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ChatGPT as an Artificial Intelligence (AI) Writing Assistant for EFL Learners: An Exploratory Study of its Effects on English writing Proficiency

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ABSTRACT

ChatGPT, a revolutionary Artificial Intelligence (AI) tool, has taken the world by storm after its release by OpenAI in 2022. Many researchers have attempted to explore what role ChatGPT can play as an AI assistant in teaching and to what extent ChatGPT can be utilized for English as a foreign language (EFL) learners. The present study made exploratory efforts in shedding lights on the effect of applying ChatGPT as an AI Writing Assistant in English writing classroom for EFL learners. The research was conducted with 51 EFL learners divided into a control group (n=25) and an experimental group (n=26). The control group was given traditional in-class instruction and after-class activities, while the experimental group was encouraged to use ChatGPT during pre-writing stage and after-writing stage for content planning, personized interaction and tailored feedback. To avoid misuse of this AI tool, students are encouraged to do the drafting on their own. During the experiment (a duration of 10 weeks), writing tasks were employed to collect available data. It was found that the experimental group exhibited better writing proficiency in terms of content, structure and language use, compared with that of the control group. Overall, this research highlights the potentiality of ChatGPT as a valuable AI tool for EFL learners to improve English writing proficiency.

CCS CONCEPTS

• **Social and professional topics**; • **Applied computing** → Education; Computer-assisted instruction;

KEYWORDS

Artificial Intelligence (AI) Writing Assistant, EFL learners, ChatGPT integration, Writing proficiency

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1 INTRODUCTION

English writing is a crucial indicator of language proficiency for EFL learners and has caught considerable attention from researchers in the field of second language education [1]. In recent years, technology has revolutionized the way English is taught, and technology-assisted language teaching has become a critical component of EFL writing [2] [3] [4]. The strategy of integrating technology in second language teaching is becoming increasingly appealing to EFL learners and educators, as it offers solutions to limitations in traditional learning settings [5] [6].

The release of ChatGPT, a general-purpose intelligent chatbot developed by OpenAI, was the most notable development of AI tool which has engendered both opportunities and challenges in the field of language education. ChatGPT relies on extensive language models to produce text that closely resembles human language [7]. Its applications in language learning are manifold, including generation of personalized materials, assistance in writing, research, and problem-solving tasks [8]. Despite its recognition as an innovative and groundbreaking tool for language education, concerns have surfaced regarding potential risks associated with its misuse, including issues related to fairness, plagiarism, and violations of academic integrity [8]. Criticisms have also been voiced regarding the accuracy and reliability of information generated by ChatGPT.

Despite the increasingly heated discussion on integrating this AI technology in language education, there is a noticeable research gap concerning the impact and effectiveness of this tool on the improvement of language proficiency for EFL learners. While prior studies have underscored the potentialities and limits of AI-powered ChatGPT, it is crucial to delve into how learners interact with and benefit from ChatGPT, addressing their specific needs and challenges. This research gap highlights the necessity for further exploration to bridge the knowledge divide and obtain insights into optimizing the utilization of ChatGPT for language learning.

In this study, we investigate the impact of AI-powered ChatGPT on the writing proficiency of Chinese EFL learners. Specifically, we examine the effects of use ChatGPT in English writing classroom during pre-writing stage and after-writing stage, attempting to find out how the utilization of ChatGPT improve writing proficiency of EFL learners in terms of content, structure and language. The results of this study are expected to contribute to our understanding of integrating AI tools into EFL instruction to enhance writing skills and offer implications for language educators in incorporating AI-assisted writing instruction into the EFL writing curriculum.

2 LITERATURE REVIEW

Over the years, efforts to integrate technology into language learning have been made by researchers in the field. Technology provides

unique experiences for language learners to actively engage with the target language [9]. With the progression of artificial intelligence (AI) and natural language processing (NLP), numerous intelligent language learning platforms has evolved [10]. Among these platforms, ChatGPT stands out, employing expansive language models to generate human-like text. Demonstrating proficiency in text generation, answering queries, and executing diverse language-related tasks, ChatGPT is recognized for its versatile capabilities [11]. The application of ChatGPT holds considerable promise in delivering an array of advantages for language learning, catering to individuals with varying levels of proficiency.

