

## The Role Analysis of Gen AI for College Students-Evidence from China

Zitong Huang<sup>1</sup>

Nuoni Peng<sup>2</sup>

Yu Han<sup>3</sup>

Bin Huang<sup>4</sup>

Jiayin Qi<sup>5,\*</sup>

\*Corresponding author

<sup>1</sup> Student, Guangzhou University, Guangzhou, PR China, t18319748808@163.com

<sup>2</sup> Student, Guangzhou University, Guangzhou, PR China, 2668411953@qq.com

<sup>3</sup> Student, Guangzhou University, Guangzhou, PR China, 1306498784@qq.com

<sup>4</sup> Research Scholar, Guangzhou University, Guangzhou, PR China, hb@gzhu.edu.cn

<sup>5</sup> Professor, Guangzhou University, Guangzhou, PR China, qijiayin@139.com

### ABSTRACT

The rapid development of generative Artificial Intelligence (GenAI) has attracted widespread attention regarding its application and impact in the field of higher education. Currently, universities worldwide have not yet reached a unified stance on GenAI, and they lack systematic guidance on college students' use of GenAI. This research employs two methods to explore the impact of GenAI on college students' studies: a meta-analysis of 30 selected papers and organic data analysis via internet crawling. The results indicate that GenAI plays 5 positive roles and 6 negative roles in college students' usage. This study aims to provide universities with a reference for guiding students to use GenAI correctly.

**Keywords:** Generative artificial intelligence, role analysis, higher education.

### INTRODUCTION

Generative Artificial Intelligence (hereinafter referred to as GenAI) refers to tools that "describe algorithms that can be used to create new content (e.g., ChatGPT), including audio, code, images, text, simulations, and videos" (Kalota, 2024). The development of GenAI began with the emergence of ChatGPT in 2022, which showcased exceptional text generation and multilingual dialogue capabilities in the field of natural language processing, causing a major sensation at the time. In 2023, the release of GPT-4 further enhanced the model's ability to handle complex content and introduced visual information understanding, broadening its application in the field of image processing and visual content comprehension. In the same year, Baidu followed the international trend and announced that its large model, "ERNIE Bot," was officially in use, signaling the entrance of GenAI research and application in China into a phase of rapid development. Shortly after, Chinese-created GenAI, such as Chat GLM and Tongyi Qianwen, joined the research wave, advancing the localized development and innovative application of GenAI technology. By 2024, the emergence of AI programmer Devin marked a programming field breakthrough for GenAI, beginning to play a significant role in software development and algorithm design. This series of technological advancements underscores not only the swift development momentum of GenAI technology but also reveals its vast potential for application and strategic value in future technological innovation.

The technological revolution driven by artificial intelligence is an inevitable aspect of learners' education, life, and future work today. A survey conducted at the University of Cambridge on the use of ChatGPT revealed significant statistical data: up to 47.3% of surveyed students admitted to seeking academic help using ChatGPT. Furthermore, among the surveyed students who have used this tool, more than 20% of respondents indicated that they "often" or "always" rely on this emerging technology during academic research (Rogers & Liu, 2023). In China, a questionnaire survey initiated by China Youth Daily among students from colleges across the country on the use of AI tools showed that 84.88% of respondents have used AI tools, with 16.30% frequently using them, 57.49% occasionally using them, and 19.43% rarely using them (Bi *et al.*, 2023). The increasing usage data of GenAI among college students not only reflects the gradual penetration of GenAI in the field of education but also reveals its important value in promoting personalized learning and enhancing the quality of education.

The continuous penetration and application of GenAI in the field of education have triggered profound reflection and an active response from higher education institutions regarding teaching methods, academic integrity, and technological integration. With the increasing maturity of GenAI technology, the attitudes and systems of various colleges have undergone significant changes. Harvard and Oxford have adapted to the application of GenAI in education, actively issuing guidelines on its use, and striving to ensure that academic integrity and ethical standards are upheld. In contrast, places such as France, India, and Denmark have imposed restrictions on the application of GenAI in education, showing great concern about the potential risks of the technology, particularly regarding data privacy, information security, and the potential impact on students' learning

methods. It is worth noting that the University of Hong Kong has shifted from resisting and prohibiting to fully embracing generative artificial intelligence, reflecting the institution's positive attitude towards educational innovation and technological integration, and indicating that GenAI is steadily gaining global recognition. However, China has not yet taken a clear policy stance on the regulation of GenAI in higher education. This suggests that different regions have not reached a consensus on attitudes and norms regarding the use of generative AI in higher education.

Based on this, many scholars have explored the impact of GenAI on college students in various application scenarios within higher education. However, this research is relatively scattered and lacks systematic summarization, limiting our understanding of the role of generative artificial intelligence in students' learning and restricting the optimization of educational policies and teaching practices. To deeply study the role of GenAI in the learning process of college students, it is necessary to systematically analyze the current situation, needs, and challenges of students' use of GenAI, as well as to analyze college students' understanding of the role of GenAI based on a large amount of real and accurate data.

