

Generative Artificial Intelligence in Chinese Higher Education: Chinese Undergraduates' Use, Perception, and Attitudes

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Abstract: This study aims to investigate the perceptions and use of as well as attitudes towards generative Artificial Intelligence (AI), like ChatGPT, among Chinese undergraduates. Through a questionnaire survey conducted at the Hunan Institute of Technology, the study uncovers a majority inclination to incorporate generative AI as an auxiliary tool in education. It also reveals optimism about generative AI's capability to enhance personalized learning, essay guidance, and programming assistance. Conversely, respondents identified areas where generative AI is precluded from replacing traditional learning methods and raised both ethical and technical concerns. Pedagogical implications based on the findings propose a blended learning strategy, the development of ethical usage guidelines, and continuous AI education for both instructors and students. The study is significant in offering insights for instructors, developers, and policymakers in fostering effective and ethical generative AI integration in higher education. Further research in diverse settings is also suggested for a more comprehensive understanding of generative AI in Chinese higher education.

Keywords: ChatGPT, education, generative AI, use and perception

1. Introduction

ChatGPT and its variants that use generative AI models represent a significant technological advancement in natural language processing large language models with far-reaching implications in many dimensions of our lives, including education^[1-3]. The power of these AI models is nothing short of remarkable, boasting capabilities such as engaging in conversations, writing code, and composing papers, among others. However, they are double-edged swords. The rapid development and application of them bring a mixed combination of opportunities and challenges in the educational arena. On one hand, they foster personalized learning and empower educational practices; on the other, the ethical boundaries surrounding the application of them demand serious consideration. In response to the risk of students cheating on assignments using generative AI, some educational institutions, including schools in New York City and Los Angeles, have implemented decisive protective measures by prohibiting ChatGPT from their networks^[4-5]. Thus, it is important to question whether generative AI is a "Promethean Fire" or a "Sword of Damocles" for higher education in China, choosing between resistance or embracing and utilizing the groundbreaking technology. To answer these questions, an in-depth investigation and analysis of undergraduates' use and understanding of generative AI are paramount.

Several international studies have examined students' perceptions of ChatGPT. For instance, Firat^[6] surveyed the opinions of seven scholars and fourteen doctoral students from Turkey, Sweden, Canada, and Australia. Haensch et al.^[7] analyzed students' attitudes toward ChatGPT and its potential value for application through TikTok videos. Dahlkemper et al.^[8] focused on students' evaluation of the language quality and scientific accuracy of ChatGPT's responses to physical science questions. Bonsu & Baffour-Koduah^[9] explored Ghanaian higher education students' familiarity with and intended use of ChatGPT. Despite the growing body of research on ChatGPT in China, questionnaire surveys investigating Chinese college students' understanding and application of the technology are still scarce.

To bridge this gap, this study aims to probe the use and perception of as well as attitudes towards generative AI among Chinese university students via questionnaire surveys. The primary goals are to elucidate the benefits and potential risks that generative AI presents for higher education and to devise

suitable countermeasures based on such understanding. By doing so, the findings can offer valuable guidance for higher education institutions as they formulate response strategies.

2. Methodology

2.1. Participants and sampling method

The study encompassed university students across diverse majors from the Hunan Institute of Technology. We utilized a method of convenience sampling for the study, a technique where participants are chosen based on their readiness and willingness to engage in the research. In order to foster frankness in responses, participants were given firm assurances that their identities would not be divulged and their answers would remain confidential. Among the total undergraduate population of 17,860 at the university, 727 individuals contributed by participating and submitting valid questionnaires. This led to an impressive 100% valid return rate.

2.2. Data collection methods and tools

In this study, we leveraged an online questionnaire as it is a widely acknowledged cost-effective and user-friendly research instrument, to procure quantitative data related to the students' use and perception of generative AI. The questionnaire consisted of four sections including 29 queries: respondent's basic information (Q1-Q4), the use of generative AI (Q5-Q12), the perception of generative AI (Q13-Q25), and attitudes towards generative AI (Q26-Q29). The questionnaire survey was carried out from September 27 to October 26, 2023.

