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Article

Application of Artificial Intelligence (AI) Supported by Human-Computer Interaction Platforms in College English Teaching: An Experimental Study from the Perspective of Cognitive Linguistics

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Abstract: In recent years, with the rapid development of artificial intelligence (AI) technology, the application of human-computer interaction platforms in college English teaching has gradually become a research hotspot. However, there is limited research exploring the specific impact of AI-supported human-computer interaction platforms on English teaching from the perspective of cognitive linguistics. This study, grounded in cognitive linguistics theory, investigates the effect of AI-supported human-computer interaction platforms on the enhancement of college students' English language proficiency through experimental design. The experimental results show that the experimental group using this platform significantly outperformed the control group in terms of vocabulary, grammar, reading, and writing skills, indicating the effectiveness of human-computer interaction technology in language teaching. This study provides new theoretical and practical support for college English teaching and offers suggestions for optimizing the design of human-computer interaction platforms.

Keywords: college english teaching; cognitive linguistics; Artificial intelligence (AI); human-computer interaction; experimental research

1. Introduction

1.1. Research Background

1.1.1. The Role of Artificial Intelligence in Transforming Educational Models

The development of artificial intelligence technology is profoundly transforming traditional educational models. AI technologies are gradually being adopted in the field of education, particularly in language learning, providing more personalized and interactive teaching tools for both teachers and students [1–4]. AI-supported human-computer interaction platforms, through technologies such as natural language processing (NLP), speech recognition, and machine learning, have shifted language learning from passive memorization to active engagement, significantly enhancing learning efficiency and outcomes [5,6].

In traditional classroom settings, teachers' resources and energy are limited, making it difficult to meet the personalized needs of every student. AI-supported human-computer interaction platforms enable targeted

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teaching, helping students address weaknesses, particularly in vocabulary memorization, grammar practice, and reading comprehension [7]. Furthermore, these platforms can analyze data to track students' learning behaviors, dynamically adjust learning plans, and provide real-time feedback and improvement suggestions.

With the popularization of online education, the application of AI technology has gradually transitioned from being a supportive tool to a comprehensive teaching aid. In the future, AI is expected to play a greater role in resource allocation, learning process monitoring, and personalized assessment, offering more effective and scientific solutions for language learners.

1.1.2. The Unique Value of Cognitive Linguistics in Language Teaching

Cognitive linguistics, as a linguistic branch emerging in the late 20th century, emphasizes the cognitive nature of language and the close relationship between language, thought, and experience [8, 9]. Core theories such as conceptual metaphor theory and frame semantics provide new explanatory frameworks and teaching methods for language learning. Traditional language teaching has focused more on language rules and forms, with less attention given to the cognitive processes involved in language. In contrast, cognitive linguistics asserts that language is an integral part of human cognitive activity and that language learning should prioritize context and conceptual frameworks [10]. This perspective offers unique value in the design of English language teaching.

For example, conceptual metaphor theory suggests that many metaphors in language expression stem from human cognitive patterns. Through metaphor teaching, students can gain a deeper understanding of abstract concepts and cultural nuances. Frame semantics theory, on the other hand, posits that the meaning of words is always embedded in a specific contextual framework, thus highlighting the importance of context-based vocabulary learning.

Additionally, cognitive linguistics emphasizes the importance of simulating real-life language usage scenarios to help learners establish semantic networks and pragmatic abilities. When combined with AI technology, cognitive linguistic teaching methods can become more dynamic and interactive, effectively improving the quality and outcomes of language teaching.

1.2. Significance of the Study

1.2.1. The Application Effectiveness of Human-Computer Interaction Platforms in College English Teaching

In college English teaching, teachers face the dual challenges of students' differing language proficiency and limited teaching resources. AI-supported human-computer interaction platforms can fill the gaps of traditional teaching, providing personalized and real-time learning support [11, 12]. Therefore, exploring the specific effects of these platforms is of significant importance.

This study focuses on the college English teaching environment, analyzing the role of human-computer interaction technology in enhancing students' language proficiency, especially in vocabulary memorization, grammar learning, reading comprehension, and writing skills. It aims to provide practical evidence for optimizing college teaching models.

1.2.2. Filling the Research Gap and Providing Optimization Suggestions

Although the application of AI in education has increased in recent years, research exploring AI platforms in language teaching from the cognitive linguistics perspective remains relatively scarce. Existing studies have mainly focused on technical implementation and functional design, with less attention to the linguistic theories that support these platforms [13].

This study, grounded in cognitive linguistics theory, validates the platform's effectiveness through experiments and analyzes the relationship between students' learning behaviors and outcomes, thus filling the current research gap. Moreover, the study will offer optimization suggestions based on experimental findings, providing valuable insights for platform designers, educators, and policymakers.

1.3. Research Aims and Questions

The primary objective of this study is to explore the impact of AI-supported human-computer interaction platforms on the improvement of college students' English language proficiency. The main research goals are as follows:

1.3.1. Research Objectives

(1) To investigate the impact of AI-supported human-computer interaction platforms on enhancing college students' English learning outcomes.

