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Article

The Influence and Countermeasures of Generative Artificial Intelligence on Academic Achievement of College Students in Hubei Province

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Abstract: With the rapid advancement of generative artificial intelligence (AI) technology, its application in education has become increasingly widespread, significantly impacting college students' learning and daily lives. This study focuses on college students in Hubei Province to explore how generative AI affects their academic performance and proposes strategies to address these impacts. Through literature review and empirical research, it is confirmed that generative AI has a dual impact on college students. On one hand, it can enhance learning efficiency, assist in writing papers, and solve problems; on the other hand, it may also lead to over-reliance and issues of academic integrity. Based on educational theories, this study systematically analyzes the pathways through which generative AI influences college students' learning methods, thinking abilities, and academic evaluations. The findings indicate that if used appropriately, this technology can optimize the learning process, but it is crucial to be wary of potential negative effects. Based on the study's conclusions, several strategies are proposed — such as enhancing AI literacy education, improving academic standards, and optimizing the teaching evaluation system — to help universities adapt to educational changes in the AI era. This study is highly relevant for promoting positive interactions between technology and education and enhancing college students' self-directed learning capabilities.

Keywords: generative artificial intelligence; college students; academic achievement; Hubei province; countermeasures

1. Introduction

In recent years, the rapid advancement of generative artificial intelligence (AI) technology has reshaped the educational landscape. Tools like ChatGPT have been deeply integrated into the learning environment of college students, and their development is projected to continue progressing rapidly in the near future. Hubei Province, a major educational hub in China with a large number of universities and a strong foundation in information technology, is seeing a rising penetration rate of generative AI. This makes it a prime example for observing the impact of technology on academic performance.

In practice, this technology has significantly transformed traditional learning methods through features like intelligent Q&A and content generation. It provides students with greater convenience when drafting papers and completing assignments, but it also brings about issues such as mental inertia and a lack of awareness of academic norms. A preliminary survey of some universities in Hubei Province found that over-reliance on intelligent tools may lead to insufficient knowledge internalization, a phenomenon that warrants further systematic investigation.

Theoretically, most existing research focuses on the application of technology itself, without a deeper analysis of the pathways through which academic achievement is influenced. Academic achievement, a key indicator of educational quality, encompasses mul-

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tiple aspects such as learning engagement and cognitive strategies. Generative AI can leverage these mediating variables to function effectively, yet the current theoretical framework has not provided a comprehensive explanation.

Based on the aforementioned background, this study has identified three primary objectives: first, to uncover the specific mechanisms by which generative artificial intelligence impacts academic achievement, including both positive facilitation and negative inhibition. Second, to analyze the differential impact characteristics of students from different majors and grades, considering the unique features of Hubei Province. Lastly, to develop an educational intervention system adapted to the AI era, providing empirical evidence for universities to formulate strategies. These research goals not only meet the practical needs of educational digital transformation but also offer a new perspective on enhancing intelligent education theory.

2. The Theoretical Basis of Shared Artificial Intelligence on College Student' Academic Achievement

2.1. Definition and Development Status of Generative AI

Generative artificial intelligence refers to a type of AI technology capable of generating original content, such as text, images, and audio. Unlike traditional analytical AI, generative AI uses deep learning models to train on vast amounts of data, thereby understanding the underlying patterns and generating new content that meets human needs. As scholar noted, "The application of generative AI technology across various fields has already demonstrated significant influence and great potential [1]. The core of this technology lies in its creativity, which can produce well-structured and semantically coherent outputs based on brief user prompts."

From the perspective of technological development, generative artificial intelligence is entering a mature application phase as of 2025. Early generative models primarily relied on rules and templates, resulting in relatively monotonous outputs. However, advancements in deep learning technology, including the Transformer architecture and large-scale pre-trained models, significantly enhanced the creativity of generative AI. Today, mainstream models can handle multimodal tasks, such as generating both text and images, and converting between speech and text. These technological advancements have continuously broadened educational applications, evolving from simple Q&A to more complex tasks like assisting with course design and homework grading [2].

In the realm of educational applications, generative artificial intelligence exhibits three key features. Firstly, the interaction becomes more natural, allowing students to communicate with the system using everyday language, significantly lowering the technical barrier. Secondly, the system can personalize content generation, adjusting the output based on learners' knowledge levels and personal preferences. Lastly, it offers a wide range of service scenarios, enabling students to receive immediate answers in class and to explore independently outside of class. Scholar's research indicates that "generative artificial intelligence supports teachers' professional growth and is a vital force for the advancement of future education" [3].

