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AI Applications in Business, Education and Society: Reshaping Teaching and Learning in Higher Education

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ABSTRACT - Generative Artificial Intelligence is transforming higher education by assisting with concept clarification, academic support, content development, and independent learning. This study examines human–GenAI interaction and its association with perceived teaching and learning outcomes using a quantitative descriptive survey. Data was gathered via a structured five-point Likert-scale questionnaire from 54 participants, encompassing undergraduate and postgraduate students, research scholars, and faculty members. Descriptive statistics, Spearman's rank correlation, a one-sample t-test, and simple linear regression were used. Findings showed positive perceptions of GenAI support, especially for clarifying difficult concepts. Academic use was positively associated with student engagement, while perceived usefulness was associated with learning outcomes. Usage frequency was not significantly associated with perceived academic performance. The study highlights educational opportunities alongside concerns about academic integrity, overdependence, and responsible use.

Keywords: Generative Artificial Intelligence, Higher Education, Human–AI Interaction, Teaching and Learning, Educational Technology, Student Engagement, AI-Assisted Learning

1. INTRODUCTION

The development of Generative Artificial Intelligence (Gen AI) is transforming higher education by supporting personalized learning, academic assistance, content creation, and problem-solving. AI tools such as ChatGPT, Gemini, and Copilot are increasingly used by students for assignments, coding, and independent learning, while educators utilize them for lesson planning and instructional support. Human–AI interaction offers opportunities to improve learning experiences, collaboration, and teaching effectiveness. However, concerns regarding academic integrity, overdependence, ethical usage, and digital literacy remain important. This study centers how individuals interact with Generative AI within universities and analyzes its perceived effects on learning and teaching process.

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2. STATEMENT OF THE PROBLEM

The increasing adoption of Generative AI systems in higher education has transformed the way students learn and educators teach. Despite the growing usage of AI-assisted educational tools, there is limited empirical evidence regarding how humans interact with Generative AI and how such interaction influences teaching effectiveness, student engagement, and learning outcomes. Investigating these interactions is essential for developing efficient pedagogical frameworks and ethically AI is responsible for integrating across higher education institutions.

3. OBJECTIVES OF THE STUDY

1. To investigate the future scope of Generative AI integration within higher education instruction.
2. To analyse human interaction patterns using Generatively AI platforms.
3. To evaluate how Generative AI applications alter student engagement and learning effectiveness.
4. To assess faculty perceptions regarding the role of Generative AI in classrooms.
5. To identify challenges associated with Generative AI usage in higher education.

4. RESEARCH QUESTIONS

1. How do students and educators interact with Generative AI in higher education?
2. What is the influence of Generative AI on instructional quality and educational outcomes?
3. Does Generative AI improve student engagement and academic performance?
4. What challenges arise from the implementation of Generative AI in education?
5. What factors influence the acceptance and integration of Generative AI in higher education

5. HYPOTHESES OF THE RESEARCH

The subsequent hypotheses were formulated and evaluated using the survey responses:

H1: A meaningful connection exists between Generative AI usage for academic purposes and learner involvement.

H2: Generative AI positively influences perceived learning effectiveness in higher education.

H3: Perceived usefulness of GenAI is significantly associated with teaching and learning outcomes.

H4: Ease of application of GenAI technologies significantly affects system acceptance.

H5: A substantial correlation exists between frequency of AI usage and perceived academic performance.

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6.Research_boundaries

This investigation focuses on examining human interaction with Generative Artificial Intelligence (Gen AI) in higher education, including students across all academic levels, independent researchers and academic staff. It explores the frequency and purpose of AI usage, perceived usefulness, ease of use, student engagement, and learning effectiveness. The study also examines the perceived influence of GenAI tools on academic performance, personalized learning, teaching efficiency, and access to educational resources.

7.Significance_Of_the_Study

This study contributes to the growing field of Artificial Intelligence in Education by examining human interaction with Generative AI and its perceived influence on pedagogy and student development. The findings provide insights into AI usage patterns, student engagement, learning effectiveness, and the challenges associated with AI integration. The study may help educators adopt effective AI-assisted teaching strategies, support institutions in developing appropriate AI usage policies, guide researchers in exploring human–AI interaction, and assist policymakers in establishing ethical guidelines for responsible AI use.

