The Role of ChatGPT in Enhancing Students' Critical Thinking in Academic Writing

1. Durratul Hikmah

2. Badilatil Walida

[1&2] Universitas Nurul Jadid, Indonesia

Abstract

In recent years, there has been a significant shift in how students complete their assignments. This change is largely influenced by technological advancements, particularly the emergence of ChatGPT. Students have increasingly relied on ChatGPT for various aspects of their writing. This research aims to explore the role of ChatGPT in helping students develop their critical thinking skills in writing academic papers. The research employs a quantitative method with a survey technique. The subjects of this study are 40 English Education students on one of universities in East Java, representing Writing classes from each semester. In this study, questionnaires are used to determine the frequency of responses and the percentage size. The research identifies various roles that ChatGPT plays in students' critical thinking processes during academic writing, such as helping to identify text genres, assisting in evaluating the quality of writing and identifying the strengths and weaknesses of texts, as well as helping to generate new ideas for writing.

Keywords
Academic Writing
ChatGPT
Critical thinking
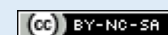
The Role of ChatGPT in Enhancing Students' Critical Thinking in Academic Writing

Introduction

In the ever-evolving digital era, the presence of ChatGPT has become a significant phenomenon in the field of education, representing a revolutionary breakthrough in artificial intelligence (AI) and natural language processing (NLP) technology (Liebrenz et al., 2023). ChatGPT's ability to understand and generate text that resembles human writing has opened up a wide range of services, from supporting writing tasks to facilitating adaptive learning experiences for students. As this technology evolves, it is crucial to explore its potential benefits, limitations, and implications in the context of education.

One of the main advantages of ChatGPT responsiveness in an educational environment is the potential for a more personalized learning experience for students. ChatGPT can be used to generate customized learning materials, case studies, and content that meets the specific needs and learning styles of each student, thereby enhancing their engagement and understanding of the subject matter. Additionally, ChatGPT can provide quick and relevant answers to students' questions, providing them with what they need to overcome academic challenges (Chinonso et al., 2023; Qureshi, 2023; Su (苏嘉红) & Yang (杨伟鹏), 2023).

In the academic world, the demand to produce high-quality academic work is increasing. Every academician is expected to be able to write scientific papers that are not only informative, but also demonstrate deep critical thinking skills. This critical thinking skills is crucial because it involves analyzing, evaluating, and synthesizing complex information to develop strong and original arguments (Akpur, 2020). However, not all students have these skills naturally. The most difficult challenge students face when starting to write is finding ideas (Hikmah et al., 2022). Many of them struggle to identify relevant and interesting topics, and often confused in determining the right perspective to develop their arguments. The process of brainstorming, which should be a creative and productive first step, often turns into an exhausting challenge, especially for those who are not yet familiar with the critical thinking methods required to compose academic papers.

Critical thinking is an essential skill in the academic and professional world. (Apriani et al., 2022) defined critical thinking as "disciplined, clear, rational, open, and evidence-based thinking." This ability involves the ability to analyze, evaluate, and synthesize information to form a strong and well-grounded argument. In the context of academic writing, critical thinking enables students not to only convey information, but also to critically examine and interpret data in depth.

According to Bloom's taxonomic theory developed by Benjamin Bloom in 1956, critical thinking lies at a higher cognitive level, namely analysis, synthesis, and evaluation. Bloom emphasizes that the learning process not only involves knowledge and understanding, but also the ability to analyze relationships between ideas, synthesize new information, and critically evaluate arguments (Apriani et al., 2022).

Thus, critical thinking not only helps in understanding the material, but also in developing new knowledge.

However, developing critical thinking skills is not an easy task. (Todorova & Koleva, 2021) mentions that critical thinking requires specific skills and dispositions, such as intellectual curiosity, a healthy skepticism, and a desire for clarity. This skill can be honed through practice and habituation, one of which is through academic writing. However, in recent years, there has been a significant change in how students in Writing classes complete their assignments. These changes are largely influenced by technological developments, especially the emergence of ChatGPT. Students have increasingly relied on ChatGPT in various aspects of their writing. From generating new ideas to crafting precise sentences, ChatGPT has become an indispensable partner in their efforts to produce quality writing.

