

Design-Based Research on AIGC-Based Human-Machine Collaborative Strategy for English Reading

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Abstract

This study focuses on the difficulties faced by university students in English reading and aims to design a human-machine collaborative strategy based on generative artificial intelligence technology to assist in improving their English reading skills. Using a design-based research approach, the study investigates the main difficulties and strategies in English reading for university students through a literature review. Based on traditional reading strategies and the performance of AIGC tools, the study designs an AIGC-assisted English reading human-machine collaborative strategy and applies it in real teaching practices. Through three rounds of iterative design and modification, a refined AIGC-based English reading human-machine collaborative strategy for university students was developed. A comparison of pre- and post-tests shows that the strategy can significantly improve university students' English reading levels.

Keywords

Generative Artificial Intelligence, English Reading, Human-Machine Collaborative Strategy

1. Introduction

In the field of higher education, English reading proficiency, as one of the core competencies, has a critical impact on university students' academic development and career planning. Currently, some university students face significant challenges in English reading, and their reading effectiveness is constrained by multiple factors. The rise and development of AIGC technology has provided an innovative path to address these challenges. This technology simulates human creative thinking processes and has the ability to generate multimodal content, offering

personalized and diversified learning support for learners. With its powerful natural language processing, intelligent interaction, and personalized learning support capabilities, AIGC can effectively assist university students in improving their English reading effectiveness.

However, existing studies on AIGC-based human-computer collaborative strategies for English reading in university students are still scarce, especially lacking a systematic design framework and evaluation system. Therefore, it is necessary to conduct in-depth research to develop an AIGC-based human-computer collaborative strategy for university students' English reading and systematically evaluate its effect on enhancing students' reading abilities. This study first reviews the current status of university students' English reading and the existing reading strategies. It then uses a design-based research approach and interviews to explore the human-computer collaborative English reading strategy supported by AIGC. The aim is to provide precise and personalized guidance for university students' English reading process and offer a new theoretical perspective and practical path for optimizing English reading teaching practices.

Currently, university students who are non-English majors face shortcomings in their English learning process. Research findings show that most students lack the correct reading skills and strategies for English reading. They often encounter problems such as encountering too many unfamiliar words, overly complex sentence structures, or difficult grammar, which leads to difficulties in comprehension and hinders reading progress. Moreover, students often take notes mechanically and randomly during English reading and rarely review their weak language knowledge after class. Many non-English major students, when doing reading comprehension or reading test questions, seldom mark the original text or do so inaccurately, relying on subjective guesses to select answers. Insufficient English reading ability lowers students' motivation and interest in learning English and even causes English learning anxiety, negatively affecting their English reading. Additionally, teaching content is outdated and lacks real-world examples and application scenarios related to the development of the times, which makes it difficult to stimulate students' interest and creativity in learning (Kim, 2022).

Learning strategies can effectively help students in their English learning. Especially in the current technological era, teachers using relevant internet technologies in teaching can enrich English reading instruction, alleviating students' learning anxiety (Dang, 2024). Existing studies have shown a significant positive correlation between students' English reading levels and the learning strategies they use, and teaching reading strategies is an effective teaching method (Li & Gan, 2022). Oxford (1990) proposed a comprehensive learning strategy system. Based on the relationship between learning strategies and language information, learning strategies can be divided into two major categories: direct strategies and indirect strategies, which are further refined into six subcategories. Some scholars have proposed problem-solving strategies to improve students' academic performance in English exams (Shang & Ma, 2024). However, the effectiveness of dif-

ferent learning strategies varies (Qi, 2022). Furthermore, the selection of English learning strategies is influenced by various factors such as English proficiency, learning attitudes, academic majors, as well as external factors like learning environments and family background (Vargas, 2022).