(2) To reveal the theoretical foundations and practical significance of platform design from the perspective of cognitive linguistics.

(3) To provide theoretical support and practical suggestions for optimizing the application of AI technology in language teaching.

Based on these objectives, this study aims to address the following research questions:

1.3.2. Research Questions

(1) What is the specific application effect of AI-supported human-computer interaction platforms in college English teaching?

(2) What are the advantages of the platform in improving vocabulary, grammar, reading, and writing skills?

(3) How does cognitive linguistics theory manifest and function in the platform design?

(4) How do students' learning behaviors (e. g., usage frequency, study duration) influence their learning outcomes?

2. Theoretical Framework and Literature Review

2.1. The Application of Cognitive Linguistics in English Language Teaching

2.1.1. Insights from Conceptual Metaphor Theory on Vocabulary Learning

Conceptual Metaphor Theory (CMT), a fundamental component of cognitive linguistics, posits that metaphor is not merely a linguistic phenomenon but a basic mode of human cognition [14]. Lakoff and Johnson suggest that metaphors function by mapping the structure of one conceptual domain (the source domain) onto another (the target domain), enabling individuals to comprehend abstract or complex concepts through familiar experiences [15].

In language learning, CMT offers innovative perspectives and methods for vocabulary instruction. For instance, many abstract English concepts rely on metaphorical mappings rooted in concrete experiences. Take the concept of "time" as an example: metaphors such as "time is money" and "time moves forward" illustrate how abstract temporal concepts are grounded in tangible experiences. By uncovering and analyzing these cognitive patterns, teachers can guide students to grasp the intrinsic logic behind vocabulary usage.

Studies by Boers and Lindstromberg in 2021 have demonstrated that teaching methods incorporating conceptual metaphors can significantly enhance students' vocabulary retention and application skills [16, 17]. Through AI-supported human-computer interaction platforms, learners can engage with interactive exercises and visualized representations, making metaphorical structures more accessible and fostering deeper vocabulary comprehension.

2.1.2. Frame Semantics and Its Relevance to Grammar Learning

Frame Semantics, proposed by Fillmore, argues that the meaning of words and sentences is shaped by specific cognitive frames [18]: a set of background knowledge or conceptual structures associated with a word. For example, the verb "buy" activates a frame that includes elements such as buyer, seller, goods, and transaction.

In grammar instruction, Frame Semantics provides learners with a contextualized pathway to language acquisition. For instance, when learning verb collocations, students can understand these structures by

recognizing the frames activated by the verbs, thus mastering their common usages and pragmatic features. This approach surpasses rote memorization by emphasizing practical language use.

AI platforms can simulate real-world contexts for grammar practice, enabling students to perceive the dynamic nature of verb frames through conversational exercises. Leveraging semantic web technologies and natural language processing (NLP), these platforms can also generate grammar activities tailored to individual proficiency levels, helping students internalize grammar rules through usage.

2.2. Integration of Artificial Intelligence with Language Learning

2.2.1. Interactivity and Adaptability of AI Platforms

AI-supported platforms excel in interactivity and adaptability, making them ideal tools for language learning. Firstly, such platforms simulate authentic language environments and provide dynamic interactive experiences. For example, conversational AI tools such as chatbots enable learners to practice contextualized dialogue, mimicking real-life communication scenarios. Research indicates that interactive learning enhances language application skills and boosts learners' confidence [19].

Secondly, AI platforms exhibit adaptability by dynamically adjusting learning content based on individual performance [20]. By tracking learning behaviors—such as response time and accuracy—these platforms identify learners' weaknesses and offer targeted practice, creating a more efficient learning experience compared to traditional classrooms.

Furthermore, immediate feedback is a core feature of AI platforms. Real-time feedback during learning processes helps correct errors promptly, preventing the consolidation of inaccurate information [21]. For instance, in pronunciation training, AI-powered speech recognition systems can instantly detect and address pronunciation errors, offering actionable improvement suggestions.

2.2.2. Adaptive Learning and Feedback Mechanism: Case Studies

Adaptive learning is a prominent advantage of AI technology in education. Using learning analytics, AI platforms identify learners' unique needs and dynamically tailor instructional content and progression [22]. For instance, in reading comprehension exercises, platforms can recommend texts of appropriate difficulty based on learners' accuracy and reading speed.

Platforms such as Duolingo and Edmodo exemplify this approach, offering highly personalized learning experiences driven by data-driven algorithms. Research by Wang et al. has shown that adaptive learning significantly reduces study time while improving learning outcomes [23].

Feedback mechanisms are integral to adaptive learning. Unlike traditional classrooms, where feedback may be delayed or incomplete, AI platforms provide immediate and detailed feedback [24]. For example, in writing exercises, NLP-based systems can automatically detect errors in grammar, spelling, and structure, offering specific recommendations for improvement.

2.3. Literature Review

In recent years, research on the application of AI technologies in college English teaching has gained momentum. Major areas of focus include:

(1). Platform Design and Technological Implementation: Studies in this area emphasize the development of platform functionalities, such as speech recognition, personalized learning pathways, and interactive dialogue systems [25].

