

# **Research on AI-Empowered Teaching Design for College English Reading and Writing Courses: Evidence from Non-English-Major Undergraduates at the University of Sanya**

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**Abstract:** Against the backdrop of the rapid development of artificial intelligence (AI), its application in language education has attracted increasing scholarly attention. This study investigates the instructional design and implementation of AI-empowered college English reading and writing courses, taking non-English-major undergraduates at the University of Sanya as the research participants. AI-based tools, including intelligent writing support systems, automated feedback and assessment platforms, and scenario-based simulations generated by DeepSeek, were integrated into course design to construct a technology-enhanced teaching model. A mixed-methods approach was adopted to examine the effects of the AI-supported model on students' English reading comprehension and writing performance. The results demonstrate that the integration of AI technologies comparatively improves learning efficiency and contributes to the development of learner autonomy and classroom engagement. Furthermore, the findings indicate a pedagogical transformation of traditional English reading instruction from a "knowledge transmission-oriented model" to a "competency-oriented workshop," in which students function as active learners, collaborative practitioners, and producers of learning outcomes, while teachers act as facilitators of learning. These findings offer empirical evidence and pedagogical implications for the reform of college English reading and writing instruction in the context of AI-enhanced education.

**Keywords:** AI Empowerment; College English; Reading and Writing Courses; Instructional Design

## **1. Research Background**

In the context of globalization, English has

become one of the core universal languages in higher education. In China, college English courses have long been responsible for enhancing students' comprehensive language abilities, with reading and writing skills being crucial dimensions for language output and thought expression. However, traditional English reading and writing courses face several challenges. For instance, the teaching methods are often conventional, with a focus on teacher-centered instruction, resulting in limited language output from students. There is also insufficient personalized support, which makes it difficult to address the varying abilities of different students. Meanwhile, feedback from teachers tends to be inefficient, with writing corrections taking too long and feedback not being timely enough. Furthermore, there is often a disconnect between what is taught and actual needs, along with rigid organizational structures in teaching.

With the maturation of artificial intelligence technology, machine intelligence has shown great potential in the fields of natural language processing (NLP), intelligent assessment, and personalized recommendations. The "Outline for the Construction Plan of a Strong Educational Nation (2024-2035)" indicates that "efforts should be made to advance the construction of smart campuses and explore effective ways to leverage digital tools for large-scale, personalized education and innovative teaching, actively adapting to changes in learning methods." [1]. Integrating AI with instructional design can not only automate the handling of large-scale reading and writing tasks but also personalize the learning pathways for students. For teachers, this represents an opportunity to step out of their comfort zones and bring the classroom into the real settings. Therefore, the exploration of the application of AI in college English reading and writing courses carries significant practical importance.

## **2. Literature Review**

Scholars have conducted a growing body of research on the integration of AI across various educational domains, including curriculum-based ideological and political education, English textbook development, classroom instructional design, cognitive development, as well as the enhancement of listening, speaking, reading, and writing skills. Since the fall semester of 2023, Tsinghua University has implemented AI-empowered teaching practices in over 200 courses, one key component of which is the use of generative AI to support teaching and learning. This initiative represents a transformative educational practice driven by emerging technologies and reflects a broader shift toward technology-led innovation in higher education.

### **2.1 Applications of Artificial Intelligence in Language Education**

One of the fundamental components of artificial intelligence lies in its generative capability, embodied in generative models and generative AI. In the field of language education, language intelligence, a crucial pathway through which machine intelligence evolves toward cognitive intelligence, is the AI technology most closely aligned with language learning and teaching [2]. By leveraging technologies such as big data and AI, classroom instruction can conduct in-depth analyses of individual students' learning habits, interests, and abilities, thereby providing diversified foreign language learning opportunities as well as personalized learning resources, pathways, and feedback [3]. In recent years, the application of AI in language education has continued to expand. Gaining a more comprehensive understanding of students' learning conditions, tracking their learning dynamics, and enhancing learning experiences have become indispensable elements of the learning process [4]. This trend indicates that teacher–student interaction, student–student interaction, and human–computer interaction have emerged as key focal points in contemporary language pedagogy. Some studies suggest that AI-agent-based writing assistance tools can significantly reduce teachers' workload in grading while increasing students' writing output and opportunities for practice.