Integrating artificial intelligence into English reading strategies is expected to improve students' English reading ability. According to the human-computer collaborative learning theory, generative artificial intelligence can effectively promote students' cognitive development and abilities (Joo et al., 2000). Continuous interaction between students and machines can enhance students' intelligence, motivation to learn, and self-efficacy (Gu, 2025). Unlike conventional learning methods, human-computer collaborative learning is characterized by diversity (Wang, 2025). Generative artificial intelligence can assist or replace humans in creating vast amounts of high-quality content faster and at a lower cost based on user-provided prompts (Wang et al., 2023). In the educational field, AI tools not only provide automated answers and support to students' questions but can also automatically extract and categorize related knowledge points and application scenarios, providing corresponding answers and explanations. AI plays a unique role in many teaching scenarios, such as homework grading, distance education, and self-directed learning (Yeh, 2024). Furthermore, large language models can serve as language partners for students and generate content in themes and styles based on students' interests, making interactions more engaging and participatory, effectively improving students' critical thinking skills and creativity (Chen, 2024). However, in the process of human-computer collaborative learning, it is also necessary to avoid its drawbacks, such as preventing students from becoming overly dependent on machines and ensuring that machines do not undermine students' autonomy, which could even hinder the development of their higher cognitive abilities (Li, 2025).

2. Research Design

2.1. Research Subjects and Research Questions

This study aims to explore the impact of the AIGC-based human-computer collaborative strategy on university students' English reading. Therefore, 30 university students from different schools and majors were recruited for this study. These students' English proficiency levels varied based on their scores in the College English Test (CET-4 and CET-6). All the recruited volunteers participated in this study and received the teaching intervention of the human-computer collaborative strategy, which included the use of intelligent auxiliary tools and online learning platforms.

This study seeks to answer the following specific questions:

- 1) How can an AIGC-based human-computer collaborative strategy be designed for university students' English reading?
- 2) Can the AIGC-based human-computer collaborative strategy improve university students' English reading proficiency?

2.2. Research Tools

This study uses a combination of design-based research and interview methods to systematically develop, iterate, and validate the effects of the A AIGC-based human-computer collaborative strategy for English reading. The design-based research method is applied throughout the strategy development process, using a “design-implementation-evaluation-revision” iterative cycle to gradually improve the human-computer collaborative strategy.

Quantitative Data Collection: To comprehensively assess the strategy’s effectiveness, the study uses the Preliminary English Test (PET) as the reading level assessment tool. The pre-test uses the 2020 PET test paper, and the post-test uses the 2022 PET test paper to ensure consistency and timeliness of the evaluation. These two sets of PET authentic examination papers were pre-tested prior to the experiment, and the results indicated that the difficulty level of the test items was appropriately aligned with the participants’ language proficiency.

Qualitative Data Collection: After the experiment, the study uses semi-structured interviews to collect qualitative data, conducting in-depth discussions with the 30 participants to understand their experiences with the human-computer collaborative strategy, the difficulties they encountered, and their perceptions of the strategy’s effectiveness. The interview outline, designed by the researchers, covers aspects such as the ease of strategy operation, the practicality of AIGC support, and the specific improvements in reading ability.

2.3. Research Process

The research is conducted through three rounds of teaching practice. In the first round, the 2020 PET test paper was used as reading material to initially assess the applicability of the first Strategy. In the second round, PET simulation questions were used to optimize the strategy based on the issues identified in the first round, forming the second Strategy. In the third round, the 2021 PET test paper was used to further verify the effectiveness of the third Strategy. The dynamic adjustments of the strategy were made based on the analysis of students’ answer data, strategy usage records, and feedback from each round of practice, ensuring that the strategy meets the practical needs of university students’ English reading.

3. Enactment

3.1. Iteration 1

3.1.1. Design of the English Reading Human-Computer Collaborative Strategy

University students often face various challenges during reading, such as difficulty in comprehension, slow reading speed, low efficiency, and difficulty understanding specialized terminology. These problems typically stem from insufficient vocabulary, weak grammar knowledge, poor reading habits, and distractions. This study first analyzes these difficulties in students’ learning and then designs corresponding human-computer collaborative strategies based on AIGC.

1) Understanding Barriers Caused by Cultural, Regional, and Other Differences

Although university students receive systematic professional knowledge education, they are often limited to a particular field or discipline, with insufficient knowledge of interdisciplinary or cross-domain content. When they encounter reading materials covering a broad range of knowledge, they struggle to understand and grasp the core content and deeper meaning of the text due to a lack of relevant background and prior knowledge. Additionally, due to a narrow knowledge base, students may lack understanding of the professional terms and concepts involved in the subject matter of the article, further increasing the difficulty of reading. AIGC can not only intelligently recommend appropriate reading materials to expand students' knowledge but can also provide explanations of cultural background, helping students understand cultural symbols and customs in the article. Therefore, the design of this study utilizes AIGC for human-computer collaborative learning to help students effectively overcome the barriers caused by narrow knowledge and cultural and regional differences.