The contributions of this study are reflected as follows: firstly, the article applied meta-analysis of research to extract, summarize, and integrate the complete roles of GenAI in the learning process of college students. Furthermore, we crawled Internet data through Python and used content analysis to identify the roles played by GenAI in the comments. Based on these two research methods, we obtained a more comprehensive argumentation and provided the conclusion and analysis.

## THE META-ANALYSIS OF RESEARCH ON ROLE RECOGNITION OF GENAI

### Research Method

The meta-analysis of research is "a process of integrating research conclusions through extensive reading and statistical analysis of a large number of papers" (GLASS, 1977). This research method requires systematic collection of information followed by screening and summarizing the obtained information. It aims to increase the sample size of the study to enhance the credibility of the conclusions, thereby addressing the issue of inconsistent research outcomes. Therefore, it is necessary to adhere to the standard research process of the meta-analysis of research.

The first step is to identify the research question for this paper. In this phase, our research question should guide the paper meta-analysis process, considering the research background, paper search scope, and screening criteria. The research question of this study is what role GenAI plays in the learning process of college students, and the meta-analysis of research is carried out based on this research question.

The second step is to conduct paper search and screening. In this study, the author mainly uses keywords such as "evaluation of GenAI," "role of generative artificial intelligence," "challenges of GenAI," and "generative artificial intelligence in the learning process," to search for relevant papers in English academic databases (such as Web of Science, Science Direct) from 2018 to 2024. A total of 64 papers were retrieved, excluding 4 papers that could not be downloaded or were duplicates, 8 papers that did not match the research theme, 19 papers that were not about college students, and 3 non-academic report-type papers, resulting in 30 papers for the meta-analysis of research. The process of papers screening and selection is shown in Figure 1.

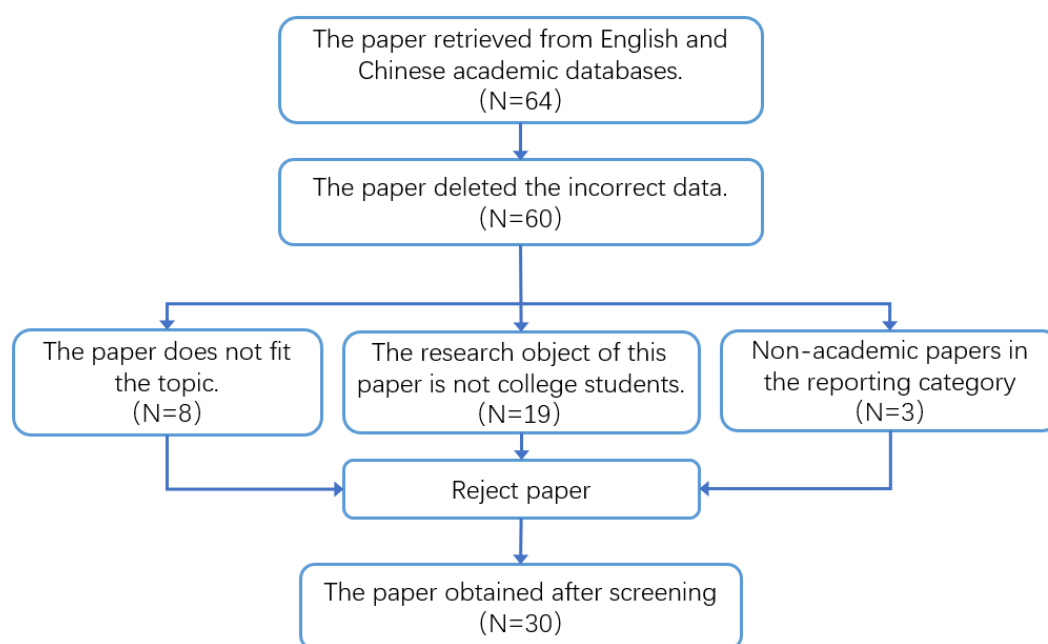


Figure 1: Flow of paper search and screening

Finally, analyze and integrate the content of the papers. By reading the 30 papers, the roles of GenAI in the learning process of college students and the related evaluation content mentioned in the literature are extracted into a document. These roles are summarized into positive and negative roles. On this basis, the roles are further classified. After the classification work is completed, the number of documents involved in each viewpoint is counted, and the final results are shown in Table 1.

Table 1: The reference styles in the text.

| No. | Role types     | Role                  | Number of papers |
|-----|----------------|-----------------------|------------------|
| 1   | Positive roles | Personal assistant    | 3                |
| 2   |                | Thought inspirer      | 2                |
| 3   |                | Learning partner      | 3                |
| 4   |                | Virtual teacher       | 4                |
| 5   | Negative roles | Lazy conniver         | 3                |
| 6   |                | Academic gunman       | 5                |
| 7   |                | Information leaker    | 6                |
| 8   |                | Information misleader | 4                |
| 9   |                | Potential infringers  | 3                |

### Analysis of The Positive Roles in GenAI

GenAI has been integrated into the daily study and academic research of college students, adding a new dimension to their learning experience. Based on the powerful functions and convenient use of GenAI, it plays several positive roles in the process of its use, greatly improving students' learning efficiency and promoting the development of personalized and independent learning. In the process of the meta-analysis of research, we summarized four positive roles.

