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The Impact of AI on the Academic Achievement of Undergraduate Students - An Experimental Study

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Abstract

Background/purpose. This study explores the use of Artificial Intelligence (AI) technology on college academic outcomes among students in the College of Humanities and Sciences at a large research university in the United Arab Emirates, focusing on students taking a sociology course. With the growing incorporation of AI in educational settings, its ability to improve student learning results, engagement levels, and overall efficiency has garnered significant interest. Nevertheless, empirical research linking students' views on AI to quantifiable academic achievement remains scarce, especially in the social sciences.

Materials/methods. This study employed a quasi-experimental quantitative design to examine the impact of generative Artificial Intelligence (AI) on undergraduate students' academic achievement.

Results. The findings suggest that perceived GPA Improvement is the most significant factor, indicating that students who see a measurable enhancement in their academic outcomes tend to have a more favorable view of AI.

Conclusion. This research provides evidence that the use of artificial intelligence (AI) tools can markedly improve university students' academic success, particularly in course comprehension and exam preparation.

1. Introduction

With the rapid development of technology, artificial intelligence stands out as one of the most useful methods for earning a living, apparently alongside robotics, virtual reality, 3D printing, and internet access (Holmes, 2018).

The technological advances of the information age make human beings as much a necessity for computers as computers are for us, and with this progress, computers continue to become increasingly intelligent (Sujith et al., 2022; Zhang et al., 2021).

Many researchers have stressed the importance and impact of assessment feedback on student learning in higher education. Most recently, though, assessment has also been broadened to consider not only students but also curriculum design, teachers' instruction, and administrators' preparation. Assessment is turned into help for student learning and is a key factor in future academic accomplishment (Lan, K., 2025; Eltahir, & Ahmed,2023).

Artificial intelligence is increasingly recognized as a valuable area of research and application within higher education, contributing to enhanced educational quality and improved student outcomes (Hooda et al.). Nonetheless, the integration of AI tools presents specific considerations that educators, students, and policymakers must address to foster a productive educational atmosphere (Holmes& Miao,2023) effectively.

Research has demonstrated a favorable connection between AI-driven learning approaches and student motivation, indicating that technology can meaningfully engage learners and enrich their educational experiences. Furthermore, notable improvements in academic performance following the implementation of AI-supported learning underscore the efficacy of these methods in helping students grasp academic material (Pertiwi et al., 2024; Khare, 2018; Xu, 2024).

2. Literature Review

The incorporation of Artificial Intelligence (AI) in higher education has sparked significant scholarly investigation, revealing a variety of effects on students' learning outcomes, motivation, and ethical understanding, some of which are conflicting. This section aims to critically analyze previous research to uncover shared trends, differences across disciplines, and the underlying factors that contribute to these varied findings.

2.1. Meta-Analyses and General Evidence

Meta-analyses and systematic reviews generally affirm AI’s positive influence on academic performance, yet they differ in scope and methodological rigor. Liu et al. (2025) and Sun and Zhou (2024) both reported statistically significant improvements in student achievement across varied contexts. However, Liu et al. emphasized contextual moderators (discipline, assessment form), whereas Sun and Zhou highlighted design factors (AI type, feedback immediacy). García-Martínez et al. (2023) reached a similar conclusion but cautioned that gains in measurable performance do not always correspond to improved perceptions of learning. Collectively, these syntheses suggest that while AI generally enhances outcomes, its efficacy is neither universal nor automatic.

2.2. Empirical Studies in Higher Education Contexts

Empirical evidence in higher-education settings reveals considerable heterogeneity. Oyeyemi et al. (2024) demonstrated that AI-supported environments foster critical thinking and problem-solving, echoing Rokhayani et al. (2022) in language instruction contexts. In contrast, Eteng and Ezeoguine (2025) found negligible improvement when chatbots were introduced without structured pedagogy. The divergence may stem from differences in the depth of AI integration: studies employing guided, task-specific systems (e.g., ChatGPT for analytical writing) tend to show larger gains than those using general conversational agents. This comparison underscores the importance of instructional scaffolding and disciplinary alignment in achieving meaningful impact.