2) Vocabulary Barrier Leading to Reading Difficulties

Another reason university students struggle with reading is encountering unfamiliar words. Unfamiliar words refer to those that the reader does not recognize or understand during reading. To overcome this barrier, students need to expand their vocabulary, actively learn specialized terminology, improve their ability to understand context, and become familiar with complex language structures. Moreover, using dictionaries, consulting materials, and practicing vocabulary can help address the reading difficulties caused by unfamiliar words.

Thus, this study designs a strategy that uses AIGC to help university students overcome vocabulary barriers during reading. First, students can use AIGC tools to quickly look up the meaning and usage of unfamiliar words without frequently flipping through dictionaries or other materials. Second, AIGC can provide contextual information about unfamiliar words, helping students better understand their meanings. Additionally, AIGC can generate personalized exercises and example sentences related to the unfamiliar words based on students' learning needs and proficiency levels, helping them deepen their understanding and retention of these words. Through these methods, AIGC can effectively assist students in overcoming vocabulary barriers and improve their reading comprehension.

3) Difficult Sentences Leading to Reading Barriers

Students may encounter difficulties in reading due to complex, long sentences. These long and complex sentences are often structurally intricate, with multiple coordinating or subordinate relationships, making comprehension difficult. These sentences may involve deeply nested clauses and complex grammatical structures, requiring students to have a high level of grammar comprehension and sentence analysis ability.

Thus, this study designs a strategy using AIGC to help students overcome the difficulties posed by long and complex sentences. First, AIGC can provide analysis

and explanations of these sentences, helping students clarify sentence structure and logical relationships. Second, AIGC can generate personalized exercises and explanations on long and complex sentences based on students' learning needs and proficiency levels, helping them strengthen their understanding and application of such sentences. Moreover, AIGC can generate sentences with similar structures but different difficulty levels and lengths, helping students better understand the content. Through these methods, AIGC can effectively assist students in overcoming the barriers posed by long and complex sentences, improving their reading comprehension.

4) Complex Article Structure Leading to Reading Barriers

University students may also face difficulties in reading due to the structure or writing style of an article. If the structure of the article is complex or unclear, students may struggle to understand the logical relationships and organizational framework, leading to comprehension difficulties. Additionally, if the writing style is unfamiliar or hard to adapt to, such as students not being accustomed to reading academic papers or literary works with a particular style, it can also create reading difficulties.

Therefore, this study designs a strategy using AIGC to help students overcome reading difficulties caused by complex article structures or writing styles. First, AIGC can provide analysis and explanations of the article structure, helping students understand the organizational framework and logical relationships of the article. Second, AIGC can generate personalized exercises and explanations on article structure or writing styles based on students' learning needs and proficiency levels, helping them improve their understanding and application of different writing styles. Additionally, AIGC can provide example texts or case studies related to specific writing styles, helping students better understand and adapt to various article structures and writing styles. Through these methods, AIGC can effectively assist students in overcoming barriers related to article structure or writing style, improving their reading comprehension.

5) Inaccurate Information Positioning Leading to Reading Barriers

Another possible reason for students' difficulties in reading is the inaccurate positioning of keywords. When students cannot accurately identify important keywords or phrases in the text, it can lead to misunderstandings or missing crucial information. This may be due to a lack of keyword recognition skills or the occurrence of synonyms or near-synonyms in the text, making it difficult for students to grasp the core meaning of the article.

AIGC can help students overcome the reading difficulties caused by the inaccurate positioning of keywords. First, AIGC can provide personalized guidance and exercises on how to identify keywords, helping students accurately recognize the important keywords in the text. Second, AIGC can generate exercises and explanations involving synonym replacement based on students' learning needs and proficiency levels, helping them improve their ability to recognize and understand synonyms. Through these methods, AIGC can effectively assist students in over-

coming reading difficulties caused by inaccurate positioning of keywords, improving their reading comprehension.

