



Investigating the Efficacy of Interaction and Feedback in AIGC-Embedded Chinese as a Foreign Language (CFL) Writing Instruction

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Abstract. This study, targeting advanced Chinese as a foreign language learners (CFL) in colleges, employing qualitative and quantitative research methods to explore the types and effects of teacher-student interactions and feedback in writing instruction assisted by Artificial Intelligence Generated Content (AIGC). A 32-lesson action research project on AIGC-assisted writing instruction was conducted with a class of foreign students at an advanced proficiency level in Chinese. The results indicate that AIGC-assisted writing tools significantly improve students' writing abilities. Moreover, the teacher-student interaction and feedback mechanisms in the human-computer collaborative teaching environment exhibit characteristics of immediacy, personalization, and complementarity, which effectively contribute to the enhancement of students' writing skills. This study provides a reference for Chinese language education targeted at foreign students and promotes the innovation and application of educational technology.

Keywords: AIGC-Embedded Instruction; Interaction and Feedback; Writing; Chinese as a Foreign Language

1 Introduction

As globalization advances further, there has been a growing demand for advanced Chinese writing skills tailored to meet the professional needs of various sectors, particularly in the realms of business cooperation and communication. However, traditional Chinese writing instruction often encounters challenges, notably inadequate teacher-student interaction and delayed feedback, which undermine the efficacy of the teaching process. In recent years, the rapid evolution of artificial intelligence technology has led to the gradual integration of AIGC technology into the field of education, thereby presenting fresh opportunities for enhancing Chinese writing instruction. This study is designed to delve into the application effects of AIGC in Chinese writing teaching, with a particular focus on its influence on teacher-student interaction and feedback mechanisms, through a series of teaching experiments and action research endeavors. By doing so, we aim to contribute to the understanding and improvement of Chinese writing instruction in the digital age.

2 Literature Review

The application of AIGC technology in the educational domain has gained increasing popularity, as it possesses the capability to generate personalized learning content and provide tailored feedback based on students' individual learning needs [1]. This tailored approach has been shown to significantly enhance the effectiveness of teaching [2]. In the realm of writing instruction, researchers have explored the integration of AIGC technology into the classroom setting, aiming to augment students' writing proficiency and creativity [3].

Despite these advancements, there remains a notable gap in the literature concerning the impact of AIGC technology on teacher-student interaction and feedback mechanisms. While studies have investigated the use of AIGC in enhancing learning outcomes, they have largely overlooked its potential to reshape the dynamics of the teaching-learning process, particularly in terms of enhancing communication and providing timely, constructive feedback [4][5].

Consequently, this study endeavors to address this research gap by providing a comprehensive exploration of the application effects of AIGC in Chinese writing teaching. Specifically, it aims to investigate how AIGC technology influences teacher-student interaction and feedback mechanisms, offering both theoretical insights and practical guidance for the innovation and improvement of Chinese writing instruction in the digital age.

3 Research Methodology

3.1 Research Questions and Hypotheses

This study aims to address the following three central issues:

1. The impact of AIGC-assisted writing tools on the effectiveness of Chinese writing instruction.
2. The distinctive characteristics of teacher-student interaction and feedback mechanisms within a human-computer collaborative teaching environment.
3. The effectiveness of these characteristics in fostering students' writing improvement.

Based on these research questions, the following hypotheses are proposed:

Hypothesis 1: The implementation of AIGC-assisted writing tools significantly enhances students' writing skills.

Hypothesis 2: The interactive feedback mechanism between teachers and students within a human-computer collaborative teaching environment effectively promotes the improvement of students' writing skills.

By examining these hypotheses, this study seeks to contribute to the understanding of how AIGC technology can be leveraged to optimize Chinese writing instruction and enhance student learning outcomes.

