A Study on Gender Differences in the Use of Generative Artificial Intelligence for Assisted Learning Among University Students: A Review and Outlook

Sun Wen

School of Foreign Languages, Nanning Normal University, Nanning 530000, China

Abstract: *With the development of Generative Artificial Intelligence (GAI), the use of GAI to assist learning among university students has become increasingly common. However, there are limited academic researches on the gender differences in the use of GAI for assisted learning among university students. This paper systematically reviews relevant domestic and international literature from 2023 to 2025 using bibliometric and content analysis methods, revealing the existence of gender differences. Previous studies have mainly focused on four aspects: usage of GAI, attitude toward using GAI, learning outcomes and efficiency, and ethical value judgement. Therefore, this paper will elaborate on these differences in detail, providing an in-depth analysis of how students of different genders perform when utilizing GAI for learning, with the aim of offering insights for promoting the rational application of GAI in higher education.*

Keywords: Gender differences, Generative artificial intelligence, University students, A review.

1. Introduction

In the wave of rapid digital technological advancement, Generative Artificial Intelligence (GAI) has made remarkable progress. With cutting-edge applications such as ChatGPT serving as a prime example, GAI is reshaping the educational landscape in a disruptive manner. From the revolution of teaching methods to the expansion of knowledge dissemination channels, GAI's influence permeates all aspects of education. As key hubs of knowledge dissemination and innovation, universities are particularly sensitive to new technologies, with students quickly recognizing the potential value of GAI tools in enhancing learning efficiency and broadening knowledge boundaries. Consequently, students have actively integrated GAI into their learning processes to improve their academic performance.

However, despite the widespread use of GAI in higher education, there is a relative lack of systematic reviews focusing on the gender differences in university students' use of GAI for assisted learning. Existing research tends to concentrate on the general applications of GAI, with insufficient attention paid to the differential performance of male and female students in this context. This gap in the literature makes it difficult to clearly identify research trends and hotspots in this field from a macro perspective, limiting our understanding of this complex phenomenon in the context of higher education. Moreover, this knowledge gap hinders educators from developing more targeted teaching strategies based on gender differences, thereby impacting the promotion of educational equity and teaching quality.

Therefore, in order to systematically explore the gender differences in university students' use of GAI for assisted learning, this study employs bibliometric and content analysis methods to conduct a thorough review of relevant domestic and international literature published between 2023 and 2025. The aim is to provide an in-depth examination of the gender-related disparities observed when students leverage GAI in their learning processes.

2. Data Analysis

During the data retrieval phase, in order to ensure the authority and representativeness of the data sources, this study selected two representative databases: Web of Science (WOS) and China National Knowledge Infrastructure (CNKI). In WOS, multiple searches were conducted using the keywords 'GenAI OR Generative Artificial Intelligence' AND 'gender differences'. In CNKI, the keywords "生成式人工智能" (Generative Artificial Intelligence) AND "性别差异" (gender differences) were used for multiple searches. The earliest literature found in both domestic and international sources was published in 2023. To facilitate further analysis, the search period for both domestic and international literature was set from 2023 to 2025.

To ensure the quality of the retrieved data, the researcher manually screened the data, removing irrelevant and duplicate literature, such as conference papers and call-for-papers notices. As a result, 10 valid foreign-language articles were identified. Unfortunately, no Chinese articles meeting the inclusion criteria were found.

In the literature analysis phase, to further extract valuable information from the screened literature, the researcher employed bibliometric and content analysis methods to conduct a thorough investigation and analysis of the selected papers.

Bibliometric analysis, as a mature quantitative analysis method, involves the statistical analysis of the external characteristics of literature. It focuses on the literature system and bibliometric features, quantitatively analyzing various characteristics of the literature, such as the number of publications, citation frequencies, journal impact factors, etc. This method helps to reveal distribution patterns, research

hotspots, and trends in the development of academic disciplines. In this study, bibliometric analysis was applied to the selected literature to quickly assess the overall scope, development trends, and the popularity of different research directions in this field. By analyzing the trends in the number of publications retrieved from the Web of Science database using specific keywords, the researcher could visually observe the changing level of attention to the study of gender differences in university students' use of GAI-assisted learning in recent years. Additionally, by examining citation frequencies, the researcher could identify key influential studies in this field, providing a foundation for further in-depth analysis.