Initially, many students faced difficulties in developing creative ideas and crafting effective sentences. The brainstorming process, which usually takes time and energy, has now become more efficient with the help of ChatGPT. By inputting a few keywords or basic concepts, students can receive relevant and innovative suggestions and ideas, making it easier for them to start and develop their writing topics (Bishop, 2023; Zhai, 2022). However, as dependency on ChatGPT increases, educators have raised concerns that excessive reliance on ChatGPT may reduce students' ablity to think critically, analyze information, and construct strong and original arguments.

Some previous studies (Chen & Zhao, 2024; Meishar-Tal, 2024; Nguyen Minh, 2024; Vicente-Yagüe-Jara et al., 2023; Yuan et al., 2024) have indeed examined ChatGPT's responsiveness in writing skills. However, studies on the role of ChatGPT responsiveness in students' creative thinking process in writing have been limited. Meanwhile, the finding of previous studies show inconsistenies; some acknowledge the positive impact of ChatGPT, while others rejected it. Therefore, further research on the role of ChatGPT on students' critical thinking skills in writing needs to be carried out.

By understanding the interaction between ChatGPT responsiveness and critical thinking skills in writing academic papers, this research is expected to provide valuable insights for the development of innovative teaching methods and support the improvement of students' academic quality. The results of this study also provide practical recommendations for educators in utilizing artificial intelligence effectively in higher education.

Method

This study employs a survey research design. Survey research design is a quantitative research process used to obtain an overview of the views, habits, and attributes of the population using samples from the population (Creswell, 2013). This study was conducted to find out the role of ChatGPT on students' thinking ability in writing academic papers. The respondents of this research were English Education students of Nurul Jadid University from the 2023/2024 academic year who enrolled in Writing Skill courses during the even semester. These courses included both Paragraph Writing classes and Writing for Academic Purposes classes. The total popolation of the research subjects are 76 students, divided into four clasess-two clasess for Paragraph Writing and two clasess for Writing for Academic Purposes.

Due to the uneven distribution of students across the classes, a sample of 10 students from each class was selected, ensuring proportional representation. Thus a total of 40 students were included in the study. The sampling technique employed in this study was stratified random sampling, as it allowed for the selection of an equal number of students from each class despite the differences in class sizes.

The data in this study were collected using a questionnaire. The questionnaire consists of 12 questions referring to different indicators of critical thingking process, those are 4 questions for analysis process, 4 question for evaluation process, and 4 question for creation process.

Table 1 Indicators in Questionnaire

Indicators	Number of items	Total
Analyzing	1,2,3,4	4
Evaluating	5,6,7,8	4
Creating	9,10,11,12	4
Total Number of Items		12

All questions are closed question that students cannot share or give opinion. In filling the questionnaire, the students only choose the options given using a Likert scale with a value range 1-5. After the questionnaires were given back to the researchers, they were processed to find the result. The way to present the result was to indicate the percentage of respondents who selected each alternative for each item by using the formula:

$$P = \frac{f}{n} \times 100$$

P= percentage
f= total of respondents' answer
n= total of number of respondents

The percentage (P) is obtained by dividing the total number of responses (f) by the total number of respondents (n), then multiplying the result by 100 to get the percentage. Since there are three indicators of questionnaire, the analysis was done per indicator by counting the percentage of students' responses to each existing options.

Results

The Role of ChatGPT in Students' Critical Thinking

To further understand the role of ChatGPT in developing students' critical thinking skills in academic writing, a survey was conducted involving a number of English Education students at Nurul Jadid University. The survey was designed to measure the extent to which ChatGPT contributes to three main aspects of the critical thinking process, namely analysis, evaluation, and creation. The survey results are presented in the form of a table that includes various statements related to the role of ChatGPT, along with the scores and percentage of respondents who agree or disagree with these statements. Table 1. provides a detailed overview of students' views on the benefits offered by ChatGPT in improving the enhancing of their critical thinking in academic writing.