(2). Effectiveness Evaluation: Some studies validate the impact of AI platforms on language proficiency through experimental data. For instance, Steiss et al. found that students using AI feedback systems performed better in writing tests compared to those in traditional classrooms [26].

(3). User Experience and Learning Behavior Analysis: Research has also explored learners' acceptance of AI platforms and the influence of usage behaviors on learning outcomes [16,17].

However, existing research reveals the following gaps:

(1). Insufficient theoretical support, particularly the limited application of cognitive linguistics.

(2). Overemphasis on technological functionality at the expense of understanding the cognitive processes underlying language acquisition.

(3). Limited sample sizes and short experimental durations, making it difficult to validate the long-term effectiveness of AI platforms.

This study seeks to address these gaps by integrating cognitive linguistics theory with experimental data, offering theoretical and practical insights to optimize the design and application of AI platforms in college English teaching.

3. Research Design and Methods

3.1. Research Subjects and Groups

This study selected 120 undergraduate students majoring in English from a certain university as the research subjects. The English proficiency of the participants was basically balanced based on the entrance examination scores (all around 60 points, SD=2.5); at the same time, the distribution of students in gender and age (male-female ratio was 1: 1, and the average age was 20.3 years old) was also balanced. The participants were randomly divided into an experimental group and a control group, each with 60 people, to ensure that the two groups were homogeneous in terms of language, gender and age.

The experimental group used an artificial intelligence-supported human-computer interaction platform for learning, while the control group received traditional classroom teaching, a teacher-led learning process. To ensure fairness and comparability, the experimental design kept the class hours, teaching content, and learning objectives consistent for the two groups of students. The specific group characteristics are as follows (Table 1):

Table 1. Experimental Content and Grouping Method.

Grouping Method (random method) 120 Students	Experimental Group (60 Students)	Control Group (60 people Students)
Teaching Tools	AI-Based Interactive Platform	Paper Textbook + Teacher Guidance
Learning Method	Human-Computer Interaction Platform	Traditional Classroom Teaching
Study Time	6 h per week	6 h per week
Course Contents	Vocabulary, Grammar, Reading and Writing	Vocabulary, Grammar, Reading and Writing

3.2. Experimental Platform Functions

3.2.1. Interactive System Based on Natural Language Processing Technology

The experimental platform uses advanced natural language processing (NLP) technology to enable interaction in multiple language tasks, including vocabulary learning, grammar practice, and conversation simulation. Students can practice specific language points by talking to virtual assistants (such as chatbots). For example, in the grammar learning module, the platform can detect whether the sentences entered by students conform to the target grammar rules and provide instant feedback and suggestions. In addition, by simulating daily life scenarios (such as ordering food, shopping, and job interviews), the platform provides students with language practice opportunities in real contexts to enhance their practical application capabilities. The core functions of the platform include (Figure 1):

From Figure 1, it explains:

(1) Contextualized learning stage: using natural language processing technology to simulate real scenarios, such as shopping and travel conversations;

(2) Instant grammar correction stage: when students enter sentences, the platform will automatically detect grammatical errors and give detailed feedback;

(3) Pronunciation practice and correction stage: based on speech recognition technology, help students

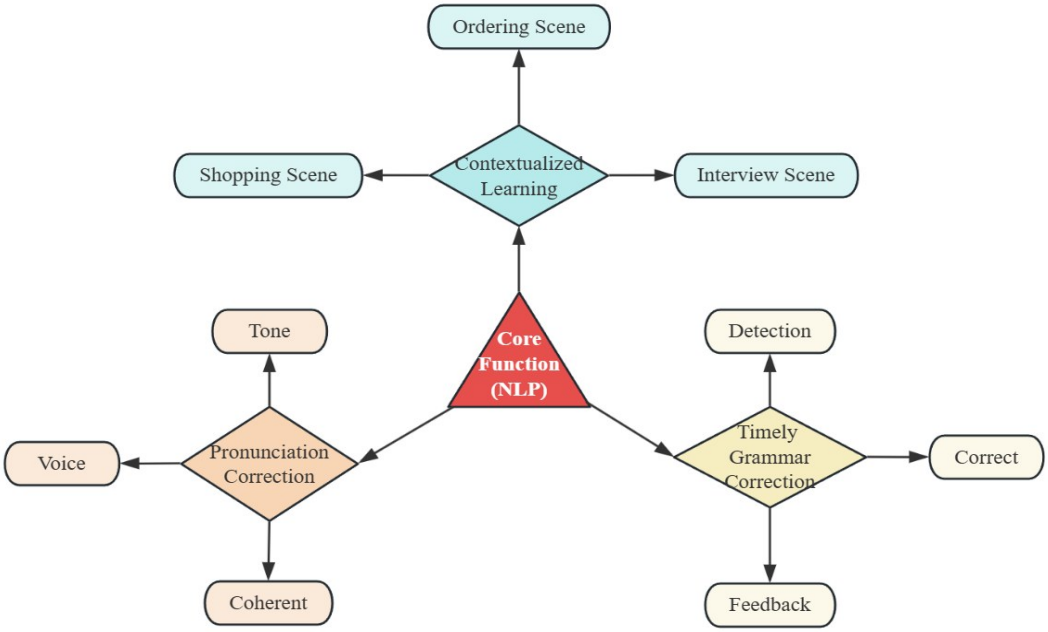

Figure 1. Functions of the Natural Language Processing Technology Interactive System.

improve pronunciation and intonation.