3.1.2. Application of English Reading Human-Computer Collaborative Strategy

All the volunteers involved in the study successfully registered for the AI platform within the designated time and used the English reading human-computer collaborative strategy to complete Parts 1-3 of the reading section of the 2020 PET exam, which included a total of 15 questions. Analysis of the volunteers' learning records revealed that, overall, the first human-computer collaborative strategy was helpful for the students' English reading learning. Most of the participants mentioned that the strategy helped improve their English reading proficiency. For example, Student F said: "I feel that AIGC really helps me learn English, and it also gives me some assistance in English reading."

3.1.3. Analysis of Issues in the English Reading Human-Computer Collaborative Strategy

By analyzing the learning records of volunteers during the learning process, several issues with the first English reading human-computer collaborative strategy were identified. These issues include:

1) Limited Applicability of the AIGC platform. In the collaborative learning scenario, volunteers who interacted with the artificial intelligence (AI) had a certain degree of autonomy in their conversations, with some flexibility in the dialogue. However, it was noted that AIGC failed to fully understand the learners' needs and did not completely capture the individual requirements of the learners, which affected the learning outcomes. For example, Student B mentioned: "After uploading words or parts of the article, AIGC translated it for me without me issuing a command." Student C said: "AIGC also makes mistakes or provides results that are different from what I expected." Additionally, "AIGC has a 2000-word input limit, and I cannot upload an entire long article for collaborative learning."

2) Concentration and Uniformity in the Strategies Used by Volunteers. Almost all volunteers made errors related to "incorrect or inaccurate information positioning," resulting in the use of nearly identical strategies. This suggests that there was a lack of diversification in the approach adopted by the volunteers.

3.1.4. Suggestions for Revising the English Reading Human-Computer Collaborative Strategy

Based on the issue analysis and suggestions from the volunteers, the following correction ideas are proposed:

1) Providing More Specific Instructions. When interacting with AIGC, more specific questions will be provided to standardize the language used by volunteers when interacting with AIGC. This ensures that AIGC can assist learning more accurately, making the learning process more efficient.

2) Changing the Collaborative Learning process for incorrect or inaccurate Information. Positioning the original strategy of "sending the question and the key

information you identified to AIGC to determine its correctness, and writing out synonyms for the keyword” will be adjusted. The revised strategy will be: “Send the part of the article containing the keyword to AIGC, let it generate questions based on the topic, and write out synonyms for the keyword.”

3.2. Iteration 2

3.2.1. Design of the English Reading Human-Machine Collaborative Strategy

Based on the first version of the English reading human-machine collaborative strategy, modifications were made in the second round according to feedback from the first round of teaching implementation and the students’ responses. The second iteration incorporated a collaborative learning process to address reading obstacles caused by unfamiliar phrases. Even though students may recognize individual words, they might still struggle with unfamiliar phrases when these words are used in combination with others. To address this issue, an appropriate reading strategy was found, which mirrors the strategy used for unfamiliar vocabulary obstacles. The strategy involves “requesting AIGC to generate several sentences using the phrase, and then inferring the meaning of the phrase based on the context until the correct meaning is guessed.”

3.2.2. Application of the English Reading Human-Machine Collaborative Strategy

During the designated time, the volunteers completed the English reading tasks using the human-machine collaborative strategy. Overall, this strategy helped improve their English reading level. Analysis of the volunteers’ learning outcomes indicated that most of the participants found the strategy helpful for their reading progress. For example, Student H mentioned: “It was very helpful for my reading.”

3.2.3. Analysis of Issues in the English Reading Human-Machine Collaborative Strategy

All volunteers successfully completed the reading tasks within the designated time and recorded their experiences using the collaborative strategy. Compared to the first round, fewer suggestions or feedback were provided by learners in this round. The main feedback included:

1) Effectiveness of AIGC prompts: The prompts were helpful, but some still need refinement. For example, Student C noted: “In the first round, I wasn’t sure about how to operate, and sometimes the results did not meet my expectations. Now, with more specific prompts, it feels more effective.”

2) Underutilization of certain strategies: The first strategy, “Understanding barriers due to cultural and regional differences,” and the fifth strategy, “Complex article structure,” were not utilized by the students in either round. For instance, Student I remarked: “Most of the mistakes I encountered were due to unfamiliar words and inaccurate positioning. These have been the main issues in my previous reading exercises as well.”