Content analysis, on the other hand, is a research method that provides an objective, systematic, and quantitative description of the content of literature. It involves coding, categorizing, and analyzing the literature to uncover underlying information, viewpoints, and themes, thereby revealing deeper meanings and patterns within the literature. In this study, content analysis was primarily used to conduct a detailed examination of the collected literature. The researcher carefully read each article and extracted and organized relevant information about gender differences in the use of GAI for assisted learning among university students, categorizing and coding the data for further analysis.

3. Research Outcomes

Through a detailed study of the relevant literature, combined with the use of bibliometric and content analysis methods, the researcher gained a deeper understanding of the research trajectory and dynamics concerning gender differences in university students' use of GAI for assisted learning. Specifically, it was found that existing studies focus on four key areas. These areas are:

1) The frequency of GAI usage, the contexts in which it is used, and other usage patterns;

2) Attitudes and perceptions towards GAI;

3) The learning outcomes and efficiency improvements achieved by using GAI in the learning process;

4) Ethical issues, such as privacy protection, associated with the use of GAI.

These four dimensions provide a comprehensive analytical framework for systematically understanding gender differences. By thoroughly examining the gender differences within each dimension, the researcher is not only able to clearly present the current state of research and its findings but also to identify existing gaps and areas for further investigation.

It is hoped that these research results will offer valuable insights and references for the future development of gender-focused studies on the use of GAI for assisted learning among university students, driving deeper research in this field and providing more targeted guidance for educational practices.

3.1 Usage of GAI

There are significant differences between male and female students in their usage of GAI, with these differences primarily manifesting in three key dimensions: usage frequency, usage scenarios, and usage goals.

Usage Frequency refers to the number of times male and female students use GAI within a specific time frame, reflecting the frequency of interaction between students of different genders and the GAI tools.n Usage Scenarios pertains to the specific contexts in which male and female students use GAI during various activities, such as studying, researching, or creating. This dimension highlights the practical situations and application domains in which GAI is utilized. Usage Goals describes the objectives male and female students aim to achieve by using GAI, which could range from improving learning outcomes, stimulating creative ideas, to enhancing career development.

Many studies indicate that, overall, male students tend to use GAI more frequently than female students, and their usage scenarios are also more diverse. This suggests that male students engage with GAI across a broader range of contexts compared to their female counterparts.

3.1.1 Usage Frequency

Numerous studies have shown that there is a significant correlation between academic discipline choice and gender. Research by Ashworth & Evans (2001) found that male students tend to gravitate towards STEM fields, such as artificial intelligence and computer science, which are closely related to mathematics, while female students are more likely to choose fields such as education, law, or literature, where the requirements for mathematics are lower. This difference in academic choices further influences students' frequency of GAI use.

In STEM disciplines, gender differences are particularly pronounced. Influenced by societal, cultural, and educational factors, male students typically demonstrate greater engagement and interest in artificial intelligence technologies, which provides them with more opportunities to interact with and apply GAI, thereby accumulating rich experience in its use. As a result, male students tend to use GAI more frequently. In contrast, in non-STEM disciplines, where the connection between the subject matter and artificial intelligence technology is weaker, the gender difference in GAI usage frequency is less pronounced (Sun L. & Zhou L., 2024).

Kim J. et al. (2025) also support this view, suggesting that male students in STEM fields frequently encounter technology-related tasks in their studies and practices, which leads to more positive attitudes towards GAI and a greater ability to leverage its functionalities. However, Computer Science is an exception. Bikanga Ada M. (2024) argues that in this field, the frequency of GAI use between male and female students is similar, with the key difference lying in their usage goals. Male students tend to focus more on using GAI to solve practical problems.

3.1.2 Usage Scenarios

In terms of students' usage scenarios of GAI, Møgelvang A. et al. (2024) pointed out that gender differences are significant. Their survey covered 16 different usage scenarios, such as text generation, historical research, and scientific experiment design. The results showed that, in 14 of these scenarios, male students used GAI chatbots significantly more frequently than female students.