Table 2. Students' views on ChatGPT's roles

Indicator	Statement	SD	D	N	A	SA	Score	%
Analyzing	My writing skill improves because I can identify different text genres with the help of ChatGPT.	4	2	15	15	4	133	66.5
	ChatGPT helps me understand the structure of texts better.	6	5	17	9	3	118	59
	With the help of ChatGPT, I can easily compare different types of texts.	6	5	12	15	2	122	61
	ChatGPT helps me analyze the content of texts more deeply.	4	9	15	10	2	117	58.5
Evaluating	I can assess the quality of my writing with the help of ChatGPT.	4	5	17	10	4	125	62.5
	ChatGPT helps me identify the strengths and weaknesses in my writing.	6	5	16	8	5	121	60.5
	With ChatGPT, I can ensure that every sentence in my text is relevant to the topic.	7	5	17	7	4	116	58
	I can evaluate the flow and logic in my texts with the help of ChatGPT.	5	2	20	10	3	124	62
Creating	ChatGPT helps me find new ideas for my writing.	4	3	13	11	9	138	69
	With the help of ChatGPT, I am more creative in developing my writing	4	4	17	10	5	128	64
	I can organize well-structured paragraphs with the help of ChatGPT	2	5	20	9	4	128	64
	ChatGPT helps me write clear opening and closing sentences in my texts.	5	8	14	10	3	118	59

Tabel 1. reveals how students assess the role of ChatGPT on three main aspects of the critical thinking process: analysis, evaluation, and creativity. In this analysis, the survey results reflect students' views on the role of ChatGPT in these three aspects.

Analytical Aspect

In the analysis aspect, there are four statements related to how ChatGPT helps students in identifying different types of text, understanding the text structure, comparing different types of texts, and analyzing text content more deeply. The survey results show that the majority of respondents felt supported by ChatGPT in improving their analytical skills, albeit with varying response rates. The first statement, which stated that students' writing skills improved because they could identify different genres of text with the help of ChatGPT, received fairly high approval with a score of 133 and a percentage of 66.5%. This indicates that more than half of the respondents' experiences improvement in their writing skills directly related to the ability to distinguish different text genres, an important skill in academic writing.

However, when moving on to more specific statements, such as an understanding the text structure and the ability to compare different types of text, the approval rate decreased slightly. As many as 59% of students agreed that ChatGPT helps them understand the text structure better, while 61% stated that they can easily compare different types of text with the help of ChatGPT. This suggests that while there is recognition of the benefits provided by ChatGPT, it is possible that students feel their understanding of text structure and comparison still needs improvement, or the assistance from ChatGPT may not have fully met their expectations in this area.

The last statement in the analysis category, that ChatGPT helps students analyze text content in more depth, obtained the lowest approval rate in this group with a score of 117 and a percentage of 58.5%. This may indicate that while ChatGPT is effective in aiding with general understanding and texts comparison, students may feel that in-depth analysis of text content still requires more active engagement on their part, which cannot ne fully replaced by ChatGPT. This highlights the importance of developing critical analysis skills that are not only depended on technology, but also require practice and in-depth understanding from the students themselves.

Evaluation Aspect
In the evaluation category, the questionnaire items include students' ability to assess the quality of their writing, identify strengths and weaknesses in writing, ensure the relevance of each sentence to the topic, and evaluate the flow and logic in the text with the help of ChatGPT. From the survey results, it can be seen that students generally agree that ChatGPT plays an important role in this evaluation process, albeit with varying levels of approval. The first statement related to students' ability to assess the quality of their writing with the help of ChatGPT had a score of 125 and a percentage of 62.5%. This indicates that most students feel that ChatGPT helps them in assessing how well their writing is, which is an important step in the process of revising and refinement process of academic papers. In this context, ChatGPT appears to serve as a useful tool in providing quick feedback that students can use to improve the quality of their writing.

