

The Influence of Artificial Intelligence Assistance on Writing Capabilities of EFL Learners in Chinese Universities: A Study on Chongqing University of Technology as an Example

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Abstract. With the rapid development of artificial intelligence (AI), its application in education has gradually attracted the attention of the relevant academic circles, especially in the field of language learning. However, the question of how AI can help EFL (English as a Foreign Language) learners, especially in Chinese colleges and universities, is still worth further research. Based on the semi-structured interview method and using Nvivo12 to encode the interview data, 16 EFL students from Chongqing University of Technology were interviewed to explore the influence of AI-assisted English writing on undergraduate EFL learners' writing capabilities. Through conducting consistent data analysis of students of different majors in some dimensions, the study figures out that in the subjective evaluation and cognition, almost all students talk about the positive and negative effects of AI from various perspectives of AI itself and personal changes. However, there are some differences in the results of previous studies, including the focus on the feedback of EFL learners in developing countries.

Keywords: Artificial intelligence, language learning, EFL students, English Writing.

1. Introduction

With the widespread application of artificial intelligence (AI) in various fields, its practice in language learning has received increasing attention from the relevant academic community. According to some researchers, positive views and benefits of artificial intelligence solutions highlight the potential for effective integration into teaching practice [1]. However, solving the technical problem and providing training or support to balance artificial intelligence and human interaction are important for successful implementation [1].

Previous literature has analyzed the impact of AI on language learning. Most scholars use qualitative research methods. From an international perspective, some researchers indicate that AI provides teachers with advantages in planning, implementation, and evaluation [2]. This study also highlights challenges such as limited AI technological capabilities and teachers' lack of technical knowledge [2]. Isabel Pedersen points out that emerging generative AI tools require a cultural adaptation process [3]. In addition, some scholars hope that further research should focus on investigating the effects of AI-generated feedback on native English students [4]. Furthermore, Barrett, A., Pack, A. conclude that all steps in the writing process could be improved [5]. Yet, the question of whether digital acceleration leads people to use automated writing tools for writing remains an unexpected turn in the digital transformation [3].

At present, AI research in the field of English writing is a hot topic. Its application in English writing in non-native English-speaking countries, such as China, is still a difficult problem. English writing is the pain point of Chinese students' second language output, so it is particularly crucial to explore the impact of artificial intelligence on Chinese college EFL (English as Foreign Language) learners' writing. From a domestic perspective, some researchers propose typical behavioral patterns of AI-led, AI-inspired, and AI-guided activities [6], while Guo K & Wang D finds that ChatGPT provides significantly higher feedback on content, organization, and language compared to teachers [7]. Previous scholars have also tried to use homemade chatbots to meet the personalized language learning of students. Liu, C., Hou, J. use a chatbot to show that it significantly improves students'

English writing scores, self-efficacy and self-regulation ability [8]. Moreover, Kai Guo and Danling Li use chatbot creation platforms to show the use of self-made chatbots has a positive impact on students' writing motivation [9].

Nonetheless, previous studies have several limitations. Firstly, existing research does not provide a comprehensive overview of the complex impact of artificial intelligence on English writing. Other related issues still require further exploration. Secondly, previous researchers do not use a more diverse range of individuals to validate the effectiveness of AI-assisted language learning across different contexts. Thirdly, early studies rarely provide feedback on EFL learners in developing countries to assess the influence.

Therefore, the study adopts a semi-structured interview method to interview college students from Chongqing University of Technology and explore how to apply artificial intelligence to language learning better. The research aims to understand further how artificial intelligence assistance affects the writing skills of college students and how it can be better integrated into language learning activities.

2. Research Methods

2.1. Research Design

Hu Yu and Lu Honglei indicate that a semi-structured interview is a commonly used method in qualitative research [10]. It combines empirical research and interpretivism and emphasizes the importance of empirical research. Then, it provides important theoretical methods [10]. Zhang Chan points out that grounded theory, as a qualitative research method, "fills" the awkward gap between theoretical research and empirical research [11]. It becomes a basic paradigm of qualitative research, gradually penetrating many disciplines of social science research [11]. Therefore, this study adopts the semi-structured interview method to interview 16 EFL learners from Chongqing University of Technology to understand the students' views on AI-assisted English writing and deeply explore their specific feelings in the process of AI-assisted language learning.

