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The Role of Using Generative Artificial Intelligence Applications in Improving University Students' Academic Performance: A Field Study on a Sample of University Students

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Abstract

This study aims to analyze the role of generative artificial intelligence (AI) applications in improving the academic performance of university students, through a field study involving 63 undergraduate and postgraduate students. The study adopted a descriptive-analytical methodology based on a questionnaire covering four dimensions: the use of generative AI applications, educational benefits, cognitive skills, and academic performance. Statistical analysis employed percentages, Cronbach's alpha coefficient, and Pearson's correlation coefficient.The findings revealed that 76.2% of the sample had previously used generative AI applications. The results further demonstrated a statistically significant positive correlation between the use of these applications and improvements in academic performance. The study additionally confirmed that educational benefits and cognitive skills both contribute positively to improved student outcomes, reflecting the importance of conscious and structured use of AI in supporting university-level learning.

Keywords: *Generative Artificial Intelligence; University Education; Academic Performance; Educational Benefits; Cognitive Skills; University Students.*

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Introduction

The university sector has undergone profound transformations in recent years driven by the rapid pace of digitalization, particularly with the growing adoption of generative AI applications in learning and academic research. These applications have ceased to be merely auxiliary technical tools; they have become epistemic intermediaries that facilitate access to information, strengthen conceptual understanding, organize ideas, and assist in fulfilling academic obligations. The significance of this topic is especially pronounced within the Algerian university context, where these technologies are increasingly employed to improve research, summarize lectures, perform translation, and prepare academic presentations—raising important questions about the extent to which they contribute to improving academic performance and developing cognitive skills.

Contemporary scholarship affirms that artificial intelligence has become a foundational pillar in the advancement of higher education through intelligent instruction, performance analytics, and the refinement of assessment mechanisms, alongside its role in enriching and personalizing the learning experience. Proceeding from this premise, the present study seeks to examine the relationship between the use of generative AI applications and the level of academic performance, with particular attention to educational benefits and cognitive skills as two explanatory variables of this relationship. This is pursued through the integration of theoretical analysis and field-based inquiry into the realities of technological practices within the university environment.

Despite the rapid proliferation of generative AI applications among university students, their impact on academic performance remains the subject of ongoing scholarly debate. While some regard these tools as a means of enhancing comprehension, organizing thought, and accelerating output, countervailing concerns have emerged regarding excessive dependency and the potential erosion of students' critical thinking and self-directed effort. Moreover, the use of these technologies varies according to gender, academic level, field of study, and prior technical experience—factors that underscore the necessity of empirical

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investigation to elucidate the relationship between AI use and educational benefits, cognitive skills, and academic performance indicators.

The research problem of the present study may accordingly be framed in the following central question:

What role do generative AI applications play in improving the academic performance of university students?

The following sub-questions derive from this central inquiry:

- What is the level of university students' use of generative AI applications?
- What educational benefits are achieved through the use of these applications?
- Does generative AI contribute to the development of students' cognitive skills?
- Is there a correlational relationship between the use of generative AI applications and academic performance?
- Are educational benefits and cognitive skills associated with improvements in academic performance?

Research Hypotheses

The study proceeds from the following main hypothesis:

There is a statistically significant correlational relationship between the use of generative AI applications and improvements in the academic performance of university students.

The following sub-hypotheses are derived from the main hypothesis:

- There is a statistically significant correlational relationship between the use of generative AI applications and educational benefits.
- There is a statistically significant correlational relationship between the use of generative AI applications and the development of cognitive skills.
- There is a statistically significant correlational relationship between educational benefits and improvements in academic performance.
- There is a statistically significant correlational relationship between cognitive skills and improvements in academic performance.

The significance of this study is articulated around the following dimensions:

- Documenting the actual state of university students' use of generative AI applications.
- Clarifying the educational benefits that these applications can yield.
- Analyzing the relationship between generative AI and cognitive skills.
- Contributing to the academic debate on how to integrate generative AI into the university environment without compromising academic integrity.

The study aims to achieve the following objectives:

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- Assess the extent to which university students use generative AI applications.
- Identify the educational benefits associated with the use of these applications.
- Analyze the impact of generative AI on the development of certain cognitive skills.
- Measure the relationship between the use of generative AI and academic performance.