2.3. Discipline-Specific Applications

Research focused on specific domains has demonstrated that the advantages of AI are amplified when integrated into targeted curricula. Taskiran (2023) found that the introduction of AI courses in nursing education significantly enhanced students' preparedness to apply medical AI technologies. Rajeswari and Madhusudan (2022) found that combining AI with Augmented Reality (AR) improved academic motivation, cognitive skills, and inclusivity, particularly in experiential learning environments. These results indicate that AI is most effective when aligned with the specific needs of a discipline.

2.4. Contradictory and Mixed Results

The mixed results across studies can be attributed to several interrelated factors:

- Instructional Design: Umer (2025) notes that pedagogical framing determines whether AI facilitates cognitive engagement or mere answer retrieval. Poorly designed AI interventions risk promoting surface learning.

- Disciplinary Sensitivity: Taskiran (2023) and Rajeswari & Madhusudan (2022) demonstrated that domain-specific adaptation, such as medical or AR-based contexts, amplifies benefits, suggesting that generic AI applications may dilute impact.

- Ethical and Motivational Variables: Almassaad et al. (2024) emphasized that students' ethical orientation and trust in AI mediate learning outcomes. Where ethical guidelines are explicit, performance improvements are more sustainable.

- Technological Maturity: Studies conducted in technologically advanced environments (e.g., China, UAE) tend to report higher satisfaction and achievement levels, implying that institutional readiness moderates success.

2.5. Ethical and Pedagogical Considerations

A critical theme in the literature is the emphasis on ethics and responsible use of AI. Almassaad et al. (2024) examined Saudi students' perceptions of generative AI, highlighting the need for awareness initiatives to foster ethical practices in higher education. Halagatti et al. (2023) analyzed AI's role in assessments, demonstrating its ability to automate evaluations and provide predictive insights, thereby allowing educators to focus more on teaching. Similarly, Bressane et al. (2024) contended that AI-driven decision-support systems can guide curriculum development, promote inclusivity, and address cognitive challenges.

2.6. Emerging Challenges and Gaps

A recent study by UnHyeok Ko et al. (2025) identified challenges associated with AI integration in teacher education. Their findings revealed that both undergraduate and graduate preservice teachers exhibited only superficial engagement with AI and had a limited understanding of its pedagogical applications. This underscores the pressing need for structured training and deeper interaction with AI to facilitate meaningful educational integration.

2.7. Synthesis

In summary, the existing literature indicates that AI possesses a significant, albeit context-dependent, potential to improve learning outcomes. Although meta-analytical studies affirm its overall effectiveness, empirical evidence reveals variability that hinges on discipline, instructional design, and ethical considerations. The inconsistencies in results underscore the necessity for longitudinal, cross-cultural, and mixed-methods research that not only assesses academic improvements but also addresses ethical awareness and sustainable implementation practices.

The literature reviewed indicates that artificial intelligence (AI) technologies possess considerable potential to improve educational outcomes, student engagement, and cognitive development across various academic fields. Nevertheless, a substantial portion of current research has focused on STEM and related technical areas, resulting in a relative lack of exploration in the social sciences, particularly in the sociology of education. These gaps underscore the necessity for studies that specifically investigate how AI impacts conceptual understanding and performance in interpretive and discussion-based disciplines such as sociology.

Given that sociology education emphasizes critical thinking, analytical reflection, and contextual interpretation, skills that are distinct from those prioritized in technology-centric fields, an analysis of AI's educational role in this discipline is especially pertinent. This study aims to fill a crucial gap in the existing literature by empirically assessing the impact of generative AI tools on the academic performance of undergraduate sociology students in the United Arab Emirates. By embedding this inquiry in a real classroom setting, the research seeks to determine whether AI can effectively enhance understanding and academic success in social science learning environments characterized by reasoning, interpretation, and ethical considerations.

