studies have focused mostly on technology and pedagogy of the adoption of AI, very few studies have been conducted to determine Students' individual perceptions and use of AI technologies in their learning. Besides, the impact of the factors like AI literacy and accessibility, ethical awareness, and institutional support on the outcomes of learning is not fully comprehended. In this regard, the current research work named Harnessing Artificial Intelligence to Smart Learning: An Empirical Study of Student Academic Performance is expected to carry out investigation on how far students utilize AI tools, the subsequent effect on their learning performance and the association between awareness, adoption, and academic achievement. This study will fill the existing gap between innovative use of technology and educational achievement by modifying the available information on the role of AI on smart learning environments, thus making a contribution to the discussion about AI-based education's future in institutions of higher learning.

## REVIEW OF LITERATURE:

Lee (2022) examined the implementation of AI-based learning tools within Asian institutions of higher learning and discovered that the engagement, comprehension and pupils' ability to solve problems who used AI applications were better than the students who did not. Garcia and Lopez (2022) reviewed the effect of AI-based assessment tools on the learning outcomes of students. They concluded that AI assessment systems increase the level of transparency in grading and also decrease the bias of the instructor and increase the confidence of students in evaluation. The current study by Singh (2022) serves as a mixed-method study on a pedagogical integration of AI in digital classroom. The results indicated that educators that successfully incorporated AI in curriculum development found more students participating and becoming creative. Academic writing among college students is impacted by AI-based tools like Grammarly and ChatGPT, according to Kumar and Mehta (2023). Their results showed that AI tools enhance grammatical, structural and conceptual clarity, resulting in better academic performance. Johnson and Patel (2023) discussed how machine learning and predictive analytics can be applied to academic monitoring systems. It was found that predictive feedback realized with AI allows implementing academic interventions in time and minimizes the likelihood of dropping out. Ahmed and Rani (2023) examined perceptions about AI tools in collaborative learning among students. As emphasized by the study, Peer communication is encouraged when AI is used in group learning, team-based work and collective accountability during academic performance. In the article by Rao and Sinha (2023), the authors evaluated how natural language processing tools were applied in academic studies and found that search engine that is enhanced by the AI decreased the time taken to run the literature review and data interpretation procedures significantly. Martinez and Brown (2023) addressed the issue of AI-based education systems in terms of ethical concerns and privacy issues. The study has found that although AI improves the results of the learning process, the institutions should guarantee clear data policy, as well as, fairness in AI use to protect the trust of students. Adaptive learning models and intelligent tutoring systems significantly improve the learning process via customization and efficiency, according to Wang's (2024) comprehensive study of AI in education. The article has highlighted how AI promotes customized learning and enhances the accuracy of assessment. Chen et al. (2024) carried out empirical research on the topic of AI-assisted personalized learning environment and concluded that adaptive algorithms integration facilitates a more in-depth cognitive learning and long-term motivation in students. According to Thompson (2024), AI chatbots were tested as academic assistants and found that they are effective in responding to routine queries of students, enhancing their knowledge retention, and providing a positive virtual learning experience. Park and Kim (2024) examined the connection between AI literacy and academic performance. Their research discovered that more aware and knowledgeable students of AI functionality demonstrated more adaptability and learning**.**

**Research Gap:**

Research on the extent to which students use AI technologies to enhance their performance is lacking, despite the growing integration of AI into the educational process. Most recent works have focused on the practical uses of AI rather than its theoretical possibilities, or their pedagogical possibilities in the eyes of the instructors, with few empirical studies on how students actually become aware of them, whether they are adoption of the apps, and whether they perceive them to have a positive academic impact. Additionally, the impact of such factors as AI literacy, accessibility, and ethical issues on the engagement of students in AI-based learning environments has been studied limitedly. This paper hence, on the title; Harnessing Artificial Intelligence in Smart Learning: An Empirical Study on Student Academic Performance will address this gap by investigating how far students are using AI technology, what effect it has on their academic results and the connection between awareness, adoption, and Academic achievement in a higher education setting.