#### Personal Assistant

GenAI serves as personal assistant for college students, providing personalized and efficient services to complete a large number of simple and highly repetitive tasks. Eva A. M. et al. (2023) point out that GenAI can help students to complete tasks such as data sorting, intelligent filtering, and processing text, saving students a great deal of time and energy and allowing them to devote more resources to core research design work. Some studies analyze the performance of GenAI in the learning process, and point out that ChatGPT can identify and filter information and data highly relevant to students' current tasks and needs, providing valuable supplementary information and improving the depth and breadth of resource acquisition (Doanh et al., 2023; Villarreal et al., 2023). This way, GenAI can help college students focus on core areas of improvement by freeing them from repetitive labor.

#### Thought Inspirer

Through deep learning algorithms, GenAI can mine and analyze vast amounts of academic papers, artworks, historical data, etc., providing high-quality ideas and inspirational support to help creators broaden their thoughts. Xie and Guo (2024) argue that AI technology can derive the characteristics and laws of different music genres through learning and analyzing a large amount of music data, inspiring more musical creativity. Oliński et al. (2024) point out that GenAI significantly broadens research ideas by integrating the advantages of applications in different disciplines. Additionally, GenAI's ability to cross-disciplinary learning and application can organically integrate knowledge and creativity from different fields, breaking traditional thinking limitations and providing new creative perspectives and inspiration.

#### Learning Partner

GenAI can act as a learning partner, an indispensable role embodying its benefits. Learners can discuss problems with GenAI as if interacting with a human, developing skills such as independent learning, thinking, and arguing. Villarreal et al. (2023) and Debby R. E. et al. (2024) state that ChatGPT can simulate conversational exchanges, provide language corrections, and offer vocabulary and grammar help. It can also enhance communication skills by engaging students in conversation and encouraging them to express their thoughts and ideas effectively. Reje et al. (2024) argue that dialogic learning helps develop deeper logical and critical thinking skills, improving students' problem-solving abilities. As a "conversationalist," GenAI can stimulate college students' curiosity and interest in learning, enhancing their critical thinking skills and mindset for in-depth inquiry.

#### Virtual Teacher

With its powerful knowledge base and timely feedback mechanism, GenAI functions similarly to a virtual teacher, providing college students with timely feedback, assessment, academic Q&A, and decision-making guidance. Leng et al. (2024) and Maram et al. (2024) found that the emergence of GenAI has shifted traditional "one-size-fits-all" teaching methods towards personalized education. Mohammadreza et al. (2023), Rahman and Watanobe (2023) pointed out that ChatGPT can provide instant Q&A feedback and guidance to students during the learning process, helping them find and correct errors, deepen their

understanding, and improve their learning efficiency. Although GenAI is not specialized in education, it can already perform some functions of teachers in certain teaching scenarios.

### **Analysis of The Negative Roles in GenAI**

The application of GenAI in higher education also brings certain negative impacts, resulting in a series of significant challenges. Due to the uncontrollability of GenAI and the difficult-to-grasp user psychology, it can play some negative roles during its use, which may pose potential dangers to students and require the attention of educators. Through paper collation, we focus on analyzing the following five types of negative roles.

#### ***Lazy Conniver***

In the process of using GenAI, college students may become dependent on it, gradually allowing AI to replace autonomous thinking, which weakens their motivation and desire for knowledge. Choi et al. (2023) pointed out that if college students rely on "fetched" information acquisition over the long term, it may impair critical thinking and the ability to think independently, preventing students from developing the necessary skills to self-assess. Mohammadreza (2024) expressed concern that the convenience of obtaining answers and the high efficiency in solving problems offered by GenAI are likely to lead to over-dependence on the tool. The powerful functions of GenAI in the learning process may amplify college students' laziness, ultimately leading to the gradual loss of independent thinking and creativity. Therefore, Yan et al. (2024) emphasized, "Maintaining a high degree of independence is crucial for college students to ensure that they retain ownership of the learning experience, which is not overshadowed by the involvement of GenAI."

#### ***Academic Gunman***

In academic research, some college students may use GenAI to generate academic papers or research reports directly, leading to an imbalance in academic fairness, making GenAI an indirect academic gunman. Many papers highlight the application of GenAI in academic research but note that immoral or unfair use by users (such as ghostwriting or plagiarism) creates a crisis of credibility in the academic community, known for its rigor and innovation (Ahmed M., 2023; Debby R. E. et al., 2024; Ankita et al., 2023). The improper use of AI disrupts academic balance, belittles personal efforts, and destroys the enthusiasm of diligent students (Yan, 2023). Thus, using GenAI as an academic gunman can shake trust in academic authority and alienate the academic spirit of university students (Lee, 2024).

