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**The Impact of Generative Artificial Intelligence Tools on Academic
Achievement and Cognitive Depth Among Higher Education Students: A
Critical Analytical Study**

أثر أدوات الذكاء الاصطناعي التوليدي على التحصيل العلمي والعمق المعرفي
لدى طلبة التعليم العالي

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Abstract:

This study aims to explore the impact of generative artificial intelligence (GenAI) tools on the academic achievement and cognitive processes of university students. Utilizing a critical analytical approach and reviewing recent literature published between 2023 and 2026, this paper examines the balance between the benefits of AI in enhancing self-directed learning and personalization, and the risks of "cognitive offloading" (over-reliance on machines for thinking) alongside the decline of independent critical evaluation. Ultimately, the study proposes a practical educational governance framework to ensure AI functions as a supportive cognitive scaffold rather than a replacement for human intellect.

Keywords: Generative Artificial Intelligence; Academic Achievement; Higher Education; Cognitive Offloading; Critical Thinking.

المخلص:

تهدف هذه الدراسة إلى استكشاف أثر أدوات الذكاء الاصطناعي التوليدي (GenAI) على التحصيل الأكاديمي والعمليات المعرفية لدى طلبة الجامعات. وبالاعتماد على منهج تحليلي نقدي ومراجعة الأدبيات الحديثة المنشورة بين عامي 2023 و2026، تفحص هذه الورقة التوازن بين فوائد الذكاء الاصطناعي في تعزيز التعلم الذاتي والتخصيص (مراعاة الفروق الفردية)، ومخاطر "التفريغ المعرفي" (الاعتماد المفرط على الآلات في التفكير) المصحوبة بتراجع القدرة على التقييم النقدي المستقل. وفي نهاية المطاف، تقترح الدراسة إطاراً عملياً للحوكمة التعليمية لضمان عمل الذكاء الاصطناعي كدعامة معرفية مساندة، بدلاً من أن يكون بديلاً للفكر البشري.

الكلمات المفتاحية: الذكاء الاصطناعي التوليدي؛ التحصيل الأكاديمي؛ التعليم العالي؛ التفريغ المعرفي؛ التفكير النقدي.

1. INTRODUCTION

The higher education sector is currently witnessing one of the fastest technological transformations in modern history. Since late 2022, spanning through 2024 and 2025 up to the current year of 2026, generative artificial intelligence (GenAI) tools have proliferated widely among university students. These applications, capable of generating cohesive texts, summarizing extensive volumes, and solving complex problems in mere seconds, have established an entirely new reality within university walls.

The core research problem lies in a profound division within the academic community regarding this technology. While one track of researchers views AI as a golden opportunity to develop students' skills and provide personalized learning tailored to individual paces, an opposing track argues that it severely threatens educational quality. They contend that it turns students into lazy consumers of ready-made information,

which weakens their actual cognitive abilities and negatively impacts their genuine academic achievement when placed in real, unassisted testing environments.

Research Questions

- How does generative AI contribute to improving and facilitating students' academic achievement?
- What are the cognitive and psychological harms resulting from an over-reliance on these tools?
- How can universities restructure their assessment methods and examinations to effectively address this challenge?

Literature Review

To understand the scope of this technology, it is essential to examine the latest findings of global academic studies investigating this topic between 2023 and 2026. Current scientific perspectives can be broadly divided into two main tracks:

1. The Technological Empowerment Track

This perspective focuses primarily on the positive dimensions of AI integration. A study conducted by **Freeman**^[1] for the Higher Education Policy Institute report indicates that AI tool usage among university undergraduates has surged past 80%. Students in this study affirm utilizing the technology to explain difficult concepts and summarize lengthy papers that they find challenging to read in full, thereby saving time and increasing daily learning efficiency.