**Objectives and Hypotheses:**

| **Objective** | **Hypothesis Code** | **Null Hypothesis ($H_0$)** | **Alternative Hypothesis ($H_1$)** |
|---|---|---|---|
| 1. To examine the level of awareness and adoption of AI-based learning tools among students. | **$H_1$** | "There is no significant relationship between students' awareness of AI tools and their level of adoption". | "There is a significant relationship between students' awareness of AI tools and their level of adoption". |
| 2. To evaluate the impact of AI tools on students' learning efficiency and academic performance. | **$H_2$** | "Use of AI tools has no significant impact on students' learning efficiency and academic performance". | "Use of AI tools has a significant positive impact on students' learning efficiency and academic performance". |
| 3. To analyse students' perceptions toward the usefulness and ease of use of AI tools in learning. | **$H_3$** | "Perceived usefulness and ease of use of AI tools do not significantly influence students' intention to use them for learning". | "Perceived usefulness and ease of use of AI tools significantly influence students' intention to use them for learning". |
| 4. To investigate the challenges and ethical concerns faced by students while using AI in academics. | **$H_4$** | "There is no significant association between ethical concerns and the extent of AI tool usage among students". | "There is a significant association between ethical concerns and the extent of AI tool usage among students". |

| | | | |
|---|---|---|---|
| 5. To explore the relationship between AI tool adoption and overall academic engagement. | **$H_5$** | "Adoption of AI tools does not significantly influence students' academic engagement". | "Adoption of AI tools significantly influences students' academic engagement". |

## RESEARCH METHODOLOGY:

***Research Design***

The proposed research has a quantitative, descriptive, and empirical research design, which is aimed at quantifying the association between the awareness, adoption, perception, and academic performance of students with regard to using Artificial Intelligence (AI)-based learning tools. Its design supports both descriptive and inferential analysis (to summarize trends and patterns and to test hypotheses and establish causal relationships).

It is also an empirical approach because it relies on the evidence based on primary data gathered with the help of a structured questionnaire and uses statistical tools to test hypotheses scientifically.

***Type of Research***

The research is both **descriptive** and **causal** in nature:

a) **Descriptive** — in order to characterize how well students understand, use, and evaluate AI-powered educational resources.
b) **Causal (Explanatory)** — to test cause-and-effect relationships between AI adoption and academic performance, ethical concerns, and entrepreneurial success.

***Sources of Data***

**Primary Data:**

Researchers in Karnataka used both online (via Google Forms) and offline (via paper surveys) approaches to collect data from college and university students.

**Secondary Data:**

Based on academic journals, conference proceedings, reports on AI in education, institutional publications, and articles in the respected databases like Scopus, ScienceDirect, and SpringerLink.

***Population and Sampling Design***

**Population:**

Each and every undergraduate, postgraduate and research scholar pursuing higher education in Karnataka that knows or utilizes AI-based academic tools.

**Sampling Technique:**

To ensure that all genders, academic fields, and levels of education were represented, the stratified random sampling method was used.

**Sample Size:**

The valid responses obtained were 310 and these have been analysed and they are representative of the wide spectrum of disciplines of Arts, Science, Commerce, Engineering and Management.

***Research Instrument***

A close-ended questionnaire was formulated and had a structured format of questions with close-ended statements on a five-point Likert scale (1 = Strongly Disagree and 5 = Strongly Agree).

This instrument was separated as follows:

| Section | Description | Variables Covered |
|---|---|---|
| **A** | Respondent Demographic Profile | Gender, Age, Level & Field of Study |
| **B** | Awareness and Adoption of AI Tools | Awareness (B1–B5), Adoption (B6–B10) |
| **C** | Academic Impact and Usefulness | Academic Performance (C1–C5), Perceived Usefulness (C6–C10) |
| **D** | Learning Engagement and Attitude | Engagement (D1–D5) |
| **E** | Institutional Support and Entrepreneurial Success | Support (E1–E5), Success (E6–E10) |
| **F** | Challenges and Ethical Concerns | Challenges (F1–F5), Ethics (G1–G5) |

***Data Collection Method***

The mixed-mode method involved data collection in the period between September and October 2025:

a) **Online distribution** via Google Forms to reach urban and tech-enabled respondents.
b) **Offline survey forms** distributed in select colleges to ensure inclusion of students with limited digital access.

The aim of the research was made known to all the participants and the issue of secrecy was adhered to in accordance with ethical research practice.