3. Research Problem

While artificial intelligence technologies continue to surge into higher education settings at an exponential pace, bringing novel affordances for engaging and assisting students, limited empirical data have quantified their actual influence on academic achievement, especially in social science fields. This dearth of evidence complicates educators' and policymakers' capacity to make informed choices involving AI integration into curricula. Thus, the present study explores how the deployment of AI tools affects the academic performance of sociology majors enrolled in an introductory sociology of education course at a leading university in the United Arab Emirates. Do these technologies truly enhance understanding of course concepts? Or do the more complex ideas remain challenging regardless of technological support systems? The research aims to disambiguate AI's role in students' mastery of the social sciences.

4. Objectives

The research seeks to achieve the following objectives:

a. Comparing the academic performance of students who use AI tools (experimental group) with those who do not (control group).

b. To assess the improvement in academic achievement within the experimental group before and after the use of AI tools.

c. To identify which aspects of AI usage have the most significant impact on academic performance.

5. Research Questions

5.1. Main Research Question

What is the effect of using Artificial Intelligence (AI) tools on the academic achievement of university students?

5.2. Sub-Questions

1. Are there statistically significant differences in post-test scores between the experimental group and the control group?

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2. Does the use of AI tools lead to a statistically significant improvement in the performance of students in the experimental group between the pre-test and post-test?

3. Which elements of AI applications have the most significant impact on enhancing academic success?

6. Methodology

This study employed a quasi-experimental quantitative design to examine the impact of generative Artificial Intelligence (AI) on the academic achievement of undergraduate students

6.1. Research Design

Two groups, an experimental group and a control group, were used in a quasi-experimental design, with pre- and post-measurements of academic achievement

6.1.1. Group Assignment Method

Participants were randomly divided into two groups to ensure comparability and minimize potential bias. A sample of 30 undergraduate students enrolled in the Sociology of Education course was selected and evenly divided into two groups: an experimental group (n = 15) and a control group (n = 15). The randomization method used a computer-generated list of student identification numbers to assign participants to their respective groups.

Both groups were taught by the same instructor, who used a uniform syllabus, shared learning objectives, and identical assessment tools to maintain consistency in teaching.

6.2. Recruitment and Procedure

A 20-point pre- and post-test with multiple-choice questions was created. The assessment covered key instructional topics throughout the semester, including the fundamentals of educational sociology and its theoretical viewpoints, the connection between education and social structures, and the influence of social institutions on educational outcomes.

To maintain proper scope and representativeness, every question was sourced from the official course material and reviewed by three experts in sociology and educational measurement. Their evaluations affirmed that the assessment effectively aligned with course goals and was appropriate for measuring both initial knowledge levels and learning improvements attributable to the AI intervention. To gauge how students felt about using AI tools, a questionnaire was created. It covered topics including regular use, preparation, review, comprehension, time-saving, enhanced GPA, ethics, and preference for AI over conventional techniques.

6.2.1. Validity of the Experimental Test

The test questions were revised, added to, or removed based on the suggestions of three knowledgeable arbitrators who reviewed both the pre- and post-tests.

6.2.2. Reliability

The test's Cronbach's alpha coefficient was 0.829, indicating high internal consistency and excellent reliability for the test items.

6.3. Participants

Students enrolled in a sociology of education course at a prominent institution in the United Arab Emirates made up the study's participants. Thirty students were chosen as a sample and split equally between the experimental and control groups.

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6.4. Materials

For 15 weeks, the experimental group's academic performance on the subjects covered in the educational sociology course was assessed using ChatGPT, whereas the control group's was assessed using the traditional teaching method.

6.4.1. Mode of AI Utilization

Students in the experimental group used ChatGPT not merely as an information source but as an interactive learning tool designed to promote deeper engagement with course material. Rather than passively retrieving answers, students were instructed to engage in dialogic interaction with the AI — asking follow-up questions, requesting clarifications, and using the tool to test their understanding of key sociological concepts.