Review of Prior Studies

➢ *Guidoum & Saadi (2024) — The Impact of Artificial Intelligence on Students' Academic Performance from University Teachers' Perspectives*

This study focused on the impact of artificial intelligence on students' academic performance from the perspective of university faculty. Employing a descriptive-analytical methodology with a questionnaire administered to 150 university professors, the study found that faculty members perceive a positive impact of AI on academic performance—particularly with respect to critical thinking, problem-solving, learning autonomy, and creativity—while also noting challenges such as excessive dependency, reduced human interaction, the need for faculty training, and ethical concerns (Guidoum & Saadi, 2024, p. 381).

➢ *Gacemi (2024) — L'Intelligence artificielle à l'université: Questions pratiques et enjeux éthiques*

This study examined university students' use of generative AI in completing academic work, demonstrating that such use has become a tangible and deeply embedded feature of student practice—particularly in problem-solving and the generation of textual and audio-visual content. The study also addressed ethical concerns related to plagiarism, academic fraud, and the loss of institutional control over the use of these tools in higher education (Gacemi, 2024, p. 692).

➢ *Chelghoum & Chelghoum (2025) — Artificial Intelligence in Education: Opportunities, Challenges, and Ethical Concerns*

This study surveyed the opportunities and challenges of artificial intelligence in education, demonstrating that AI offers innovative solutions across learning, administration, personalized instruction, virtual assistance, and automated assessment, while simultaneously raising ethical concerns related to privacy, plagiarism, data security, and diminished human interaction (Chelghoum & Chelghoum, 2025, p. 1).

The present study distinguishes itself from these prior works by focusing directly on university students' use of generative AI applications and its relationship with improvements in their academic performance, based on a questionnaire addressed to the students themselves. Unlike prior studies, it does not limit its scope to academic performance alone, but extends its analysis to educational benefits and cognitive skills simultaneously. It further employs percentages to illuminate differences according to gender, academic level, field of study, and prior AI experience.

Research Methodology

This study adopted a descriptive-analytical methodology as the most appropriate approach for examining educational phenomena and diagnosing the relationships among their constituent variables. This methodology was employed to document the realities of generative AI use among university students and to analyze its relationship with educational benefits, cognitive skills, and academic performance levels. The study further integrated the findings of the field questionnaire within a theoretical framework by embedding statistical indicators and percentages into the analysis, thereby enabling an assessment of the degree of alignment between field findings and the conclusions of prior scholarship.

This approach is consistent with the nature of the present study, which does not confine itself to description alone but extends to the interpretation of the correlational relationship between AI use and improvements

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in academic performance. The study drew on field data collected by means of a questionnaire, which was processed statistically using percentages, Cronbach's alpha reliability coefficient, and Pearson's correlation coefficient.

Theoretical Framework

Generative AI and University Education

Generative artificial intelligence has become one of the most prominent manifestations of digital transformation in higher education, owing to the capabilities it offers in facilitating information access, simplifying complex concepts, supporting self-directed learning, and assisting in the preparation of research and academic presentations. Contemporary scholarship further highlights its role in advancing university education through intelligent instruction, performance analytics, and the personalization of learning (Jagrif, 2024, p. 458). Field findings indicate that 76.2% of sample participants had previously used generative AI applications, reflecting the broad presence of these tools within the university environment.

Domains of Generative AI Use in University Learning

The domains of generative AI use within the university environment are diverse, encompassing the summarization of lectures, simplification of concepts, translation, enhancement of written expression, preparation of presentations and research papers, and organization of ideas. These tools also support self-directed learning and provide students with immediate responses to their queries. Some studies suggest that these applications contribute to personalizing learning pathways and improving university pedagogical practices (Salehi & Salehi, 2024, p. 14). Field findings indicate that 41.3% of students use these applications at a high level, with students in economics, business, and management sciences recording the highest utilization rates compared to other disciplines.

Educational Benefits of Generative AI Applications

Generative AI applications provide a range of educational benefits, the most significant of which include facilitating the understanding of complex concepts, accelerating task completion, improving the quality of academic writing, and supporting autonomous learning. The literature further affirms that these applications contribute to improving the quality of higher education by providing feedback and personalizing learning in accordance with students' needs (Abd Al-Karim & Marmat, 2024, pp. 614–615). The study findings revealed that 73.0% of sample participants considered AI to be highly helpful in understanding complex concepts, while 79.4% stated that it contributed to accelerating the completion of academic tasks.