Furthermore, a systematic review by **Hon**^[2] supports this trend, demonstrating that AI functions as a 24/7 "personal tutor." It assists students by correcting linguistic errors and deconstructing complex mathematical or philosophical concepts into simpler, step-by-step explanations tailored specifically to the student's level.

2. The Cognitive and Ethical Hazard Track

Conversely, an increasing number of empirical studies raise serious warning flags. Notably, **Vieriu and Petrea**^[3] directly address the impact of these tools on students' development and cognition, concluding that continuous reliance on machines to draft research and solve assignments leads to a sharp decline in independent critical thinking skills. A student who obtains a ready-made answer at the click of a button loses the crucial ability to search, compare conflicting sources, and perform self-analysis.

Taking a balanced, mid-ground approach, **Noroozi et al.**^[4] emphasize that the impact of AI is neither entirely positive nor entirely negative. Instead, the outcome depends entirely on the method of use; if a student employs it as a "guide" for direction, their achievement improves, but if it is used as a "substitute" to perform the cognitive work on their behalf, their academic standard inevitably declines.

Section 1: Mechanisms of Personalized Learning and Enhancing Academic Productivity

This section analyzes how generative AI can serve as a powerful positive catalyst

that raises the academic achievement of university students when utilized with awareness and purpose.

1. Personalized Learning and Addressing Individual Differences

In traditional university lectures, professors often deliver explanations using a uniform approach directed at everyone simultaneously, which may not align with the varying comprehension levels and learning paces among students. Here, the true value of generative AI emerges as a flexible, ever-present personal tutor; it allows students to adapt and tailor academic material to fit their unique intellectual capabilities.

For instance, a student can ask the program to simplify a complex issue by inputting prompts such as: *"Explain this linguistic or scientific theory to me in a very simple manner,"* or *"Give me real-life examples to help me understand this difficult concept."* This real-time content modification serves as a form of "cognitive scaffolding" that breaks the barrier of dread associated with dry academic subjects, accelerating the process of true comprehension and material absorption^[5].

2. Instant Formative Feedback and Enhancing Academic Writing

In traditional educational systems, university students faced a significant time lag between completing an assignment and receiving their assessment; a student would write a draft of their research or essay and then wait days or weeks for their supervisor's comments and corrections. This gap often leads to a decline in student enthusiasm or causes them to forget the nuances of their research ideas. Today, generative AI has revolutionized this aspect by transforming evaluation from a rigid final stage into a living, continuous process, acting as a 24/7 resident academic editor. This mechanism manifests across three interconnected levels:

- **Academic Writing Style and Structural Support:** The role of AI tools extends beyond merely correcting passing spelling mistakes; it

encompasses adjusting complex grammatical structures and rephrasing weak sentences to make them more cohesive and powerful. This direct linguistic development helps students grasp and emulate rigorous academic writing styles required by universities, thereby elevating the final quality of their research outputs ^[6].

- **Writing Argumentation and Gap Detection:** Intelligent models possess the ability to examine the logical sequence of ideas within a text, subsequently alerting the student to points of weakness. For example, it might indicate that *"the third paragraph lacks scientific or statistical evidence to support it,"* or *"the transition from the first to the second idea was abrupt and requires a transitional sentence."* This structural examination cultivates the student's skill in constructing coherent scientific arguments and teaches them how to bridge cognitive gaps in their research prior to submission^[7].
- **Learners' Psychological Safety and Overcoming Evaluation Anxiety:** These technologies provide a flexible learning environment free from preconceived judgments or social embarrassment. Many students suffer from "evaluation anxiety" and shyness when presenting their weak, initial drafts to professors for fear of negative criticism. Engaging in repetitive dialogue and refining the text multiple times with the machine grants students the psychological safety necessary to learn from their mistakes and develop their work independently, ultimately enabling them to submit a mature and polished scientific product that reflects their true achievement ^[8].