2.2. Interviewee Selection Principles

The object of this study is located in Chongqing, a new first-tier city in China. With Chongqing University of Technology, a general university of science and technology, as the specific selection site, and 15 weeks in the second semester of 2023-2024 as the reference period. 16 undergraduate students (including 2024 graduates) meeting the following conditions are selected for interview:

(1) The content of offline classroom learning or independent learning after class must include writing.

(2) No less than 4 class hours per week for students' English public or professional courses in offline classes.

(3) Students who study English independently after class should study for no less than 4 hours per week.

(4) Participate in interviews voluntarily and provide rich insights.

One of the conditions (2) and (3) can be satisfied. At the same time, the selection covers students of different grades, from freshmen to seniors. In terms of major selection, this research tries to meet the principle of diversity, at least for students covering engineering and management. At the same time, students majoring in English must be selected.

The basic information of the 16 interviewees is shown in Table 1 below:

Table 1. Basic information of interviewees

Name	Grade	Major	English Learning method	Weekly learning hours	CET4	CET6	TEM4
Student A1	Junior	Land Resource Management	Independent learning after class	8 hours	Pass	Pass	Not Applicable
Student A2	Junior	English	Offline Classroom Learning	12 class hours	Pass	Pass	Not pass
Student A3	Junior	English	Offline Classroom Learning	18 class hours	Pass	Pass	Pass
Student A4	Senior	Electronic Commerce and Law	Independent Learning after Class	7 hours	Pass	Not pass	Not Applicable
Student A5	Sophomore	Bioengineering	Offline Classroom Learning	4 class hours	Pass	Not pass	Not Applicable
Student A6	Senior	Automation	Independent Learning after Class	8 hours	Pass	Pass	Not Applicable
Student A7	Sophomore	Measurement and Control Technology and Instrument	Offline Classroom Learning	4 class hours	Pass	Not pass	Not Applicable
Student A8	Junior	Industrial Engineering	Independent Learning after Class	4 hours	Pass	Not pass	Not Applicable
Student A9	Junior	English	Offline Classroom Learning	20 class hours	Pass	Pass	Pass
Student A10	Senior	Big Data Management and Application	Independent Learning after Class	4 hours	Pass	Not pass	Not Applicable
Student A11	Sophomore	Administration Management	Offline Classroom Learning	4 class hours	Pass	Not pass	Not Applicable
Student A12	Freshman	Intellectual Property	Offline Classroom Learning	4 class hours	Pass	Not pass	Not Applicable
Student A13	Junior	English	Offline Classroom Learning	12 class hours	Pass	Pass	Pass
Student A14	Sophomore	Business Administration	Offline Classroom Learning	4 class hours	Pass	Not pass	Not Applicable
Student A15	Junior	English	Offline Classroom Learning	12 class hours	Pass	Pass	Pass
Student A16	Junior	Bioengineering	Independent Learning after Class	4 hours	Pass	Pass	Not Applicable

2.3. Research Process

The research process can be divided into three stages: preparation, implementation, and analysis. In the preparation stage, researchers develop the interview outline (see the appendix) and select interviewees who are willing to express their ideas according to the formulated principles. After interviewees sign consent forms, the interviewer is trained in the interview content and process according to the interview objectives. During the implementation stage, key points of the interview are accurately and comprehensively recorded by Tencent conference screen recording. The interviewees did not express their subjective views and had good psychological qualities. Then, the researchers determine whether to end the interview (if the planned time has exceeded, if all planned questions have been asked, and if the answers are sufficient). During the analysis stage, the researchers check the collected data for completeness and accuracy. After the audio data is converted into written format and saved, researchers use Nvivo12 (Qualitative analysis software) to analyze and interpret the data. By using this tool, each piece of data is assigned a three-level code for reference by Nvivo12. Finally, the interview material is then organized and classified based on audio and note information.

3. Results and Analysis

3.1. Open Coding

As the first step of grounded theory, open coding requires getting rid of the shackles of ideas and building an initial code system [12].

This research uses Nvivo12 software to analyze the interview data. Firstly, researchers analyze the interview text of 16 interviewees and then obtain a total of 75 nodes. This study selects nodes with a frequency greater than or equal to two times. Table 2 shows the examples of these nodes.