Generative AI and Cognitive Skills

The influence of generative AI extends to certain cognitive skills, such as the organization of ideas, the establishment of connections between concepts, and self-directed learning. However, this influence remains contingent on the mode of use: AI can support critical thinking when employed reflectively, while excessive reliance upon it may weaken students' independent intellectual effort. In this regard, Bousaid and Quidoum (2024, p. 547) note that passive use of AI may be detrimental to critical thinking, despite its potential application in developing cognitive skills. Field results showed that 61.9% of students believed that AI applications help them connect disparate concepts, while 58.7% affirmed that these tools assist in organizing ideas logically.

Generative AI and Academic Performance

Academic performance refers to the level of achievement attained by the student, encompassing the quality of academic work, the capacity to complete assigned tasks, and improvements in academic results. The literature indicates that AI can contribute to supporting academic performance by fostering learning autonomy and developing problem-solving and critical-thinking skills (Guidoum & Saadi, 2024, p. 381).

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The study findings clarified that 54.0% of sample participants considered AI to be highly helpful in completing tasks on time and improving the quality of reports and academic presentations, while 44.4% stated that it had contributed to improving their academic results.

Ethical and Methodological Governance of AI Use

Despite the multiple benefits of generative AI applications, their use raises ethical and methodological challenges related to plagiarism, academic fraud, and the weakening of critical thinking. The scholarly literature therefore stresses the necessity of treating these applications as assistive tools rather than substitutes for the student's own intellectual effort (Shinoun, 2025, p. 145). It is equally important to verify the accuracy of AI-generated information, to uphold scientific integrity, and to train students in the critical evaluation of outputs—ensuring that AI remains a learning support rather than a replacement for independent thought and analysis.

Field Research Framework

Study Population and Research Instrument

The study comprised a sample of 63 university students, predominantly female (82.5% female, 17.5% male), with participants concentrated within the younger age cohort and with high participation among master's-level students—particularly those enrolled in economics, business, and management sciences. The study employed a 27-item questionnaire distributed across four main dimensions: use of generative AI applications, educational benefits, cognitive skills, and academic performance, using a five-point Likert scale.

Instrument Reliability and Statistical Methods

The reliability of the research instrument was verified using Cronbach's alpha coefficient, which yielded an overall value of 0.926—a high figure confirming the strong internal consistency of the questionnaire. The study also employed percentages to describe sample characteristics and analyze responses, alongside Cronbach's alpha and Pearson's correlation coefficient to examine the relationships between the use of generative AI applications and each of the following variables: educational benefits, cognitive skills, and academic performance.

Presentation and Analysis of Results

Current State of Generative AI Application Use

The results showed that 76.2% of sample participants had previously used generative AI applications, compared to 23.8% who had not, indicating the widespread presence of these tools within the university environment. The rate of high-level use stood at 41.3%, compared to 28.6% moderate use and 30.2% low use—reflecting variation in usage intensity according to experience and field of study.

AI Use by Gender, Academic Level, and Field of Study

The findings revealed that prior usage rates stood at 90.9% among male students compared to 73.1% among female students; these differences should be interpreted with caution given the sample's gender imbalance. Usage increased markedly with academic level, reaching 100% among doctoral students, 84.6% among second-year master's students, and 77.8% among first-year master's students. By field of study, students in economics, business, and management sciences recorded the highest utilization rate at 84.0%, compared to 50.0% among science and technology students and 40.0% among students at the École Supérieure des Professeurs (teacher training college).

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Educational Benefits of Generative AI Use

The most prominent educational benefits identified were task acceleration (79.4%), understanding of complex concepts (73.0%), and improvement in the quality of academic work (60.3%). The results further demonstrated that students with prior experience using these applications perceive their benefits more strongly: 83.3% of prior users reported that these tools help them complete tasks rapidly, compared to 66.7% of non-users.

Cognitive Skills Associated with AI Use

The results indicate that AI helps students connect different concepts (61.9%), organize their thoughts logically (58.7%), and strengthen self-directed learning (57.1%). These findings suggest that AI's influence on cognitive skills is mediated by the degree of conscious and critical engagement with its outputs.