Since the launch of ChatGPT, there has been various explorations of its application in various language learning courses with a focus on improving learners' writing skills [12]. Armed with extensive knowledge, ChatGPT is capable of generating words and grammatically sound structures to aid in the creation of coherent and cohesive written text. This tool not only comprehends human queries but also gives appropriate responses. Furthermore, ChatGPT proves invaluable in helping language learners address challenges related to writing organization, coherence, grammar, and vocabulary. It provides alternative suggestions to rectify grammatically incorrect sentences, contributing to an overall enhancement in writing proficiency. The potential of ChatGPT in elevating writing proficiency has been acknowledged in the literature [13]. It was argued that this AI-powered tool facilitates the production of coherent and cohesive text by offering learners immediate feedback and presenting grammatically correct sentences [13].

Several experiments were conducted to investigate the integration of ChatGPT in the classroom. Studies conducted by Ali et al. (2023) revealed that incorporating ChatGPT in the classroom setting enhances student motivation and engagement, particularly in the context of foreign language learning [14]. The results indicated that ChatGPT has the capacity to inspire students to improve both their writing skills, suggesting its potential as a valuable instructional tool for enhancing student performance in the classroom. Therefore, these outcomes endorse the utilization of ChatGPT as an effective learning instrument to elevate students' overall academic achievements.

Another experiment by Su et al. (2023) suggested that ChatGPT can serve as a valid support for students, particularly in terms of linguistic and structural features. Additionally, ChatGPT is capable of providing tailored feedback, offering advice on content planning, and proofreading passages [15]. Similarly, Yan (2023) conducted an exploratory investigation into the effects of ChatGPT on undergraduate learners' behaviors and attitudes during an L2 writing practical study [16]. Findings highlighted ChatGPT as a potential instrument in L2 writing experiences. However, concerns were raised about students' apprehensions regarding its impact on academic honesty. Song, C & Song, Y (2023) employed a comprehensive approach, combining quantitative and qualitative methods, to evaluate the efficacy of ChatGPT in AI-assisted language learning for EFL students. The findings of this study recognized AI's innovative instructional role and its positive effect on writing skills and motivation. Concerns about over-use and over-reliance of this AI tools were also raised [12].

The literature discussed above largely consists of some general theoretical discussions on the potentialities and limitations of AI tools like ChatGPT in language learning [17] [18] [19]. While some initial studies have explored the interaction of English as a Foreign Language (EFL) learners with AI systems, there remains a limited empirical investigation into how ChatGPT can effectively support them in language learning tasks [20] [21]. Furthermore, there is a noticeable absence of quantitative research specifically delving into the effects of ChatGPT on writing proficiency of EFL learners. This study aims to address this gap by examining the impact of using ChatGPT in the English writing classroom, focusing on both the pre-writing and after-writing stages. The objective is to reveal how ChatGPT contributes to the improvement of EFL learners' writing proficiency, with a particular emphasis on content, structure, and language aspects. By conducting a quantitative analysis, this research aims to offer valuable insights into how ChatGPT impacts the writing skills of EFL learners. Consequently, it seeks to contribute to a more comprehensive understanding of the applications of Artificial Intelligence tools in language education.

3 METHODOLOGY

3.1 Participants

The study was carried out in the autumn semester of 2023 at a foreign language studies university in China. Fifty-one second-year university students from two regular classes were randomly assigned to the experiment and control groups, with no significant differences in student numbers or academic achievement. In that semester students in both classes were taking the English writing course during which the experiment was implemented. Participants took this course to improve their writing skills in an academic context and had agreed to undergo pre-and post-test assessments as part of the study. Prior to their involvement, participants in the ChatGPT-assisted class were provided with written informed consent after receiving detailed explanations of the experiment's purpose, procedures, potential risks, and benefits. The experimental class consists of 25 students, with 5 boys and 20 girls, while the control class comprises 26 students, with 6 boys and 20 girls. The gender ratios between the two classes are fairly balanced, and the average age of students was similar (AI class = 20.66 ± 0.26; Paper book class = 20.89 ± 0.30). Over a 10-week period, both the experimental and control classes were taught by a male experienced teacher who used the same instructional materials for both groups.