In particular, the gender gap was most pronounced in scenarios related to programming, solving mathematical or statistical problems, and text generation. These areas saw a clear disparity in how frequently males engaged with GAI. On the other hand, female students' usage scenarios were comparatively narrower, primarily focusing on using GAI chatbots to understand text, assist with the writing process, and other creative tasks.

This suggests that gender differences not only affect the frequency of GAI usage but also influence the specific tasks that each gender tends to engage in when using GAI.

3.1.3 Usage Goals

There are significant gender differences in the goals behind students' use of GAI. According to Møgelvang A. et al. (2024), the primary objective for male students in using GAI is to effectively improve learning efficiency and enhance career prospects. During their learning process, they aim to use GAI to quickly tackle complex academic problems, thereby improving both the speed and quality of their knowledge acquisition. Looking ahead to their future careers, male students recognize that GAI technology is a powerful tool to enhance their competitiveness in the job market, and they actively explore its applications across various employment-related fields.

On the other hand, female students' use of GAI tends to focus more on the holistic development of their abilities and the stimulation of creative thinking. They often use words like "ideas," "inspiration," and "possibilities" to explore GAI's potential in sparking innovative thinking. In their learning and creative processes, female students are eager to leverage GAI to generate new ideas and approaches.

This reflects a divergence in the purposes for which GAI is utilized by male and female students—while males focus on practical and career-oriented goals, females are more inclined towards using GAI as a tool for creative and intellectual exploration.

3.2 Attitude Toward Using GAI

There are significant gender differences in students' attitudes towards using GAI for assisted learning. In this context, attitude refers to the emotional tendencies and evaluations—whether positive or negative—that students exhibit towards the act of using GAI for learning. A positive attitude is reflected in a high level of recognition and acceptance of GAI, leading to its frequent and active use. In contrast, a negative attitude is characterized by skepticism, resistance, and doubts about the effectiveness or appropriateness of GAI for learning.

The underlying reason for these differing attitudes lies in the cognitive differences between male and female students regarding GAI. Male students generally tend to view GAI as a valuable tool that can enhance their learning efficiency, solve complex problems, and boost their academic and professional outcomes, leading to a more favorable stance. Conversely, female students may approach GAI with more caution, viewing it with some degree of skepticism or uncertainty, especially if they are less familiar with or confident in its technological capabilities.

This cognitive divergence ultimately shapes their emotional responses, with male students generally exhibiting a more positive attitude towards GAI-assisted learning and female students showing more hesitation or reluctance.

First and foremost, male students generally hold a more positive attitude towards GAI-assisted learning. The underlying reasons for this attitude difference are primarily rooted in their practical experience with technology and their long-term considerations regarding future employment prospects.

From a practical technology application perspective, Daher & Hussein (2024) and Avcı (2024) pointed out that male students, particularly those in the technical and scientific fields, tend to exhibit a more positive attitude towards GAI. This positive attitude is likely to serve as a driving force for the widespread adoption of new AI technologies in the educational sector. For instance, in surveys on student usage of GAI, male students are often more attuned to the tool's value in the learning process and hold more optimistic predictions about its future development. This suggests that when male students engage with and use GAI technology, they experience the tangible benefits it brings to their learning, which leads to a more favorable evaluation.

In terms of attitudes towards future employment, male students tend to have a more profound awareness of the close relationship between GAI technology and their future career development. Møgelvang et al. (2024) highlighted that male students place greater emphasis on the connection between GAI technology and the job market. They clearly recognize that mastering GAI technology is an effective way to enhance their professional competitiveness. Whether during their current studies, where GAI serves as a tool to develop skills for future employment, or in actual work settings, GAI technology can provide them with more opportunities and advantages, helping them achieve greater success in their careers.

Thus, male students' positive attitudes are shaped by both their direct experience with GAI technology and their awareness of its significance in boosting their career prospects, positioning GAI as a valuable tool for both academic and professional advancement.

In comparison, female students tend to be more concerned than male students about the potential negative effects of using GAI for assisted learning, particularly regarding its impact on critical thinking and independent thought. Research

by Møgelvang A. (2024) reveals that female students are more likely to focus on the possible drawbacks of GAI, especially concerns about cognitive rigidity and the loss of independent thinking skills. As a result, they generally adopt a more cautious attitude towards the application of GAI in educational settings.