Given that the principal survey technique was an online questionnaire, we utilized the WJX online survey platform (www.wjx.cn) in tandem with various social media outlets to accumulate data. WJX is widely acknowledged due to its cost-effectiveness, efficiency, security, and its capability to represent data visually. The questionnaire was curated and disseminated on the WJX platform by utilizing QR codes and links propagated on social media platforms such as QQ and WeChat. In addition, we employed analytic software like SPSS (29.0) and Excel for the execution of data analysis and the creation of plots, to streamline our research process.

2.3. Cronbach's Alpha and Sample Size Credibility

To assess the internal consistency or reliability of all items in the questionnaire, we employed SPSS for our calculations. The SPSS analysis report exhibits a Cronbach's Alpha score of 0.951 for the questionnaire with 29 items as Table 1 shows. This high score signifies a sturdy correlation among the individual questionnaire items, thereby emphasizing that the research results possess a high degree of reliability.

Furthermore, we utilized an online sample size calculator (<https://www.surveysystem.com/sscalc.htm>) to verify the credibility of our sample size relative to our target population. The commonly employed parameters in statistics to gauge the credibility of a sample size include the confidence interval (CI) and confidence level (CL). As is shown by Table 1, our analysis of 727 participants, drawn from a population of 17,860 undergraduates, yielded a CI of 3.56% and a CL of 95%, indicating 95% certainty that the sample accurately represents the population within a +/-3.56% margin. Thus, if 40% of respondents selected a specific answer, we could infer that between 36.44% and 43.56% of the broader population would have made the same choice. These calculations demonstrate that our sample size boasts a high degree of credibility.

Table 1: Reliability of the Questionnaire and Sample Size Credibility

Population	Sample Size	Reliability of the questionnaire		Sample Size Credibility	
		The Number of Items	Cronbach's Alpha	CI	CL
17,860	727	29	0.951	3.56%	95%

3. Results and Discussion

3.1. Distribution of Gender, Grade Level, and Field of Study

As Table 2 shows, the survey drew responses from 727 individuals, out of which 27.37% (199 respondents) identified as male and 72.63% (528 respondents) as female. The grade level of respondents varied; 10.59% were first-year students, 41.27% were in their second year, 29.30% were third-year students, and 18.84% were in their fourth year. As for the field of study, the majority of respondents (53.65%) were from arts and history majors, followed by 26.55% from science and engineering, 2.61% from arts, 13.62% from economics and management, and 3.58% specialized in other fields.

Table 2: Distribution of Gender, Grade Level and Field of Study

Distribution of gender, grade level, and major	Percentage
<i>Distribution of gender</i>	
Female	72.63%
Male	27.37%
<i>Distribution of grade-level</i>	
First-year students	10.59%
Second-year students	41.27%
Third-year students	29.30%
Fourth-year students	18.84%
<i>Distribution of field of study</i>	
Liberal arts and history	53.65%
Science and engineering	26.55%
Economics and management	2.61%
Arts	13.62%
Other field of study	3.58%

Interestingly, a considerable number of individuals responded to the survey, with a notably higher percentage of female respondents (72.63%) than male (27.37%) in a university where male students outnumber female students. This possibly suggests that females were more willing to participate in the survey or more interested in generative AI. As for the grade level of the respondents, there is a relatively even spread of respondents among the first three years of study, but a slightly lesser percentage of fourth-year students. This may imply a higher attrition rate as students' progress in their years of study, or maybe, fourth-year students were less likely to respond to the survey due to its time commitment or relevance.

Concerning the field of study, the dominance of arts and history majors among the respondents stands out, accounting for more than half of the respondents, with science and engineering majors coming second. Given that the survey questionnaire is distributed randomly, this proportion might indicate that students studying arts and history as well as science and engineering students have a higher level of interest or understanding of generative AI. Alternatively, it could indicate that students from these fields are more curious or more willing to spend time participating in such research.

3.2. The Use of Generative AI

3.2.1. Awareness of Generative AI

It was found that 74.97% (545 respondents) were aware of generative AI like ChatGPT, while 25.03% (182 respondents) were not. The reasons for their lack of awareness can be varied and may be due to limited exposure or education in their curriculum. In terms of gaining awareness about generative AI, social media emerged as the most common platform at a significant 31.39% ratio. Other substantial sources included friends (24.60%) and internet news (22.33%), reflecting a web-centric pattern overall. This highlights the powerful role social media plays in contemporary society, more so in the educational context and spreading awareness about evolving technologies such as generative AI. This overall web-centric pattern aligns with the global trend, where digital platforms are becoming principal channels for the dissemination and acquisition of knowledge, especially among younger, more tech-savvy populations such as university students.