3.2 Research Methodology and Process

This study employs a mixed-methods approach, combining both qualitative and quantitative research methodologies. The qualitative research methods utilized include the action research method, observation method, interview method, case study method, and text analysis method. The study targets advanced Chinese language learners among international students at a vocational college, with a sample size of 60 students divided into two groups of 30 each. The grouping is randomized, and all groups are taught by the same instructor. Three researchers are responsible for conducting observations and other data collection activities.

The study leverages AI intelligences to provide generative feedback on students' writing assignments. A quasi-experimental design is adopted, featuring pre- and post-tests for both the experimental and control groups. Over a span of 32 classes of writing instruction, AI intelligences are integrated into the review process of student work. Each time assignments are submitted by students in the experimental group, the AIGC tool promptly offers feedback, such as grammar checking and vocabulary recommendations. Simultaneously, the teacher provides personalized guidance and suggestions based on the AIGC tool's feedback and the students' homework. The teacher further analyzes students' assignments and iteratively improves the content and format of feedback through interviews and observations. In contrast, students in the control group submit their assignments in the traditional manner, which are then corrected and provided with feedback by the teacher in a standardized way.

To collect comprehensive data, the study utilizes questionnaires, semi-structured interviews, and classroom observations. Questionnaires are administered to assess students' acceptance and satisfaction with AIGC-assisted writing tools. Interviews are conducted to gain deeper insights into students' and teachers' perceptions of and suggestions for AIGC-assisted writing tools. Classroom observations are used to document and analyze the characteristics of student-teacher interaction and feedback mechanisms within the human-computer collaborative teaching environment.

4 Results and Analysis

4.1 Quantitative Data Analysis

Prior to and subsequent to the conclusion of the experiment, the students' writing proficiency was assessed utilizing the "Writing Level Assessment Scale" alongside a standardized writing test. The pre- and post-test scores for both the experimental and control groups were meticulously collected and analyzed using statistical software. The reliability of the pre- and post-test scores in this study was deemed satisfactory, with a Cronbach's alpha coefficient ($\alpha=0.903$). Additionally, the scores of both tests for both groups adhered to normal distribution.

Prior to the implementation of the experimental intervention, a baseline comparison was established between the experimental and control groups through a pre-experimental test. The results of the data analysis from this pre-test indicated no statistically significant difference in the students' test scores between the two groups, as evidenced

by a t-value of 0.596 and a p-value of 0.552, which exceeded the conventional significance threshold of 0.05.

However, upon the completion of the experimental intervention, a post-experimental test was conducted to assess the impact on the students' writing achievement. The analysis of the post-test data revealed a notable disparity in the mean writing achievement scores between the experimental and control groups. Specifically, the experimental group attained a mean score of 68.53, with a standard deviation (SD) of 17.79, suggesting a high level of performance consistency among the participants. Conversely, the control group's mean score was substantially lower, at 55.89, with an SD of 16.07, indicating a more variable range of performance.

A statistical comparison of the mean scores between the two groups was further conducted using an independent-samples T-test, which confirmed the significance of the observed difference. The obtained t-value was 4.75 ($n=30$), and the p-value was less than 0.001, indicating a highly statistically significant difference favoring the experimental group. These findings imply that the experimental intervention had a positive and measurable impact on the students' writing achievement, as evidenced by the substantial increase in their mean scores compared to the control group.

These results suggest that the writing proficiency of the students in the experimental group improved significantly during the experimental period, whereas the improvement among the students in the control group was relatively modest. Consequently, these findings indicate that the AIGC-assisted writing tool exhibits significant advantages in enhancing students' writing skills.

4.2 Qualitative Data Analysis

This study examines the performance of students and teachers within both the experimental and control groups during the teaching and learning process. Semi-structured interviews were conducted to gather insights on the teacher-student feedback process, and textual analyses were performed on students' assignments, teachers' feedback, and students' subsequent re-feedback texts.