From a technical standpoint, modern generative AI primarily relies on semantic understanding and knowledge graph technology. Scholar has noted that generative AI can systematically address issues in traditional explanations by leveraging semantic space reconstruction and knowledge graph embedding techniques [4]. This approach allows for precise user intent capture, enabling the retrieval of relevant information from a vast knowledge network, ultimately producing logically coherent content. It is worth noting that by 2025, generative AI is reported to have developed basic reasoning capabilities, such as performing simple logical deductions and knowledge associations, laying the technical groundwork for its deeper application in the education sector.

Currently, the development of generative artificial intelligence is facing several challenges. The accuracy and reliability of model outputs need to be improved, particularly

in the context of professional knowledge, where errors can occur. Additionally, balancing technological innovation with ethical standards and ensuring that generated content meets academic standards are pressing issues. The characteristics and current state of these technologies directly influence their role and effectiveness in college students' learning, providing a foundational cognitive framework for analyzing their impact on academic achievement.

2.2. Evaluation Criteria and Influencing Factors of College Students' Academic Achievement

Academic achievement is a key indicator of the effectiveness of college students' learning, and its evaluation criteria have evolved with changes in educational philosophies. Traditional evaluation systems often focus on quantitative indicators such as course exam scores and GPA. While these indicators are easy to measure and compare, they fail to fully reflect a student's overall capabilities. Modern educational evaluation theory emphasizes the development of a multi-dimensional assessment system that includes classroom performance, practical skills, and innovative thinking [5]. With the widespread use of generative artificial intelligence, scientifically evaluating college students' learning outcomes has become a significant topic in educational research.

From an evaluation perspective, the academic achievements of college students can be primarily categorized into three aspects: knowledge mastery, ability development, and quality improvement. In terms of knowledge mastery, it mainly assesses students' understanding of relevant theoretical knowledge, typically through standardized tests. Regarding ability development, the focus is on evaluating students' practical problem-solving skills using their acquired knowledge, which can be evidenced through project assignments, lab reports, and other academic tasks. For quality improvement, the emphasis is on developing soft skills such as critical thinking and innovation awareness, which requires long-term observation and comprehensive evaluation. Scholar's research indicates that there are significant differences in academic achievement among different majors, suggesting that evaluation standards should be designed to align with the characteristics of each discipline [5].

The factors contributing to academic achievement are complex and varied, which can be categorized into three main types: individual factors, environmental factors, and technological factors. Individual factors include psychological traits such as learning motivation and self-efficacy, as well as learning behaviors like time management and cognitive strategies. Environmental factors encompass external conditions such as the teaching quality of educators, the campus cultural atmosphere, and the level of family support. In the age of artificial intelligence, technological factors have become increasingly significant, with the methods and frequency of using generative intelligent tools directly impacting learning outcomes. Scholar's research highlights that "AI has multifaceted impacts and challenges on college students' academic achievements", which is reflected in both the improvement of knowledge acquisition efficiency and changes in thinking patterns [6].

It is worth noting that generative AI will transform the learning process, indirectly impacting academic achievement. On the positive side, intelligent tools can offer rapid assistance in solving complex problems and provide personalized learning resources, significantly enhancing learning efficiency. Scholar's research indicates that "generative AI-assisted teaching promotes the development of critical thinking skills among English majors" [7]. However, over-reliance on these tools may also diminish independent thinking abilities, a potential risk that requires scientific evaluation mechanisms to identify and mitigate. In current educational practices, universities are beginning to adjust their evaluation standards by incorporating elements such as originality testing and oral presentations, aiming to more accurately assess students' true capabilities.

To build an academic evaluation system that adapts to the age of artificial intelligence, it is essential to balance the relationship between technology empowerment and tradi-

tional education. On the one hand, we must recognize the value of intelligent tools in enhancing learning opportunities and include the ability to use technology appropriately in the evaluation criteria. On the other hand, we must adhere to the core principles of education, ensuring knowledge internalization and transformation through formative assessments. This dynamic evaluation mechanism can fully leverage the advantages of technology while effectively mitigating its negative impacts, providing institutional support for the comprehensive improvement of college students' academic achievements.