3.2 Instrument

In order to collect data, the participants were given standardized writing tests to assess their writing proficiency. The pre- and post-test writing assessments each consisted of a writing prompt and a writing task, which required participants to write argumentative essays. These two tests utilized the International English Language Testing System (IELTS) academic writing tasks 2 to measure participants' academic writing skills. For both tests, all participants were provided with a writing prompt chosen from the book "IELTS Academic 16" (2021) and required to write an essay of 250 words at minimum within a 40-minute timeframe. During the tests, candidates were prohibited from using any supplementary materials or engaging in any form of mutual discussion. Those tests were meant to gauge the participants' writing proficiency concerning content, structure, and grammatical range and accuracy. To ensure

objectivity in the scoring process, two independent raters evaluated the writing samples for the pre-tests and post-tests. The raters were experienced English writing instructors who possessed the necessary expertise to accurately assess the participants' academic writing skills. The study was conducted during the regular academic semester at the university, utilizing the language laboratories and computer facilities provided by the institution.

3.3 Experiment procedure

The writing program, which was conducted over a duration of 10 weeks, involved both the experimental and control classes receiving traditional in-class instruction. The course was taught by a single instructor, who employed the same instructional materials and curriculum for both classes. The primary goal was to familiarize students with diverse English essay forms such as narratives, descriptions, and argumentative writing. Among these four types of English essays, the main teaching objective is to furnish students with the necessary skills to write argumentative essays as argumentation is the most prevalent task in most English proficiency tests in China.

Students in the experimental class in this study were instructed on how to effectively interact with ChatGPT to enhance their writing skills at the beginning of the experiment. The initial step involved watching an informative video that detailed ChatGPT's unique features, capabilities, and its applicability in an educational setting. Then they were introduced the general rules and possible skills of using it. Participants were encouraged to show the flexibility to use ChatGPT for a personalized English writing experience tailored to their schedules and preferences. At the pre-writing stage, they were encouraged to use ChatGPT for research assistance, brainstorming, seeking writing suggestions, etc. However, the first draft of their written task was required to be started in the classroom in order to ensure the authenticity of their work and guarantee the academic integrity. At the after-writing stage, they had the flexibility to use ChatGPT for revision suggestions, alternative phrasing options, vocabulary expansion, language polishing, etc. Participants were motivated to incorporate the feedback provided by ChatGPT into their writing revisions before they handed in their revised work. To mitigate plagiarism risks, stringent measures were adopted to avoid misuse and over-reliance. The educator ensured that participants received comprehensive guidance on using ChatGPT as a writing aid, with a focus on creating original content rather than relying solely on AI-generated material. The instructor placed considerable emphasis on the ethical use of AI in academic writing, guiding participants on integrating AI feedback while preserving their distinctive writing style and thoughts.

The control group, on the other hand, received traditional writing instruction and used the same instructional materials as the experimental group. Participants attended in-person writing classes led by the teacher. During the experimental period, control group participants engaged in traditional writing exercises and activities, focusing on various aspects of writing, such as grammar, vocabulary, organization, coherence, and sentence structure. They were allowed to explore topic-relevant materials on the internet and refer to books and dictionaries for needed information. The teacher gave instructions on writing skills and offered suggestions for improvement. Additionally, students shared their work with peers and received constructive comments from them. Unlike the experimental group, the control group did not have any AI-assisted interaction from ChatGPT. Instead, their writing was based on the teacher's instructions and peer's feedback. The teacher emphasized the importance of practice, guided participants on effective writing strategies, and reviewed their writing to provide suggestions. Throughout the experimental period, control group participants attended regular writing classes, completed writing assignments, and received feedback from the teacher. They were also encouraged to reflect on their writing progress and make necessary revisions based on the feedback provided by the teacher and peers. The details of the experiments are illustrated in Table 1.

Upon the conclusion of the 10-week experiment period, all participants, both in the control and experimental classes, took a post-test. In line with our commitment to maintaining the comparability of assessments, the post-test incorporated identical writing tasks, chosen from the book "IELTS Academic 16" (2021). Participants were assigned to respond to these writing prompts to evaluate their progress in academic writing proficiency over the duration of the study.