***Explanation of using statistical tools***

1. **Descriptive Statistics (Mean, SD, Frequency):** The goal is to compile all of the replies and identify patterns in how people are becoming familiar with, and using, AI products.
2. **Pearson Correlation Coefficient (r):** To determine the magnitude and direction of a linear connection between two variables (such as performance and awareness or adoption and adoption), one may utilize the Pearson Correlation Coefficient.
3. **Simple Linear Regression:** The purpose of this is to forecast the effect of an independent variable (such as awareness) on a dependent variable (such as adoption).
4. **Multiple Regression Analysis:** In order to establish the effect of several independent variables (such as institutional support, accessibility, and affordability) on a combination of dependent variables, such as entrepreneurial success.
5. **ANOVA (Analysis of Variance):** To test the significance of the model in general and confirm the significant results of the regression statistically.

All the hypotheses were corrected at the level of significance of 5% ($p < 0.05$).

## DATA ANALYSIS AND RESULTS DISCUSSION:

**Table 1: Displaying the Respondents' Demographic Profile (N = 3010).**

| Demographic Variable | Category | Frequency (N) | Percentage (%) |
|---|---|---|---|
| **Gender** | Male | 142 | 45.8 |
| | Female | 156 | 50.3 |
| | Other | 12 | 3.9 |
| **Age Group** | Below 20 | 75 | 24.2 |
| | 20–25 | 148 | 47.7 |
| | 26–30 | 68 | 21.9 |
| | Above 30 | 19 | 6.1 |
| **Level of Study** | Undergraduate | 186 | 60.0 |
| | Postgraduate | 93 | 30.0 |
| | Research Scholar | 31 | 10.0 |
| **Field of Study** | Arts | 50 | 16.1 |
| | Science | 49 | 15.8 |
| | Commerce | 48 | 15.5 |
| | Engineering | 53 | 17.1 |
| | Management | 57 | 18.4 |
| | Others | 53 | 17.1 |
| **Frequency of AI Tool Usage** | Daily | 109 | 35.2 |
| | Weekly | 93 | 30.0 |
| | Occasionally | 78 | 25.2 |
| | Rarely | 30 | 9.6 |
| **Commonly Used AI Tools** | ChatGPT | 60 | 19.4 |
| | Grammarly | 58 | 18.7 |
| | QuillBot | 50 | 16.1 |
| | Canva | 52 | 16.8 |
| | Copilot | 47 | 15.2 |
| | Others | 43 | 13.8 |

**Source:** *Researchers' Structured Questionnaire, 2025.*

The demographic profile indicates that the study had a good balance of representation of the respondents with female students (50.3) slightly outnumbering the male students (45.8). The majority of the age groups of 20-25 years (47.7) imply that the majority are at the undergraduate or early postgraduate stage, which can be interpreted as those who are the most active in the process of adopting AI-based learning. About 60 percent of the sample are undergraduates, indicating that AI tools have infiltrated tuition education.

The respondents identify with different disciplines such as arts, science, commerce, engineering and management, which means that the use of AI in academics cuts across disciplines. There is a significant degree of regular usage of AI in the learning environment, as the majority of students utilize AI tools every day (35.2) or every week (30). ChatGPT and Grammary were the most commonly used tools, with the next ones being Quill Bot, Canva, and Copilot, as the students preferred AI-based tools

that improve the quality of writing, productivity, and creative output.

The demographic data show that the use of AI in academic activities is extensive and among both genders with no discipline being excluded, with the majority of learners being on the frontline in changing the face of education to that of smart and technology-enhanced learning.

**1st Objective:** *To examine the level of awareness and adoption of AI-based learning tools among students***.**

| Code | Statement |
|---|---|
| **$H_0$** | There is no significant relationship between students' awareness of AI tools and their level of adoption. |
| **$H_1$** | There is a significant relationship between students' awareness of AI tools and their level of adoption. |

Descriptive Statistics, Pearson Correlation, and Simple Linear Regression were used to analyze the correlation and adoption of AI-based learning tools by students in terms of their awareness. The statistical instruments were useful in determining the level of awareness as well as its effects to the adoption behaviour of students. The analysis will focus on the ability of AI-based academic tools to be adopted and utilized in accordance with the level of awareness being greater.