6.5. Ethical Considerations and Informed Consent

Students were clearly informed that their involvement was optional and that their answers and academic performance would be kept entirely confidential. Prior to administering the pre-test, written informed consent was obtained from all participants. A consent form was provided during class meetings, detailing the aims of the study, anticipated time commitment, data usage, and guarantees of anonymity. Those who chose to participate signed this form.

6.6. Statistical Analysis

Descriptive statistics (means, Pearson correlation) were performed using the Statistical Package for the Social Sciences (SPSS). Separate samples T-test to compare the two groups' means. Samples in pairs to compare the same group's performance before and after the intervention, use the t-test. To test variations in GPA levels, use a one-way ANOVA.

7. Results

7.1. Study Results Main Question

What is the effect of using Artificial Intelligence (AI) tools on the academic achievement of university students?

To answer the main question, show tables 1-5 below:

Table 1. Test Score Distribution

Question Type	Number of Questions	Mark per Question	Score
MCQs	20	1	10
Total			20

Table 2. Variable Definitions

Variable	Description
ID	Student Number
Group	1 = Experimental, 2 = Control
Pre-Test/Post-Test	Score out of 20

Table 3. Students' Scores in the Pre-Test and Post-Test

ID	Group	Pre-Test Score	Post-Test Score
2019113××	1	13	16

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2020202××	1	14	17
2021200××	1	12	15
2022117××	1	14	16
2023102××	1	14	16
2020200××	1	11	14
2021100××	1	12	15
2021106××	1	12	14
2021108××	1	12	14
2021113××	1	14	16
2021101××	1	13	17
2020202××	1	12	16
2021102××	1	14	18
2021109××	1	11	14
2021110××	2	13	17
2022106××	2	12	11
2022109××	2	13	13
2022112××	2	13	12
2022113××	2	10	10
2022117××	2	12	13
2022200××	2	14	15
2022115××	2	12	11
2022105××	2	14	15
2022116××	2	10	11
2023102××	2	11	11
2023103××	2	13	12
2023104××	2	10	10
2023100××	2	13	13
2023101××	2	11	11
2023106××	2	11	11

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Table 4. Statistical Analysis

Test Type	Group	Mean	T-value	p-value	Significance
Independent Samples T-Test – Pre-Test	Experimental	12.2	0.31	0.75	Not Significant
	Control	12.4	0.31	0.75	Not Significant
Independent Samples T-Test – Post-Test	Experimental	16.1	4.01	<0.001	Significant
	Control	13.1	4.01	<0.001	Significant
Paired Samples T-Test – Experimental Group	Pre vs Post	12.2 → 16.1	7.25	<0.001	Significant
Paired Samples T-Test – Control Group	Pre vs Post	13.1 → 13.1	0.01	1.0	Not Significant

* The mean difference is significant at the 0.05 level.

Table 4 presents a summary of the statistical analyses related to the primary research question. The results indicate no significant differences between the groups on the pre-test, suggesting they were initially similar. However, the post-test results revealed significant differences within the experimental group, demonstrating a beneficial effect of AI tools on academic performance.

The findings strongly suggest that incorporating AI tools into the educational framework significantly enhanced academic outcomes for students in the experimental group. Conversely, the control group, which did not utilize AI, showed no notable improvement, further emphasizing the effectiveness of AI-driven interventions.

In summary, the statistical analysis clearly demonstrates that AI tools had a favorable, statistically significant impact on academic performance, resulting in a marked increase in scores among students who engaged with these tools compared with those who did not. The lack of differences between the groups prior to the intervention bolsters the credibility of the conclusion, indicating that the observed improvement can be attributed to the intervention itself rather than to external factors.

7.2. Study Results to Sup-Q1

Are there statistically significant differences in post-test scores between the experimental group and the control group?

To answer this question, an independent samples t-test was used on the post-test scores of both groups, as shown below:

Table 5. Independent Samples T-Test

Group	Mean	Std. Deviation	T-value	p-value	Significance
Experimental	16.1	—	4.01	<0.001	Significant
Control	13.1	—	4.01	<0.001	Significant

* The mean difference is significant at the 0.05 level.