The next statement regarding ChatGPT's assistance in identifying strengths and weaknesses in student writing obtained a slightly lower score, namely 121 with a percentage of 60.5%. However, this relatively high approval rate indicates that students feel supported in identifying areas that need improvement as well as aspect that are already strong in their writing. This is one of the key aspects of academic writing development, where the writer not only has to evaluate their writing as a whole, but also has to be able to identify areas that need further adjustment or improvement.

However, on the ability to ensure the relevance of each sentence to the topic with the help of ChatGPT, the approval rate dropped to 58% with a score of 116. This decline may reflect the challenges students face in using ChatGPT to ensure every element in their writing is directly relevant to the topic being discussed. This may be due to limitations in how ChatGPT interprets specific contexts or specific topics, which in turn affects students' ability to maintain a tight focus on the main topic of their writing.

Finally, the ability to evaluate flow and logic in text with the help of ChatGPT obtained a score of 124 with a percentage of 62%. This shows that students feel that ChatGPT is quite effective in helping them assess whether the flow of arguments in their writing

is logical and easy to follow. Logic and flow are essential elements in academic writing, and ChatGPT's assistance in this area seems to be well appreciated by students.

Creativity Aspect
The last aspect discussed in this survey table is creation, which includes statements about how ChatGPT helps students in discovering new ideas, developing creativity, and organizing paragraphs and sentences well. The survey results show that students generally feel that ChatGPT has a positive impact in helping them become more creative and organized in their writing.

The first statement in this category, which states that ChatGPT helps students find new ideas for their writing, scored the highest in the entire table with 138 and a percentage of 69%. This indicates that ChatGPT's ability to provide suggestions and new ideas is highly appreciated by students, especially in the early stages of writing where finding the right topic is often a major challenge. ChatGPT's openness to various possibilities and ideas seems to be very helpful in expanding students' horizons and encouraging them to think more creatively.

In addition, the statement that ChatGPT makes students more creative in developing their writing received a score of 128 and a percentage of 64%. This confirms that besides helping in finding new ideas, ChatGPT also supports students in the process of developing these ideas into cohesive and engaging arguments. In this context, ChatGPT seems to function as a tool that supports the exploration of ideas that students may not have thought of before, thus further encouraging their creativity.

Furthermore, the statement regarding the student's ability to organize well-structured paragraphs with the help of ChatGPT also scored 128 with a percentage of 64%. This shows that ChatGPT assists students in maintaining a clear and organized structure in their writing, which is crucial in academic writing where logic and organization are key to conveying strong and convincing arguments. However, in the last statement about ChatGPT's assistance in composing clear opening and closing sentences, the approval rate decreased to 59% with a score of 118. This may indicate that while ChatGPT is helpful in maintaining the overall structure, some students may feel that specific aspects of writing, such as designing effective opening and closing sentences, still require more practice and involvement on their own part.

Discussion

The survey conducted to assess the role of ChatGPT in helping students develop critical thinking skills in academic writing revealed varying results on three main aspects: analyzing, evaluating, and creating. The survey results indicate that ChatGPT has a positive impact on students' analytical skills, although its influence is uneven in all aspects. A total of 66.5% of respondents agreed that their writing skills improved because they could identify different genres of text with the help of ChatGPT. This shows that ChatGPT assists students in distinguishing different types of text, an important skill in academic writing. However, only 59% of respondents felt ChatGPT helped them understand the structure of the text better. This indicates that while ChatGPT is effective in aiding genre identification, its ability to deepen structural understanding may still be limited (Karakose et al., 2023).

In the evaluation aspect, as many as 62.5% of respondents felt that they could assess the quality of their writing with the help of ChatGPT, which indicates an increase in reflective ability. However, this percentage decreased when it came to the ability to identify strengths and weaknesses in their writing, which only reached 60.5%. This could be due to ChatGPT's limitations in providing very specific and detailed feedback, which is necessary for deeper critical evaluation (Domenech, 2023; Karakose et al., 2023; Nam & Bai, 2023).