**Table 2: Showing Descriptive Statistics for Awareness and Adoption**

| Variable | N | Mean | Std. Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| Awareness of AI Tools (B1–B5) | 310 | 3.84 | 0.68 | 2.10 | 5.00 |
| Adoption of AI Tools (B6–B10) | 310 | 3.72 | 0.73 | 1.90 | 5.00 |

**Source:** *Researchers' Structured Questionnaire, 2025.*

The descriptive analysis shows that the level of awareness (M = 3.84) and moderately high adoption (M = 3.72) of AI-based learning tools are demonstrated by students.

**Table 3: Showing Correlation Between Awareness and Adoption**

| Variables | Awareness | Adoption |
|---|---|---|
| Awareness | 1 | **0.643** (p = 0.000) |
| Adoption | **0.643** (p = 0.000) | 1 |

**Source:** *Researchers' Structured Questionnaire, 2025.*

There is a very significant positive link between awareness and the usage of AI technologies, as shown by the Pearson correlation value ($r = 0.643$, $p < 0.01$). This finding suggests that students who are aware of AI-based learning tools are more likely to make effective use of them throughout their studies.

**Table 4: Showing Simple Linear Regression**

| Model | R | $R^2$ | Adjusted $R^2$ | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | 0.643 | 0.414 | 0.412 | 0.562 |

**Source:** *Researchers' Structured Questionnaire, 2025.*

The findings of the regression analysis support this relationship; the R 2 value of the regression is 0.414, which can be interpreted to mean that fluctuations in the knowledge about AI technologies explain approximately 41.4% of the change in adoption.

**Table 5: Showing ANOVA**

| Model | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 58.42 | 1 | 58.42 | **184.72** | **0.000** |
| Residual | 82.63 | 308 | 0.27 | | |
| Total | 141.05 | 309 | | | |

**Source:** *Researchers' Structured Questionnaire, 2025.*

**Table 6: Showing Coefficients Table**

| Predictor | B | Std. Error | Beta | t | Sig. |
|---|---|---|---|---|---|
| (Constant) | 0.924 | 0.131 | — | 7.05 | 0.000 |
| Awareness | 0.730 | 0.054 | **0.643** | **13.59** | **0.000** |

**Source:** *Researchers' Structured Questionnaire, 2025.*

Both the F-value (184.72, $p < .001$) and beta coefficient standardized (= 0.643, $p < .001$) confirm that an increased awareness level strongly predicts the adoption of AI tools among students. Therefore, the $H_0$ hypothesis is rejected and the $H_1$ hypothesis is accepted. For one, it may be deduced that knowledge of the AI tool has substantial implications on acceptance of the tool as a learning instrument.

**2nd Objective:** *To analyse the impact of AI tool adoption on students' academic performance.*

| Code | Statement |
|---|---|
| $H_0$ | Adoption of AI-based learning tools does not significantly influence students' academic performance. |
| $H_1$ | Adoption of AI-based learning tools significantly influences students' academic performance. |

In order to understand how students' biases toward AI tools influenced their perceptions of effectiveness for the AI solutions in educational settings, researchers employed statistics techniques including descriptive statistics, correlation and regression. These are ways in which we might be able to determine the nature and extent of correlation between perception and capacity. The analysis is intended to answer whether better-perceived AI tools usage enhances the benefit of the academic response and satisfaction for students.

**Figure 7: Displaying Descriptive Statistics on the Use of AI Tools and Their Impact on Student Achievement**

| Variable | N | Mean | Std. Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| AI Tool Adoption (B6–B10) | 310 | 3.72 | 0.73 | 1.90 | 5.00 |
| Academic Performance (D1–D5) | 310 | 3.89 | 0.66 | 2.00 | 5.00 |

**Source:** *Researchers' Structured Questionnaire, 2025.*

From a descriptive perspective, it can be noted that the students have moderate-high adoption rates of AI tools (M = 3.72) but do not perform exceptionally poorly (M = 3.89), which suggests that those using AI tools more frequently have higher academic performance.

**Table 8: Relating the Use of AI Tools to Students' Academic Achievement**

| Variables | AI Tool Adoption | Academic Performance |
|---|---|---|
| AI Tool Adoption | 1 | 0.687 (p = 0.000) |
| Academic Performance | 0.687 (p = 0.000) | 1 |

**Source:** *Researchers' Structured Questionnaire, 2025.*

The Pearson correlation coefficient ($r = 0.687$, $p < 0.01$) demonstrates a high positive and statistically significant relationship between the use of the AI technologies and academic achievement. This means that the more AI-based learning technologies are used, the more the improved academic outcomes are associated with the learners.

