Construction and Implementation Pathways of an AI-Empowered "Integrated Learning and Application" Teaching Model for College English

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Keywords: Artificial Intelligence, College English, Integrated Learning and Application, CET Vocabulary Teaching, Teaching Model, Implementation Pathways

Abstract: With the rapid development of digital education and the continuous reform of college English teaching, the traditional teaching mode has long separated learning from practical use. This problem has seriously affected the improvement of students' overall English ability. This problem is especially obvious in the process of vocabulary input and output in CET-4 preparation. This study builds a "learning-application integration" teaching model from four aspects: teaching objectives, content, methods and evaluation. This model is based on social constructivism, output hypothesis and complex dynamic system theory. We promote the deep integration of artificial intelligence and college English vocabulary teaching by setting hierarchical goals, organizing visualized content, innovating intelligent methods and carrying out diversified evaluations. We also solve three core problems: the separation of theory and practice, the separation of skills and context, and the insufficient cooperation between humans and machines. This study provides a clear theoretical framework and practical operation path for the innovation of college English teaching in the AI era. It helps improve the accuracy of vocabulary teaching and strengthen students' practical language application ability.

1. Introduction

1.1 Research Background

The development of global digital education strategy and the rapid update of artificial intelligence technology have pushed foreign language teaching into a new stage of "technology support and integration of learning and application"[1]. The College English Teaching Guide (2020 Edition) clearly puts forward the student-centered teaching concept. It requires vocabulary teaching to change from mechanical memory to flexible use. It also requires that students can use words accurately in real scenes such as exams, academic communication and workplace communication.

At present, college English vocabulary teaching still has many problems. Many students only memorize words but cannot use them. They often use words incorrectly in specific contexts. The early research of our research group shows that 78% of students have difficulty turning the words they have learned into practical language skills. The application of AI technology in teaching is relatively scattered. It has not been systematically combined with teaching objectives, curriculum framework and evaluation mechanism. In addition, 83% of teachers lack sufficient digital literacy. They only regard AI as a simple auxiliary tool instead of a teaching partner. This situation limits AI's role in creating scenes and personalized guidance[2]. Therefore, building an AI-supported "integration of learning and application" teaching mode is an important way to solve the current teaching problems and improve the quality of college English teaching.

1.2 Research Questions

This study mainly focuses on the following three core issues:

1) How can we build a clear and practical AI-supported"integration of learning and application"teaching mode for college English vocabulary teaching? How can we form a complete

  DOI: 10.25236/ehmit.2025.028

closed loop of “input-processing-output”?

2) How can we deeply integrate AI technology with college English vocabulary teaching content? How can we use technical advantages to help students transform from “learning words” to “using words”?

3) What conditions do we need for the smooth implementation of this mode? What effective suggestions can we put forward for the promotion and application in colleges and universities?

1.3 Research Framework

This study follows the logical thinking of “theoretical combing - problem analysis - model construction - path design”:

First, We sort out relevant literature, clarify the research status and theoretical basis of AI-assisted foreign language teaching, and point out the deficiencies of existing research;

Second, We analyze the core contradiction of “separation of learning and application” in college English teaching and the advantages of AI in solving this problem;

Third, We build an AI-supported “integration of learning and application” teaching mode from four dimensions: objectives, content, methods and evaluation;

Finally, We design the implementation path and supporting mechanism of the mode, and provide reference for college English teaching reform.we review the literature to clarify the current state and theoretical foundations of AI-enabled foreign language teaching research, while identifying the limitations of existing studies;

2. Literature Review

2.1 The Evolution and Limitations of Research on AI-Empowered Foreign Language Teaching

Internationally, the research on the integration of AI and foreign language teaching has changed from focusing on technical application to overall teaching paradigm innovation. Among the six AI foreign language teaching paradigms summarized by relevant scholars, adaptive learning system and intelligent writing evaluation have initially shown the characteristics of“integration of learning and application”[1]. However, these applications still have three obvious shortcomings: they lack sufficient emotional interaction support and cannot meet the emotional communication needs in complex language scenes; they lack dynamic adjustment ability and cannot respond to students’ learning state changes in a timely manner; they have weak theoretical support and insufficient combination of technology application and language acquisition theory.

Domestic relevant research shows the characteristics of “practice is ahead of theory”. For example, Pigaiwang has built a small cycle training mode of “learning-using-revising”. This mode helps improve the memory effect of CET-4 writing words; the “Guanzhi”system of Zhejiang University realizes the closed learning path of “diagnosis-learning-application-rediagnosis”; Guizhou University uses VR technology to build immersive scenes and strengthen the practical use of words in contexts[2]. Although these practices have achieved certain teaching effects, they lack a systematic theoretical system of “integration of learning and application”. The depth of the combination of technology and teaching content and the accuracy of personalized learning support need to be further improved.

2.2 Theoretical Foundations of the “Integrated Learning and Application” Teaching Concept

The concept of “integration of learning and application” is supported by cross-disciplinary theories. The core theories include three aspects:

1) Social Constructivism: Vygotsky’s theory emphasizes that language learning is a constructive process with the help of external tools [3]. We can use AI as an intelligent support tool to build an interactive communication environment for students. In this way, students can take the initiative to master vocabulary knowledge in practice.

2) The Output Hypothesis: Swain believes that language output is a key link in mastering

vocabulary[4]. The instant feedback provided by AI can promote the benign cycle of "word output - thinking reflection - ability improvement". It also helps balance language understanding and output.