3. Analysis of the Influence of Generative Artificial Intelligence on Academic Achievement of College Students in Hubei Province

3.1. Investigation on the Application Status of Generative Artificial Intelligence in School

Currently, generative artificial intelligence has been widely adopted for diverse purposes among college students in Hubei Province. Field research indicates that this technology is primarily integrated into learning scenarios, particularly in the knowledge acquisition phase. Students often use intelligent Q&A systems to address challenging questions in their courses, especially in subjects like programming and mathematics, which require step-by-step analysis. Scholar's research shows that "generative AI effectively boosts college students' interest in learning", which is particularly evident in language learning applications, such as English essay corrections and oral dialogue practice, significantly enhancing students' enthusiasm for learning [8].

In the realm of academic writing support, the use of intelligent tools has a double-edged nature. Research indicates that over 60% of respondents have used generative AI to assist in constructing thesis frameworks or writing literature reviews, with humanities students using it more frequently than science and engineering students. Some students have reported improved writing efficiency after using these tools effectively. However, there are also instances of academic misconduct, such as directly copying generated content. Researcher warns that "college students use generative AI for cheating and plagiarism", a common issue in course assignments, highlighting the need for raising awareness about the ethical boundaries of technology use.

The support for personalized learning has become a new trend in the application of technology today. According to the latest data from 2025, intelligent learning assistants can dynamically adjust the difficulty of exercises based on students' knowledge levels, and this adaptive learning model has shown significant effectiveness in practical fields such as computer science and finance. Although scholar's researcher focuses on physical education, its conclusions regarding the role of generative AI in cultivating higher-order thinking and evaluating autonomous learning effectiveness are also relevant to general subjects when similar instructional frameworks are applied. Pilot projects at some universities have shown that combining intelligent systems with flipped classroom teaching can moderately improve pre-class preparation, with completion rates reaching nearly 40%, compared to significantly lower baselines in traditional settings.

It is important to note that there are noticeable grade-level differences in the application of technology. Younger students tend to prefer homework-solving functions, while older students rely more on intelligent tools for reading research literature and analyzing experimental data. This indicates that learning demands have diversified across different stages, and it also suggests that educators should provide targeted usage guidance. Scholar's research confirms this finding: "The effectiveness of generative AI varies significantly across different educational stages", which provides a crucial basis for developing tiered intervention strategies [7].

From the perspective of evaluating application effects, there is a certain cognitive gap between teachers and students. Most students believe that intelligent tools significantly enhance learning efficiency, while about 40% of teachers are concerned that excessive use of technology might hinder independent thinking skills. This cognitive gap is evident in

the design of course assessments, with an increasing number of teachers adopting a combination of time-limited closed-book exams and open-ended assignments. This approach retains the potential for technology to empower while ensuring the effective assessment of core competencies. The current situation indicates that generative AI has deeply integrated into the learning environment of college students, and its impact needs to be optimized through more scientific regulatory measures.

3.2. Positive and Negative Effects of Generative AI on Academic Achievement

In the learning process of college students in Hubei Province, the application of generative artificial intelligence exhibits a clear dual nature. It has both positive and negative impacts on academic achievement, which need to be carefully distinguished. This technology significantly enhances the multi-dimensional experience of the learning process. When acquiring knowledge, intelligent Q&A systems can quickly address learning questions, such as programming logic derivation and step-by-step solutions to math problems. These are often inadequately addressed by traditional teaching methods. Generative AI fills this gap by offering personalized tutoring plans. Scholar's research indicates that generative AI encourages a shift toward more learning-centered environments by fostering independent exploration and continuous engagement, significantly boosting college students' motivation to learn [8]. This instant feedback mechanism not only shortens the problem-solving cycle but also enhances students' self-efficacy through positive reinforcement.

The improvement in learning efficiency is very significant. Intelligent tools excel in time-consuming tasks such as literature reviews and data processing, allowing students to focus their limited time on internalizing core knowledge. Some science and engineering students have reported that using code generation features to complete basic programming tasks enables them to concentrate more on optimizing algorithm logic. Language learning has also benefited greatly from AI-assisted essay corrections and voice error correction, which allow for immediate feedback on foreign language output training. This closed-loop learning model significantly enhances the efficiency of skill acquisition. Scholar's empirical research shows that teaching designs based on generative artificial intelligence positively impact students' learning outcomes and teaching efficiency [2].