3.2.2. The Reasons for Use of Generative AI

Out of the respondents aware of such AI, approximately 56.70% of respondents (309 respondents) who are aware of this kind of AI reported having used it, which indicates a significant level of adoption

and awareness of generative AI. However, a considerable proportion (43.30% or 236 respondents) have not used such AI technology. Upon investigation of the reasons for usage, nearly half of the respondents (46.61% or 144 out of 309 respondents) cited urgent need, suggesting a practical use of generative AI in an immediate context, while 37.29% of the users were motivated by their curiosity about the new technology, reflecting a desire to explore and stay updated with the latest technological developments. Chatting with AI chatbots for amusement was a reason for under 15% of the users. A minor percentage of just 2.12% mentioned other reasons.

Notably, despite the lack of past use by some 236 respondents, over 80% (or 190 respondents) of them expressed willingness to attempt using generative AI like ChatGPT, if given the chance in the future. This highlights the intriguing capabilities of AI technologies that can captivate the interest of potential users, especially among the academically engaged population.

3.2.3. The various Models of Generative AI used

The survey also captured the models of Generative AI used by respondents, with “Character AI” being the most popular at roughly 44%, followed by “Wenxin Yuyan”, “New Bing” and “ChatGPT” at approximately 27%, 26%, and 23% respectively. This indicates that while “Character AI” appears to have a larger market share among Chinese students, the other models also hold a significant user base, with “Wenxin Yuyan” and “New Bing” sharing similar popularity levels, and “ChatGPT” closely following. The popularity of “Character AI” could be attributed to several factors, such as its effectiveness, ease of use, or marketing reach in the Chinese market. Additionally, the preference for one AI model over another may depend on the specific needs and interests of individual students. Moreover, the difference in popularity percentages between the models might be due to the convenience of accessibility and varying fees for using the service of the various models. Further research into the reasons behind these choices and the user experiences of each tool may provide valuable insights into students’ preferences and potential improvements for existing generative AI models.

3.2.4. Understanding of Generative AI

When asked about their understanding of generative AI like ChatGPT, the majority of respondents (56.96%) reported a moderate level of knowledge. Meanwhile, the number of people who are familiar or very familiar with the technology (21.68% and 7.44% respectively) is less than the number of people who are not very or completely unfamiliar with it (13.27% and 0.65% respectively). This shows that while many respondents possess some understanding of generative AI, there’s still room for improvement in generative AI literacy, given its expanding role in various fields and potential for future careers.

3.2.5. The Frequency of Using Generative AI

In terms of frequency of use, nearly 48% of them tend to use AI occasionally, showing that while it is not an everyday tool for many, it still holds relevance when needed. As for the primary applications of AI, the results indicate that “Learning” stands out as the most significant use, with over 80% of users resorting to AI in this context. This showcases the potential of generative AI in aiding the educational process and supplementing learning experiences. Additionally, chat functions and academic paper writing were noted as the second and third most popular applications, respectively. These findings emphasize that ChatGPT and its variants have a wide range of uses, from enabling communication through chatbots to assisting with research and academic writing. This signals the growing integration of AI in education and its potential to transform traditional approaches to learning and knowledge construction.

3.3. The Perception of Generative AI

3.3.1. Advantage of Generative AI

Moving on to perception towards generative AI (Q13-Q25), respondents identified several advantages of AI like ChatGPT. These included service efficiency (76.38%), intelligence (75.08%), ease of operations (71.52%), real-time responses (66.99%), and multi-language support (61.81%). These findings underscore the diverse benefits that users appreciate in generative AI, pointing to its potential to streamline operations, save time, and provide highly personalized and responsive service in multi-lingual contexts. The insights could be helpful for developers and educators alike to understand what aspects are most valued by users and therefore, tailor the development and application of such AI systems accordingly.

3.3.2. Drawbacks of Generative AI

Despite the listed benefits, several respondents also identified potential drawbacks of such AI, led by the inability to answer subjective queries based on user requirements (63.43%), technical limitations (50.49%), and high costs (39.48%). The areas requiring improvement or enhancement in AI like ChatGPT according to respondents included emotional understanding (60.52%), context comprehension (57.93%), and comprehensive explanatory ability (52.43%). Moreover, ethical considerations and data security and privacy issues were also noted. These insights are valuable feedback for AI developers as they reveal areas that could impact user satisfaction and adoption. Addressing these concerns and improving on these aspects could consequently lead to broader acceptance and more efficient use of generative AI like ChatGPT among users.