3. Time Management and Reducing Routine Academic Workloads

The research process and university studies in a traditional context demand immense organizational effort and a massive consumption of time in procedural and routine tasks. Students spend long hours,

and sometimes days, formatting reference lists according to international styles, organizing data within tables, proofreading punctuation, and searching randomly through thousands of titles and books across digital engines. This exhausting administrative effort often leads to high "academic burnout," depleting students' mental energy before reaching the actual writing and deep analysis phase^[9]. With the integration of generative AI tools and smart research platforms, this landscape has completely transformed, highlighting the technology's impact through two fundamental dimensions:

- **Automation of Complex Organizational Tasks:** AI can generate, format, and index bibliographic citations with extreme accuracy in mere seconds, as well as classify and tabulate statistical data and organize the general frameworks of reports. This time reduction enhances students' academic productivity, allowing them to manage their study time more effectively and invest squandered hours into accomplishing multiple academic tasks^[10].
- **Cognitive Resource Allocation Toward Creative Thinking:** From an educational psychology perspective, the human mind possesses a limited cognitive load capacity. When AI undertakes routine tasks of low cognitive value, a phenomenon known as the "liberation of the student's mental capacity" occurs. This mental liberation allows students to dedicate themselves entirely to the most crucial and profound task in higher education: the critical and close reading of texts, understanding and debating concepts, and focusing on innovation, creative thinking, and problem-solving^[9,10]. Here, technology does not think instead of the student; rather, it prepares the mental and temporal environment for them to think better.

Section 2: The Cognitive Disengagement Syndrome and the Intellectual Dilemma

Despite the aforementioned benefits,

the unregulated and excessive use of GenAI tools inflicts severe cognitive and psychological damage on university students, which is analyzed here as the "intellectual dilemma."

1. Cognitive Offloading and Intellectual Laziness

One of the most dangerous, invisible challenges facing the academic achievement of university students today is the phenomenon of "cognitive offloading." This term refers to the human practice of outsourcing and transferring mental tasks which the mind is supposed to perform to an external tool (like AI) to reduce one's own mental burden [11]. In its fundamental nature, the human mind resembles a muscle; it grows, strengthens, and expands through continuous training and practice, whereas it suffers from atrophy and laziness if it resorts to rest and ready-made solutions. When a university student habitually relies on AI programs to solve every mathematical problem, draft every literary essay, or summarize every lecture, they engage in a form of complete mental outsourcing to the machine, depriving their brain of experiencing natural cognitive processes [12].

The negative effects of this phenomenon on academic achievement manifest in two main ways:

- **Impaired Long-Term Memory:** For information to move from temporary memory to long-term memory, the mind must undergo what is known as "desirable difficult cognitive struggles"—the effort expended in searching, reading, making mistakes, and retrying. When a student obtains a complete answer and ready-made phrasing at the click of a single button, the information passes over their mind superficially and transiently, preventing the brain from building strong neural connections to fix this information. Consequently, it evaporates quickly, leaving the student without real cognitive benefit for their future [11].

- **Retrieval Failure When Needed:** The inevitable outcome of this cognitive reliance appears clearly when students are placed in

genuine evaluative situations, such as closed written exam halls, sudden oral interviews, or actual work environments after graduation. In these moments, where the phone screen is absent and AI disappears, the student finds themselves in a state of "intellectual bankruptcy" and complete inability to recall concepts or construct sentences, because they did not previously train their minds on the skill of retrieving information and generating ideas independently [12,11]. The student here transforms from an "aware learner" into a mere "conduit" that transfers text from the machine to the papers without true awareness of its content.

2. Eradicating Higher-Order Thinking Skills and the Crisis of the "Illusion of Competence"

In the educational and academic field, human mental capacities are classified based on "Bloom's Taxonomy." This hierarchy divides mental skills into two categories: lower-order thinking skills (such as remembering, memorizing, and superficial understanding) and higher-order thinking skills (which sit at the top of the pyramid and include analysis, evaluation, critique, and the original creation of ideas).