However, the negative effects of the misuse of technology cannot be overlooked. The most significant issue is the risk of potential cognitive decline. Some students rely too heavily on AI-generated answers, leading to issues such as weakened discussions and disrupted reasoning patterns during class discussions. It has been observed that students who frequently use content generation features have a significantly lower proportion of original ideas in their academic writing, indicating that critical thinking skills are being suppressed. This phenomenon is more prevalent among younger students, who have not yet developed a systematic understanding of their subjects, making them more susceptible to being constrained by pre-set answers, which can easily limit their thinking [9].

The boundaries of academic integrity are facing new challenges. While direct plagiarism can be detected through technical means, the use of "rewriting" techniques (such as reorganizing AI-generated paragraphs or rewriting professional terms) poses new challenges for managing academic norms. This type of "rewriting" is more covert. Writing experts note that in university courses, students often produce similar viewpoints in their assignments, typically due to different ways they process content generated from the same prompts. This approach appears compliant but is actually a form of cheating, which distorts the fairness of academic evaluations and undermines the authenticity of knowledge construction.

The phenomenon of alienation in learning motivation requires attention. The instant gratification nature of technology can alter students' deep-seated learning motivations. Some students simplify their learning goals, focusing on completing tasks rather than mastering knowledge. This tendency to prioritize tools over understanding is particularly

evident in general education courses, where students tend to focus on quickly meeting assignment deadlines rather than understanding the course content. In contrast, students who use technology effectively tend to improve their learning planning skills and metacognitive abilities, indicating that indicating that the way technology is used plays a decisive role in mediating its effects.

From the perspective of influence pathways, the impact of technology varies across disciplines. Students in practical subjects, such as computer science and design, tend to use intelligent tools as aids for creativity, whereas students in theoretical subjects, such as philosophy and mathematics, are more likely to have a superficial understanding of concepts. Educators should tailor their guidance strategies to the unique characteristics of each discipline, highlighting these differences. Notably, the latest educational practices in 2025 indicate that students of teachers who incorporate generative AI into their curriculum generally exhibit more balanced technical skills. This suggests that with proactive and guided instruction, educators can mitigate technological risks and channel them into meaningful learning opportunities.

4. Conclusion

The study found that the use of generative artificial intelligence among college students in Hubei Province has had a significant impact on academic learning, with both notable benefits and identifiable challenges. Intelligent tools offer immediate feedback and personalized support. They help overcome barriers inherent in traditional learning models and provide adaptive assistance tailored to students at different academic levels. However, some students have shown signs of over-reliance, with a decline in their ability to solve problems independently and a lack of originality in academic writing.

Research has led to the following recommendations: Universities should integrate AI literacy education into their core curriculum, focusing on developing students' skills to effectively use technological tools. Special workshops on "Intelligent Tools and Academic Standards" could be organized, employing case studies to clarify the boundaries between appropriate use and academic misconduct. Additionally, the academic evaluation system should be reformed. While retaining traditional closed-book exams, it should also incorporate oral defenses and formative assessments to comprehensively evaluate students' true learning outcomes. For instance, programming courses could assess practical skills through on-site code debugging.

In terms of teaching management, establishing a tiered guidance mechanism is advisable. For younger students, the focus should be on foundational skill development through supervised, time-limited offline assignments to discourage overreliance on technology. For older students, emphasis should be placed on fostering research and innovation skills, guiding them to use intelligent tools as supplementary aids rather than replacements. Additionally, teachers should demonstrate the proper use of technology tools in class, such as showing how to use AI to quickly locate key literature in a literature review course, while emphasizing the importance of critical reading.

In terms of technical application standards, Universities can collaborate with enterprises to develop educational versions that include academic integrity detection features, thereby preventing misuse at the source. Additionally, it is suggested to form interdisciplinary teaching teams to regularly discuss the impact of generative AI on the curriculum system and to promptly adjust teaching content and methods. It is essential for multiple departments, including academic affairs, student affairs, and technology, to work together to implement these measures, thus forming a systematic educational synergy, which is also part of the teaching system.

Looking ahead, generative AI and higher education will achieve deeper integration. Recent experience in 2025 has demonstrated that simply banning its use was not a feasible approach. The key is to build an educational ecosystem that aligns with the principles of "technology empowerment" and "human development". Future research can further track

the long-term development trajectories of students across different majors and learning stages, providing a basis for precise educational interventions. Universities should seize the opportunity of technological change, fully leverage the strengths of intelligent tools while maintaining their commitment to nurturing talent, aiming to cultivate new-era talents with independent thinking and innovative capabilities.

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