3.3.3. Ethical Issue

More than half of the respondents (55.66%) remain neutral on this issue. A smaller portion (10.36% and 12.94%) believe that using AI for academic writing should be considered misconduct, while an even smaller number (12.62% and 8.41%) disagree or strongly disagree with this perspective. This indicates that opinions about the role of generative AI like ChatGPT in academic writing are varied, with no clear consensus among the respondents. Interestingly, the majority of respondents demonstrated a neutral stance (55.66%) on whether the use of AI like ChatGPT in academic creations is considered academic misconduct, which reveals a degree of uncertainty or divided opinions. The results indicate that further debate and discussion on establishing guidelines for the ethical use of AI in academic settings are urgent.

3.3.4. Generative AI's Relevance to Their Academic Activities

Similarly, when asked about the AI's relevance to their academic activities, 84.14% believed it to be either "helpful" or "very helpful", and 54.02% similarly perceived it to be promotive to their innovative capabilities. It's promising to see that 84.14% of respondents indicated that AI like ChatGPT has been either "helpful" or "very helpful" in their academic pursuits. This demonstrates a strong positive perception of the role AI can play in supporting academic activities, potentially ranging from research assistance and data analysis to project creation and collaborative work. Moreover, the survey shows that 54.02% of respondents believe that the use of AI can enhance their innovative capabilities. This understanding can partly be due to AI's capacity to bring about novel approaches to problem-solving, encourage exploration and experimentation, and empower students with tools and methods that were previously not accessible or feasible manually. However, concern about students' over-reliance on AI should be raised and further study and guidelines are needed to ensure their moderate and proper use of it in their academic activities.

3.3.5. The Status of Generative AI in Education

Concerning the issue of whether AI-generated text could replace traditional educational methodologies, the majority leaned towards neutral or disagreeing opinions. When asked about the potential areas where such AI could not replace traditional education methods, interpersonal communication (69.13%), fostering students' thinking ability (68.7%), and creativity (64.78%) were predominantly cited. The findings reveal that most respondents were either neutral or disagreed with the prospect of AI-generated text replacing traditional educational methodologies. This may suggest that despite acknowledging the numerous benefits of AI in education, students still see an irreplaceable value offered by traditional approaches. This could include the human touch in teaching, the complexity of human thought processes, and the dynamic and interactive nature of conventional classroom environments that are hard to emulate completely through AI.

The survey further identifies specific domains where AI might fall short of traditional methods. These encompass interpersonal communication, fostering thinking ability, and creativity, as primarily cited by the respondents. These insights can serve as valuable feedback for instructors and AI developers alike. This underscores the need for striking a balance between AI-driven and traditional teaching approaches, integrating the best of both to truly enhance education. Based on such understanding, suitable countermeasures can be devised that ensure AI is introduced wisely in a way that enhances rather than undermines the strengths of traditional teaching.

3.4. The Attitudes toward Generative AI

Continuing with the respondents' perception towards generative AI, they expressed hopes for AI, like ChatGPT, to aid in personalized teaching (61.49%), provide essay guidance (57.61%) and programming assistance (57.61%), contribute to paper writing (46.93%), and complement experimental instruction

(45.95%). This finding reveals that respondents believe that generative AI has the potential to provide substantial benefits across a range of academic tasks. This perception may inspire educators and technologists to explore new ways of integrating AI into educational practice and tools.

When asked whether they would incorporate AI like ChatGPT as an educational auxiliary tool if they were teachers, the majority of respondents, precisely 70.55%, indicated a willingness to consider AI as an auxiliary tool in education if they were occupying the role of teachers themselves. This majority consisted of 11.97% of respondents who were decidedly sure they would use AI, and another 58.58% who were more tentative, expressing that they might do so. That said, a significant portion, precisely 32.36%, remained undecided on the subject. This uncertainty could indicate a lack of sufficient information about the capabilities and limitations of generative AI, or alternatively, could reflect concerns about potential risks, such as the reliability and accuracy of the AI tool, or classroom management issues.