3.4 Statistics analysis

To evaluate the impact of integrating ChatGPT on writing proficiency, the researcher employed a one-way analysis of covariance (ANCOVA) as the primary analytical method. ANCOVA was chosen to control for any pre-existing differences between the groups by using the scores on the pre-tests as a covariate. This approach enables the researcher to discern whether observed disparities in writing proficiency can be attributed to the type of instruction received rather than pre-existing group differences. The independent variable under consideration was the integration of ChatGPT, distinguishing between the experimental and control classroom settings. Dependent variables encompassed global writing proficiency and specific writing skills, including content, organization, and language use. The ANCOVA results were presented utilizing means, standard deviations, and effect sizes, with a significance level set at $p < 0.05$. In addition to ANCOVA, independent samples t-tests were conducted to provide supplementary insights into specific outcome measures. This approach aimed to offer a more comprehensive perspective on the effectiveness of the intervention in terms of specific aspects of writing proficiency

The assessment of participants' writing proficiency in both the pre-test and post-test utilized the writing scoring rubric developed by Jacobs et al. (1981). This analytical scoring technique takes into account various criteria, including content, organization, and language use. To ensure the validity of the scoring process, two raters were assigned to conduct the scoring independently. Most importantly, both raters did not know which group the participants belonged to, whether they were in the experimental or control group. This blinding process was implemented to minimize the potential for systematic errors or biases in the scoring process. The inter-rater reliability test, specifically Cohen's Kappa, indicated a high degree of consistency in the scoring process, with a reliability index of 0.80. This suggests a strong consistency between the raters,

Table 1: Key experimental arrangement

Aspects	Experimental group	Control group
Time-span	10 weeks	10 weeks
Teaching strategy	Blended (online learning and in person classroom)	Blended (online learning and in person classroom)
Learning focus	Content, language use, organization, features of argumentative writing	Content, language use, organization, features of argumentative writing
Writing tasks	Classroom exercises + assigned writing topics	Classroom exercises + assigned writing topics
AI-assisted learning	Yes (with ChatGPT)	No (teacher-led classes)
Progress tracking	Yes (writing portfolio)	Yes (writing portfolio)

Table 2: Descriptive statistics for pre-and post-tests scores for both groups.

		Pre-test		Post-test	
	class	M	SD	M	SD
organization	experimental	15.39	3.22	16.35	3.51
	control	15.65	3.34	15.96	3.09
content	experimental	14.80	3.79	18.56	3.58,
	control	15.62	3.68	16.67	3.71
Language use	experimental	14.78	3.21	21.51	3.17
	control	14.53	3.16	17.35	3.84
Overall writing	experimental	46.46	14.32	63.72	15.21
	control	46.95	16.71	55.45	15.98

reinforcing the reliability of the scoring method employed in the study.

4 RESULTS AND DISCUSSIONS

As shown in Table 2, descriptive statistics were calculated for the participants' scores on pre- and post-tests of the dependent variables in both the experimental and control groups. The overall writing mean score of the experimental group increased from 46.46 (SD = 14.32) on the pre-test to 63.72 (SD = 16.71) on the post-test, while the pre-test mean score of the control group increased from 46.95 (SD = 17.26) to 55.45 (SD = 15.98) on the post-test. As for organization, the pre-test mean score for experimental group (M = 15.39, SD = 3.22) was slightly lower than the control group (M = 15.65, SD = 3.34). In comparison, the mean score of organization post-test for the experimental group (M = 16.35, SD = 3.51) was higher than the control group (M = 15.96, SD = 3.09). As regards to the content, the mean score for experimental group on the pre-test (M = 14.80, SD = 3.79) again was slightly lower than the control group (M = 15.56, SD = 3.58). Nevertheless, the organization post-test reveals that the mean score for the experimental group (M = 18.56, SD = 3.58) was substantially higher than the control group (M = 16.67, SD = 3.71). Concerning language use, the pre-test mean score for experimental group (M = 14.78, SD = 3.21) was slightly higher than the control group (M = 14.53, SD = 3.16). However, for language post-test, the mean score for the experimental group (M = 21.51, SD = 3.17) was significantly greater than the control group (M = 17.35, SD = 3.84).