8. REVIEW OF LITERATURE

8.1 Generative AI in teaching workflow

Generative AI developed into a vital asset within tertiary education, supporting personalized learning, automated tutoring,automated asset production and scholarly guidance. Platforms such as ChatGPT, Gemini and Copilot enable students to access learning resources, clarify complex concepts, and complete academic tasks efficiently. These applications offer pathways to enrich educational engagements and support innovative teaching practices.

8.2 Human–AI Interaction

Human–AI interaction examines how individuals communicate and collaborate with artificial intelligence systems to accomplish specific tasks. In tertiary education, students and educators interact with GenAI for information retrieval, problem-solving, curriculum design and creation and academic support. Effective interaction may improve learning efficiency, accessibility, and decision-making while requiring users to evaluate AI-generated information.

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8.3 AI-Assisted Teaching and Learning

AI-supported educational models can effectively enhance student collaboration, independent study, personalized instruction, and timely academic feedback. GenAI platforms provide learners with flexible opportunities to explore concepts at their self-directed tempo and assist educators in preparing learning materials. However, concerns regarding overdependence on AI, academic dishonesty, reduced originality and limitations in critical thinking highlight the necessity for being responsible and ethical integration into educational practices.

8.RESAERCH GAP

Although existing literature discusses the applications and potential benefits of Generative AI in education, further empirical investigation is needed to understand how human interaction with these tools relates to educational outcomes in higher education. In particular, the relationships between AI usage, perceived usefulness, ease of use, student engagement, and learning effectiveness require further examination across different categories of academic respondents. This study addresses this gap by analyzing survey responses to explore usage patterns, perceptions, educational benefits and moral challenges tied to the integration of GenAI within university settings.

9. RESEARCH METHODOLOGY

9.1 Methodological framework

This research implements a quantitative research methodology using a descriptive survey design to examine human interaction with Generative Artificial Intelligence (Gen AI) in higher education. Data are collected through a structured questionnaire to understand AI usage patterns, user perceptions, student engagement, learning effectiveness, and ethical concerns. The collected responses are analyzed using appropriate quantitative methods to identify patterns and relationships among the study variables.

9.2 Target demographic framework

The target demographic framework comprises students across all academic levels,independent researchers and academic staff in tertiary education. These respondents represent different academic backgrounds and varying degrees of experience with GenAI platforms. Their responses help examine the usage of AI in academic activities and their perceptions of its impact on teaching and learning.

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9.3 Participant selection method

A convenience sampling framework was deployed to gather data from readily accessible and consenting participants within the target population. This final cohort represents a diverse cross-section of academic credentials, providing insights into diverse perspectives on Generative AI usage. Participation is voluntary, and the collected responses are used for academic research purposes.

9.4 Participant cohort volume

An aggregate of 54 respondent records are available in the collected survey data and are considered for the empirical evaluation. The sample includes students across all academic levels, independent researchers and academic staff from different academic backgrounds. The responses provide a basis for descriptive and statistical analysis of Generative AI usage, perceived learning effectiveness, student engagement, and associated challenges in higher education.

9.5 Data origins

Empirical Data: Empirical data are collected directly from respondents through a structured questionnaire designed to examine Generative AI usage, human–AI interaction, student engagement, perceived learning effectiveness, and ethical concerns in higher education. The responses provide insights into participant's experiences and perceptions regarding the usage of Generative AI into curriculum and other activities.

Retrospective Data: Retrospective data were obtained from published research articles, academic journals, books, conference proceedings, and scholarly databases relating to Generative AI, human–AI interaction, and educational technology. These sources informed the literature review and helped establish the study context and research gap.

9.6 Research Instrument

The study employs a standardized survey instrument comprising respondent profile Metris and Likert-scale statements related to Generative AI awareness, usage patterns, ease of use, perceived usefulness, teaching and learning effectiveness, ethical concerns, and overall satisfaction. A five-point Likert scale is deployed to measure respondent's opinions, anchored from 1 (Strongly Disagree) to 5 (Strongly Agree). The questionnaire facilitates systematic data collection and quantitative analysis of respondents' perceptions and experiences.