3.2.4. Suggestions for Revising the English Reading Human-Machine Collaborative Strategy

Based on the analysis of the issues and suggestions provided by the volunteers, the following revisions were proposed:

- 1) Remove the first and fifth strategies: In the actual reading process, there were no issues arising from cultural differences or complex article structures. Therefore, these two strategies were considered unnecessary and were removed to make the collaborative learning process more focused, quicker, and more efficient.
- 2) Change the method for identifying the cause of errors: Instead of relying on AIGC to identify the reasons for errors in questions, students should first determine the cause themselves and compare their assessment with AIGC's judgment.
- 3) Refine AIGC prompts: When guessing the meaning of a word in the first strategy, the remarks were refined to: "Please use *** to create three sentences for me." The next step in the questioning process should be: "I guess *** means perfect. Is this correct? If I guessed wrong, please provide three more sentences without revealing the correct answer."

3.3. Iteration 3

3.3.1. Design of the English Reading Human-Machine Collaborative Strategy

In the previous applications of the human-machine collaborative strategies, volunteers did not encounter comprehension barriers due to cultural differences, nor did they find that complex article structures posed significant difficulties. Therefore, it was concluded that these two issues were not the main obstacles to reading. As a result, it was suggested to remove the strategies targeting "cultural and regional differences" and "complex article structures" to enhance the precision, speed, and efficiency of the collaborative learning process. In future learning sessions, if related issues arise, participants can treat AIGC as a reference resource and use the tool independently, simplifying the problem-solving process.

3.3.2. Application of the English Reading Human-Machine Collaborative Strategy

During the designated time, the volunteers completed the English reading tasks using the human-machine collaborative strategy. Overall, the volunteers' completion rate was high, and their word-guessing abilities improved. The strategy proved helpful in enhancing their English reading level. For example, Student A mentioned: "This strategy feels the most practical and easy to use, providing me with a lot of help when I need it."

3.3.3. Effectiveness Analysis of the English Reading Human-Machine Collaborative Strategy

- 1) Overall high completion rate: All volunteers completed the reading tasks within the designated time and engaged in collaborative learning with AIGC. In this round, there were almost no suggestions for changes.
- 2) Improved word-guessing ability: In this iteration, when students encoun-

tered unfamiliar words or phrases, their efficiency and accuracy in using guessing strategies improved. Most students were able to guess the correct meaning within two rounds.

3) Overall improvement in English reading level: Based on the analysis of volunteers' learning records, most participants mentioned that the strategy significantly helped improve their English reading abilities. For instance, Student A commented: "This strategy feels the most useful, and it was very convenient to operate, providing me with plenty of the help I needed."

4. Research Results and Data Analysis

4.1. The AIGC-Based Human-Machine Collaborative Strategy Significantly Improved University Students' English Reading Level

The research data includes 15 English reading questions, and the performance of university students before and after implementing the human-machine collaborative strategy was recorded and analyzed. The normality of the data was tested using the Shapiro-Wilk test to determine whether parametric or non-parametric statistical methods should be used. Based on the distribution characteristics of the data, paired sample t-tests were used to compare the differences in mean scores between the pre-test and post-test, thereby evaluating the effectiveness of the learning strategy. As shown in **Table 1**, the average score in the pre-test was 11.143 (standard deviation = 1.351), while the average score in the post-test was 11.929 (standard deviation = 1.542). This indicates that the students' average score improved after implementing the strategy.

For small sample sizes (less than 50), the Shapiro-Wilk test is recommended. As shown in **Table 2**, the results of the Shapiro-Wilk test for both pre-test and post-test scores indicate that the data follow a normal distribution ($p > 0.05$), allowing the use of paired sample t-tests.

As shown in **Table 3**, the students' scores after implementing the human-machine collaborative strategy were significantly higher than those before (t (df)

Table 1. Basic indicators.

Name	Sample Size	Min Value	Max Value	Mean	Standard Deviation	Median
Pre-test Score	30	8.000	13.000	11.143	1.351	11.000
Post-test Score	30	9.000	14.000	11.929	1.542	12.000

Table 2. Normality test analysis results.