After that, a series of ANCOVAs were conducted to investigate the distinctions between the experimental and control classrooms and their effects on the post-test scores of students' writing tests while controlling for the pre-test scores as a covariate in the analysis. Before conducting the ANCOVA, preliminary assessments like examining normal distribution, linearity, equality of variances, homogeneity of regression slopes were carried out to verify the fulfillment of essential assumptions. The results of the ANCOVA for the two groups' global writing proficiency are presented in Table 3. Statistically significant differences were observed between the post-test scores of global writing in the two groups [$F(1, 50) = 15.32$, $p = 0.002$, partial eta squared = 0.21] after controlling for the pre-test scores of writing. The ANCOVA results in Table 3 indicate that the experimental classroom exhibited significant higher levels of global EFL writing compared to the conventional classroom. This implies that ChatGPT-assisted learning was effective in enhancing the students' overall writing proficiency.

In order to assess the effect of ChatGPT integration on the writing sub-scales, three additional ANCOVAs were performed. The results in Table 4,5,6 show that there is a significant effect of group on the organization, content language use respectively, providing evidence that ChatGPT integration has a positive effect on enhancing the sub-scales of writing, and this effect is statistically significant even after controlling for the pretest score.

Based on the above-analyzed descriptive statistics and ANCOVA, this study suggests that ChatGPT-assisted writing instruction significantly contributed to enhancing overall writing performance and its sub-scales, including content, organization, language use.

Table 3: Results of ANCOVA on overall writing proficiency

Source	Type III sum of squares	Df	Mean square	F	Sig	Partial eta squared
Pre writing	3265.365	1	3265.365	40.285	0.000	0.345
Group	1021.301	1	1921.301	15.321	0.002	0.210
Error	4318.621	50	60.115			

Table 4: Results of ANCOVA on organization

Source	Type III sum of squares	Df	Mean square	F	Sig	Partial eta squared
Pre writing	350.342	1	350.342	140.315	0.000	0.635
Group	89.326	1	89.326	35.324	0.004	0.410
Error	118.141	50	4.145			

Table 5: Results of ANCOVA on content

Source	Type III sum of squares	Df	Mean square	F	Sig	Partial eta squared
Pre writing	365.314	1	365.314	40.285	0.000	0.545
Group	51.541	1	51.541	12.321	0.003	0.224
Error	218.125	50	6.125			

Table 6: Results of ANCOVA on language

Source	Type III sum of squares	Df	Mean square	F	Sig	Partial eta squared
Pre writing	325.215	1	325.215	240.185	0.000	0.735
Group	86.301	1	86.301	55.431	0.002	0.420
Error	43.665	50	0.845			

Therefore, it can be concluded that the integration of ChatGPT in English writing course had a positive impact on various writing components and can be considered as an effective approach to enhance students' writing proficiency.

5 CONCLUSION

By employing a pre-test and a post-test with both an experimental group and a control group, the present study sought to investigate the effect of ChatGPT integration in an English writing course on writing proficiency of Chinese EFL learners. The results indicate that the integration of ChatGPT in English writing course significantly improved writing proficiency in the experimental group. The results could offer insights into the exploration of innovative teaching practices and technology-driven language learning programs, contributing to the enhancement of writing skills among Chinese EFL learners. Furthermore, these findings might carry significant pedagogical implications for language educators and educational institutions. Educators should explore ways to incorporate ChatGPT into the curriculum, leveraging its learning-enhancing benefits rather than succumbing to concerns about its potential disruption to traditional teaching mode.

However, it is important to note that this study only represents an initial exploration into the application of ChatGPT in English classrooms for EFL, aiming to assess its potential in enhancing English writing proficiency. Several limitations in the present study should be acknowledged. Firstly, the sample size was relatively small, and future research should extend a larger sample size to increase the generalizability of the findings. Secondly, the study was conducted over a brief time period, and future longitudinal studies of ChatGPT integration on writing skills should be conducted to track the long-term impact of ChatGPT on language learning outcomes. Lastly, greater attention should be given to preventing the misuse of AI tools, and the development of a clear application protocol is essential to ensure the responsible and effective use of this technology.

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