#### ***Information Leaker***

During data collection or student use, GenAI may risk storing or using information without permission, leading to the leakage of users' personal information. Guo et al. (2023) indicated that a large amount of data, including experimental data, intellectual property, and personal information, may be involved in interactions with GenAI. Once "memorized" by generative AI, it could be accessed by unauthorized third parties at any time. Students' personal privacy or unpublished achievements are highly likely to be saved by the generative AI system during use, becoming part of the AI's corpus (Ankita et al., 2023; Salvatore et al., 2023; Albayati, 2024; Hua et al., 2024).

#### ***Information Misleader***

The credibility of GenAI remains a focal point of debate. Due to program limitations, GenAI may spread incorrect information or knowledge. Debora et al. (2023) stated that ChatGPT might generate biases when answering questions due to algorithmic and information processing limitations, leading to text errors, especially in cutting-edge scientific fields. Incorrect information provided by GenAI can cause academic confusion for users, particularly students, exacerbating the spread of misinformation. Some papers highlight that GenAI may produce false or inappropriate content, leading to misinformation and academic conclusion bias (Badi, 2023), raising concerns and distrust in GenAI (Huang & Jimmy X., 2024). Automatically generated content is difficult to verify, which can affect public opinion, destroy the credibility of information dissemination, and lead to issues like misinformation and infringement of public interests (Debby R. E., 2024).

#### ***Potential Infringers***

Using GenAI for creative work may infringe on the intellectual property rights of the original creator, and data mining by its content-generating technology challenges global intellectual property protection. Scholars have noted that the widespread application of GenAI technology makes it easier to access and reproduce information such as artworks, music, movies, and literature, but this poses a copyright infringement risk (Grant, 2023). Authoritative surveys show that copyright infringement is a primary concern about generative AI (Lee, 2024). Wu et al. (2024) stated that GenAI, like ChatGPT, could lead to social and ethical issues related to intellectual property infringement. The incomplete regulatory system exacerbates bad behavior by criminals using ChatGPT for intellectual property infringement, increasing the difficulty of protection.

### **ROLE RECOGNITION OF GENAI BASED ON NETWORK DATA CRAWLING**

This study aims to analyze the role GenAI plays in learning scenarios within the Bilibili software and further validate and supplement the results of meta-analysis of research from Study 1.

#### **Data Sources**

This study selected user evaluations of GenAI on the Chinese Bilibili software as the specific data source. The main users of Bilibili are from the 1990s and 2000s, accounting for 82% of the total user population. The majority of its user base is a young and vibrant student group, with an average age of 22.8 years. It is the content social software with the highest concentration of

Chinese college students. Additionally, the daily active users of Bilibili have surpassed 100 million, and the monthly active users have reached 341 million. The high-quality growth of its users ensures the creation of high-quality content and a unique interactive experience. After this analysis, it is confirmed that the software meets the research needs regarding usage scale, user group, and data quality. Additionally, studies conducted on various fields using Bilibili as the object make it highly representative. User comments are timely, authentic, and objective, providing real-time feedback on evaluations and experiences with generative artificial intelligence. This viewpoint expression, based on actual experiences and true feelings, is relatively objective and fair, offering valuable reference information for this study.

Before data collection, different keyword search strategies were formulated according to Bilibili's search method. A batch of generative artificial intelligence application keywords covering as much discussion content as possible was determined through preliminary observation. During the data collection phase, this paper set the video release period from January 1, 2023, to April 31, 2024, obtaining 20 popular videos related to generative artificial intelligence with over 200 comments each. Basic data indicators such as the publisher, release time, and comment content were included. A total of 2,341 comments were captured. After excluding duplicate and meaningless texts (texts with less than 10 characters, advertising information, duplicate comments, etc.), the final sample included 1,078 comments.

### Data Analysis

This paper follows the content analysis method to explore the roles implied in the text data. This method can objectively analyze the information content, obtain hidden thematic features non-intrusively, and has significant advantages in classification systems widely used in humanities and social sciences. Therefore, this paper classifies and encodes user evaluation information in the Bilibili software based on the content analysis method to identify the role of generative artificial intelligence in the learning process. According to the encoding scheme, this research process is divided into two steps. First, open coding is used to analyze the data based on the potential symbolic meaning of the comment data. Then, based on the "top-down" rule and existing theoretical research, the encoded categories are abstracted into more conceptualized categories, refining the classification structure to achieve selective and theoretical coding of text data. After completing the encoding, the reliability of the results is ensured by checking the completeness and mutual exclusivity of each item. Additionally, since the encoding process of all comments is performed by two people, SPSS 26.0 is used to calculate the percentage consistency of the encoder and Cohen's kappa coefficient to test reliability. It is generally accepted that a percentage consistency coefficient and Cohen's kappa coefficient of greater than or equal to 0.90 indicate a high degree of consistency, and greater than or equal to 0.80 indicate an acceptable degree of consistency (Lombard et al., 2002), as shown in Table 2.