Furthermore, Bikanga (2024) supports this view, arguing that female students have a relatively lower level of trust in GAI. This mistrust leads them to have stronger learning needs and a desire to better understand how to assess the credibility of information provided by GAI, as well as when it is appropriate and wise to use it. Specifically, in learning scenarios, female students are more inclined to question the accuracy of the information provided by GAI. This skeptical attitude directly results in a more conservative approach to using GAI for academic purposes. When relying on GAI to complete learning tasks, female students tend to engage in more detailed screening and critical thinking to avoid the risks associated with blindly depending on the technology.

This cautious and discerning approach illustrates that, while female students may recognize the value of GAI, they are more likely to seek a deeper understanding of its reliability and appropriate use in educational contexts, ensuring they maintain their critical thinking abilities and minimize any potential negative effects on their learning.

3.3 Learning Outcomes and Efficiency

There are significant differences between male and female students in the learning outcomes and efficiency when using GAI.

Learning outcomes refers to the theoretical knowledge acquired and the practical skills developed by students. It represents the tangible achievements students gain through knowledge accumulation and skill enhancement by the end of a learning cycle. Learning outcomes encompass both the depth and breadth of theoretical understanding as well as the application of knowledge in real-world contexts.

Learning efficiency, as a metric of learning effectiveness within a unit of time, it not only reflects the speed at which students progress in their learning, but also indicates their ability to absorb and apply knowledge. Learning efficiency highlights how well students can convert newly acquired information into usable skills and competencies. The differences in performance between male and female students in these two areas—learning outcomes and learning efficiency—deserve deeper exploration. These differences can provide valuable insights into how gender influences the effectiveness of using GAI as a learning tool, shedding light on distinct patterns in how males and females engage with and benefit from this technology.

3.3.1 Learning Outcomes

Due to gender differences, male and female students exhibit distinct characteristics in their learning outcomes when using GAI for assisted learning across various academic fields.

Male students, when using GAI for assisted learning, tend to show more significant advantages in the STEM (Science, Technology, Engineering, and Mathematics) disciplines. According to the research by Kim J. et al. (2025), male students in STEM fields have a more positive attitude toward GAI tools and use them more frequently.

In programming studies, male students make use of GAI tools, such as reference code examples and algorithmic suggestions, which allow them to complete programming tasks more efficiently. The accuracy and efficiency of their code writing are improved, potentially giving them an advantage in related course grades. In mathematics, GAI provides male students with multiple problem-solving approaches, helping them expand their thinking and gain a deeper understanding of complex mathematical concepts. This contributes to their outstanding performance in mathematics-related learning outcomes.

In contrast, although male students have a relatively lower acceptance of GAI in humanities and social sciences, the tool proves valuable for tasks that require significant data organization and idea synthesis. GAI can help them quickly filter and integrate information, and when writing papers, it can assist them in gathering comprehensive literature and conducting preliminary analyses, thus improving the quality of their papers. However, compared to female students, male students may exhibit some shortcomings in the nuance of textual expression and emotional richness, which are more emphasized in humanities tasks.

Thus, male students tend to benefit more from GAI in technical and quantitative fields, where efficiency and problem-solving are prioritized, while their performance in the humanities may be somewhat less developed due to the need for finer linguistic and emotional expression.

Female students, when using GAI for assisted learning, exhibit distinct advantages in language learning and creative fields. Research by Alzubi A. A. F. et al. (2025) indicates that, in language learning, female students perceive GAI tools as significantly beneficial for vocabulary accumulation, grammar learning, and writing feedback.

In language learning, particularly in English, female students use GAI tools to memorize vocabulary. By reviewing a large number of example sentences and vocabulary distinctions, their vocabulary grows rapidly, allowing them to use words more accurately in language expression. In writing, GAI's grammar checks and expression optimization suggestions help female students improve their writing skills more quickly. The logical coherence and fluency of their writing are enhanced, leading to a more polished and coherent output. In creative learning, female students benefit greatly from using GAI tools for artistic creation. The creative ideas and painting techniques provided by GAI stimulate their artistic potential, enabling them to produce works with greater creativity and expressiveness. This results in better outcomes in both artistic appreciation and creative ability, allowing them to achieve superior learning outcomes in creative domains.