For example, a student inputs the following sentence: "He went to school yesterday." The platform's feedback is as follows (Figure 2):

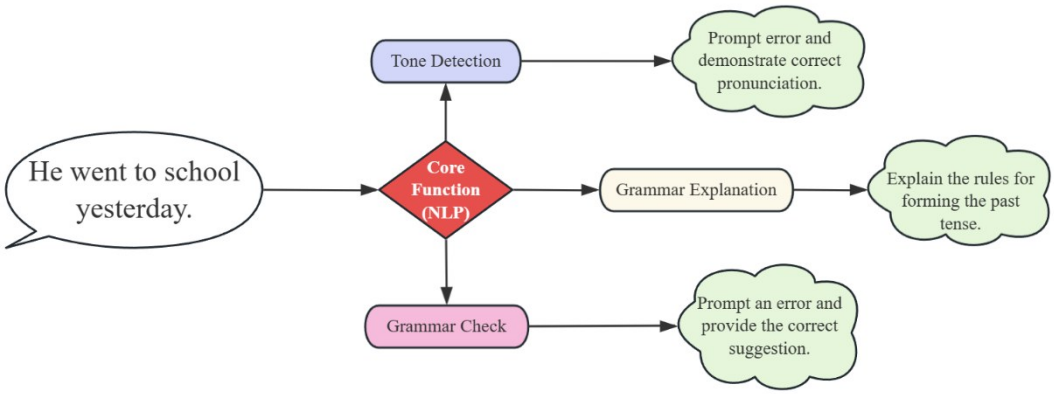

Figure 2. Experimental Platform Feedback.

(1) Pronunciation practice and correction: Based on speech recognition technology, it helps students improve their pronunciation and intonation.

(2) Syntax error detection: It indicates that the verb form is wrong and suggests changing it to "He went to school yesterday."

(3) Explanation of grammatical rules：Explain the rules for forming past tense.

3.2.2. Personalized Learning Path and Real-Time Feedback Mechanism

The platform combines adaptive learning technology to dynamically adjust the learning path based on students' learning performance and provide a real-time feedback mechanism (Figure 3). For example, in the vocabulary learning module, the system adjusts the vocabulary list and exercise frequency based on the students' mastery of different words. The real-time feedback mechanism is another major feature of the platform. Students will receive immediate feedback after completing the exercise, including accuracy, error analysis, and improvement suggestions. Studies have shown that this instant feedback can significantly improve students' learning outcomes and initiative [20].

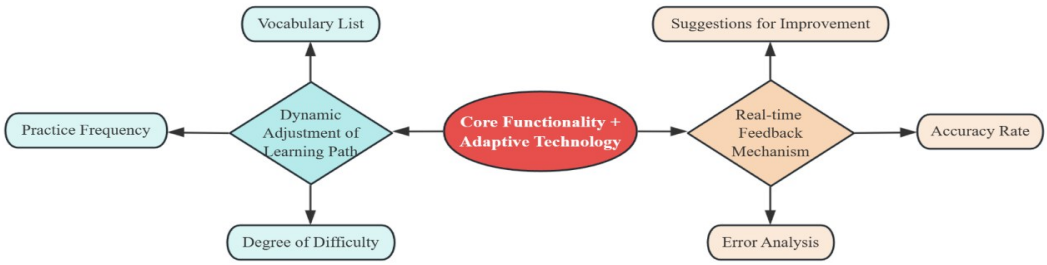

Figure 3. Personalized Learning Path and Real-time Feedback Mechanism**.**

The above Figure 3 shows two path analyses under the combination of core functions and adaptive technology. On the one hand, it is the adjustment of the learning path., based on the platform dynamically adjusting the learning difficulty according to the students' learning behavior. For example, in the vocabulary practice module, the platform pushes new words based on the accuracy rate. On the other hand, there is supervision of the feedback mechanism: instant feedback includes the accuracy rate of answering questions, error type analysis and improvement suggestions.

3.3. Research Tools

3.3.1. Comprehensive Language Proficiency Test

The study designs a comprehensive language proficiency test covering four dimensions: vocabulary, grammar, reading comprehension and writing., with the same weight and a total score of 100 points. The specific design is as follows (Table 2):

Table 2. Comprehensive Language Ability Test.