Name	Sample Size	Mean	Standard Deviation	Skewness	Kurtosis	Kolmogorov-Smirnov Test		Shapiro-Wilk Test	
						<i>D</i>	<i>p</i>	<i>W</i>	<i>p</i>
Pre-test Score	30	11.143	1.351	-0.736	0.890	0.172	0.314	0.920	0.217
Post-test Score	30	11.929	1.542	-0.449	-0.710	0.185	0.217	0.933	0.336

* $p < 0.05$, ** $p < 0.01$.

Table 3. Paired t-test analysis results.

Name	Pair (Mean $\pm$ SD)		Difference (Pair 1-Pair 2)	<i>t</i>	<i>p</i>
	Pair 1	Pair 2			
Post-test Score Pair Post-test Score	11.14 $\pm$ 1.35	11.93 $\pm$ 1.54	-0.79	-2.242	0.043*

* $p < 0.05$, ** $p < 0.01$.

= t value, $p < 0.05$). This statistical significance indicates that the human-machine collaborative strategy effectively improved students' English reading level.

The data analysis above shows a significant change in university students' performance on the English reading questions before and after implementing the human-machine collaborative strategy. The paired sample t-test revealed that the average score after the implementation of the strategy was significantly higher, indicating that the human-machine collaborative strategy had a significant effect on improving students' English reading level. This result can be attributed to the effectiveness of the strategy and the learning advantages brought by the human-machine collaborative learning environment, such as personalized learning and timely feedback. Therefore, this research provides important guidance for educational practice, suggesting that the introduction of human-machine collaborative strategies in English reading teaching can effectively enhance students' learning outcomes.

4.2. Analysis of the Reasons for the Improvement in University Students' English Learning Ability with AIGC Assistance

After the experiment, interviews were conducted to explore the reasons behind the improvement in university students' English proficiency through the AIGC-based English reading human-machine collaborative strategy. The analysis of the interview data revealed the following main reasons, explaining why the strategy significantly enhanced students' English learning abilities.

4.2.1. Optimization of "Vocabulary and Phrase Barriers"

Vocabulary and phrase barriers are the primary factors hindering reading fluency. The core issue lies in the learners' understanding of vocabulary and phrases detached from specific contexts, leading to passive memorization that cannot be converted into practical application skills. This strategy emphasizes inferring the meanings of unfamiliar words and phrases through context and the main idea of the article, which follows the fundamental principle of "contextual understanding" in language acquisition. This encourages learners to grasp the connotations and denotations of vocabulary and phrases within dynamic textual contexts rather than memorizing their superficial meanings in isolation. This method not only deepens the recognition of vocabulary and phrase usage scenarios but also cultivates learners' ability to infer meanings actively based on contextual clues, laying a foundation for handling unfamiliar vocabulary in subsequent readings.

The integration of AIGC further strengthens the effectiveness of this process. By generating multiple example sentences containing target vocabulary or phrases, AIGC provides learners with rich contextual samples. Through repeated “inference-validation” cycles, learners gradually master the collocation rules, semantic emphasis, and cultural connotations of vocabulary and phrases, effectively avoiding understanding biases caused by “multiple meanings of words” or “rare meanings of familiar words.” This human-machine collaborative model transforms vocabulary and phrase learning from static memorization to dynamic understanding, significantly enhancing learners’ ability to handle vocabulary barriers during reading and optimizing overall reading performance.

4.2.2. Optimization of “Long and Difficult Sentence Understanding”

The difficulty in understanding long and complex sentences primarily stems from learners’ inadequate ability to analyze complex sentence structures, making it difficult to extract core information from the convoluted syntactic elements. This strategy introduces the method of analogy learning, guiding learners to compare and analyze sentences with similar structures, which helps decompose sentence complexity and focus on the internal structural rules. For example, starting with simple sentence structures to understand basic syntactic relationships and gradually transitioning to more complex sentences with multiple clauses, inversions, or omissions, can help learners establish an analytical logic of “structure decomposition-main clause extraction-modification supplementation,” reducing the cognitive load when processing long and complex sentences.