3.3.2 Learning Efficiency

Due to gender differences, male and female students exhibit

varying levels of learning efficiency when using GAI for assisted learning across different tasks.

Male students tend to demonstrate higher efficiency in handling complex logical tasks and exploring new areas of learning when using GAI. Research by Daher and Hussein (2024) indicates that male students have a higher perception of the efficiency of GAI tools and are more willing to use them to solve complex problems. In learning physics, particularly with abstract concepts, male students can quickly utilize GAI to search for related animations, simulations, and other resources that aid their understanding. This enables them to grasp knowledge points rapidly, thereby shortening their learning time. In exploring new learning fields, male students, driven by their curiosity and desire for exploration, are able to familiarize themselves with the functionalities of GAI tools more quickly and apply them to the study of new subjects. When learning about artificial intelligence, male students are able to adapt to and use GAI tools swiftly to access cutting-edge information, learn new algorithms, and model structures, thus showcasing high learning efficiency. In summary, male students are more efficient in utilizing GAI to handle complex, technical tasks and in exploring unfamiliar fields, leveraging the tool to gain a competitive edge in their learning processes.

Female students exhibit a distinct efficiency advantage in creating learning plans and engaging in personalized learning when using GAI for assisted learning. Alzubi et al. (2025) suggest that female students are more inclined to use GAI tools to develop detailed study plans. In language learning, for instance, female students utilize GAI tools to analyze their learning progress, create targeted study plans, and organize their study time effectively, thereby improving the systematization and structure of their learning process. In terms of personalized learning, female students are adept at using the personalized learning resources offered by GAI tools. Based on their learning progress and areas of weakness, they focus on targeted study strategies. In mathematics, GAI tools recommend exercises and explanations suited to their current level, enabling female students to study more efficiently, address knowledge gaps, and enhance their overall learning effectiveness. This tailored approach allows female students to optimize their learning strategies and improve their academic performance.

3.4 Ethical Value Judgement

The ethics of GAI-assisted learning refers to the behavioral guidelines and value judgments related to academic integrity, data privacy, educational equity, and other aspects during the learning process. Research indicates that there are gender differences in value judgments on these ethical issues.

Male students, in their ethical value judgments regarding GAI-assisted learning, tend to focus more on the functionality and practicality of GAI, showing relatively lower sensitivity to risks. For example, research by Raman et al. (2024) indicates that male students prioritize the efficiency of knowledge acquisition when using GAI, often using terms like "good" and "useful" to emphasize its utility, while paying insufficient attention to ethical risks such as academic integrity and data privacy. Furthermore, Prohorov et al. (2024)

point out that the proportion of male students using GAI is slightly higher than that of female students, and they use GAI more frequently. This higher usage frequency may lead them to overlook potential ethical issues.

In terms of ethical value judgments regarding GAI-assisted learning, female students place greater emphasis on safety and reliability. Raman et al. (2024) similarly note that female students often use terms such as "dangerous" and "errors" to express concerns about the accuracy and safety of the technology, showing greater sensitivity to the risks associated with GAI-assisted learning. When using GAI, female students are more concerned with whether the usage process adheres to academic standards, demonstrating a higher level of attention to issues of academic integrity.

4. Conclusion

This study explores the gender differences in GAI-assisted learning through an analysis of relevant literature. The research found significant differences between male and female students across multiple dimensions, including usage of GAI, attitude toward using GAI, learning outcomes and efficiency, and ethical value judgement.

In terms of usage of GAI, males use GAI more frequently than females, with this difference being especially pronounced in STEM fields. Males, with their stronger technological acceptance, apply GAI extensively in programming, solving complex mathematical problems, and simulating experiments, aiming to enhance learning efficiency and broaden career opportunities. In contrast, females use GAI less frequently, primarily focusing on tasks related to text comprehension and writing. Females tend to leverage GAI to deeply analyze the underlying meanings of texts, generate writing ideas, and stimulate creative thinking for personal development.

Regarding attitude toward using GAI, males tend to hold a more positive attitude toward GAI-assisted learning. This positive attitude is largely driven by the positive experiences males have gained from practical use and their consideration of GAI's potential value in future employment. Conversely, females exhibit lower trust in GAI and approach its use with more caution. They are concerned that over-reliance on GAI could undermine their critical thinking and independent thought abilities, negatively impacting their learning and growth.