Table 2: Example of Bilibili software-related comment encoding

| Form           | Role Recognition        | The Type of Behavior    | Original Statement                                                                                                                                                                                                                                                                                                                                                                                       | Kappa Coefficient | Cronbach Alpha |
|----------------|-------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------------|
| Positive roles | Digital media generator | Generate PPT            | 做 PPT 的福音! AI 一键生成 PPT!<br>The good tool for doing PPT! AI can generate PPT with one click!                                                                                                                                                                                                                                                                                                              | 0.894             | 0.938          |
|                |                         | Make videos             | 影视动画专业, 从前到后, 除了合成盒动画需要大量修改, 音频包装几乎不用大改, 模型需要稍微手动优化一样, 其他东西都可以直接生成。<br>Film and TV animation majors, from beginning to end, everything can be generated directly, except for the composite box animation needing a lot of modification, and the audio package which almost doesn't need to be altered. The model needs to be optimized slightly manually, but everything else can be generated directly. |                   |                |
|                |                         | Generate paintings      | 我们插画系已经有人全程用 open ai 的 ai 绘画软件作画还拿高分。<br>In the department of illustration, we already have someone who used open ai drawing software to draw the whole time and got a high score.                                                                                                                                                                                                                       |                   |                |
|                |                         | Make games              | 比如利用 ai 辅助做游戏的成本和难度大幅削减后, 有更多的人能去创造并发售属于自己的游戏世界。<br>For example, after the cost and difficulty of making a game using ai assistance was drastically cut down, more people were able to go out and create and ship their own game worlds.                                                                                                                                                                 |                   |                |
|                | Learning partner        | Provide emotional value | ChatGPT 是我在心情低落时安慰自己的好伙伴, 因为不管说什么它都不会说出去。<br>ChatGPT is a great companion for comforting me when I'm feeling down because no matter what I say it won't tell                                                                                                                                                                                                                                             |                   |                |

|  |                    |                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
|--|--------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
|  |                    |                              | anyone.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |
|  |                    | Discuss the issues           | 用下来感觉 GPT 最大的作用就是在一步一步地提问中，自己的逻辑会越来越清晰。<br>I feel that the most useful thing about the GPT is that my logic will become clearer and clearer as I ask questions step by step.                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|  |                    | Simulate character dialogues | 前几个月准备南洋理工大学本科面试的时候就用的 ChatGPT，我让它模拟面试官并给我提出 critical thinking 的问题，我拿语音输入的插件对着它讲话。个人感觉还挺好用的，相比 gpt3.5，gpt4 不仅问题精度更高，而且会提意见，比如让我多练练语法或者多讲些事例之类的。<br>When I was preparing for my undergraduate interview at Nanyang Technological University a few months ago, I used ChatGPT. I asked it to simulate the interviewer and ask me critical thinking questions. Personally, I think it works quite well, while I spoke into it with the voice input plugin. Compared to gpt3.5, gpt4 not only asks more accurate questions, but also gives me advice such as practicing more grammar or telling more examples. |  |  |
|  | Personal assistant | Translate text               | 我直接把我论文摘要复制到 GPT 让他帮我翻译成英文我觉得貌似比其他软件翻译的好。<br>I copied my abstract directly to GPT and asked him to translate it into English for me. I think it seems to translate better than other software.                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |
|  |                    | Generate text                | 写邮件用 ChatGPT 生成模板，超级好用，每天至少都能省出半个小时的样子。<br>Writing emails using ChatGPT to generate templates is superb and saves at least half an hour every day.                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |
|  |                    | Embellish the article        | 写英语论文和演讲稿经常用 AI 来帮忙润色，AI 的英语文笔比我好得多。<br>I write English essays and speeches often with the help of AI to polish them up, and AI's English writing is much better than mine.                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
|  |                    | assist development           | 以后开发软件将变得非常简单，写出个框架，大概能用就行了，只要加一个 ChatGPT 调用程序就行了，碰见什么 bug，让程序自动去问 ChatGPT，让 ChatGPT 针对 bug 赶快补上就行了。<br>In the future, the development of software will become very simple. We write a framework, which can probably be used, and then add an addition of a ChatGPT call program on the line. Encountered any bug, let the program ask ChatGPT, so that ChatGPT for bugs to quickly fill in on the line.                                                                                                                                                                                                   |  |  |
|  |                    | Support decision-making      | 他最多只能根据你提供的相关的数据进行分析不足，具体你的方案还是要根据你自己来定，不过 ai 的确是选择困难症的福音。<br>The most he can do is to under-analyze based on the relevant data you provide, and your specific plan is still based on you, but ai is indeed a boon for the choice-challenged.                                                                                                                                                                                                                                                                                                                                                              |  |  |
|  |                    | Auxiliary research           | medpeer 也接入了 GPT-4 等大语言模型，无需魔法，无论是项目申请、科研写作还是实验设计、数据分析都可以在上面完成。<br>Large language models such as GPT-4medpeer have also accessed to medpeer. No magic is needed, whether it is project application, scientific writing or experimental design, data analysis can be done on it.                                                                                                                                                                                                                                                                                                                            |  |  |