Table 2. Open coding examples

Categorization	Typical initial statements (partial)
Can do some basic work well	A11: The article is changed to be more concise, or the title is reduced to how many words it can be completed. A9: AI can give you some inspiration or do some basic work. It can help you be more efficient.
Well-organized and summarized	A3: If I have a few key people who are rather scattered, AI can help me integrate them. A9: AI is strong in collecting information and overall attribution.
Cannot meet the needs well	A13: It cannot reach that word count. A16: You must meet the teacher's requirements, which are not achievable.
Provide false information	A13: Some of the information is fabricated. AI may not have that information and just make it up for you. A15: AI sometimes makes things up. It will fabricate some information. Sometimes, it is hard to find the information and just talk nonsense.
Thinking laziness	A11: The final exam may end with a big question for us to write alone, but I could not write it myself at the time. So, I went to learn from AI. I was thinking about what I had learned, and I felt like I still needed to use AI to write anything myself. A5: Since the launch of AI this year, most people's first thought when faced with a big assignment is to rely on AI.
AI is just an auxiliary tool	A10: The main English learning still relies on memorizing and experiencing on one's own. It is just a tool.
Emergency tools for completing tasks	A3: Because it is a fast-paced life now, many things may be urgent and require you to get them out quickly. At the same time, the workload may still be very large. With the help of AI, efficiency will at least be greatly improved.
Mild dependence	A14: There will be some dependence. After all, there is a lot of homework. Using AI to do some simple things is not a big problem. A16: There is a certain dependency. After all, AI can provide me with a basic framework. After entering university, the support of mobile phones is different from that of high school.
Feel a little anxious	A15: I feel a little anxious. Since our major is English, AI is also widely used in fields such as translation and interpretation.
Do not feel anxious	A4: I do not feel anxious at the moment. Because for me, at most, AI may provide more assistance during the decades I have lived. In the industry that I may engage in the future, I think it is more of a helping role. A5: In our profession, AI may not be particularly noticeable. I feel that things like experiments may not be able to replace humans at present completely, so I do not have this kind of anxiety at the moment.
The enthusiasm for writing has been improved	A11: AI will summarize into a chat box for you to give feedback, which will indeed make you more motivated. For example, asking me to write an organizational plan now may not be as resistant as before.
The translation is generally accurate	A5: The explanation of terminologies is quite accurate. A7: AI gives a lot of meanings, and I think most of them are quite accurate.

Note: A1 represents the first interviewee. The categories before each paragraph are summarized based on the interviewee's original statements.

3.2. Axial Coding

The purpose of axial coding is to explore the logical relationship between various categories in open coding and re-encode them to develop the major categories and sub-categories [12].

In this study, a total of 12 categories are classified and sorted out in the axial coding stage. The following 11 major categories are summarized from the logical relations among the 12 categories: objective result, comparative evaluation, basic work, content defects, requirement deficiency, diversity, authenticity, accuracy, writing enthusiasm, psychological transformation, and subjective initiative (see Table 3).

Table 3. Axial Coding process

Major category	Independent category	Connotation
Objective result	Low writing score	The teacher's rating is not particularly high
	High writing score	Being at a mid to high level is better than completing it alone
Comparative evaluation	Better at grammar than myself	Grammar generally does not contain errors
	Better than doing it by myself	It is better than completing it alone
Basic work	Helps check for basic errors	Can help check grammar
	Can do some basic work well	Can do basic work such as reducing the word count of the article
	Well-organized and summarized	AI will do a great job in collecting data and overall attribution
Content defects	General and not specific	The article is written in a hollow and lacks details. The article needs to be improved by oneself
	A wide range of knowledge involved	Any question can be asked and answered
	Repetitive invalid content	Answer some irrelevant nonsense
Requirement deficiency	Cannot meet the needs well	The answer was not entirely based on one's ideas. The word count does not meet the requirement
Diversity	Provide inspiration and ideas	Provide a framework for ideas and inspiration
Authenticity	Provide false information	AI may fabricate some incorrect information
Accuracy	The translation is generally accurate	The explanation of terminologies is quite accurate
	The grammar is relatively accurate	Grammar is generally not wrong
Writing enthusiasm	Do not have much effect on writing motivation	A low professional level will not affect writing enthusiasm
	The interaction is boring	Translation mechanization. No emotions and it is very boring
	The enthusiasm for writing has been improved	Summarize into a chat box format to make oneself more motivated
Psychological transformation	Do not feel anxious	The major is practical, and I do not feel anxious
	Feel a little anxious	AI is widely used in translation, interpretation, and other fields. It brings some anxiety
	Overdependence tendency	Do not know how to do own English homework after class
	Mild dependence	Simple writing can be done with the help of AI, but there may be some dependence
	Thinking laziness	Students with weak self-discipline will become lazier
Subjective initiative	Independent	AI is a tool. Not addicted to using it
	AI is just an auxiliary tool	AI requires humans to work together to complete tasks. Just as an auxiliary tool
	Emergency tools for completing tasks	Many tasks need to be completed in a very short amount of time. Need AI as an emergency tool to complete
	Just an ordinary tool	The knowledge in textbooks is more authentic. Treating AI as just an ordinary tool