AIGC plays a key supporting role in this process by providing sentences with varying levels of difficulty but similar structures. This ensures that learners of different English proficiency levels can start from an appropriate level and gradually accumulate experience in structure analysis. Learners with a weaker foundation can begin with lower-difficulty sentence structures and gradually accumulate experience, while those at higher levels can challenge themselves with more difficult sentences to deepen their understanding of complex structures. This personalized learning support avoids frustration due to inappropriate difficulty levels and enables learners to develop structural sensitivity to specific sentence patterns through extensive practice, improving their reading speed and accuracy for long and difficult sentences and ensuring the overall improvement of reading levels.

4.2.3. Optimization of “Information Localization Bias”

The accuracy of information localization directly impacts reading efficiency, and the core issue is that learners lack the ability to identify and convert key words, leading to difficulty in quickly locating target content in information-dense texts. This strategy advocates the method of summarizing information and synonym replacement for key words, guiding learners to shift from the traditional word-by-word reading model to a goal-oriented reading mode. This encourages them to clarify their information needs before reading and then accurately locate the information by identifying key words and their synonyms. This process helps culti-

vate learners' ability to filter information, enabling them to quickly identify core information in complex texts and enhancing the specificity and efficiency of their reading.

AIGC's real-time feedback function is invaluable in this process. After learners submit the questions and key information they have identified, AIGC quickly provides feedback on the accuracy of the localization and identifies any biases, such as incorrect keyword selection or overlooking synonym replacements. This immediate feedback allows learners to correct cognitive biases promptly, strengthen their grasp of information-matching rules, and gradually form the habit of precise localization. Particularly in academic reading or exam contexts, this improvement in ability can significantly reduce information retrieval time and optimize reading effectiveness.

4.2.4. Human-Machine Collaborative Model Combines Personalized and Efficient Learning

The limitations of traditional reading strategies often lie in insufficient practice and delayed feedback. The human-machine collaborative model effectively compensates for these shortcomings, forming a closed-loop learning system of "targeted breakthroughs-strengthened training-instant feedback." This strategy combines traditional methods such as context inference and structure analysis with the technological advantages of AIGC, preserving the essential rules of language learning while enhancing learning precision and efficiency through technology. AIGC can generate personalized practice materials based on learners' specific weak points, such as vocabulary understanding biases or long-sentence analysis errors, avoiding the inefficiency of uniform training and ensuring the precise delivery of learning resources.

At the same time, AIGC's immediate feedback mechanism allows learners to verify their understanding and judgments in a short period, promptly correcting errors in cognition and reinforcing correct reading strategies. This model is adaptable for learners of different English proficiency levels: beginners can build confidence through low-difficulty practice and multiple attempts, while more advanced learners can challenge themselves with higher difficulty levels to achieve breakthroughs in their abilities. Human-machine collaboration not only optimizes the training process for specific reading skills but also cultivates learners' active reading thinking, ultimately leading to systematic improvements in reading levels.

5. Discussion and Recommendations

5.1. The AIGC-Based English Reading Human-Machine Collaborative Strategy for University Students

The AIGC-based English Reading Human-Machine Collaborative Strategy for English reading, developed through three rounds of iterative optimization, constitutes a systematic solution targeting the core reading obstacles faced by university students. The central rationale of this strategy lies in integrating traditional reading approaches with the technological strengths of AIGC to construct a col-

laborative human-machine reading framework. This strategy specifically addresses four typical reading difficulties: unfamiliar vocabulary, idiomatic or complex phrases, syntactically challenging sentences, and inaccurate identification of key information during the reading process.

For vocabulary-related reading obstacles, the core issue is insufficient vocabulary, and the strategy emphasizes “contextual guessing,” guiding learners to infer the meaning of unfamiliar words based on context and the main idea of the article, breaking the reliance on mechanical memorization. AIGC acts as a “multi-context provider,” generating multiple example sentences containing target vocabulary, providing rich semantic contexts for learners. This helps learners deepen their understanding of the vocabulary’s connotations, collocation rules, and applicable contexts through the “guess-verify” cycle until the word meaning is accurately grasped.

For phrase-related reading barriers, the issue arises from insufficient accumulation of phrases and a lack of contextual understanding. The strategy follows the same “contextual guessing” logic, emphasizing the need to infer the meaning of phrases in context rather than breaking down individual words. AIGC supports this process by generating diverse examples with target phrases, helping learners understand the fixed collocations, semantic emphasis, and emotional tone of the phrases in a dynamic context, thereby building sensitivity to the context of the phrases.