|                |                  |                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       |       |
|----------------|------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|
|                |                  | Retrieve information         | ChatGPT 更像是一个大号的搜索引擎，如果你需要一些特定的资料不再需要费劲的搜索，只需要完整的描述你的问题，ChatGPT 就能找到相关的信息。<br>ChatGPT is more like a large search engine, if you need some specific information no longer need to bother searching. Just a complete description of your problem, ChatGPT will be able to find the relevant information.                                                                                                                                                                                                                                                                       |       |       |
|                |                  | Consolidation of information | 可以去看看 Chat DOC，你可以给他喂资料，他来负责阅读和总结。<br>Check out Chat DOC, you can feed him information and he'll take care of the reading and summarizing.                                                                                                                                                                                                                                                                                                                                                                                                                                    |       |       |
|                | Thought inspirer | Spark inspiration            | 没有灵感的时候就问问题，总有一个问题和一个回答可以帮助自己的。GPT 真的太好用了。<br>When you have no inspiration, ask it questions. There are always one question and one answer that can help you. GPT has great value..                                                                                                                                                                                                                                                                                                                                                                                           |       |       |
|                |                  | Comb the frame               | 我在写期末作业的时候，就是用 GPT 来搭框架，内容自己去查。<br>When I was writing my final assignment, I just used the GPT to build the framework. Then I searched the content on my own.                                                                                                                                                                                                                                                                                                                                                                                                                 |       |       |
|                |                  | Expand ideas                 | ChatGPT 是一个数据库，用来提供一些方法论，扩展思路，完善知识体系都是很不错的。<br>ChatGPT is a database, which is useful for providing some methodology, expanding ideas, and refining the body of knowledge.                                                                                                                                                                                                                                                                                                                                                                                                    |       |       |
|                | Virtual teacher  | Tutor learning               | 我觉得 ChatGPT 可以作为一个类似助教，课后帮同学们进行答疑。<br>I think ChatGPT can be used as a teaching assistant to help students with Q&A after class.                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |       |
|                |                  | Provide guidance             | 老师让用 oragin 做图，ChatGPT 直接手把手教我如何用 python 的 MATLAB 库做图，什么滤波切线求导微分都不在话下。<br>My teacher let me use oragin to make graphs. ChatGPT straight up handheld me how to make graphs with python's MATLAB library, nothing about filtering tangents and solving derivatives for differentiation.                                                                                                                                                                                                                                                                                         |       |       |
|                |                  | Develop learning tasks       | GPT 以后定制学习是完全可以的，比如说你要精通掌握某一个领域的知识，那这个学习机器人就专门针对你所处的阶段评估，然后专门训练，然后天天就盯着你出新题，给考题，给复习知识，直到你熟练掌握为止，这个就是定制化。<br>GPT later customized learning is completely possible. For example, you have to be proficient in mastering a certain field of knowledge. This learning robot is specifically for the stage where you are in the assessment. It will prepare special training for you, and then staring at you and give the new questions every day. It will always give you the test to review the knowledge until you are proficient in the mastery of it. This is customization. |       |       |
| Negative roles | Academic gunman  | Ghostwrite paper             | 让 ChatGPT 写论文，然后全篇自己修改几遍再增加自己的内容。<br>Order ChatGPT write the paper and then revise the whole thing a few times on your own before adding your own content.                                                                                                                                                                                                                                                                                                                                                                                                                    | 0.886 | 0.965 |
|                |                  | Falsify research data        | 可以让 GPT 根据你要的结果去生成实验数据，然后让它自己分析证明。<br>You can let GPT generate experimental data based on the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |       |

|  |                       |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
|--|-----------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
|  |                       |                                           | results you want, and then let it analyze the proof itself.                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
|  |                       | Plagiarize academic work                  | 给它喂文献，然后将参考文献拼凑出一篇不就是新的论文吗。<br>Feed it paper and then piece together the references to create a not a new paper.                                                                                                                                                                                                                                                                                                                                                                           |  |  |
|  | Ideological invader   | Guide the dialogue of political positions | 我学某个评论跟它吵了半个小时湾湾的归属问题。<br>I learned some comment to argue with it for half an hour about the attribution of the Taiwan.                                                                                                                                                                                                                                                                                                                                                                    |  |  |
|  |                       | Spread ideological bias                   | ChatGPT 它理解能力其实没有非常好，而且它有很多都是看似正确实则并不的答案，还有，它种族歧视 ChatGPT is not very good at understanding, and it has many answers that appear to be correct but are not, and it is racist.                                                                                                                                                                                                                                                                                                              |  |  |
|  |                       | Distort objective facts of history        | 它历史知识很差，连辛亥革命的历史意义都能搞错，要不是我学过，差点就抄到我的作业上了。<br>Its knowledge of history is so poor that it can even get the historical significance of the Xinhai Revolution wrong, and if I hadn't studied it, I would have almost copied it on my homework.                                                                                                                                                                                                                                               |  |  |
|  | Information misleader | Fabricate paper                           | 昨天让 ChatGPT 帮我找一篇我方向相关的文献，它给我回了条英文参考文献，我按照参考文献的期刊名称，期数，页码去找，那个位置的文献名称和它给出的文献名称完全不一样，编得跟真的一样。<br>Yesterday I asked ChatGPT to help me find a paper related to my direction, and it gave me back a reference in English. When I went to find it according to the journal name, issue number, and page number of the reference, the name of the paper in that location was completely different from the name of the paper that it had given me, and it was made up just like the real thing. |  |  |
|  |                       | Misinterpret expertise                    | 问它一个化学发光分析仪的原理，能把磁珠的用途搞错，要不是我懂，就被忽悠了。<br>Ask it about the principles of a chemiluminescence analyzer that can get the use of magnetic beads wrong, and if I didn't know better, I'd be fooled.                                                                                                                                                                                                                                                                                             |  |  |
|  |                       | Fabricate of terminology                  | 事实上，相对专业一些的领域都会出现这种情况：一本正经地胡说八道，把一些相关的专业名词胡乱组装起来，表面看起来很正确，仔细一看全是错。<br>In fact, this happens in relatively professional fields: it will talk nonsense with a straight face. It's a jumble of related technical terms. Although the output appears to be correct on the surface, on closer inspection it is all wrong.                                                                                                                                                                       |  |  |
|  | Lazy conniver         | Replace thinking                          | 这玩意一出我感觉我周围的同学瞬间都成废人了，屁大点事都问 ChatGPT，完全不会思考。<br>When this thing came out, I felt like all my classmates around me were instantly wasted, asking ChatGPT for anything and not thinking at all.                                                                                                                                                                                                                                                                                              |  |  |
|  |                       | Ghostwrite essay                          | 大学小组制作的作业基本全可以靠它来写。自己再修改一下就能用。<br>The group homework in the university can basically command it to write. You can modify it yourself.                                                                                                                                                                                                                                                                                                                                                      |  |  |