When a university professor asks a student to write a critical essay or compare two theories, the primary and implicit goal of this assignment is not merely to stuff pages with information, but to train the student and guide their mind through an "intellectual crucible" that forces them to deconstruct texts, detect contradictions, weigh arguments, and then formulate their own independent opinion. However, with the uncritical integration of generative AI tools, a dangerous breach of this educational process has occurred. The machine has begun to undertake all higher-order thinking skills on behalf of the student, threatening their true academic achievement through two primary dimensions [13, 14]:

- **Bypassing the Cognitive Process:** When a student asks a program to write a ready-made critical essay, the machine jumps directly to the top of the cognitive pyramid

(creation) and presents the student with a polished final product in seconds. As a result, the student skims through this text superficially and transiently without realizing how the arguments were constructed or how the ideas were linked. This "technological shortcut" deprives the student of the opportunity to activate their neural cells and train their minds on self-critique and analysis, which over the long term leads to the dimming of their intellectual skills and a decline in their capacity for independent judgment^[14].

-The Rise of the "Illusion of Competence": The most dangerous psycho-educational effect left by this over-reliance is the student's acquisition of a false sense of intelligence and academic excellence. The student sees an excellent essay in front of them with rigorous language and deep analysis, internally deluding themselves that they possess this cognitive merit, while the truth is that their mind expended zero effort in its formulation. The cognitive shock manifests when this student graduates into the labor market or is placed in a live oral defense; their complete inability to think critically or solve complex problems outside the phone screen is laid bare. They graduate holding a high university degree, yet they lack genuine and original intellectual development ^[13].

3. Digital Hallucinations and Scientific Inaccuracies

Alongside behavioral and cognitive impacts like intellectual laziness, the academic achievement of university students faces a highly critical technical and scientific obstacle termed in computer and educational sciences as "digital hallucination." This phenomenon refers to the tendency of generative AI models to fabricate information, dates, events, or statistical figures that have absolutely no existence in reality, then presenting them to the user in a confident and fluent linguistic style that implies absolute accuracy at first glance^[15, 16].

This dilemma reflects on the quality of research and the student's academic

achievement through two primary dimensions:

-Blind Trust and Misinformation: A hurried student, or one who lacks a solid foundational knowledge in their specialization, tends to place blind trust in the machine's outputs. When smart tools formulate a false hypothesis or an incorrect historical fact using grand and persuasive phrases, the student copies and integrates it into their academic assignments without fact-checking. This not only spoils scientific research but also entrenches distorted and incorrect scientific concepts in the student's mind, thereby harming their cumulative achievement^[16].

-Phantom Citations and Shattering Academic Integrity: The peak danger of digital hallucinations manifests when a student requests the program to provide references and studies to support their research. Due to the mechanism of these programs, which is based on predicting words rather than actual searching in databases, they often invent complete references fabricating author names, glittering article titles, prestigious journal names, and even constructing highly realistic volume and page numbers ^[15]. When these papers fall into the hands of university professors or examining committees, these references are discovered to be phantoms that do not exist, plunging the student directly into the trap of scientific forgery and academic dishonesty.

Section 3: The Assessment Crisis and Redesigning University Examinations

Faced with this new reality in 2026, traditional assessment methods (such as standard take-home assignments or standard term papers) have become largely ineffective, as professors can no longer verify authorship. Consequently, the entire assessment framework must be restructured.

The AI Detection Dilemma and Academic Equity

When AI usage proliferated, universities rushed to adopt anti-plagiarism software known as "AI Detectors" to scan student research and uncover machine-

generated text. However, practical applications and empirical studies have proven that these tools have turned into a problem rather than a solution, as they lack full scientific accuracy and have caused trust crises within campuses for two main reasons^[17, 18]:

-The Dilemma of "False Positives" and Unjust Accusations: Detection software relies on statistical algorithms that measure word predictability and text consistency. The dangerous irony here is that an outstanding student, who possesses a strong, organized writing style and adheres to strict academic standards, often writes in a way that aligns closely with AI metrics. Consequently, these programs flag research by authentic students who never used the technology as "cheating"^[18]. This programmatic error strikes at their psychological security and creates an environment of pre-emptive accusation, particularly toward students writing in a second language (such as English for non-native speakers), whose style tends toward a high level of formality that algorithms misclassify as AI^[17].