3.3. Selective Coding

Selective coding is the further integration and refinement of the content formed by axial coding [12]. One scholar says that identifying the core categories from the main categories can systematically handle the relationships between the categories [12]. Finally, it forms a grounded theory based on various categories [12].

This study creates a selective coding mind map after analyzing the axial coding. It vividly showcases the inherent relationships between various categories and fully demonstrates the impact of artificial intelligence on college students' English writing skills (See Fig. 1).

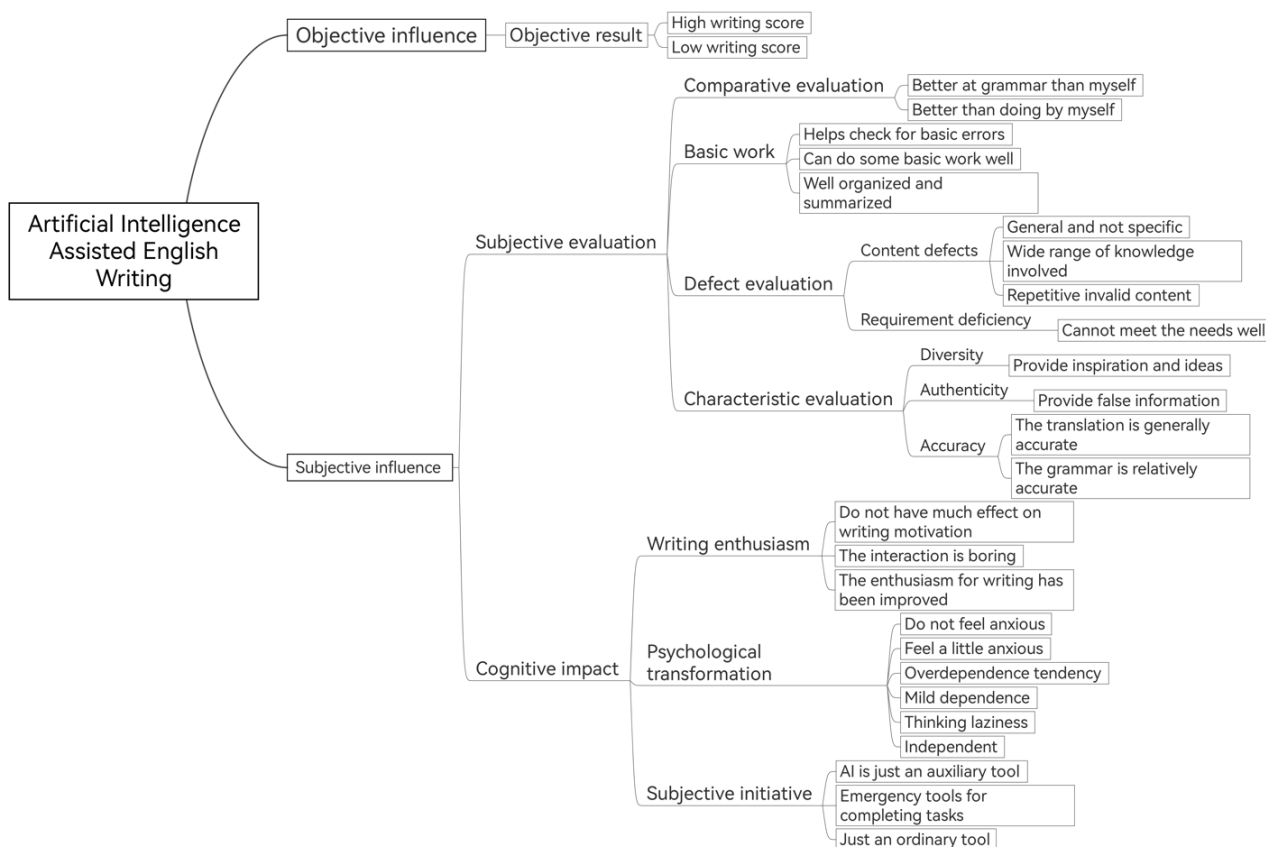


Fig. 1 Selective Coding mind map (picture credit: original)

3.4. Theoretical Saturation Testing

Saturation refers to the situation where additional interviews fail to generate new concepts and categories when a certain number of interviews have been conducted [12]. This study selected 18 nodes during the analysis process and conducted saturation tests on the remaining nodes. It is found that the remaining nodes cannot be reclassified. Therefore, this study ultimately reaches saturation.