The reliance on ChatGPT in the creation aspect showed a more significant impact, with 69% of respondents stating that ChatGPT helped them find new ideas for writing. This confirms that ChatGPT can be an effective tool in enriching idea, an element that is often difficult for students to achieve, especially when they face an idea impasse (Mhlanga, 2023; Sallam, 2023). However, even though ChatGPT is able to help in the development of ideas, only 64% of respondents feel that they have become more creative in developing their writing. This suggests that while ChatGPT can trigger initial ideas, the process of developing deeper ideas may still require more significant human intervention, in line with (Thorp, 2023) finding that AI can be a creative catalyst, but true creativity still depends on deep and reflective human thinking.

Overall, the results of this survey show that ChatGPT does have a significant role in helping students in several aspects of critical thinking, especially in identifying text genres and emerging new ideas. However, the limitations of AI in providing in-depth structural analysis and context-rich evaluative feedback suggest that while these technologies are particularly useful, more complex critical thinking skills still require practice and development supported by more intensive human interaction. Thus, as stated by (Zaman, 2023; Zhytnyk et al., 2024), AI can be a valuable tool in education, but its role should be seen as a complement, not a replacement, of traditional teaching centered on the development of high-level cognitive skills.

Conclusion

The conclusion of this study indicates that ChatGPT's roles in students' critical thinking process when writing academic papers are in the aspects of text analysis, evaluating writing quality, and creativity in writing. Although respondents generally perceive the benefits of using ChatGPT, their confidence levels vary depending on the aspect being evaluated. Users find ChatGPT most beneficial in identifying text genres and generating new ideas, while its support in deep text analysis and ensuring sentence relevance is still considered less optimal. For future research, it is recommended to explore more deeply the factors that influence the effectiveness of ChatGPT in various aspects of writing. The study could also expand the scope of respondents to determine if these findings are consistent across different user groups with diverse backgrounds. Additionally, it is important to evaluate how future improvements in ChatGPT's capabilities can better support deeper text analysis and ensure the relevance of every sentence in a text, thereby making a more significant contribution to improving users' writing quality.

Acknowledgment

are also grateful for the resources and guidance provided throughout the research process.

References

Akpur, U. (2020). Critical, Reflective, Creative Thinking and Their Reflections on Academic Achievement. *Thinking Skills and Creativity*, *37*, 100683. https://doi.org/10.1016/j.tsc.2020.100683

Apriani, E., Santiana, S., & Harmi, H. (2022). Investigating the Role of ICT toward Students' Higher Order Thinking in Writing Skills at Islamic University Students. *AL-ISHLAH: Jurnal Pendidikan*, *14*(2), 2213–2224. https://doi.org/10.35445/alishlah.v14i2.2260

Bishop, L. (2023). A Computer Wrote this Paper: What ChatGPT Means for Education, Research, and Writing. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4338981

Chen, R., & Zhao, H. (2024). ChatGPT in Creative Writing Courses in Chinese Universities: Application and Research. *2024 12th International Conference on Information and Education Technology (ICIET)*, 243–247. https://doi.org/10.1109/ICIET60671.2024.10542824

Chinonso, O. E., Theresa, A. M.-E., & Aduke, T. C. (2023). ChatGPT for Teaching, Learning and Research: Prospects and Challenges. *Global Academic Journal of Humanities and Social Sciences*, *5*(02), 33–40. https://doi.org/10.36348/gajhss.2023.v05i02.001

Creswell, J. W. (2013). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (Fourth Indian edition). PHI Learning Private Limited.

