

# A Critical Thinking-Oriented Approach in English as a Foreign Language (EFL) Writing: Using ChatGPT as an Ideal Peer

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## Abstract

The present research reports on the effects of an AI-assisted critical thinking-oriented writing intervention supported with ChatGPT in EFL writing. AI-assisted Brainstorming Worksheets and AI-assisted Peer-review Checklists were provided to scaffold the writing process. This study employs a mixed-method approach, including pre- and post-tests with argumentative writing assessments and semi-structured interviews, involving 60 Chinese EFL learners at the CEFR intermediate (B1 to B2) level. Before the study, a pre-test was conducted to write an IELTS argumentative essay with a non-AI-supported CT-oriented approach scaffolded by peers. A post-test using an AI-assisted CT-oriented process scaffolded by ChatGPT (a virtual peer) was conducted immediately after the one-semester intervention. As a means of mitigating bias, two lecturers independently assessed the pre- and post-writing samples. Regarding data analysis, a t-test was employed to assess the variations in the participants' writing proficiency. The writing tests were measured in nine aspects in terms of a subject-specific thinking perspective, i.e., clarity, accuracy, precision, relevance, depth, breadth, logic, significance, and fairness. In addition, six qualitative interviews were conducted after the intervention to explore the benefits and drawbacks of implementing ChatGPT in CT-oriented writing compared to the conventional approach. For quantitative results, the intervention saw significant improvements in the students' critical thinking reflected in writing. For qualitative results, how ChatGPT affected EFL learners' CT-oriented writing was reported in five main aspects: in-depth CT concept understanding, model discourse with CT elements, information and

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feedback, logic, and AI interaction. This study demonstrates how ChatGPT can be applied to scaffold CT-oriented writing training for EFL learners. The findings also offer insights into further research and development in AI tools for EFL writing practices.

**Keywords:** Critical thinking, EFL writing, Technology acceptance, ChatGPT, AI-enhanced education

## Background

Students learning English as a foreign language (EFL) frequently encounter extreme difficulties when writing in English (Bai et al., 2021). EFL learners face the difficulty of having insufficient critical thinking (CT) in their writing, thereby hindering their ability to produce outstanding written work (Dong, 2017a; Liu & Yao, 2019; Yih Mah et al., 2021; Yin et al., 2023; Yin et al., 2024). The latest research has shown that the scaffolding environment has transitioned from traditional classroom settings to digital platforms, utilizing technology as a scaffolding tool (Lu & Xie, 2022; Yin et al., 2023). This research aims to build a new language pedagogy with established emerging technologies, which provides a thinking-oriented writing approach scaffolded with ChatGPT.

There are limitations for previous research. First, prior research has identified the benefits of CT (Chason et al., 2017; Susilo et al., 2021). However, there has been a lack of research on how AI-powered language models can serve as effective peers for thinking-oriented writing in EFL learning. Previous studies only applied the early chatbots with limited capabilities, such as providing predetermined responses instead of personalized and dynamic feedback (Goda et al., 2014) or focused on writing assessment (Zuckerman et al., 2023). Second, few researchers have tried using GPT to assist with writing. They only focused on the superficial output or feedback produced by ChatGPT and cannot prompt guiding questions to scaffold students' thinking as it is only functionalized as a "knowledgeable peer who is unfortunately not able to initiate conversations and guide thinking development" (Su et al., 2023, p. 8). Although OpenAI's GPT-series models can understand and analyze natural language, it is limited in digital literacy and relies on users' input (Godwin-Jones, 2022). Therefore, providing instructions and guidance is important for students to gain the skills to formulate practical questions and effectively utilize ChatGPT to think while writing (Su et al., 2023). Therefore, this research fills the gap that ChatGPT can be a scaffolded tool to facilitate thinking in EFL writing. AI-assisted Brainstorming Worksheets and AI-assisted Peer-review Checklists were provided to scaffold the writing process. These two worksheets can compensate for their limitations by guiding both the students and this knowledge peer to a thinking-aimed training process during the writing.

The research questions examined in the research were:

1. What changes will take place to EFL learners' acceptance of ChatGPT as a result of the intervention?
2. How does ChatGPT affect EFL learners' writing performance through CT-oriented writing intervention?

## **Methodology**

The research adopted a pretest and posttest design involving 60 Chinese EFL learners at the CEFR intermediate (B1 to B2) level. Before the study, a pre-test essay was conducted to write an IELTS argumentative essay with a non-AI-supported CT-oriented approach scaffolded by peers. After an eight-week AI-assisted CT-oriented intervention training scaffolded by ChatGPT, a post-test essay without AI was also conducted immediately after the one-semester intervention, and thus to see whether the intervention could positively change students' writing proficiency.

Two lecturers independently assessed the pre- and post-writing samples to mitigate bias, utilizing a rubric developed by (Dong, 2017b) to assess specific CT in EFL writing. In addition, the semi-structured interview contained seven open-ended questions, which could be divided into four sections: factors affecting students' acceptance of AI-assisted CT-oriented writing, students' perception of brainstorming and peer review, students' perceived AI interaction, and students' attitudes towards different types of CT-oriented writing.

The paired t-test was used to compare the data collected before and after the AI-assisted CT-oriented writing intervention in writing proficiency and ChatGPT acceptance. Following quantitative data collection, further semi-structured interviews were conducted to investigate students' perceptions of AI-powered CT-oriented writing tools.

## **Results**

For quantitative results, writing performance before and after the intervention were compared by using a t-test analysis. The participants' mean score of their CT-oriented writing practice was lower than that of the most recent practice. The paired t-test result showed a significant difference between students' pre-post-test writing performance ( $p < .05$ ). The mean for students' writing scores increased from 23.13 (SD = 3.08) to 29.58 (SD = 3.16). The result suggests that intervention supported by the two AI-assisted worksheets using ChatGPT is helpful in improving students' writing quality in terms of CT. In

alignment with prior studies (Guo et al., 2022; Su et al., 2023), the utilization of an AI-enhanced, CT-infused intervention supports the idea that ChatGPT can effectively function as a virtual tutor or knowledgeable peer in aiding with concept organization, outline development, and feedback. However, previous research lacked empirical data to prove the role of ChatGPT in improving writing abilities, such as Su et al. (2023), who examined the potential of ChatGPT to scaffold at different stages of writing to provide support.

Regarding qualitative results, after thematic analysis of interviews, five main categories were summarized to explain how AI helped CT-oriented writing process: In-depth CT concept understanding (18), model discourse with CT elements (17), information and feedback (16), logic (21), and AI interaction (9). These indicated that ChatGPT could not only deepen the understanding of CT but also enhance writing by providing appropriate model discourse, helpful information to enrich writing content, and evaluations with instant feedback, further improving writing logic. Additionally, the interaction between AI and students helped increase technology acceptance for ChatGPT use. As mentioned by Su et al. (2023), ChatGPT is limited under such framework since ChatGPT can only generate content upon request and cannot prompt guiding questions to scaffold students' thinking. Hence, besides the advantages of guiding "thinking development" (Su et al., 2023, p. 8), the two AI-assisted CT-oriented worksheets grounded in Paul and Elder's CT constructs appear to address this deficiency and have the potential to significantly stimulate ChatGPT's generative capacity to offer more detailed feedback, such as "clearer organization", "explicit linking of sub-claims to the main claim", and "specific evidence" (Su et al., 2023, p. 8).

Overall, this research provides insights that ChatGPT can be used systematically and practically to deepen higher order thinking during the writing process. This study's findings have conceptual and empirical implications regarding the use of ChatGPT in CT and writing performance for EFL educators.

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