For the understanding of long and difficult sentences, the issue lies in learners’ weak ability to analyze complex sentence structures. The strategy adopts a “structured analogy” method, guiding learners to compare and analyze sentences with similar structures, stripping away the formal complexity to focus on the inherent structural rules. AIGC, as a “gradient resource generator,” provides sentences with varying levels of difficulty, enabling learners of different English proficiency levels to start from an appropriate level, progressively mastering the logic of “core extraction—modification supplementation” through repeated practice, which helps build sensitivity to specific sentence structures.

For information localization errors, the issue stems from learners’ inability to accurately identify keywords and their synonyms. The strategy emphasizes “keyword focusing,” guiding learners to identify keywords and their synonyms to achieve precise information localization. AIGC acts as a “real-time validator,” evaluating the accuracy of the learners’ keyword selection and providing immediate feedback on deviations, helping learners refine their ability to match and filter information.

5.2. Research Results and Recommendations

This study, through three rounds of iterative design and empirical testing, confirms that the AIGC-based English reading human-machine collaborative strategy can significantly enhance university students’ English reading levels. From the research results, the effectiveness of the strategy is reflected in three dimensions:

First, the strategy directly improves learners' reading fluency and accuracy by addressing four core obstacles—vocabulary, phrases, long, difficult sentences, and information localization. Paired sample t-tests show that learners' post-test scores were significantly higher than their pre-test scores ($p < 0.05$), confirming the substantial improvement in reading ability. Second, the human-machine collaborative model restructured the learning process, with personalized resources provided by AIGC (such as graded example sentences and targeted feedback) compensating for the inefficiencies of traditional “one-size-fits-all” training, ensuring learners at various proficiency levels received appropriate support. Third, the strategy fostered learners' proactive reading and thinking, such as contextual inference, structural analysis, and goal localization, laying the foundation for long-term development of reading literacy.

Based on these findings and reflecting on issues encountered during the practice, the following recommendations are made:

1) In Teaching Practice

Emphasize the teaching of reading strategies with AIGC assistance. Educators should guide learners to understand the internal logic of strategies rather than mechanically applying tools. For example, when learning unfamiliar words, emphasize the “guess-verify” process for cultivating contextual inference skills, avoiding over-reliance on AIGC for direct translation.

Address typical issues encountered during the strategy application process (e.g., ambiguous initial instructions leading to AIGC response deviations). Targeted training should be provided to help learners master effective interaction with AIGC (such as accurately describing their needs and standardizing question formats).

Balance human-machine collaboration with learner autonomy by designing tasks like “self-judging error causes” (as corrected in Iteration 2), preventing over-reliance on technology and ensuring the development of higher-order cognitive skills.

2) In AIGC Tool Optimization

Enhance the platform's adaptation to educational scenarios. The study found that the initial platform had limitations, such as input character limits and misinterpretation of user needs. While switching from the “Wenxin Yiyan” platform to “Xunfei Xinghuo” partly resolved this, further optimization is needed:

Overcome text input restrictions, allowing for full-length uploads to meet real reading scenario demands.

Improve the platform's ability to recognize personalized needs and optimize algorithms to enhance the interpretation of vague instructions, reducing issues like “over-responses” (e.g., automatically translating without receiving instructions).

Add functional modules for strategy adaptation, such as a “structure visualization” tool for long-sentence analysis and a “synonym replacement library” for keyword localization, further improving the tool's efficiency.

6. Limitations and Research Perspectives

Expand the sample size and duration. The current study involved 30 senior-year students, and future research can include learners from different academic years and disciplines, tracking long-term differences in strategy applicability.

Refine the evaluation of strategy effectiveness. Currently, effectiveness is mainly measured through test scores. Future studies can incorporate methods like eye-tracking experiments and think-aloud protocols to explore the impact of the strategy on reading speed, depth of information processing, and other dimensions.

Explore the integration of the strategy with other learning scenarios, such as academic reading and cross-cultural communication texts, to assess the strategy's value in more complex contexts. This would provide more comprehensive empirical evidence for the widespread application of AIGC in language education.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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