Domenech, J. (2023). ChatGPT in the Classroom: Friend or Foe? *9th International Conference on Higher Education Advances (HEAd'23)*, 339–347. https://doi.org/10.4995/HEAd23.2023.16179

Hikmah, D., Maulina, H., & Nabila, N. (2022). Islamic Students' Perception on Essay Writing Challenges. *International Journal of English Education and Linguistics (IJoEEL)*, *4*(2), 1–10. https://doi.org/10.33650/ijoeel.v4i2.4602

Karakose, T., Demirkol, M., Yirci, R., Polat, H., Ozdemir, T. Y., & Tülübaş, T. (2023). A Conversation with ChatGPT about Digital Leadership and Technology Integration: Comparative Analysis Based on Human–AI Collaboration. *Administrative Sciences*, *13*(7), 157. https://doi.org/10.3390/admsci13070157

Liebrenz, M., Schleifer, R., Buadze, A., Bhugra, D., & Smith, A. (2023). Generating scholarly content with ChatGPT: Ethical challenges for medical publishing. *The Lancet Digital Health*, *5*(3), e105–e106. https://doi.org/10.1016/S2589-7500(23)00019-5

Meishar-Tal, H. (2024). ChatGPT: The Challenges It Presents for Writing Assignments. *TechTrends*. https://doi.org/10.1007/s11528-024-00972-z

Mhlanga, D. (2023). Open AI in Education, the Responsible and Ethical Use of ChatGPT Towards Lifelong Learning. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4354422

Nam, B. H., & Bai, Q. (2023). ChatGPT and its ethical implications for STEM research and higher education: A media discourse analysis. *International Journal of STEM Education*, *10*(1), 66. https://doi.org/10.1186/s40594-023-00452-5

Nguyen Minh, A. (2024). Leveraging ChatGPT for Enhancing English Writing Skills and Critical Thinking in University Freshmen. *Journal of Knowledge Learning and Science Technology ISSN: 2959-6386 (Online)*, *3*(2), 51–62. https://doi.org/10.60087/jklst.vol3.n2.p62

Qureshi, B. (2023). ChatGPT in Computer Science Curriculum Assessment: An analysis of Its Successes and Shortcomings. *2023 9th International Conference on E-Society, e-Learning and e-Technologies*, 7–13. https://doi.org/10.1145/3613944.3613946

Sallam, M. (2023). ChatGPT Utility in Healthcare Education, Research, and Practice: Systematic Review on the Promising Perspectives and Valid Concerns. *Healthcare*, *11*(6), 887. https://doi.org/10.3390/healthcare11060887

Su (苏嘉红), J., & Yang (杨伟鹏), W. (2023). Unlocking the Power of ChatGPT: A Framework for Applying Generative AI in Education. *ECNU Review of Education*, *6*(3), 355–366. https://doi.org/10.1177/20965311231168423

Thorp, H. H. (2023). ChatGPT is fun, but not an author. *Science*, *379*(6630), 313–313. https://doi.org/10.1126/science.adg7879

Todorova, M., & Koleva, E. (2021). *Enhancing critical thinking skills through the use of ICT in academic writing classes*. 050009. https://doi.org/10.1063/5.0041810

Vicente-Yagüe-Jara, M. I., López-Martínez, O., Navarro-Navarro, V., & Cuéllar-Santiago, F. (2023). Writing, creativity, and artificial intelligence. ChatGPT in the university context. *Comunicar*, *31*(77). https://doi.org/10.3916/C77-2023-04

Yuan, Y., Li, H., & Sawaengdist, A. (2024). The impact of ChatGPT on learners in English academic writing: Opportunities and challenges in education. *Language Learning in Higher Education*, *14*(1), 41–56. https://doi.org/10.1515/cercles-2023-0006

Zaman, B. U. (2023). *Transforming Education Through AI, Benefits, Risks, and Ethical Considerations*. https://doi.org/10.36227/techrxiv.24231583.v1

Zhai, X. (2022). ChatGPT User Experience: Implications for Education. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4312418

Zhytnyk, V., Gryniuk, O., & Taras Shevchenko National University of Kyiv, Kyiv, Ukraine. (2024). Artificial intelligence and education. *Constructive Geography*

and Rational Use of Natural Resources, 5 (1), 74–82. https://doi.org/10.17721/2786-4561.2024.5.1.-9/12