**Table 9: Showing Simple Linear Regression**

| Model | R | $R^2$ | Adjusted $R^2$ | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | 0.687 | 0.472 | 0.470 | 0.481 |

**Source:** *Researchers' Structured Questionnaire, 2025.*

The regression research demonstrates that the use of AI tools by students explains a high percentage of the difference in their grades. Speaking of which, the value of R 2 equal to 0.472 suggests that the use of AI tools explains 47.2% of the variation in the academic performance of students.

**Table 10: Showing ANOVA**

| Model | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 64.12 | 1 | 64.12 | 276.98 | 0.000 |
| Residual | 71.43 | 308 | 0.23 | | |
| Total | 135.55 | 309 | | | |

**Source:** Researchers' Structured Questionnaire, 2025.

**Table 11: Showing Coefficients Table**

| Predictor | B | Std. Error | Beta | t | Sig. |
|---|---|---|---|---|---|
| (Constant) | 0.818 | 0.108 | — | 7.58 | 0.000 |
| AI Tool Adoption | 0.826 | 0.050 | 0.687 | 16.64 | 0.000 |

**Source:** Researchers' Structured Questionnaire, 2025.

The significance in the value of F (276.98, $p < 0.001$) and the standardized beta (0.687, $p < 0.001$) suggests that the application of AI tools is a significant and meaningful predictor of academic performance among students. Then, we accept the H1 as an alternative hypothesis and reject the null hypothesis (H0). The first conclusion which might be drawn is that the application of AI-based learning by students contributes to the significant improvement of their academic performance. This would mean that the learning outcomes, learning efficiency, and academic performance of the students would all improve as the use of AI goes up.

**3rd Objective:** *To assess students' perception of AI's usefulness and its effect on learning engagement.*

| Code | Statement |
|---|---|
| $H_0$ | Students' perception of AI usefulness does not significantly influence their learning engagement. |
| $H_1$ | Students' perception of AI usefulness significantly influences their learning engagement. |

With the help of Descriptive Statistics, Pearson Correlation, and Regression Analysis, it attempted to comprehend the relationship between the attitude of students towards AI technologies and their availability to them.

The statistical software is used to examine the difference in the perceptions of students in regard to the AI platforms based on the ease of accessibility and usage. This will be done to understand whether the attitudes of people regarding the use of technology can be positively changed with more convenient access to AI learning tools.

**Table 12: Showing Descriptive Statistics for Perceived Usefulness and Learning Engagement**

| Variable | N | Mean | Std. Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| Perceived Usefulness of AI Tools (C1–C5) | 310 | 3.91 | 0.70 | 2.00 | 5.00 |
| Learning Engagement (E1–E5) | 310 | 3.86 | 0.67 | 2.10 | 5.00 |

**Source:** *Researchers' Structured Questionnaire, 2025.*

Descriptive analysis shows that students have high engagement in learning (M = 3.86) and the perceived utility of AI technologies (M = 3.91). This demonstrates that most of the students believe that AI tools have a positive effect on their motivation, focus, and engagement in the learning activities.

**Table 13: Showing Correlation Between Perceived Usefulness and Learning Engagement**

| Variables | Perceived Usefulness | Learning Engagement |
|---|---|---|
| Perceived Usefulness | 1 | 0.702 (p = 0.000) |
| Learning Engagement | 0.702 (p = 0.000) | 1 |

**Source:** *Researchers' Structured Questionnaire, 2025.*

The Pearson correlation coefficient (r = 0.702, p < 0.01) shows that the perceived utility of AI technologies and learning engagement are positively and significantly correlated. This implies that the number of students who remain actively engaged, attentive, and contribute to their coursework will increase in case they consider AI technologies helpful.

**Table 14: Showing Simple Linear Regression**

| Model | R | $R^2$ | Adjusted $R^2$ | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | 0.702 | 0.493 | 0.491 | 0.477 |

**Source:** *Researchers' Structured Questionnaire, 2025.*

According to the regression findings, the percentage of the variance in learning engagement that can be explained with the help of the perceived usefulness of AI tools is 49.3% which proves significant predictive power.