The analysis indicates a statistically significant difference between the two groups ($T = 4.01$, $p < 0.001$), favoring the experimental group. This suggests that students who used AI tools obtained notably higher post-test scores than those who did not. Such results reinforce the hypothesis that incorporating AI tools into the educational process can improve academic performance.

7.3. Study Results Addressing Sup-Q2

Does the use of AI tools lead to a statistically significant enhancement in the performance of students in the experimental group between the pre-test and post-test?

To address this inquiry, a paired samples T-Test was performed to evaluate the pre-test and post-test scores of the experimental group, as detailed below:

Table 6. Paired Samples T-Test (Experimental Group: Pre-Test vs. Post-Test)

Test	Mean	SD	Mean Difference	SE	T-value	DF	p-value	Significance
Pre-Test	12.2	1.32	-	-	-	-	-	-
Post-Test	16.1	-	3.9	0.54	7.25	14	<0.001	Significant

* The mean difference is significant at the 0.05 level.

The results in Table 6 indicate a statistically significant improvement in post-test scores compared to pre-test scores ($p < .001$). The large t-value (7.25) and low standard error (0.54) confirm a strong effect of AI tool usage on academic performance.

7.4. Study Results to Sup- Q3

Which elements of AI applications have the most significant impact on enhancing academic success?

To address this inquiry, refer to Table 7-8 provided below.

Table 7. One-Way ANOVA to Examine Differences Between GPA Levels by AI Usage

Source of Variance	Sum of Squares	DF	Mean Square	F-value	p-value	Significance
Between Groups	58.77	2	29.39	41.515	0.000	Significant
Within Groups	9.56	12	0.80	-	-	-
Total	68.33	14	-	-	-	-

*The mean difference is significant at the 0.05 level

The analysis reveals a statistically significant difference between GPA levels across AI usage aspects ($F(2,12) = 41.52$, $p < .001$), indicating that students with higher GPAs report more strategic and ethical engagement with AI tools The Findings indicate several items exhibit statistically significant differences ($p < 0.05$)

Table 8. Pearson Correlation Analysis Results

Variable 1	Variable 2	Pearson r	p-value	Significant?
I use AI tools regularly during my university studies.	I use AI to prepare assignments and reports.	0.388	0.0343	Yes
I use AI tools regularly during my university studies.	I use AI to review before exams	0.471	0.0085	Yes
I use AI tools regularly during my university studies.	AI tools helped me improve my understanding of the course content.	0.294	0.1144	No
I use AI tools regularly during my university studies.	AI saves me time and effort when searching for information	0.195	0.3017	No
I use AI tools regularly during my university studies.	I have noticed an improvement in my GPA since I started using AI.	0.616	0.0003	Yes
I use AI tools regularly during my university studies.	Adhere to academic ethics in the use of AI	0.404	0.0266	Yes
I use AI tools regularly during my university studies.	Using AI gives me higher achievement compared to traditional methods.	0.44	0.015	Yes
I use AI to prepare assignments and reports.	I use AI to review before exams	0.314	0.0908	No
I use AI to prepare assignments and reports.	AI tools helped me improve my understanding of the course content.	0.287	0.1245	No
I use AI to prepare assignments and reports.	AI saves me time and effort when searching for information	0.086	0.6506	No
I use AI to prepare assignments and reports.	I have noticed an improvement in my GPA since I started using AI.	0.412	0.0236	Yes
I use AI to prepare assignments and reports.	Adhere to academic ethics in the use of AI	0.288	0.1229	No