Test Dimensions	Question Type		Purpose of the Test
Vocabulary Test (25 points)	Multiple Choice Questions (20 questions)	Fill in the Blanks (5 questions)	Mastery of High Frequency Words
Grammar Test (25 points)	Grammar Multiple Choice Questions (15 questions)	Sentence Correction Questions (5 questions)	Mastery of Grammatical Rules
Reading Test (25 points)	2 Articles (500 words/article)	Multiple Choice Questions (5 questions) Short Answer Questions (5 questions)	Mastery of Reading Skills
Writing Test (25 points)	1 Article (200 words)		Training in Writing Skills

3.3.2. Learning Behavior Records

The platform background data records students' learning behaviors, including learning time (hours), number of completed tasks (times), and average accuracy (%). These data will be used to analyze the impact of students' learning habits and learning behaviors on their language ability improvement. The following is a statistical table of the learning behaviors of students in the experimental group (Table 3):

Table 3. Learning Behavior Record of Experimental Group.

Student ID	Average Study Time (hours)	Number of Completed Tasks (times)	Average Accuracy (%)
001	25.5	35	82
002	23.0	32	78
…			

4. Data Collection and Analysis

4.1. Pre and Post-Test Data Statistics and Analysis

All participants are required to complete a comprehensive language proficiency test before and after the experiment. The teaching effect of the platform is evaluated by comparing the changes in scores between the experimental group and the control group in the pre- and post-tests. SPSS statistical software is used to process the data, including independent sample t-test and regression analysis, to ensure the scientificity and reliability of the data analysis. The following figure shows the changes in the average scores of the two groups of students in the pre- and post-tests (Table 4 & Figure 4, Table 5 & Figure 5):

Table 4. Comparison of Average Scores of Pre and Post-test between Experimental Group and Control Group**.**

Scores Comparison	Experimental Group	Control Group
Pre-test Average Score	77	64
Post-test Average Score	88	75

Figure 4. Comparison of Average Scores between Experimental Group and Control Group**.**

Table 4 and Figure 4 show that the experimental group performs significantly better than the control group in the post-test, with a greater improvement in scores.

Table 5. Statistics of Pre and Post-test Scores between Experimental Group and Control Group.

Grouping	Pre-test Average Score	Post-Test Average Score	Score Improvement	t-Value	Significance (p-value)
Experimental Group	60.2	85.6	25.4	7.34	<0.01
Control Group	60.5	75.3	14.8	5.89	<0.01

It can be seen from Table 5 and Figure 5 that the improvement in the experimental group's scores is significantly higher than that of the control group, indicating that the artificial intelligence platform promotes learning outcomes.

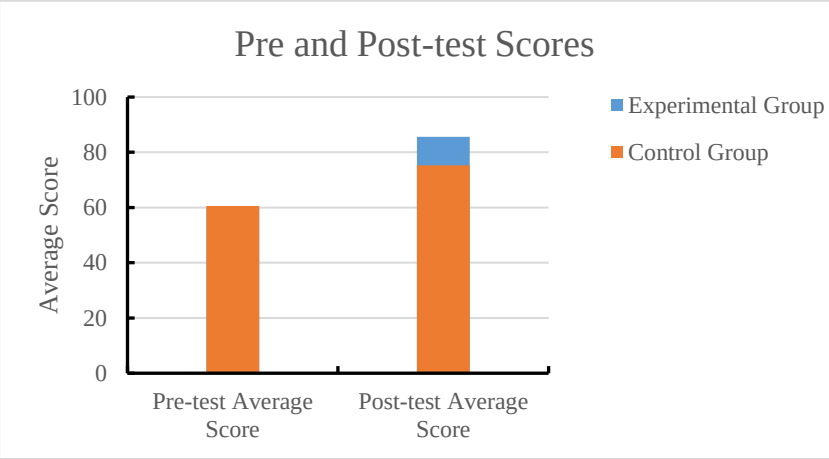

Figure 5. Pre and Post-Test Scores between Experimental Group and Control Group.

4.2. Questionnaire and Interview Feedback Data Analysis

After the experiment, all participants are required to complete a questionnaire on their learning experience, including learning interest, ease of use, and satisfaction evaluation. In addition, 10 students from the experimental group are randomly selected for semi-structured interviews to gain a deeper understanding of their feelings and feedback on the platform.as well as the advantages, disadvantages and improvement suggestions of the platform.

4.2.1. Questionnaire Data Description and Analysis

(1) Questionnaire design: Contains 15 Likert scale questions to evaluate students' learning experience (1-5 points).

(2) Questionnaire data:

a. Increased interest in learning: 86% of students said the platform increased their interest in learning.

b. Instant feedback satisfaction: 78% of students are highly satisfied with the instant feedback function.

c. Technical adaptability issues: 12% of students mentioned that the speech recognition function has limited support for regional accents.

(3) Results analyze: 78% of the students in the experimental group are satisfied with the platform's instant feedback and personalized functions, and 65% of the students believed that the platform increased their interest in learning.

4.2.2. Interviews Data Description and Analysis

(1) Interview Feedback

a. Students generally believe that interactive tasks enhance the depth of knowledge acquisition, but some complex context tasks require higher technical support.

b. Teachers believe that the platform can significantly reduce teaching pressure, but the design of teacher-student interaction still needs to be strengthened.