|  |  |                 |                                                                                                                                                                                                                                                                                         |  |  |
|--|--|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
|  |  | Assistant exams | 自从用 ChatGPT 做学校要求的体育理论考试，满分 100 我用 ChatGPT 考了 55 分后我再也不敢用 ChatGPT 直接去做这类的题目了。<br>Ever since I used ChatGPT to do a school-required physical education theory test out of 100 I got a 55 with ChatGPT, I've never dared to use ChatGPT to go straight to these types of questions again. |  |  |
|--|--|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|

It was found that nine roles were identified in the comments of the Beep software, and seven of them were similar to those in previous studies, such as learning partner, personal assistant, thought inspirer, virtual teacher, academic gunman, information misleader, and lazy conniver. Additionally, from user comments, we refined two roles not mentioned in previous studies, namely digital media generator and ideological invader.

## RESULT

The purpose of this paper is to explore the roles that GenAI plays in the learning process of college students by conducting two studies and identifying a total of 11 roles, as shown in Figure 2. Initially, through a meta-analysis of research (Study 1), a comprehensive collection and in-depth review of international papers and related materials on the application of generative artificial intelligence in higher education were conducted. Based on this, 30 high-quality papers were systematically reviewed to integrate the roles GenAI plays in the learning process of college students. The meta-analysis results include four positive roles: Personal Assistant, Thought Inspirer, Learning Companion, and Virtual Teacher; and five negative roles: Enabler of Laziness, Academic Ghostwriter, Information Leaker, Information Misleader, and Potential Infringement Perpetrator. Subsequently, this study examined user comments from the Bilibili software, employing content analysis to code the selected comments and identify the roles played by GenAI as perceived by users. In Study 2, we identified nine roles, some of which overlap with those identified in the literature review, and discovered two additional roles not covered in Study One, namely Digital Media Generator and Ideological Intruder.

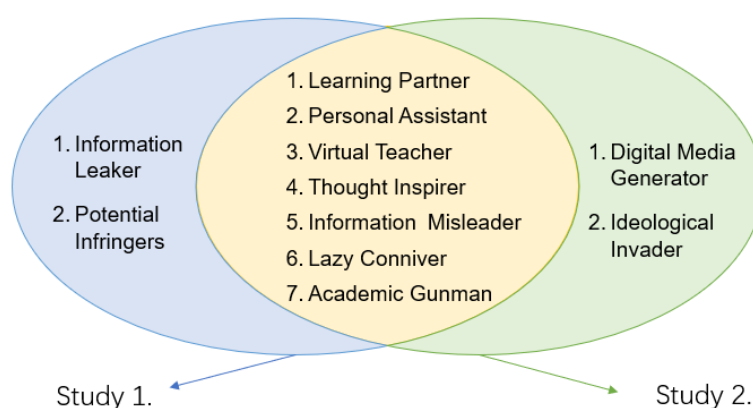


Figure 2: Roles identification results from the two studies

After an in-depth analysis of the two studies, we conclude that GenAI plays multiple roles in the learning process of college students, totaling 11. The positive roles include Learning Companion, Personal Assistant, Virtual Teacher, Thought Inspirer, and Digital Media Generator, accounting for five types. The negative roles include Enabler of Laziness, Academic Ghostwriter, Information Leaker, Information Misleader, Potential Infringement Perpetrator, and Ideological Intruder, totaling six types, as shown in Table 3.