Variable 1	Variable 2	Pearson r	p-value	Significant?
I use AI to prepare assignments and reports.	Using AI gives me higher achievement compared to traditional methods.	0.201	0.2875	No
I use AI to review before exams	AI tools helped me improve my understanding of the course content.	0.413	0.0233	Yes
I use AI to review before exams	AI saves me time and effort when searching for information	0.115	0.5456	No
I use AI to review before exams	I have noticed an improvement in my GPA since I started using AI.	0.24	0.2024	No
I use AI to review before exams	Adhere to academic ethics in the use of AI	0.2	0.2898	No
I use AI to review before exams	Using AI gives me higher achievement compared to traditional methods.	0.661	0.0001	Yes
AI tools helped me improve my understanding of the course content.	AI saves me time and effort when searching for information	0.697	0.0	Yes
AI tools helped me improve my understanding of the course content.	I have noticed an improvement in my GPA since I started using AI.	0.696	0.0	Yes
AI tools helped me improve my understanding of the course content.	Adhere to academic ethics in the use of AI	0.478	0.0075	Yes
AI tools helped me improve my understanding of the course content.	Using AI gives me higher achievement compared to traditional methods.	0.371	0.0436	Yes
AI saves me time and effort when searching for information	I have noticed an improvement in my GPA since I started using AI.	0.479	0.0073	Yes
AI saves me time and effort when searching for information	Adhere to academic ethics in the use of AI	0.134	0.4806	No

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Variable 1	Variable 2	Pearson r	p-value	Significant?
AI saves me time and effort when searching for information	Using AI gives me higher achievement compared to traditional methods.	0.301	0.1055	No
I have noticed an improvement in my GPA since I started using AI.	Adhere to academic ethics in the use of AI	0.704	0.0	Yes
I have noticed an improvement in my GPA since I started using AI.	Using AI gives me higher achievement compared to traditional methods.	0.501	0.0048	Yes
Adhere to academic ethics in the use of AI	Using AI gives me higher achievement compared to traditional methods.	0.196	0.2981	No

*The mean difference is significant at the 0.05 level

Analysis of Table 8unding shows the following:

a. Statistically Significant Relationships:

- There exists a moderate positive correlation (r = 0.388) between the 'Regular use of AI tools during university studies' and 'Utilizing AI for assignment and report preparation.' This suggests that students who frequently use AI are more inclined to employ it for their academic tasks.

- A relatively strong positive correlation (r = 0.471) is noted between 'Regular use of AI tools during university studies' and 'Employing AI for exam review.' This indicates that students who regularly engage with AI tools tend to depend more on them for preparing for exams.

- A strong positive correlation (r = 0.616) has been identified between 'Regular use of AI tools during university studies' and 'Enhancements in GPA since incorporating AI.' This finding shows that students with consistent AI use generally experience greater improvements in their academic performance.

b. Non-Significant Relationships:

- The correlation between 'Regular use of AI tools' and 'Enhanced understanding of course material' yielded an r value of 0.294 but was not statistically significant.

- Similarly, the connection between 'Regular use of AI tools' and 'Efficiency in information retrieval' was weak (r = 0.195) and lacked statistical significance.

Overall result of Table 8: The regular utilization of AI tools is significantly correlated with enhanced academic performance, especially concerning assignment preparation, exam review, and GPA improvement.

8. Discussion

The results of this research present compelling evidence that incorporating Artificial Intelligence (AI) tools in higher education significantly boosts students' academic performance. The group that used AI applications like ChatGPT for assignments, reviews, and comprehension showed marked improvement in post-test scores compared to the control group that adhered to conventional

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learning methods. These findings align with previous meta-analyses (Liu et al., 2025; Sun & Zhou, 2024) that affirmed AI's beneficial impact on educational outcomes across various fields.

8.1. Understanding AI Tools' Effectiveness

The notable advancements in the experimental group underscore AI's capacity to facilitate deeper learning processes rather than serving merely as a superficial tool. Paired-sample t-tests indicated significant pre-to-post improvements for the experimental group, whereas the control group displayed no considerable changes. This suggests that AI tools not only supplemented existing learning approaches but also transformed students' engagement with the course material.