(2) Interview Analysis: Most students said that the interactive design of the platform stimulated their learning motivation, but some students mentioned that the adaptability of the voice recognition function to local accents needs to be improved.

4.3. Experimental Data and Results Analysis

4.3.1. Experimental Data Description

The study collected pre- and post-test data of the experimental group and the control group, as well as the learning behavior data of the experimental group, through comprehensive language ability tests and platform learning behavior records. The following is a summary and analysis of the experimental data:

4.3.1.1. Descriptive Statistics of Pre- and Post-test Scores

The pre-test and post-test scores of the experimental group and the control group are statistically analyzed, and the results (Table 6 & Figure 6) are as follows:

Table 6. Statistics of Average Scores between Experimental Group and Control Group Before and After Test.

Grouping	Pre-test Average Score	Pre-test Standard Deviation	Post-test Average Score	Post-test Average Score	Average Improvement	p-value (Significance)
Experimental Group	60.2	2.5	85.6	3.2	25.4	<0.01
Control Group	60.5	2.7	75.3	4.0	14.8	<0.01

Table 6 shows that there is no significant difference in the pre-test scores between the experimental group and the control group ($p > 0.05$), but in the post-test, the experimental group's improvement is significantly higher than that of the control group ($p < 0.01$).

Figure 6 shows that the experimental group performs significantly better than the control group in the post-test, with a greater improvement in scores.

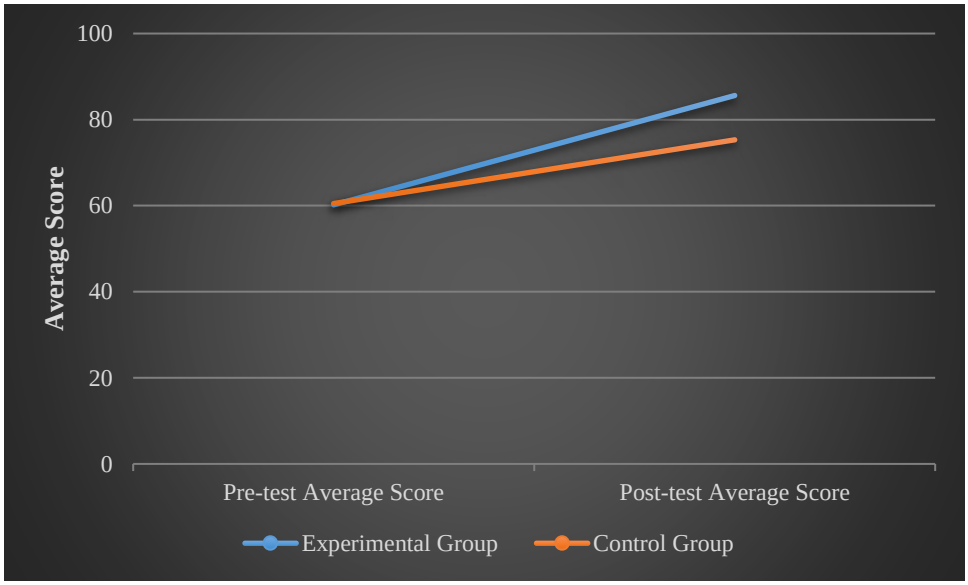

Figure 6. Statistics of Average Scores of Pre and Post-test between Experimental Group and Control Group.

4.3.1.2. Learning Behavior Data Statistics

By recording the learning behavior of the experimental group students on the platform, the relationship between learning time, number of completed tasks, accuracy rate and language ability improvement is statistically calculated (Table 7 & Figure 7).

Table 7. Statistics of Learning Behavior Data of Experimental Group.

Student ID	Study Time (hours)	Number of Completed Tasks (times)	Language Proficiency Improvement (score)	Average Accuracy (%)
001	25.5	35	26	82
002	23.0	32	24	78
003	27.8	38	28	86
Average Score	25.4	34.5	25.4	82.0

Table 7 and Figure 7 show that in the experimental group, the length of study is significantly positively correlated with the improvement in language ability ($r = 0.78$, $p < 0.01$), and the number of completed tasks and the accuracy rate were also closely related to the extent of improvement.