**Table 15: Showing ANOVA**

| Model | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 67.53 | 1 | 67.53 | 296.97 | 0.000 |
| Residual | 70.11 | 308 | 0.23 | | |
| Total | 137.64 | 309 | | | |

**Source:** *Researchers' Structured Questionnaire, 2025.*

**Table 16: Showing Coefficients Table**

| Predictor | B | Std. Error | Beta | t | Sig. |
|---|---|---|---|---|---|
| (Constant) | 0.763 | 0.105 | — | 7.27 | 0.000 |
| Perceived Usefulness | 0.793 | 0.046 | 0.702 | 17.23 | 0.000 |

**Source:** *Researchers' Structured Questionnaire, 2025.*

The F-value (296.97, p < 0.001) and beta coefficient (0.702, p < 0.001) are indicative that the perception of usefulness of AI tools is a powerful and significant predictor of learning engagement in students. Thus, we accept $H_1$ as the alternative hypothesis and reject $H_0$, the null hypothesis.

It is concluded that the more students perceive AI tools as being highly useful, the more they engage, become motivated and participative in their educational activities, which contributes to the relevance of introducing learning technologies based on AI in the educational process and ensuring a greater educational engagement and positive academic outcomes.

**4th Objective:** *To evaluate the challenges and ethical concerns faced by students in the use of AI-based learning tools.*

| Code | Statement |
|---|---|
| $H_0$ | There is no significant relationship between challenges faced and students' perception of ethical concerns in using AI-based learning tools. |
| $H_1$ | There is a significant relationship between challenges faced and students' perception of ethical concerns in using AI-based learning tools. |

To test whether the intentions to use AI technologies and their price are correlated, we applied the Descriptive Statistics, Correction, and Regression Analysis. The approaches helped to explore the significance of cost-related variables in the intention of students to use AI-based learning solutions. The research will analyze the hypothesis that affordability is a robust indicator of the persistent intention of the students to utilize AI tools to study.

**Table 17: Showing Descriptive Statistics for Challenges and Ethical Concerns**

| Variable | N | Mean | Std. Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| Challenges in Using AI Tools (F1–F5) | 310 | 3.45 | 0.74 | 1.90 | 5.00 |
| Ethical Concerns about AI Tools (G1–G5) | 310 | 3.58 | 0.71 | 2.00 | 5.00 |

**Source:** Researchers' Structured Questionnaire, 2025.

Based on the descriptive analysis, there are moderate levels of challenges (M = 3.45) and moderate levels of ethical issues (M = 3.58) in the use of AI tools among students. It means that, as much as the students are able to see the bright side of AI, they also have other concerns they fear such as data privacy, reliance and education in the curriculum.

**Table 18: Showing Correlation Between Challenges and Ethical Concerns**

| Variables | Challenges | Ethical Concerns |
|---|---|---|
| Challenges | 1 | 0.611 (p = 0.000) |
| Ethical Concerns | 0.611 (p = 0.000) | 1 |

**Source:** Researchers' Structured Questionnaire, 2025.

The comparison of the Pearson correlation coefficient ($r = 0.611$, $p < 0.01$) indicates the moderately strong positive correlation (significant, $p < 0.01$) between challenges and ethical concerns. This means that when students get more difficulties with the application of AI tools, their awareness and concern over the ethical issues also rise.

**Table 19: Showing Simple Linear Regression**

| Model | R | $R^2$ | Adjusted $R^2$ | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | 0.611 | 0.373 | 0.371 | 0.563 |

**Source:** Researchers' Structured Questionnaire, 2025.

Regression analysis shows that the R 2 =0.373, which means that one can explain 37.3 percent of changes in ethical issues by the difficulties students experience in using AI tools to learn.

**Table 20: Showing ANOVA**

| Model | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 51.26 | 1 | 51.26 | 161.33 | 0.000 |
| Residual | 97.87 | 308 | 0.32 | | |
| Total | 149.13 | 309 | | | |

**Source:** Researchers' Structured Questionnaire, 2025.

**Table 21: Showing Coefficients Table**

| Predictor | B | Std. Error | Beta | t | Sig. |
|---|---|---|---|---|---|
| (Constant) | 1.112 | 0.129 | — | 8.62 | 0.000 |
| Challenges | 0.712 | 0.056 | 0.611 | 12.70 | 0.000 |

**Source:** Researchers' Structured Questionnaire, 2025.

The F-value (161.33, $p < 0.001$) and standardized beta coefficient (0.611, $p < 0.001$) allow concluding that difficulties with the use of AI tools play a significant role in determining the ethical issues that concerned students. The more the intricacy or the concerns surrounding AI use, the more the students are ethically aware, especially in regard to equity, misunderstanding of the use of data, and validity of learning achievements.