### **2.2 Current research on the development of autonomous reading and writing ability in**

### **college English**

Reading and writing competence in college English constitutes a core component of language learning. However, second language writing instruction has traditionally placed greater emphasis on grammatical accuracy and error correction in written language, while comparatively neglecting support for students' expression of ideas within social and communicative contexts [5]. Many scholars therefore stress the significance of interactive training between reading and writing in order to highlight the effective integration of input and output. Nowadays, a growing number of studies have attempted to incorporate technological tools into writing instruction, and the application of technology is expected to become a major research direction in the field of language assessment and, more broadly, in applied linguistics [6]. According to Deci and Ryan's Self-Determination Theory, autonomy is a fundamental psychological need, and genuine intrinsic motivation arises when individuals perceive their actions as self-initiated and self-regulated [7]. This perspective suggests that the cultivation of reading and writing competence is increasingly moving toward agent-based and autonomy-oriented learning models.

### **2.3 AI-Empowered Instructional Design**

Instructional design represents a major challenge for English teachers and serves as the prerequisite and foundation for effective teaching practice. With the rapid integration of technology into education, the use of AI has become an inevitable component of instructional design. Some scholars argue that human–machine collaborative teaching requires the formulation and continuous refinement of efficient and precise instructional design frameworks and teaching plans [8]. Because students are the central agents of instruction, foreign language teaching should organically integrate AI-generated content with classical literary works. Such integration allows educators to capitalize on the efficiency advantages of AI while preserving the depth, aesthetic value, and humanistic richness of literary texts, thereby offering students a more holistic learning experience and avoiding the potential negative impact of overly “machine-like” language on language development [9]. Beyond focusing on instructional content and feedback effectiveness,

researchers have also emphasized the need to provide teachers with guidance, standards, and support for “human–AI co-analysis,” which has become a key concern in the analysis and application of generative AI–based instructional design [10]. In summary, while substantial research has examined AI applications in areas such as automated writing assessment, intelligent reading recommendations, and personalized learning pathway planning, empirical studies that concretely embed AI into course-level instructional design remain relatively limited, particularly among non-English-major undergraduate populations.

### 3. Research Questions and Methodology

#### 3.1 Research Questions

This study aims to explore the practicality of AI technologies in college English reading and writing courses, to construct an AI-empowered instructional model suitable for non-English-major undergraduates, and to examine the impact of AI-supported teaching on students’ reading comprehension and writing ability. In line with these objectives, the following research questions are proposed:

Q1: Does the integration of AI technologies lead to a significant improvement in students’ English reading and writing proficiency?

Q2: Can AI-supported personalized writing feedback enhance students’ writing performance?

Q3: How do students perceive the AI-based instructional model in terms of acceptance and learning experience?

#### 3.2 Research Methods and Procedures

The participants in this study were 137 second-year non-English-major undergraduates from the University of Sanya, drawn from two different majors: Digital Marketing (Class 2401) and Telecommunications Engineering (Class 2401). The Digital Marketing class consisted of 47 students (25 males and 22 females), while the Telecommunications class included 91 students (75 males and 16 females). Both classes used the same textbook, *New College English: Advanced Integrated Course, Book 3* (Ideological and Political Education–Enhanced Edition). The researcher began teaching these two classes in September 2025, adopting an AI-empowered instructional design throughout a 15-week teaching periods.

As the courses taught by the researcher focused on reading and writing, several widely used AI-based learning tools were incorporated into the study. An intelligent writing assessment system ([www.pigai.com](http://www.pigai.com)) was employed to provide automated correction and multidimensional feedback on students’ English compositions. Through a recursive “write–revise–rewrite” process, students were able to continuously refine their texts, while the system’s instant feedback facilitated the development of process-oriented writing awareness. For reading instruction, the intelligent recommendation platform Welearn, an online learning system aligned with the course textbook, was employed to enable teachers to monitor students’ learning progress and outcomes in a timely and intuitive manner. In addition, learners used Deepseek to generate contextualized scenarios or dialogues from the reading texts, reinforcing learning through role-play or storytelling activities. Classroom observation and interviews were also conducted to obtain a more direct and comprehensive understanding of students’ learning processes.

Focusing on the empowering role of AI technologies in college English reading instruction, this study followed a “design–implementation–evaluation–optimization” research framework, with the following steps. First, a needs analysis was conducted through an investigation of the current teaching context to identify key challenges in English reading instruction, such as insufficient student interest, significant disparities in reading proficiency, and limited opportunities for personalized teacher guidance. This analysis helped clarify both the feasibility and necessity of integrating AI into English reading instruction.