-Ease of Digital Circumvention: On the other hand, a student who genuinely wishes to cheat can bypass these programs with extreme ease. It suffices to take the AI-generated text and run it through digital paraphrasing tools or ask the AI itself to rewrite the text in a less formal human style with natural, casual errors. These simple tricks allow the text to pass through screening filters as if it were 100% human-written ^[18]. Therefore, chasing texts has become an ongoing "cat and mouse" game that pointlessly consumes academic time.

Educational experts now widely agree that the solution does not lie in developing more stringent detection software, but in initiating a radical revolution that alters the philosophy of assessment itself—shifting from evaluating a rigid final paper to evaluating the cognitive process, the student's direct understanding, and the oral presentation of their knowledge.

Traditional Assessment Type	Proposed Modification for the AI Era	Educational Objective of the Change
Traditional Take-Home Essay	Process-Based Assessment: The professor requires the submission of weekly drafts, outlines, and mind maps, accompanied by short, in-class oral check-ins to track progress ^[19] .	Ensures the student actively undergoes the journey of research, learning, and synthesis, rather than generating the text at the last minute.
Rote-Memorization Exams	Open-Book & Critical Analysis Exams: Formulating complex, problem-solving questions that require linking theories to real-world current events—tasks requiring human nuance that machines cannot fully replicate ^[19] .	Measures higher-order thinking skills, deep understanding, and the ability to apply knowledge practically rather than simple recall.
Standard Written Examinations	Viva Voce & Live Oral Presentations: Students present their research ideas before their peers and a panel, defending their hypotheses and answering live, unprompted questions ^[19] .	Builds student character, oral communication skills, and provides absolute verification of the student's genuine cognitive acquisition.

Conclusion & Recommendations

Generative artificial intelligence is an inevitable technological tool, much like the advent of the calculator or the emergence of the internet in previous decades; it cannot be banned or ignored, but must rather be governed and guided. The impact of this technology on students' academic achievement is neither an absolute evil nor a pure good; it is a mirror of how it is utilized. Complete reliance on it leads to the flattening of minds and a decline in real-world capabilities, while its intelligent use as a partner and assistant opens new horizons for excellence and productivity.

Procedural Recommendations for Higher Education Institutions:

- 1. Mandatory Digital Literacy and AI Ethics Courses:** Universities should

implement mandatory, short-form modules teaching students how to prompt AI intelligently (Prompt Engineering) and how to rigidly cross-verify information and citations to protect scientific integrity.

2. **Integrating AI into Classroom Pedagogies:** Encouraging faculty to explicitly embed AI in coursework; for example, requesting students to generate an AI essay on a specific topic, and then grading the students based on their ability to critique, find errors, and rewrite the AI output manually.
3. **Prioritizing Distinctly Human Skills:** Higher education curricula must pivot toward assessing attributes unique to humans, such as emotional intelligence, ethical resolution, local cultural contextualization, and hands-on collaborative problem-solving.