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9.7 Statistical Tools Used

The collected data are analyzed using appropriate statistical techniques to interpret response patterns and examine relationships among the study variables.

1. **Percentage Analysis:**

Used to summarize the distribution of respondents according to demographic characteristics, frequency of Generative AI usage, and AI tools commonly used.

2. **Mean and Standard Deviation:**

Used to examine the average responses and the variation in respondent's perceptions regarding the usefulness, ease of use, engagement, and learning effectiveness of Generative AI.

3. **Correlation Analysis:**

Used to assess the direction and strength of relationships between variables, such as Generative AI usage, student engagement, perceived usefulness, and learning outcomes.

4. **Regression Analysis:**

Used to examine the predictive relationship between selected independent variables, such as perceived usefulness and ease of use, and dependent variables related to teaching and learning outcomes.

5. **One-Sample t-Test:**

Used to determine whether the composite learning-effectiveness score differs significantly from the neutral midpoint of the five-point Likert response matrix.

These statistical techniques support the systematic understanding of the survey findings and help evaluate the proposed research hypotheses.

10. Theoretical model

The theoretical model illustrates the interplay involving Gen AI usage, teaching and learning outcomes in tertiary education. It identifies four independent variables—frequency of GenAI usage, perceived usefulness,

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ease of use and platform availability of AI tools—and examines their association with four dependent variables: student engagement, learning effectiveness, teaching efficiency, and academic performance.

Independent Variables : Frequency of Generative AI Usage, Perceived Usefulness, Ease of Use, Accessibility of AI Tools

Dependent Variables : Student Engagement, Learning Effectiveness, Teaching Efficiency, Academic Performance

Conceptual Relationship:

Independent Variables → Human–Generative AI Interaction → Educational Outcomes

The framework guides the investigation of the relationships between AI usage characteristics and perceived educational outcomes without assuming that these relationships necessarily establish causation.

11. Data Analysis and Interpretation

The collected questionnaire responses are analyzed using descriptive and inferential statistical techniques to understand Generative AI usage patterns, evaluate respondents' perceptions, and examine relationships between AI usage and educational outcomes

11.1 Demographic Analysis

The respondent profile is summarized by gender, age group, and educational qualification in Figures 1–3. Usage frequency and the AI tools reported by respondents are presented in Figures 4–5. Together, these distributions describe the composition and reported tool-use patterns of the 54 respondents.

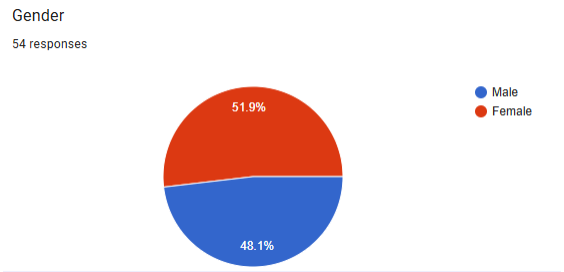


Figure 1. Gender distribution of respondents (N = 54)

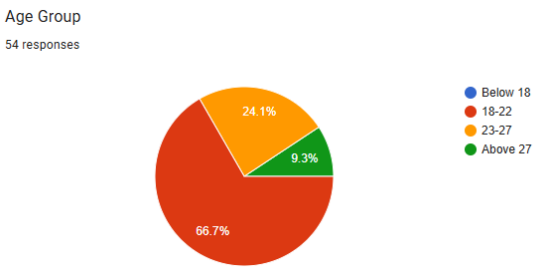


Figure 2. Age-group distribution of respondents (N = 54)

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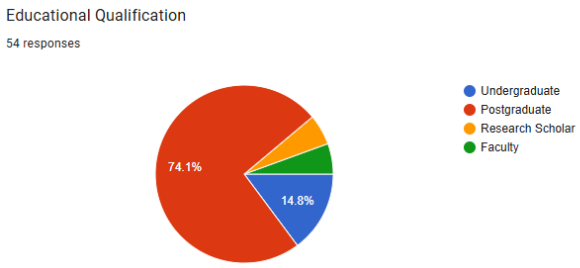


Figure 3. Educational qualification of respondents (N = 54)

11.2 Percentage Analysis

Percentage analysis is used to determine the distribution of respondents across demographic categories and Generative AI usage characteristics. It helps identify the most frequently used AI tools, the proportion of respondents using AI daily or weekly, and general patterns of adoption in higher education. The results are presented using percentages and, where appropriate, tables and charts to facilitate clear interpretation.