In terms of learning outcomes and efficiency, males excel in STEM disciplines and in handling complex logical tasks, as well as exploring new fields, leveraging GAI to achieve outstanding results and significantly improve learning efficiency. Females, on the other hand, show distinctive advantages in language learning and creative tasks, demonstrating greater efficiency in creating learning plans and engaging in personalized learning with the help of GAI.

On the ethical value judgementx front, males are more focused on the functionality and practicality of GAI, exhibiting a lower sensitivity to potential ethical risks. Females, however, emphasize the safety and reliability of GAI, maintaining a high level of attention to issues like academic integrity in order to avoid ethical risks associated

with GAI use.

Although this study has achieved certain results, research on the gender differences in the use of GAI-assisted learning by university students still has many areas that require improvement. Future studies could explore the following four directions:

First, expand the research sample to include students from different regions, disciplines, and educational stages. By analyzing diverse samples, the generalizability of the research conclusions can be enhanced, ensuring that the findings can be widely applied in various educational settings.

Second, investigate the underlying causes of gender differences more deeply. By considering various factors such as social culture, family environment, and educational methods, researchers can explore how these factors influence male and female students' use of GAI-assisted learning. This would provide a theoretical basis for future educational interventions.

Third, optimize the design of GAI-assisted learning tools based on the distinct characteristics of male and female students. By developing customized tools that cater to the personalized needs of students of different genders, the application effectiveness of GAI in education can be further enhanced.

Fourth, strengthen the study of ethical guidelines for GAI-assisted learning. Developing more targeted guidelines to clarify the ethical boundaries of GAI in educational applications would promote the rational use of GAI in education and contribute to fostering educational equity and development.

References

[1] A. A. F. Alzubi, M. Nazim, and N. Alyami, "Do AI-Generative Tools Kill or Nurture Creativity in EFL Teaching and Learning?," Education and Information Technologies, pp. 1–38, 2025.

[2] J. Ashworth and J. L. Evans, "Modeling Student Subject Choice at Secondary and Tertiary Level: A Cross-Section Study," The Journal of Economic Education, 32(4), pp. 311–320, 2001.

[3] Ü. Avcı, "Students' GAI Acceptance: Role of Demographics, Creative Mindsets, Anxiety, Attitudes," Journal of Computer Information Systems, pp. 1–15, 2024.

[4] M. Bikanga Ada, "It Helps with Crap Lecturers and Their Low Effort: Investigating Computer Science Students' Perceptions of Using ChatGPT for Learning," Education Sciences, 14(10), pp. 1106, 2024.

[5] W. Daher and A. Hussein, "Higher Education Students' Perceptions of GenAI Tools for Learning," Information, 15(7), 2024.

[6] J. Kim, M. Klopfer, J. R. Grohs, et al., "Examining Faculty and Student Perceptions of Generative AI in University Courses," Innovative Higher Education, pp. 1–33, 2025.

[7] A. Møgelvang, C. Bjelland, S. Grassini, et al., "Gender Differences in the Use of Generative Artificial Intelligence Chatbots in Higher Education: Characteristics and Consequences," Education Sciences, 14(12), pp. 1363, 2024.

[8] A. Prohorov, O. Tsaryk, and L. Fainglozs, "Employers' Expectations of Students' Generative AI Skills: A Student Perspective," In Proceedings of the IEEE Congress on Evolutionary Computation (CEC), pp. 809–814, 2024.

[9] R. Raman, S. Mandal, P. Das, et al., "Exploring University Students' Adoption of ChatGPT Using the Diffusion of Innovation Theory and Sentiment Analysis With Gender Dimension," Human Behavior and Emerging Technologies, 2024(1), pp. 3085910, 2024.

[10] L. Sun and L. Zhou, "Generative Artificial Intelligence Attitude Analysis of Undergraduate Students and Their Precise Improvement Strategies: A Differential Analysis of Multifactorial Influences," Education and Information Technologies, pp. 1–36, 2024.

Author Profile

Sun Wen is a Master Candidate at the School of Foreign Languages, Nanning Normal University. Her research focuses on Second Language Acquisition.