During the interviews, both teachers and students indicated that the AIGC tool offers immediate feedback, enabling students to correct mistakes promptly. Teachers can then provide targeted guidance and suggestions based on the feedback generated by the AIGC tool and the students' assignments. It was emphasized that both the AIGC tool and teacher feedback are indispensable components of the feedback process. Traditional teacher-student interactions and feedback possess characteristics of humanization, flexibility, and emotionality, whereas AIGC feedback exhibits strengths such as immediacy and personalization. The AIGC feedback and teacher feedback complement each other, working synergistically to enhance students' writing skills.

The results of these textual analyses revealed that students in the experimental group demonstrated significant improvements in their writing, particularly in grammatical accuracy and vocabulary richness. Enhancement of grammatical accuracy: Compared to traditional methods, the utilization of AIGC-assisted writing tools aids students in identifying and correcting grammatical errors more effectively. These tools typically provide real-time feedback and suggestions, enabling students to learn from their mistakes

instantaneously. Vocabulary richness: AIGC tools can suggest synonyms, antonyms, and contextually appropriate words, thereby encouraging students to expand their vocabulary. This not only elevates their writing quality but also enhances their overall language proficiency. These findings suggest that the AIGC-assisted writing tool is capable of providing students with effective writing instruction and feedback.

5 Conclusions and Limitations

AIGC-assisted writing tools have the potential to significantly improve students' writing skills, particularly in the areas of grammar and vocabulary. However, their effectiveness is maximized when combined with well-structured human-AI collaborative teaching methods that emphasize meaningful teacher-student interaction. The present study draws the following conclusions:

1) Human-AI Collaborative Teaching: When AIGC tools are integrated into the classroom, they serve as additional resources for teachers. This allows educators to focus more on higher-order thinking skills and the creative aspects of writing, while these tools handle the more mechanical elements of grammar and syntax.

2) Teacher-Student Interaction Model: In a human-AI collaborative teaching environment, the teacher-student interaction and feedback mechanism encompass four primary components:

Student-AI (S-AI): Through interaction with AI systems, students receive personalized learning recommendations and writing revision guidance. This interaction facilitates students' timely understanding of their learning progress and existing problems, thereby enabling them to adjust their learning strategies accordingly.

Teacher-AI (T-AI): Teachers can utilize AI systems to assess students' learning progress and gain insights into the learning pace and needs of individual students. This aids teachers in reflecting on and summarizing their teaching practices, ultimately better catering to students' learning requirements.

Teacher-Student (T-S): Teachers provide emotional support to students, rectify inappropriate information supplied by AI systems, and offer pertinent learning feedback through direct interaction. This kind of interaction fosters the establishment of a positive teacher-student relationship and enhances students' learning motivation and self-confidence.

Student-Student (S-S): Peer evaluations among students, involving mutual critique of assignments, facilitate the consolidation and enhancement of knowledge. This interaction contributes to nurturing students' cooperative spirit and critical thinking abilities.

These four components complement and reinforce each other, forming a virtuous circle within the teaching environment. In this setting, students, teachers, and AI systems actively participate in the teaching process, collectively driving the advancement of education.

3) Optimization of Educational Outcomes: To maximize the benefits of AIGC-assisted writing tools, it is crucial to thoughtfully integrate them into the curriculum. This includes training teachers to effectively incorporate these tools into their teaching

practices and ensuring that students understand how to use them to enhance their learning.

4) Continuous Improvement: As AI technology evolves, so should its utilization in education. Continuous research and development are necessary to improve these tools and ensure they remain relevant and effective in supporting student learning.

However, this study is not without its limitations. Firstly, it primarily utilized a combination of qualitative and quantitative research methods with a relatively small sample size. Secondly, the experimental duration was limited, hindering a comprehensive evaluation of the long-term impacts of AIGC-assisted writing tools. Future research endeavors should strive to augment the sample size, prolong the experimental period, and explore additional potential applications of AIGC technology in the context of Chinese writing instruction.

Acknowledgments

The author would like to express sincere gratitude to the 2024 Research Project of Beijing Information Technology College (Project Number: XY05202410) for generously providing financial support for this research project.

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