The second step involved the design of an AI-empowered reading instruction model. Based on college English curriculum standards and students’ learning characteristics, AI functions such as intelligent content recommendation, learning analytics, and automated feedback were incorporated to construct a technology-enhanced reading teaching model. Instructional components included graded reading material delivery, support for the reading comprehension process, and personalized learning pathway design, emphasizing differentiated instruction and precision teaching.

The third step focused on instructional implementation and classroom practice.

Experimental teaching was conducted in authentic classroom settings, with AI tools supporting students' English reading activities before, during, and after class. Students were guided to engage in autonomous reading, platform-based learning, and deep comprehension tasks, while teachers provided targeted guidance based on AI-generated learning data.

The fourth step entailed teaching effectiveness evaluation and data analysis. Changes in students' reading ability, learning interest, and learning strategies were examined through reading comprehension tests, observations of learning behaviors, and interviews, in order to assess the effectiveness of AI-empowered English reading instruction. It is worth noting that evaluation was not solely teacher-driven; instead, peer assessment principles were adopted, transforming students from passive recipients of assessment into active participants and collaborators in the evaluation process.

Finally, reflection and instructional model optimization were carried out. Drawing on research findings and instructional feedback, the AI-empowered reading teaching model was refined and improved. Transferable teaching experiences were summarized to provide practical references for the further application of AI technologies in English reading instruction. Post-instruction evaluation and reflection thus formed a data-driven closed loop for continuous instructional optimization [11].

## **4. Data analysis and Results**

### **4.1 Improvement in Reading Ability**

This study involved 138 students from two different majors. After a 15-week semester-long implementation of AI-empowered English reading instruction, a comparative analysis was conducted to examine changes in students' English reading proficiency. The results indicate a clear overall improvement in students' reading ability. The average score on the reading comprehension test increased from 62.4 before the intervention to 71.8 after the intervention, representing an average gain of 9.4 points, or approximately 15.1%. This improvement was statistically significant.

A comparison across majors shows similar patterns of progress. Students in Digital Marketing Class 2401 improved their average reading score from 63.1 to 72.6, an increase of

9.5 points, while students in Telecommunications Class 2401 improved from 61.7 to 71.0, an increase of 9.3 points. The comparable gains across the two groups suggest that AI-empowered English reading instruction demonstrates strong applicability and stability across different disciplinary backgrounds.

Further analysis reveals particularly notable improvements in key reading sub-skills, including main idea comprehension, information locating, and inferential reasoning. Specifically, the accuracy rate for information-locating questions rose from 58.2% to 70.4%, while the accuracy rate for inferential questions increased from 55.6% to 68.1%. These gains are closely associated with the AI system's provision of graded reading materials, immediate feedback, and personalized training pathways.

In summary, empirical data from 138 students across different majors indicate that AI-empowered English reading instruction has a significant positive effect on students' overall reading proficiency and yields consistent instructional benefits across disciplinary groups.

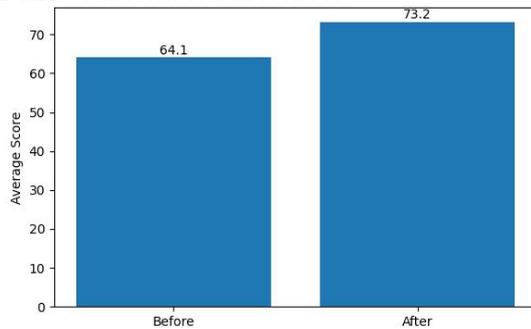
### **4.2 Improvement in Writing Ability**

The findings also demonstrate a substantial improvement in students' overall English writing proficiency following the instructional intervention. During the semester, students completed five writing tasks on the pigai platform, all aligned with unit themes. After receiving AI-generated scores and feedback, students were required to revise their essays based on the system's suggestions, typically completing three to four rounds of revision. Teachers evaluated the final submissions using the highest score achieved, while peer assessment was conducted within small groups.

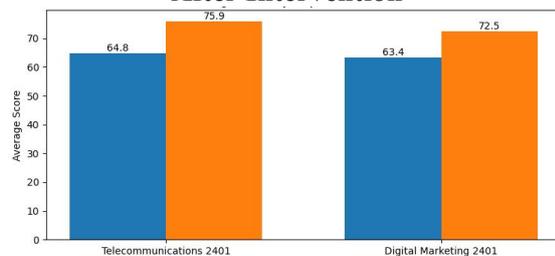
The average score on the end-of-semester writing test increased from 64.1 before the intervention to 73.2 after the intervention, reflecting an average gain of 9.1 points, or approximately 14.2%. This result suggests that AI-empowered reading instruction also plays a significant role in enhancing students' writing ability. Please see Figure 1 below.