Academic Performance Indicators

The results showed that AI contributes to completing tasks on time, improving the quality of reports and presentations, and boosting confidence in academic performance at a rate of 54.0% across each indicator, while 44.4% reported improvements in their academic results. The study further demonstrated that students with high AI usage report greater improvements in academic results and confidence in their performance: 65.4% of high users reported academic improvement compared to 26.3% of low users—confirming a positive relationship between regular AI use and certain academic performance indicators.

Testing of Research Hypotheses

The study hypotheses were tested using Pearson's correlation coefficient in order to measure the nature of the relationships among the study variables. This test was selected because it allows for the determination of both the direction and the strength of the relationship between generative AI use and each of the following: educational benefits, cognitive skills, and academic performance.

Table 1. Pearson Correlation Coefficients for Study Hypotheses

Hypothesis	Relationship Tested	Pearson r	Sig. Level	Decision
Main Hypothesis	AI use × Academic performance	0.504	0.0000259	Accepted
Sub-Hypothesis 1	AI use × Educational benefits	0.687	0.000000000489	Accepted
Sub-Hypothesis 2	AI use × Cognitive skills	0.413	0.000764	Accepted
Sub-Hypothesis 3	Educational benefits × Academic perf.	0.634	0.000000025	Accepted
Sub-Hypothesis 4	Cognitive skills × Academic perf.	0.611	0.000000103	Accepted

The results presented in the table confirm that all hypotheses are accepted, with significance values below 0.05, indicating the existence of statistically significant correlational relationships among all study variables.

The main hypothesis is accepted: the Pearson correlation coefficient between the use of generative AI applications and academic performance is 0.504, representing a moderate positive relationship. This signifies that increased use of these applications is associated with a relative improvement in academic performance.

The strongest relationship was observed between the use of generative AI applications and educational benefits, with a Pearson coefficient of 0.687—a relatively strong positive association. This indicates that

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students who use these applications are clearly cognizant of their educational value, particularly in terms of understanding complex concepts and accelerating task completion.

The relationship between AI use and cognitive skills yielded a coefficient of 0.413, a moderate positive association, indicating that these applications may contribute to the development of certain cognitive skills but to a lesser degree than direct educational benefits. This may be interpreted by noting that cognitive skills require deeper and more reflective engagement, rather than simply soliciting ready-made answers.

The results also revealed a positive relationship between educational benefits and academic performance ($r = 0.634$), and between cognitive skills and academic performance ($r = 0.611$). These findings demonstrate that improvements in academic performance are not solely contingent upon AI use per se, but are also linked to the educational benefits and cognitive skills that such use generates.

Conclusion

The study concludes that there is a positive relationship between the use of generative AI applications and the improvement of university students' academic performance. The findings demonstrate that these applications facilitate comprehension, support the organization of ideas, and accelerate the completion of academic tasks. Statistically significant correlational relationships were identified between AI use and each of the following: educational benefits, cognitive skills, and academic performance—confirming its role as a supportive learning tool when employed in a conscious and structured manner.

At the same time, the study underscores the imperative of governing the use of these applications both ethically and methodologically, in order to avert the risks of excessive dependency, plagiarism, and the erosion of critical thinking.

- 76.2% of students had previously used generative AI applications, with higher adoption rates among master's and doctoral students—underscoring the importance of integrating AI literacy training into university curricula.

- The rate of high-level use stood at 41.3%, with students in economics, business, and management sciences recording the highest utilization rates—highlighting the need to tailor AI guidance according to the distinctive needs of each academic discipline.

- The most prominent educational benefits were task acceleration (79.4%) and conceptual understanding (73.0%), affirming the value of deploying AI in support of self-directed learning and academic organization.

- 61.9% of students perceived AI as helpful in connecting concepts, and 58.7% in organizing ideas logically—underscoring the need to train students in the critical use of these applications rather than relying upon them mechanically.

- 54.0% of students reported that AI helps them improve the quality of reports and presentations and complete tasks on time, while 44.4% reported improvements in academic results—confirming that AI's positive impact is contingent upon the student's mode and awareness of use.

- The study confirmed positive correlational relationships between AI use, educational benefits, cognitive skills, and academic performance—necessitating the formulation of clear institutional policies regulating the use of these applications in teaching and research.

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- The study recommends strengthening a culture of academic integrity, educating students in information verification rather than uncritical reproduction, and encouraging the creative and reflective use of AI in learning and academic inquiry.

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