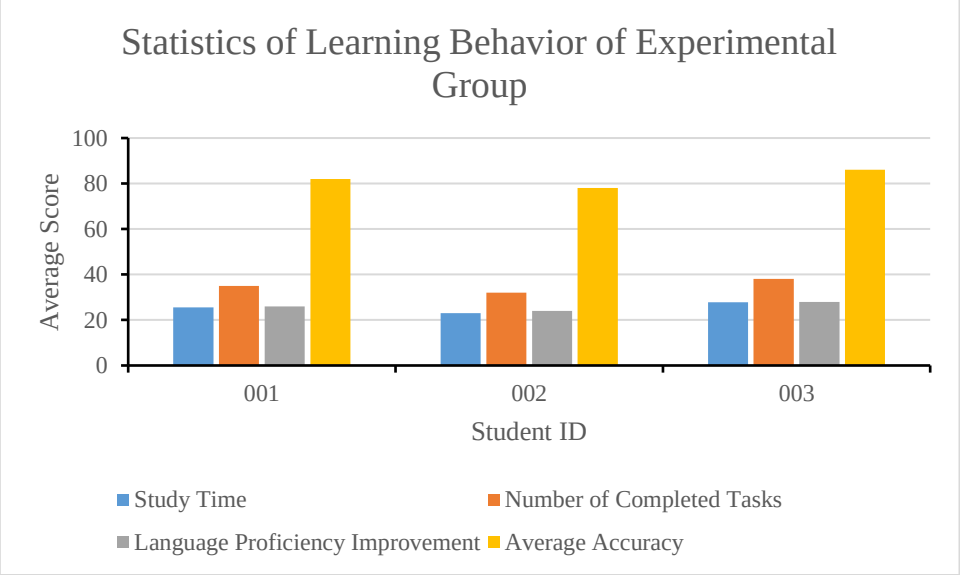

Figure 7. Statistics of Learning Behavior of Experimental Group.

4.3.2. Experimental Results Analysis

The post-test scores of the experimental group and the control group are analyzed through independent sample t-test (Table 8 & Figure 8), and it is found that the scores of the experimental group in the four dimensions of vocabulary, grammar, reading and writing are significantly higher than those of the control group.

Table 8. Comparison of Performance Improvement in Four Dimensions.

Dimensions	Average Improvement of Experimental Group	Average Improvement of Control Group	t-value	p-value
Vocabulary	15.4	8.7	7.21	<0.01
Grammar	12.6	7.2	6.85	<0.01
Reading	18.3	10.4	8.02	<0.01
Writing	14.5	9.1	7.04	<0.01

The results in Table 8 and Figure 8 show that the experimental group's improvement in each dimension is significantly higher than that of the control group, especially in the reading and vocabulary modules, indicating that the artificial intelligence platform has significant advantages in contextualized vocabulary learning and reading training.

By analyzing the regression relationship between learning behavior and academic performance improvement, we further explore the relationship between learning behavior and academic performance improvement (Figure 9). The results show that:

The above figure shows two major points as follows:

(1) Study time is the most significant predictor ($\beta = 0.64$, $p < 0.01$).

(2) The number of completed tasks and accuracy rate also make significant contributions to performance improvement (β were 0.38 and 0.29, respectively, $p < 0.05$).

To conclude, the above experimental data show that:

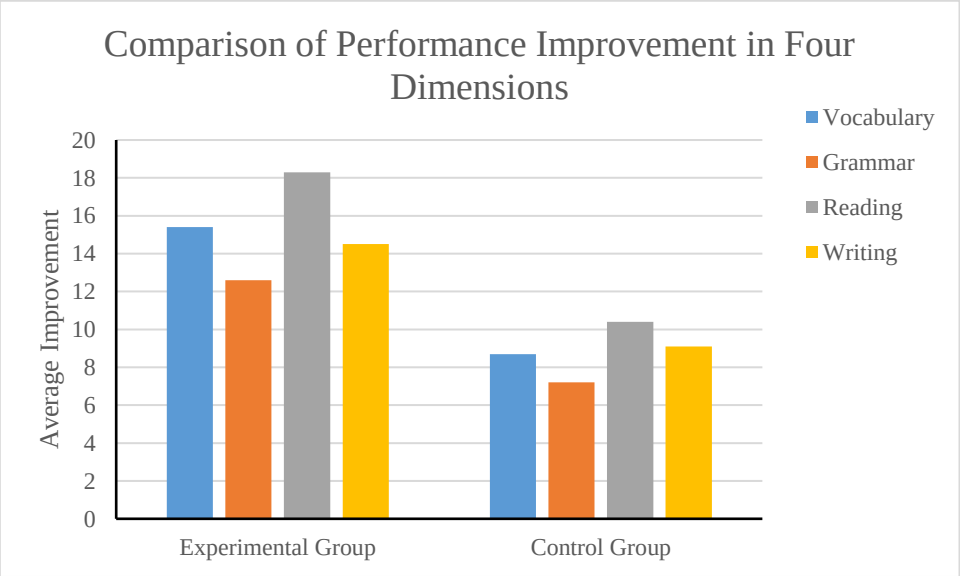

Figure 8. Comparison of Performance Improvement in Four Dimensions.