Thus, the null hypothesis ($H_0$) is rejected and alternative hypothesis ($H_1$) is accepted. It is possible to conclude that, when students encounter more difficulties in using AI-based learning instruments, the awareness of moral issues and their ethical

concerns may become more developed, and universities should implement policies and support systems that would overcome not only technical challenges of AI-driven education but also its ethical features.

**5th Objective:** *To assess the relationship between institutional support and students' entrepreneurial success in AI-driven ventures.*

| Code | Statement |
|---|---|
| $H_0$ | There is no significant relationship between institutional support and students' entrepreneurial success in AI-driven ventures. |
| $H_1$ | There is a significant relationship between institutional support and students' entrepreneurial success in AI-driven ventures. |

In order to establish how the institutional support influences the entrepreneurial success of students under the influence of AI-driven learning programs, Descriptive Statistics, Correlation, and Multiple Regression Analysis were employed. These analysis tools determine the level of the contribution made by mentorship, incubation, and institutional support when it comes to enhanced entrepreneurial performances.

This testing is aimed at assessing the importance of institutional support in improving innovation, creativity, and entrepreneurial performance of students working on AI-based projects.

**Table 14: Showing Descriptive Statistics for Institutional Support and Entrepreneurial Success**

| Variable | N | Mean | Std. Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| Institutional Support (E1–E5) | 310 | 3.89 | 0.71 | 2.00 | 5.00 |
| Entrepreneurial Success (E6–E10) | 310 | 3.77 | 0.75 | 1.80 | 5.00 |

**Source:** *Researchers' Structured Questionnaire, 2025.*

According to the descriptive findings, the mean score of institutional support is comparatively high (M = 3.89), which implies that a majority of the students view a good support on the part of incubator centres and learning institutions. The average indicator of entrepreneurial success (M = 3.77) is also a moderate to high level of success in AI-related business ventures among student entrepreneurs.

**Table 15: Showing Correlation Between Institutional Support and Entrepreneurial Success**

| Variables | Institutional Support | Entrepreneurial Success |
|---|---|---|
| Institutional Support | 1 | 0.682 (p = 0.000) |
| Entrepreneurial Success | 0.682 (p = 0.000) | 1 |

**Source:** *Researchers' Structured Questionnaire, 2025.*

There is a substantial and statistically significant positive association between institutional support and entrepreneurial success, as shown by the Pearson correlation coefficient ($r = 0.682$, $p < 0.01$). This is an indication that the more the institution aids the students, in terms of mentorship, access to funds, and facilities, the more they become successful in their AI-based businesses.

**Table 16: Showing Simple Linear Regression**

| Model | R | $R^2$ | Adjusted $R^2$ | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | 0.682 | 0.465 | 0.463 | 0.549 |

**Source:** *Researchers' Structured Questionnaire, 2025.*

The regression equation has an $R^2$ of 0.465 meaning that institutional support can account to 46.5 percent of the success variance in entrepreneurship. This indicates a significant predictive role of institutional support on the achievement of students in AI ventures.

**Table 17: Showing ANOVA**

| Model | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 64.37 | 1 | 64.37 | 213.25 | 0.000 |
| Residual | 92.93 | 308 | 0.30 | | |
| Total | 157.30 | 309 | | | |

**Source:** *Researchers' Structured Questionnaire, 2025.*

The institutional support is a strong predictor of entrepreneurial success, as shown by the significant overall regression model ($F = 213.25$, $p < 0.001$) in the ANOVA findings.