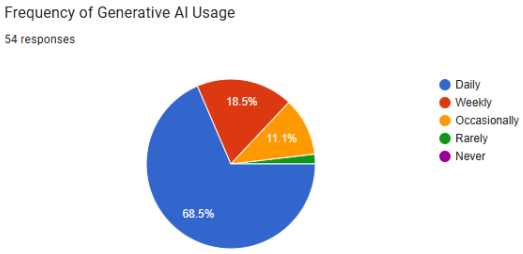


Figure 4. Frequency of Generative AI usage (N = 54)

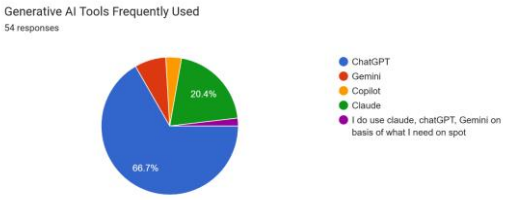


Figure 5. Generative AI tools reported as frequently used (N = 54)

The percentage is determined using the formula:

$$\text{Percentage} = (\text{Number of responses} \div \text{Total valid responses}) \times 100$$

11.3 Mean and Standard Deviation

Mean and standard deviation measures help assess perceptions concerning AI usefulness, ease of use, student engagement, learning effectiveness, academic performance, and ethical concerns. Elevated mean scores reflect stronger respondent consensus with positively worded statements, while the interpretation of negatively worded statements requires appropriate consideration.

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11.4 Hypothesis Testing

The five hypotheses were evaluated using the 54 valid response records. Spearman's rank correlation was used for ordinal relationships, a one-sample t-test compared the learning-effectiveness composite with the neutral midpoint of 3, and simple linear regression further examined the relationship between perceived usefulness and learning outcomes. Statistical significance was assessed at $\alpha = 0.05$.

H1: Generative AI Usage and Student Engagement

Spearman's rank correlation showed a statistically significant positive correlation between frequent academic application of GenAI and a student-engagement composite based on the engagement and classroom-participation items ($\rho = 0.354$, $p = 0.009$, $n = 54$). Therefore, H1 is supported. Respondents who reported more frequent academic use tended to report higher engagement. This finding demonstrates correlation rather than a definitive causal link.

H2: Generative AI and Learning Effectiveness

The learning-effectiveness composite was calculated from eight items concerning task efficiency, access to learning resources, interaction with learning materials, problem-solving, concept clarification, independent study, perceived academic performance, and personalized learning. The mean was 3.90 (SD = 0.67), significantly higher than the neutral midpoint of 3, $t(53) = 9.91$, $p < 0.001$. H2 is supported in terms of respondents' perceived learning effectiveness; the analysis does not establish a causal improvement in objective academic performance.

H3: Perceived Usefulness and Teaching and Learning Outcomes

Perceived usefulness was represented by a composite of task efficiency, access to resources, problem-solving, concept clarification, and self-learning. The outcome composite included student engagement, perceived academic performance, personalized learning, classroom participation, and creativity. Spearman's rank correlation showed a significant positive relationship ($\rho = 0.478$, $p < 0.001$, $n = 54$). Simple linear regression produced a positive coefficient ($B = 0.617$, $p < 0.001$) and $R^2 = 0.295$. Thus, H3 is supported as an association and predictive relationship in this sample; the observational survey does not establish causation.

H4: Ease of Use and User Adoption

A significant positive relationship was found between perceived ease of use and frequent academic use of Generative AI ($\rho = 0.527$, $p < 0.001$, $n = 54$). H4 is supported when reported academic usage is treated as a proxy for adoption. Because the questionnaire did not directly measure intention to adopt or continued-use intention, this outcome must be understood as an association between perceived user-friendliness and documented utilization.