Furthermore, respondents reflected significant positive attitudes towards using AI like ChatGPT, considering it a pleasant experience (60.84% agreed or strongly agreed). Meanwhile, 47.58% were in favor of leveraging such AI for instructional purposes and a whopping 97.41% expressed satisfaction (varying from ordinary satisfaction to high satisfaction) towards using ChatGPT and its variants, revealing overall positive attitudes regarding generative AI. This gives us an overall impression that Chinese students generally hold a positive view towards generative AI in an academic context. Therefore, on the one hand, teachers and academic institutions should be open to futuristic AI technologies, fostering a positive learning environment, and promoting innovation in academic structures. On the other hand, it's also important to address concerns, avoid over-reliance on AI, ensure quality standards, and abide by ethical guidelines in integrating AI into educational paradigms.

4. Pedagogical Implications

The findings from this study shed light on Chinese undergraduates' use and perception of as well as attitudes towards generative AI. Based on the findings of this study, several pedagogical implications arise with respect to integrating generative AI in Chinese higher education contexts:

a) Blended Learning Approach: Given the diverse opinions on generative AI replacing traditional education methodologies, adopting a blended learning strategy is recommended. Educators and institutions can combine the advantages of AI-driven learning tools with traditional teaching approaches, fostering a comprehensive and effective learning environment. The implementation of a blended learning approach should be done progressively, allowing both instructors and students to adapt to the new learning environment. Continuous monitoring and improvement are crucial to ensure the effectiveness of the approach.

b) Enhancing AI-driven Personalized Learning: As the respondents have identified personalized teaching as a primary area where AI can benefit their learning experience, educators must strive towards enhancing AI-based personalized learning experiences. Understanding individual students' learning styles, interests, and abilities and tailoring AI tools to adapt to these requirements would result in more targeted and effective learning experiences. In doing this, it should be kept in mind that personalized learning should be complemented by competent instructors who can provide guidance and support for a holistic learning experience.

c) Raising Ethical Awareness: Establishing clear guidelines for ethical practices and responsible use of AI in education is essential, encompassing issues such as plagiarism and data privacy. When setting up guidelines for the ethical use of generative AI in academic settings and school work, several factors should be taken into consideration: the purpose of use, acknowledgment of AI assistance, responsible usage, user accountability, and AI literacy. First, the guidelines should explicitly state that generative AI is intended for learning, research, and educational purposes only, and should not be used for dishonest practices such as cheating on assignments or tests. Second, it is crucial to establish a protocol where students are obligated to acknowledge their utilization of generative AI in academic tasks, preserving the integrity of their scholarly work. Third, the guidelines must emphasize the need for safe and responsible AI use, making it clear that AI should not be employed to create harmful or discriminatory outcomes. Additionally, students must comprehend their accountability in utilizing AI tools, including the understanding that producing inappropriate or offensive content using AI is unacceptable.

d) Promoting AI Literacy: Institutions should ensure both students and educators receive continuous training and education on generative AI's pros, cons, applications, and limitations. That is, institutions should actively promote AI literacy among both students and instructors. This enables them to better

grasp the capabilities and limitations of AI, as well as potential ethical dilemmas that may arise in AI deployment. This will empower users to integrate AI tools optimally and responsibly into their learning and teaching processes.

5. Conclusion

In conclusion, the survey of Chinese undergraduates' use, perception of, and attitudes towards generative AI like ChatGPT, reveals overall positive attitudes towards the technology and its role in education. The participants identified various benefits and drawbacks of AI, with many respondents expressing a willingness to incorporate generative AI as an auxiliary educational tool.

The findings hold significant pedagogical implications. Generative AI can be a "Promethean Fire" or a "Sword of Damocles" for higher education. While it has the potential to enhance education, it could also lead to issues of excessive reliance on such technology and ethical problems. To make the best use of it, instructors and AI developers must work collaboratively to enhance the capabilities of AI, address user concerns, promote AI literacy, and establish ethical guidelines to foster responsible AI adoption in higher education. Adopting a blended learning approach and focusing on personalized learning experiences may lead to more effective, engaging, and equitable educational experiences for students.

Despite this study's contribution to the field, continued exploration and research on students' use and perception of generative AI and AI literacy is needed as this AI technology has been gaining popularity since ChatGPT's release. Further studies focusing on more diverse educational settings and larger samples across different regions within China will provide a more comprehensive picture, leading to better AI adoption strategies and guidelines.

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