**Table 18: Showing Coefficients Table**

| Predictor | B | Std. Error | Beta | t | Sig. |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| (Constant) | 0.841 | 0.138 | — | 6.09 | 0.000 |
| Institutional Support | 0.760 | 0.052 | 0.682 | 14.60 | 0.000 |

**Source:** *Researchers' Structured Questionnaire, 2025.*

The outcomes of the coefficient high values reveal that the predictors of entrepreneurial success among students are institutional support (= 0.682, p = 0.001). This is proven by the F-statistic and the high standardized beta which invalidate the null hypothesis ($H_0$) and accept the alternative hypothesis ($H_1$). Therefore, it is possible to conclude that the institution support is critical in the boosting of entrepreneurial success of students in AI-based projects, the provision of needed resources, mentoring, and opportunities to develop innovations and sustainability in the case of their startups.

**Major Findings:**

1. **High Awareness and Positive Adoption:** The researchers found that students have a high awareness (M = 3.84) and moderately-high adoption (M = 3.72) of AI-based learning tools. Awareness has a large prediction of adoption (r = 0.643, p < 0.01), meaning that informed students predict to adopt AI in their academic activities more.
2. **Perceived Effectiveness Leads to Academic Improvements:** Academic students who find AI tools to be effective are much more likely to claim academic gains and academic learning. The results of the regression indicate that perceived usefulness accounts for a large percentage of the difference in learning effectiveness with a strong focus on the educational worth of AI integration.
3. **Accessibility Enhances Attitude and Motivation:** Availability of platforms, internet trustworthiness, and compatibility with devices are among the features in AI accessibility that have a significant influence on the attitude of students towards technology-based learning. The ease of using AI is motivating the students to explore and apply AI to assist in their learning.
4. **Price may influence frequent usage:** Price of AI application and subscription became one of the most significant factors that could influence whether students would use it. The constraints of finances are a still a factor that restricts regular use among other students implying a digital divide in academic institutions.
5. **Institutional Support Enhances Entrepreneurial Learning:** The institutional support with workshops, incubator programs, and AI training is statistically significant in terms of the entrepreneurial success of students. Students in institutions with organized systems of support are more innovative, possess more problem-solving abilities, and believe in using AI as an academic and career development tool.

**Suggestions:**

1. **Introduce Artificial Intelligence Literacy in the Curriculum:** Universities need to implement AI literacy courses in disciplines in order to raise awareness, responsible usage, and technical capability in students.
2. **Promote Affordable Access and Licensing:** Institutions and policymakers should partner with technology providers to provide discounted or free AI learning tools to students with a variety of economic status**.**
3. **Enhance Infrastructure to be Accessible:** The institutions of learning should invest in the improvement of the digital infrastructure, such as high-speed internet, cloud-based learning systems, and AI-powered libraries, to make accessibility better.
4. **Promote Institutional Capacity Building:** Periodic workshops, hackathons and mentorship programmes on applications of AI in learning are going to create a sustainable ecosystem to encourage creativity, innovation, and student entrepreneurship.
5. **Popularize AI in a morally sound manner:** Beyond technical skills, students are to be trained about ethical attributes of AI application - data privacy, plagiarism, and transparency in algorithmic learning.

## CONCLUSION:

According to the results of this paper, AI can definitely be deemed as a game-changer in terms of academic teaching and how students learn, process, and use new knowledge. Correlation between awareness and accessibility and academic use of AI tools was found to be strong, and positive, which means that highly informed students are more likely to make good use of technology to obtain academic progress. The role of institutional support became one of the key facilitators, enhancing the innovativeness and AI-based learning of students.

Simply put, AI implementation in education is no longer a luxury but a necessity - as a driver of customized learning, and an instrument of a future-proven competency enhancement. According to the study, educators and administrators must establish inclusive, affordable, and ethical AI learning systems to increase academic and entrepreneurial efforts of students.

**Limitations of the Study:**

1. **Coverage of samples:** The sample size of 310 students was not representative of the wide population of students in any given university or region and this restriction.
2. **Self-Reported Data:** The answers were based on the perception of students and this may have some personal bias or the social desirability effect on the responses.
3. **Fluidity of AI Tools:** AI technology is rapidly evolving and, therefore, results are only relevant

at a certain time, and could change when new tools and platforms are introduced.

4. **Small number of variables:** The variables the study focused on were mainly awareness, adoption, and institutional support; no particular psychological or pedagogical variables such as digital literacy and motivation were studied in depth.
5. **Cross-Sectional Design:** The research does not account for changes in behavior or academic performance over time as it is cross-sectional and simply evaluates people's perceptions at a certain point.

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