3.5. Analysis of Results

After analyzing the comprehensive data provided, the following results emerge that students' use of AI has a significant impact on their approach to English writing. These observations highlight the impact of AI on the learning process, with both favorable outcomes and potential downsides. On the positive side, students generally appreciate AI's ability to facilitate comparison and simplify the writing process. This technique helps to identify grammatical errors and suggest improvements, thereby improving the overall quality of their work. In addition, the interactivity of AI can stimulate creativity and self-expression, enriching the writing experience. When AI is incorporated into the learning process, students generally feel more engaged and satisfied with their writing efforts.

However, an important concern is that AI may lead to misinformation, especially in content generation. It emphasizes the importance of human judgment and critical evaluation when utilizing

artificial intelligence outputs. It emphasizes the necessity of balanced collaboration between humans and artificial intelligence. AI is a supportive tool that can enhance the learning experience while not overshadowing critical thinking skills as an academic foundation.

Another area of concern is that AI may lead to cognitive laziness, especially among students who may overly rely on AI-generated content or advice. This excessive dependence can hinder the development of independent thinking and problem-solving abilities, which are crucial for long-term academic and future development.

4. Discussion and Recommendation

4.1. Cause Analysis

According to the above results, AI has a certain impact on the objective results of English writing, students' subjective evaluation, and subjective cognition when assisting EFL students.

Through interviews, it is found that the comprehensive writing scores of the three interviewees are objectively evaluated by their teachers. Among them, two non-English major students (law and engineering majors, respectively) receive higher scores after interacting with AI for revision. This research result is consistent with the findings of Guo, Q. et al. [13]. The researchers evaluate the effectiveness of using AI feedback for grammar revision in EFL students' writing [13]. The scholars also find a significant decrease in error scores after revision, indicating that AWCF (Automated Written Corrective Feedback) can promote the development of EFL students' writing and improve the quality of their papers [13]. However, another English major student does not receive an ideal score, which is inconsistent with the results of Guo, Q. et al. [13]. Based on the descriptions of other English major students, the researchers infer that the differences in professional courses and the requirements of teachers and assignments are important factors affecting this result. The English major courses are demanding and difficult. As a result, this can lead to differences in the writing scores of students in different majors.

Nearly half of the students have mentioned that AI is better than themselves in certain aspects. Nearly 40% of the students indicated that AI could handle basic tasks well, such as helping them organize and summarize. English major students also add that "AI can also effectively check for grammar errors". Through a deeper understanding of their situations, the researchers find that English majors have a higher prevalence and greater emphasis on grammar knowledge in their classroom content. Therefore, the authors speculate that differences in teaching design may lead to most English majors analyzing the advantages and disadvantages of AI from a grammar perspective.

Compared to non-English major students, English major students are more sensitive to accuracy and authenticity. A scholar has pointed out that ChatGPT itself cannot fully recognize the authenticity of information [14]. It also cannot perceive and understand the logical reasoning process of humans, leading to some reasoning errors [14]. This result is also confirmed in this interview. Almost all English majors mention defects such as AI using false information, fabricating behavior, and inaccurate or inappropriate language.

As for the level of AI writing, almost every interviewee has a negative evaluation. Various majors have mentioned AI-assisted writing with simple and rigid sentences. Students majoring in English and management also point out that AI-assisted writing is not sufficiently academic and specialized. The idea is consistent with the conclusion pointed out by Guo Qian et al. that AI writing tools can only generate mechanical, formulaic text and are unable to handle advanced writing tasks that require generating new insights [15]. The authors speculate that this is related to the disciplinary nature and requirements of liberal arts majors themselves because their English writing tends to encourage students to write standard academic papers related to their professional knowledge.