Bibliography List:

Books:

- [1] Freeman, J. (2025), Student generative AI survey 2025, Higher Education Policy Institute, United Kingdom;

Articles:

- [2] Hon, K. (2026), Generative AI in higher education: A systematic review of its effects on learning outcomes and academic performance, *Journal of Educational Technology Systems*, USA, Volume 54 and Number 3;
- [3] Vieriu, A. M., & Petrea, G. (2025), The impact of artificial intelligence (AI) on students' academic development, *Education Sciences*, Switzerland, Volume 15 and Number 3;
- [4] Noroozi, O., Khalil, M., & Banihashem, S. K. (2025), Artificial intelligence in higher education: Impact depends on support, pedagogy, human agency, and purpose, *Innovations in Education*

and Teaching International, United Kingdom, Volume 62 and Number 5;

- [5] Vendrell, M., & Johnston, S. K. (2026), Scaffolding critical thinking with generative AI: Design principles for integrating large language models in higher education, *Computers and Education: Artificial Intelligence*, Netherlands, Volume 7;
- [6] Kornieva, V. L. Z. (2024), Generative AI in student essays: English teachers' perspectives on effective assessment methods, *XLinguae*, Slovakia, Volume 17 and Number 4;
- [7] Chen, J., Huang, K., Lai, C., & Jin, T. (2025), The impact of GenAI-based collaborative inquiry on critical thinking in argumentation: A case study of blended argumentative writing pedagogy, *TESOL Quarterly*, USA, Volume 59;
- [8] Zhang, B., Li, W., & Jou, M. (2025), The influence of generative artificial intelligence support on learning anxiety and academic expectation stress: the mediating role of self-efficacy, *Interactive Learning Environments*, United Kingdom;
- [9] Addae, R. K., & Brown, C. (2025), The role of artificial intelligence in enhancing human longevity: Mitigating cognitive overload for extended lifespan among master's students in mathematics at the Catholic University of Ghana, *Golden Ratio of Social Science and Education*, Indonesia, Volume 5 and Number 2;
- [10] Chan, C. K. Y., & Hu, W. (2023), Students' voices on generative AI: Perceptions, benefits, and challenges in higher education, *International Journal of Educational Technology in Higher Education*, United Kingdom, Volume 20 and Number 1;
- [11] Rokhsari, S. (2025), The impact of artificial intelligence on learners' memory: A systematic review,

- Journal of Cognition, Emotion & Education, Volume 3 and Number 2;
- [13] Naznin, K., Al Mahmud, A., Nguyen, M. T., & Chua, C. (2025), ChatGPT integration in higher education for personalized learning, academic writing, and coding tasks: A systematic review, Computers, Switzerland, Volume 14 and Number 2;
 - [14] Pang, W., & Wei, Z. (2025), Shaping the future of higher education: A technology usage study on generative AI innovations, Information, Switzerland, Volume 16 and Number 2;
 - [15] Alkaissi, H., & McFarlane, S. I. (2023), Artificial hallucinations in ChatGPT: Implications in scientific writing, Cureus, USA, Volume 15 and Number 2;
 - [16] Boretti, A. (2026), Hallucinations in generative AI: A threat to scholarly integrity and the urgent need for publisher-led academically supervised verification, Energy Research & Social Science, Volume 136;
 - [17] Liang, W., Yuksekgonul, M., Mao, Y., Wu, E., & Zou, J. (2023), GPT detectors are biased against non-native English writers, Patterns, USA, Volume 4 and Number 7;
 - [18] Weber-Wulff, D., Anohina-Naumeca, A., Bjelobaba, S., Foltýnek, T., Guerrero-Dib, J., Popoola, O., ... & Waddington, L. (2023), Testing of detection tools for AI-generated text, International Journal for Educational Integrity, Volume 19 and Number 1;
 - [19] Khlaif, Z. N., Alkhouk, W. A., Salama, N., & Abu Eideh, B. (2025), Redesigning assessments for AI-enhanced learning: A framework for educators in the generative AI era, Education Sciences, Switzerland, Volume 15 and Number 2;
- Conference paper:**
- [12] Ma, C., Yang, Z., & Gao, C. (2025), From learning aid to learning escape: The commodification of AI-powered educational technologies and their impact on Chinese international students' cognitive and ethical development, Proceedings of the 2025 International Conference on Economic Management and Big Data Application, China, July 2025;