Table 3: Summary of the 11 roles of GenAI

| Role types     | No. | Role               | Explaining                                                                                                                                                                                                                                                                                                                                           |
|----------------|-----|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Positive roles | 1   | Learning Partner   | GenAI facilitates students' review and introspection on the knowledge acquired, while offering emotional encouragement.                                                                                                                                                                                                                              |
|                | 2   | Personal Assistant | GenAI can proactively retrieve or organize extensive materials and information for students, as well as assist them in conducting research and resolving complex problems. GenAI can proactively retrieve or organize extensive materials and information for students as well as assist them in conducting research and resolving complex problems. |
|                | 3   | Virtual Teacher    | GenAI provides tutoring based on each student's actual situation, and even guide students to learn specialized knowledge in different fields.                                                                                                                                                                                                        |
|                | 4   | Thought Inspirer   | GenAI harnesses its extensive database to offer students diverse perspectives and stimulate inspiration.                                                                                                                                                                                                                                             |

|                |    |                         |                                                                                                                                                                                                                                                                                                                               |
|----------------|----|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | 5  | Digital Media Generator | Generative AI technology generates pertinent digital media content, including videos, PowerPoint presentations, and images, based on the specific Generative AI technology generates pertinent digital media content including videos, Power Point presentations, and images, based on the specific requirements of students. |
| Negative roles | 6  | Information Misleader   | The information generated by GenAI is not guaranteed to be accurate, resulting in its output being misleading to students.                                                                                                                                                                                                    |
|                | 7  | Lazy Conniver           | The ease of access to information in GenAI leads students to rely on it, resulting in a gradual lack of self-thinking.                                                                                                                                                                                                        |
|                | 8  | Academic Gunman         | GenAI's ability to generate text is used by students as a tool to complete the academic research process on their behalf.                                                                                                                                                                                                     |
|                | 9  | Information Leaker      | GenAI uses all the information it obtains as data for its own training models, but it is easy to leak personal information or research data that has not been made public. It is easy to leak personal information or research data that has not been made public.                                                            |
|                | 10 | Potential Infringers    | The content generated by GenAI cannot be subject to copyright protection, and there is a potential risk of infringement when students the content.                                                                                                                                                                            |
|                | 11 | Ideological invader     | The content output of GenAI has certain value evaluation standards, which will affect students' values in the process of use.                                                                                                                                                                                                 |

Through the corroboration and supplementation of the two studies, this paper finds that GenAI plays diverse roles in different application scenarios of the college students' learning process. The attitude and behavior patterns of college students towards the use of GenAI are closely related to their professional fields, level of knowledge mastery, and personal comprehensive abilities. The findings of this study provide new perspectives and considerations for the future exploration of the "Generative Artificial Intelligence + Higher Education" model.

## DISCUSSION

To further explore students' use and basic understanding of GenAI, in addition to adopting literature extraction and data crawling methods, this study conducted in-depth interviews with 11 college students from different majors and grades. In the interviews, many students regarded GenAI as their "learning companion" and "virtual teacher." For instance, a student majoring in educational technology shared that when completing a relatively complex assignment, GenAI could participate in the discussion as a learning companion, thereby facilitating the pooling of ideas. Additionally, many interviewees mentioned that the function of generative artificial intelligence as a "personal assistant" is prominent, such as helping students with data collection and text polishing tasks, liberating them from a large amount of repetitive labor, and allowing them to focus more time and energy on self-improvement. By comparing the interview data, we confirmed the rationality of the previously refined roles and gained a deeper understanding of previously overlooked issues.

Many students still have confusions and questions about how to use GenAI correctly. They have put forward constructive suggestions on how GenAI can be integrated into the higher education system in the future. On the one hand, higher educational institutions can offer specialized courses and lectures to guide students on how to use GenAI. On the other hand, higher educational institutions can develop or purchase professional platforms to monitor students' use of GenAI in real-time, standardize students' behavior, and help teachers better understand students' learning situations and needs.

The development of GenAI is characterized by significant dynamics and vitality. It is a continuously evolving and updating process. Currently, our research results on GenAI are primarily based on an in-depth analysis of the current situation. With continuous breakthroughs and innovations in technology, the application scenarios of GenAI will continue to expand in the future, and its role in society will be reconstructed and developed.

The technology of GenAI is a double-edged sword. In the future, the positive and negative effects of GenAI will continue to exist, requiring us to strengthen international cooperation and exchange, jointly abide by international norms, and work together to formulate and improve relevant laws and regulations to ensure that GenAI technology always aligns with human values and interests. At the same time, we also need to enhance public understanding of GenAI and establish a consensus of "technology for good," allowing GenAI to better serve human society.

## CONCLUSION

This paper aims to explore the role of GenAI in the learning process of college students. Through the aforementioned two studies and in-depth interviews, we have refined the 11 roles played by GenAI in the learning process of college students. However, there are still limitations in this study, such as the lack of in-depth interviews with college students using GenAI, the single source of network data crawled, and the apparent regional differences in the penetration rate of GenAI among college students, all of which have introduced a certain degree of error in our research. In response to this, in the next phase of research, we will further expand the interview samples covered by this study, improve the interview outline, crawl network data from different social platforms, and inject continuous momentum into the exploration of the role of GenAI in the learning process of college students.

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