It is worth noting that Wang Z's theory based on EDT and ICALL suggests that AI-assisted writing significantly improves students' autonomous learning and English writing abilities [16], which is not consistent with the results of this study. Almost no students believe that AI-assisted English writing can improve their writing skills in this study.

Regarding the change in subjective cognition and mentality, only English major students express slight anxiety, which may be related to their concerns and negative attitudes about the possibility of language-related job positions being replaced by AI. In contrast, other major students do not feel anxious. Among students who acknowledge their dependence on AI, engineering and management majors account for over 70%. Based on the interview content, the writers speculate that due to the fact that these two majors have experimental courses, most of which are practical, highly specialized and difficult. Therefore, students in this major tend to rely on AI to solve practical problems and provide ideas for answers.

4.2. Suggestions

Based on research data, the authors propose the following suggestions. From the perspective of students, firstly, students should have a correct understanding of AI at the ideological level and not simply view AI as a competitor. They should not think of AI as just an emergency tool to help them complete necessary tasks and should not believe that AI is omnipotent. They need to view AI tools and use them rationally and objectively. Secondly, Guo Qian et al. mention in their research that the potential uses of AI in academic paper writing include generating writing outlines and providing specific ideas and thoughts [15]. They also include improving literature reading speed and enhancing the quality of paper writing [15]. It can be seen that the use of AI tools can assist English writing at multiple different levels. Therefore, it is crucial to understand and explore the functions of AI tools in these areas, which is a necessary path to achieve good human-machine collaboration. Finally, unleashing human subjective initiative is a key aspect of using AI to assist writing. It is important to be able to effectively utilize AI tools to aid English writing without any dependency tendencies. It requires students to possess unique abilities in critical innovation when using AI tools and to improve instruction accuracy through continuous learning. Concrete and rich human-computer interaction enables AI to understand human language better and meet human needs.

From the perspective of teachers, Stokel-Walker, C.&R. Van Noorden points out that teachers can assign writing tasks with more critical and innovative skills, supervising students to think independently rather than simply completing writing tasks [17]. A9 expressed that their self-esteem and confidence may be affected due to differences in the grading of their assignments by teachers regarding whether to use AI-assisted writing. Therefore, the authors believe that with the rapid development of AI, teachers are one of the main subjects of the new educational relationship. They also need to make relevant efforts. Firstly, teachers can use AI tools to understand the professional knowledge and research fields in students' articles and reasonably assist students in grading papers. It can increase work efficiency so as to have more accurate judgment and evaluation of students' articles. Secondly, teachers should popularize basic operations related to using AI-assisted writing in the classroom, helping students better utilize AI tools and profit from them. Finally, teachers can design writing tasks to be more challenging and innovative. The evaluation criteria should be more reasonable and fairer [18] to ensure that students do not develop negative emotions such as inferiority, anxiety and passive behaviors such as laziness and excessive dependence.

4.3. Limitations

It should be noted that this study has some limitations. Firstly, the sample selection of this study is limited to the Chinese region, with a focus on EFL students at Chongqing University of Technology. The diversity of the sample and the universality of the conclusions still need to be further explored. Secondly, this study adopts the empirical research method of interview, which obtains and analyzes data through interviews with sample subjects. The research method could be relatively simple and not rich enough.

5. Conclusion

This study analyzes the positive and negative effects of AI-assisted English writing on students in three aspects: objective results, subjective evaluation, and cognitive impact. The key finding is that students generally agree that AI helps improve the overall quality of their work, but excessive reliance can also hinder them from thinking independently. This impact usually comes from changes in AI itself and individuals, and there are certain differences in different professions. This research deeply understands and explores the influence of AI-assisted English writing on students through interviews and data analysis to help new educational entities better utilize AI to assist EFL students in language learning in the future and better adapt to the trends of the times. It also hopes to assist future scholars in related fields.

Nevertheless, this study only investigates basic personal information on interviewees' English proficiency and majors. Other individual differences, such as interviewees' place of origin, interest in a second language, and practical differences, such as the type of AI used, writing content, and evaluation criteria, are not investigated or controlled. The interview results of the research mainly focus on objective outcomes, writing ability, and psychological transformation. Future research should continue to explore other individual factors that further affect the results of AI-assisted second language learning. It should also investigate other aspects of research outcomes further to enhance the scientific basis and efficiency of AI use in this domain.

Authors Contribution

All the authors contributed equally, and their names were listed alphabetically.

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