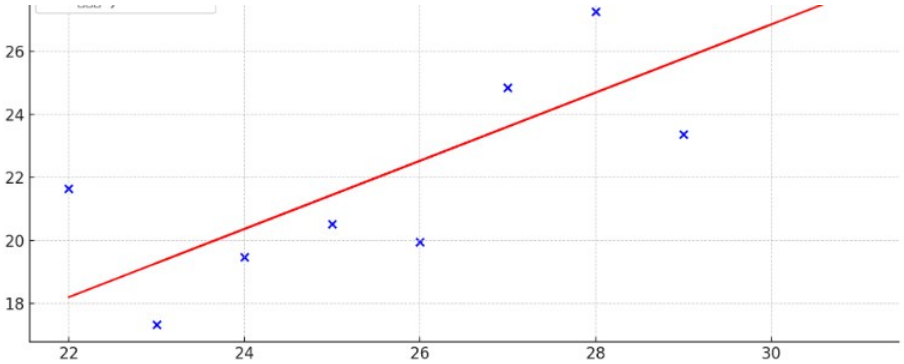

Figure 9. Regression Model of Learning Behavior and Performance Improvement**.**

(1) The experimental group shows significantly higher improvement in the four language proficiency dimensions than the control group, especially in vocabulary and reading ability.

(2) Learning behavior (learning time, number of completed tasks, and accuracy) significantly affects students' language ability improvement, proving that the personalization function of the artificial intelligence platform is effective.

(3) Students are highly satisfied with the platform, but its technical adaptability still needs to be optimized.

The above results provide empirical support for the application of artificial intelligence platforms in English teaching in colleges and universities, and propose clear directions for future platform optimization.

5. Discussion

5.1. Advantages and Challenges of AI Platforms in Language Learning

5.1.1. Analysis of Individual Differences in Learning Outcomes

Experimental data reveal that the students in the AI-assisted group demonstrated significant improvements in overall language abilities, particularly in grammar and reading. However, a subset of students showed limited progress. Surveys indicate that factors such as low learning motivation or unfamiliarity with the platform hindered these students from fully utilizing its functions. This suggests that while technology facilitates personalized learning, individual learner initiative remains a critical determinant of outcomes.

5.1.2. Impact of Technological Support on the Teacher's Role

AI platforms enhance learning efficiency but also transform traditional teacher roles. Teachers transition from knowledge transmitters to facilitators and collaborators. In this study, teachers in the experimental group

primarily contributed in two ways:

(1). Setting learning objectives and adjusting teaching strategies based on platform data.

(2). Providing personalized guidance to address emotional support and nuanced feedback that the platform cannot deliver.

Despite these advancements, teachers' technological adaptability and acceptance of AI tools significantly influenced the effectiveness of teaching interventions.

5.2. Theoretical Insights from a Cognitive Linguistics Perspective

5.2.1. Correlation between Frame Semantics and Interactive Learning

By simulating contextual scenarios, AI platforms enhanced the instructional efficacy of Frame Semantics. Scenario-based exercises allowed students to understand and apply target language vocabulary and grammar structures more intuitively. Data indicate that this method notably improved the language production skills of lower-level learners.

5.2.2. Conceptual Metaphor Theory and Language Internalization

In vocabulary instruction, the platform integrated Conceptual Metaphor Theory by concretizing abstract concepts through metaphorical mappings. This approach facilitated vocabulary retention and long-term memory formation, proving particularly effective in promoting practical application of the learned content.

5.2.3. Integration Bottlenecks of Technology and Theory

Although the application of cognitive linguistics theories yielded positive results, technological limitations in presenting complex contexts and layered semantics persisted. For example, teaching scenarios involving semantic ambiguity or polysemous words remained challenging, necessitating further research and development.

6. Conclusions and Recommendations

Based on the experimental results, the following key conclusions are drawn:

(1). AI-supported interactive platforms significantly improve students' language skills, especially in grammar and reading.

(2). The interactivity and adaptive learning features of the platform effectively boosted student motivation and diversified their learning strategies.

(3). Combining cognitive linguistics theories with contextualized teaching designs and conceptual metaphor frameworks can optimize language learning outcomes.

Recommendations:

(1). For Teachers:

Embrace technological changes and utilize platform-generated data for differentiated instruction.

Strengthen teacher-student interactions to provide emotional support and complex feedback, addressing gaps in the platform's capabilities.

(2). For AI Platforms:

Enhance functions for handling semantic ambiguity, such as improving polysemous word learning through richer contextual input.

Optimize real-time feedback mechanisms to make them more detailed and specific, further enhancing students' language production skills.

(3). For Teaching Resources Design:

Integrate conceptual metaphor and frame semantics in vocabulary and grammar modules.

Incorporate more contextualized writing exercises to improve students' language output in real-world communication.

7. Limitations and Future Directions

The limitations of this study include:

(1). Limited Sample Scope: The experiment was restricted to a single university, which may not represent a broader student population.

(2). Lack of Multilingual Exploration: The study did not explore the platform's applicability in multilingual environments.

Future Research Directions:

(1). Expanding the sample size to encompass learners from diverse language proficiency levels and cultural backgrounds.

(2). Investigating the integration of AI with affective computing to enhance platform interactivity and humanization.

(3). Exploring the potential contributions of other cognitive linguistics theories, such as Event Structure Metaphors (ESM), to language teaching.

By addressing these aspects, future research can provide deeper insights into the synergy between cognitive linguistics and AI in language education.

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Data Availability Statement

Not applicable.

Conflicts of Interest

The author declares no conflict of interest.

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