Differences across majors were also observed. Students in Telecommunications Class 2401 improved their writing scores from 64.8 to 75.9, a gain of 11.1 points, whereas students in Digital Marketing Class 2401 improved from 63.4 to 72.5, a gain of 9.1 points. Although both groups benefited from the AI-supported instructional

model, the larger improvement among telecommunications students suggests greater potential for writing development within this group. This may be attributed to disciplinary factors, as telecommunications courses are more closely related to AI technologies, enabling these students to adopt and utilize AI tools more efficiently to support their learning goals. Figure 2 shows the exact differences.



**Figure 1. Overall Writing Score: Before vs After Intervention**



**Figure 2. Writing Scores by Major: Before vs After**

Notably, students showed measurable improvements across multiple dimensions of writing quality, including lexical diversity, syntactic complexity, and discourse coherence. Lexical diversity increased by an average of 16.3%, the proportion of complex sentences rose from 21.5% to 30.2%, and discourse coherence scores improved from 65.0 to 74.1. These developments are closely linked to the AI system’s enhanced language input during reading, model text structure analysis, and real-time writing feedback functions.

Overall, AI-empowered English reading instruction, through high-quality and diversified language input combined with intelligent feedback mechanisms, effectively promotes the holistic development of students’ English writing ability.

### 4.3 Student Learning Experience and Feedback

The text in Unit 3 of the coursebook, *How My Chinese Mother-in-Law Replaced My Husband*, presents a highly representative and dramatized

case of cross-cultural family conflict. After ensuring that students had a solid understanding of the text, the instructor required them to strictly adhere to the original plot and character perspectives and use DeepSeek to generate three sets of contextualized English dialogues: husband–wife, wife–mother-in-law, and husband–mother. With AI support, students were encouraged to adapt and refine the generated dialogues based on their disciplinary backgrounds, aiming for natural language use that aligned with character traits and was suitable for classroom performance or situational dialogue tasks.

This activity functioned not merely as role-play, but as an integrated performance of reading comprehension, cross-cultural understanding, speaking, and writing skills. Throughout the process, the instructor was able to directly observe students’ learning trajectories and outcomes, enabling more informed and constructive evaluation.

Interview data further suggest that AI-generated, text-based role-play activities provided students with authentic and actionable contexts for language use, thereby effectively supporting the development of integrated language competence. First, role-play concretized character relationships, emotional tensions, and cultural backgrounds presented in the text. Rather than remaining at a surface-level understanding, students deepened their comprehension of the text’s themes and character perspectives by “stepping into the roles,” which enhanced the depth of reading comprehension.

Second, AI-generated dialogues served as scaffolding for language output. Through imitation and adaptation, students repeatedly engaged with key vocabulary, sentence patterns, and expressions from the text, reinforcing language knowledge in meaningful contexts and improving both accuracy and fluency in spoken expression. Moreover, AI tools adjusted dialogue complexity to match students’ proficiency levels, reducing speaking anxiety and strengthening learner confidence.

In addition, role-play activities significantly enhanced classroom interaction and student engagement. Compared with traditional question-and-answer formats, AI-generated situational tasks were more engaging and open-ended, prompting students to actively consider how they would express themselves if they were the characters in the text. This process

stimulated learning motivation while fostering cross-cultural awareness and critical thinking skills.

In short, AI-supported role-play activities grounded in English reading texts effectively bridged reading input and language output through contextualized, personalized, and interactive learning experiences. By emphasizing competence development and integrating disciplinary knowledge with course content, this approach moves beyond single-subject instruction and contributes to a more holistic model of language education.

## **5. Research Findings**

### **5.1 Discussion of Findings**

This study addresses three research questions. First, the findings indicate that following the integration of AI technologies into English reading instruction, students made notable progress in core reading skills, including reading comprehension, information locating, and inferential reasoning. Compared with pre-intervention results, students' overall reading test scores increased significantly, with particularly pronounced gains among low- and mid-proficiency learners. By providing graded reading materials, personalized learning pathways, and immediate feedback, AI technologies effectively reduced reading difficulty, supported the development of more systematic reading strategies, and mitigated inefficient practices such as word-by-word translation and excessive rereading. Moreover, students from different majors demonstrated largely consistent improvement trends, suggesting that AI-empowered English reading instruction exhibits strong stability and applicability across diverse academic backgrounds. Taken together, quantitative data and classroom observation results confirm that AI intervention plays a significant role in enhancing students' English reading proficiency. Second, the results show that AI systems' instant feedback, grammatical corrections, lexical suggestions, and structural guidance enable students to promptly identify and correct errors in their writing while receiving targeted recommendations tailored to their individual needs. This form of personalized support helps students develop effective writing strategies through sustained practice, leading to improved linguistic accuracy and expressive fluency.