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H5: Frequency of AI Usage and Perceived Academic Performance

The relationship between self-reported AI usage frequency and the item "AI-assisted learning improves academic performance" was weak and not statistically significant ($\rho = 0.218$, $p = 0.112$, $n = 54$). Mean ratings for this item were 3.89 among daily users, 3.80 among weekly users, 3.67 among occasional users, and 3.00 for the single respondent who reported rare usage. H5 is not supported at the 0.05 significance level. The rare-use group is very small, and the outcome reflects perceived rather than objectively measured academic performance.

12. SUMMARY OF FINDINGS

Student Engagement: Academic use of Generative AI had a significant positive association with the student-engagement composite ($\rho = 0.354$, $p = 0.009$).

Learning Effectiveness: Respondents reported a mean composite score of 3.90 (SD = 0.67), significantly above the neutral midpoint ($p < 0.001$).

Perceived Usefulness: Perceived usefulness was positively associated with teaching and learning outcomes ($\rho = 0.478$, $p < 0.001$); the regression model explained 29.5% of outcome-score variation ($R^2 = 0.295$).

Ease of Use: Ease of use was positively associated with frequency of academic AI use ($\rho = 0.527$, $p < 0.001$).

Academic Performance: The correlation between overall AI usage frequency and perceived effect on academic performance failed to reach statistical significance ($\rho = 0.218$, $p = 0.112$).

Ethics and Responsible Use: Respondents showed agreement with the need for ethical guidelines and institutional regulation, while also recognizing risks related to overdependence, academic integrity, and originality.

13. SUGGESTIONS

1. **Promote AI Literacy:** Higher education institutions should organize AI literacy and awareness programmes to help students and faculty understand Generative AI tools, their capabilities, limitations, and appropriate academic applications.
2. **Establish Ethical Guidelines:** Institutions should develop clear policies regarding AI-generated content, plagiarism, data privacy, transparency, and academic integrity to promote responsible AI usage.

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3. **Strengthen Faculty Development:** Faculty development programmes should include training on integrating Generative AI into teaching methods, assessment design, content development and student scaffolding.
4. **Encourage Responsible AI-Assisted Learning:** Students should be motivated to use AI as a supplementary learning resource while maintaining independent thinking, analytical skills, originality, and personal responsibility for submitted academic work.

14. CONCLUSION

This research, *Human–Generative AI Interaction: Reshaping Teaching and Learning in Higher Education*, examines respondents' perceptions of AI usage, student engagement, learning effectiveness, and the adoption of AI tools in academic environments. The survey generally reveals favourable output of GenAI, particularly in clarifying difficult concepts and supporting independent learning. This research further emphasizes the necessity to address challenges associated with Generative AI, including academic integrity, overdependence, originality, privacy, and ethical usage. Higher education institutions should establish appropriate AI usage policies, provide AI literacy training, and encourage faculty and students to use these tools responsibly. Generative AI should complement rather than replace human teaching, independent thinking, and critical analysis. In conclusion, effective integration of Generative AI requires a balanced and ethical approach that combines technological innovation with human guidance. Such an approach can support the development of interactive, inclusive, and student-centered learning environments while maintaining academic standards and educational quality.

15. LIMITATIONS OF THE STUDY

1. **Limited Institutional Coverage:** The study focuses on selected higher education institutions, which may limit the external validity of theoutcomes to other institutions and academic settings.
2. **Self-Reported Responses:** The data are based on respondents' personal opinions and experiences, which may be influenced by individual perceptions or response bias.
3. **Quantitative Approach:** The study primarily uses questionnaire-based quantitative analysis, which may not fully capture respondents' detailed experiences and reasons for using Generative AI.

16. Future Scope of the Study

1. **Comparative Studies:** Future research can compare Generative AI usage across different academic disciplines, institutions, and educational levels to identify differences in adoption and perceived effectiveness.

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2. **Longitudinal Studies:** Studies conducted over an extended period can examine changes in AI adoption and determine how prolonged usage relates to learning experiences and academic outcomes.
3. **Mixed-Method Research:** Future studies can combine questionnaires with interviews and case studies to gain deeper insights into students' and faculty members' experiences with Generative AI.

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