ANOVA results highlighted that improvements in GPA, ethics, and comprehension were key factors, implying that enhancements in academic performance were linked not only to cognitive benefits but also to the responsible and ethical use of AI. This is consistent with Almassaad et al. (2024), who noted that responsible adoption of AI is crucial for its sustainable integration into education.

8.2. Comparison with Prior Research

The findings support the work of Oyeyemi et al. (2024) and García-Martínez et al. (2023), which identified a positive relationship between the use of AI and students' problem-solving and critical thinking skills.

However, these results contrast with those of Eteng & Ezeoguine (2025), who found no significant impact of AI chatbots on learning outcomes. This discrepancy highlights the importance of the type and design of AI interventions. While generic chatbots may offer limited educational value, targeted AI tools integrated into specific course tasks, as demonstrated in this study, can significantly improve comprehension and achievement.

8.3. The Importance of Ethics and Responsible AI Usage

A particularly striking finding is the strong link between improvements in students' GPAs and their commitment to ethical use of AI. This indicates that ethical awareness is not merely an adjunct but a central element in maximizing the educational advantages of AI. Students who used AI tools responsibly seemed to convert their engagement into genuine understanding rather than relying on superficial shortcuts. This contributes to the expanding body of literature that underscores the connection between ethics and academic success (UNESCO, 2025).

8.4. Implications for Education and Policy

The findings suggest that educators and institutions should transcend the binary debate of 'AI versus traditional learning' and instead concentrate on the ethical and structured incorporation of AI tools into educational curricula. Training programs for both students and educators are vital to ensure that AI serves as a complement to critical thinking rather than a replacement for academic diligence. Policymakers must also acknowledge that AI can help mitigate disparities through personalized learning, but this potential can only be realized if ethical frameworks and academic integrity are prioritized.

8.5. Limitations and Future Research Directions

Despite the encouraging outcomes, the study is limited by its relatively small sample size and focus on a single institution, which restricts the generalizability of the findings. Additionally, the short-term nature of the research leaves unresolved questions regarding the sustainability of AI's impact over multiple semesters or academic years. Future studies should consider longitudinal designs, investigate cross-cultural differences, and explore how AI's role may vary between collaborative and

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individual learning settings. Furthermore, qualitative research could offer deeper insights into how students internalize ethical considerations while interacting with AI.

9. Conclusion

This research provides evidence that the use of artificial intelligence (AI) tools can markedly improve university students' academic success, particularly in course comprehension and exam preparation. The group that employed AI tools throughout the study exhibited statistically significant enhancements in post-test scores compared to the control group, which adhered to conventional educational methods.

Moreover, the analysis highlighted strong links between the responsible and ethical application of AI and academic success, emphasizing the necessity of intentional integration of AI in higher education contexts. Students who engaged with AI for in-depth learning activities, such as comprehension and review, achieved greater academic progress than those who primarily used it for assignment completion.

While the control group did not demonstrate notable improvement, the experimental group's performance exemplifies the transformative capabilities of AI when used thoughtfully. Consequently, it is recommended that universities incorporate AI literacy into their curricula and advocate for the ethical, critical, and pedagogically sound application of AI tools to promote substantial learning outcomes.

10. Limitations

This study has several limitations that should be considered when interpreting the findings. The study focused primarily on ChatGPT as the representative generative AI platform. However, students' prior exposure to other AI-based tools (such as Grammarly, QuillBot, or Google Bard) was neither controlled nor systematically documented. Future studies should differentiate between types of AI tools, for example, those providing corrective feedback versus those offering content generation to determine how tool functionality shapes educational impact. Variation in Students' Digital Skills and AI familiarity influenced how effectively they engaged with the technology. Future research should measure and control digital competency to clarify how technical proficiency moderates AI's learning effects. The study was conducted at a single institution in the United Arab Emirates, with a relatively small sample size, which may limit generalization to other disciplines or cultural contexts. Replicating the study across universities, countries, and subject areas would provide a more comprehensive understanding of AI's pedagogical value.

Declarations

Conflict of interest. The authors declare that there is no conflict regarding the publication of this paper.

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