Furthermore, personalized feedback accommodates differences in students' proficiency levels and learning pace, making instruction more efficient and focused. Classroom observations and analyses of student writing samples reveal clear improvements in lexical diversity, syntactic complexity, and discourse coherence after AI-assisted writing practice, resulting in an overall enhancement in writing quality. Although the extent of improvement varies across majors—partly due to disciplinary differences—AI-empowered instruction proves effective for diverse learner groups.

Third, interview data and classroom observations indicate that the majority of students hold positive attitudes toward AI-assisted personalized learning, immediate feedback, and contextualized practice activities. Students report that AI technologies provide learning tasks aligned with their proficiency levels, thereby improving learning efficiency and offering tangible support in reading comprehension and writing practice. Within AI-supported instructional environments, students demonstrate higher levels of motivation and classroom engagement, actively exploring learning content and continuously adjusting learning strategies based on AI feedback. Many students also note that AI-based teaching models enhance the enjoyment and autonomy of learning, making complex language tasks more manageable and comprehensible. The use of AI agents is therefore of practical significance, as it responds to learners' needs and contributes to a partial shift away from teacher-centered instruction. Overall, AI-supported teaching models show considerable effectiveness in boosting learning motivation, optimizing learning experiences, and strengthening students' autonomous learning abilities.

### **5.2 Limitations and Challenges**

Despite the notable advantages of AI technologies in English reading and writing instruction, their application is accompanied by several limitations and challenges. First, limitations in personalization and contextual understanding remain. While AI can offer customized exercises based on learners' proficiency levels, it still falls short in interpreting complex contexts, cultural nuances, and implicit meanings, and thus cannot fully replace teachers' guidance in addressing subtle

linguistic distinctions and context-sensitive interpretation.

Second, the effectiveness of AI tools is closely tied to teachers' roles and instructional design. Although AI systems can deliver instant feedback and recommend learning activities, their pedagogical value largely depends on thoughtful integration and effective teacher facilitation. Without sufficient teacher familiarity with AI functions or well-designed instructional frameworks, students may remain passive users of AI tools, limiting genuine improvement in reading and writing competence.

Third, challenges related to students' learning habits and autonomy persist. In AI-supported environments, some learners may become overly reliant on system feedback, neglecting independent reflection and self-correction. Such overdependence may hinder the internalization of learning strategies and the development of long-term language proficiency.

In addition, technological and resource constraints cannot be overlooked. AI tools require reliable devices, stable internet access, and robust data protection mechanisms. In resource-limited educational settings, large-scale implementation may be difficult, and issues of data security and privacy protection remain key concerns for institutions and society at large.

Finally, cross-cultural and linguistic differences pose challenges to the effectiveness of AI-based instruction. AI-generated reading and writing content may rely heavily on standardized corpora and may not fully account for learners' first-language interference, cross-cultural communicative conventions, or individual variation, potentially limiting the depth of language learning and the authenticity of language use.

In conclusion, while AI-empowered English reading and writing instruction offers clear advantages in personalization, efficiency, and interactivity, factors such as teacher guidance, learner autonomy, technological conditions, and cultural adaptability continue to constrain its application. These challenges call for ongoing refinement and optimization in pedagogical practice.

## 6. Conclusion

It is demonstrated that the application of AI technologies in English reading and writing instruction can significantly enhance students'

reading comprehension and writing proficiency. Through personalized learning pathways, immediate feedback, and contextualized practice, measurable improvements are observed in core competencies such as vocabulary use, sentence structure, and discourse coherence. A high level of student acceptance of the AI-based instructional model is also evident, accompanied by increased learning motivation and learner autonomy.

At the same time, several challenges are identified, including limitations in AI's ability to interpret complex contexts, the risk of students' over-reliance on automated feedback, the strong dependence of instructional effectiveness on teachers' design and facilitation, and constraints related to technological resources. In future practice, the development of blended instructional models that integrate teacher guidance with AI support is recommended so as to further optimize the cultivation of reading and writing abilities among non-English-major undergraduates.

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