3) Complex Dynamic Systems Theory: This theory holds that language learning is a dynamic interaction process of vocabulary, grammar, context and other elements. It requires the teaching mode to have flexibility and coordination[5]. The data processing ability of AI provides method support for realizing "integration of learning and application". Although existing studies have involved the application of these theories, they have not systematically analyzed the implementation mechanism of "integration of learning and application". They especially lack targeted design for CET vocabulary teaching.

2.3 Core Disconnections in Existing Research and the Entry Point of This Study

Current research exhibits three prominent disconnections:

1) Theory-Practice Disconnection: Most AI applications still follow the traditional mode of "learning first and then practicing". They fail to implement the concept of coordinated development based on complex dynamic system theory. As a result, the integration of learning and application only stays on the surface.

2) Skill-Context Disconnection: College English vocabulary teaching pays too much attention to word meaning memory and exam key explanation. It ignores the academic scene application ability required by the teaching guide. It also lacks an intelligent way to transform the words learned in reading into writing or oral output.

3) Human-Computer Collaboration Disconnection: Teacher training has not kept up with the development of AI teaching mode. Teachers' technical level and cognitive ability are limited. These factors affect the smooth implementation of the mode.

In view of the above problems, this study takes college English vocabulary teaching as the breakthrough point. We build a "integration of learning and application" teaching mode integrating "theory-technology-practice". We focus on solving four core problems: systematic mode construction, in-depth integration, personalized support and scientific evaluation.

3. Theoretical Construction of the AI-Empowered "Integrated Learning and Application" Teaching Model for College English

3.1 Core Principles of Model Construction

1) Learning-Application Synergy Principle: We break the separate linear logic of "input" and "output". We build a closed loop of "learning-application-feedback-improvement" and realize the synchronous progress of vocabulary learning and practical use.

2) Technology Appropriateness Principle:We select AI technology suitable for college English vocabulary teaching. We avoid excessive pursuit of technology and always adhere to the goal of "technology serving teaching".

3) Personalization Principle: We consider the differences in students' vocabulary foundation, learning habits and exam preparation needs. We provide accurate teaching support through AI data analysis.

4) Operability Principle: We balance the advancement of theory and practical feasibility. We make sure that teachers can easily use and operate this mode in actual teaching.

3.2 The Four-Dimensional Core Framework of the Model

1) Teaching Objectives: Stratification and Competency Orientation

Based on the CET vocabulary syllabus and considering differences in students' English proficiency, a three-tier stratified objective system is constructed:

Basic Level Objectives: We design these objectives for students with weak vocabulary foundation. We focus on helping students recognize core word meanings, master basic collocations, and use words in reading to complete basic exam questions.

Intermediate Level Objectives: We design these objectives for students with medium level. We

strengthen the scene use of high-frequency exam words and help students use words correctly in CET-4 writing and translation.

Advanced Level Objectives: We design these objectives for students with good foundation. We cultivate the flexible use ability of academic words and help students use words accurately in academic discussion, professional communication and other scenes.

We use AI diagnostic tools to adjust objectives dynamically. We update the difficulty and content focus in real time according to students' learning progress.

2)Teaching Content: Visualization and Contextualization

We rely on natural language processing (NLP) technology. We build a three-dimensional content system of "knowledge-scene-exam points" for CET vocabulary:

Construction of Vocabulary Knowledge Graphs: We sort out the semantic relationship, collocation rules, grammatical use and exam distribution of core words. We form a visual knowledge network.

Generation of Contextualized Resources: We use AI to generate rich scene resources based on the knowledge graph. These resources include simulated oral dialogue, thematic short essays, film and television clips and academic writing materials. They help vocabulary be deeply integrated with the scene.

Precise Matching of Test Points: We use AI to analyze real test questions over the years. We sort out high-frequency word exam points and error-prone points. We integrate them into teaching and strengthen the connection between learning, application and exam.

3)Teaching Methods: Intelligence and Collaboration

We build a three-dimensional teaching method system of "AI support + human-computer cooperation". We promote the transformation of vocabulary from "learning" to "use":

AI-Empowered Input:We use intelligent reading platform to push real test texts and thematic articles suitable for students' level. These materials include real-time word annotation, scene questions and use expansion; we use AI voice technology to provide standard pronunciation and help students imitate and practice.

AI-Triggered Output: We use speech recognition technology to carry out oral interactive practice such as simulated dialogue and thematic debate. AI gives real-time feedback on pronunciation and word use; we use intelligent writing evaluation tools to feedback word collocation errors and scene misuse in compositions. We also put forward improvement suggestions for students[6].

Human-Computer Collaborative Teaching: We clarify the division of labor between teachers and AI. Teachers are responsible for designing teaching objectives, creating scene tasks and guiding thinking; AI completes personalized guidance, data feedback and repetitive work such as homework correction and word testing. We form a closed loop of "teacher guidance - AI assistance - student-centered"[7].

4)Teaching Evaluation: Diversification and Process-Orientation

We break the limitations of traditional exam-oriented evaluation. We build a three-dimensional evaluation system of "process - performance - final evaluation":

Process evaluation (40%): We use AI learning platform to record students' word learning time, exercise completion, interaction participation and error correction. We combine emotional computing technology to analyze learning attitude and investment state. We form dynamic learning files for students.

Performance evaluation (30%): We set real language tasks in AI simulation scenes, such as CET-4 translation, oral dialogue and academic writing. We evaluate the flexibility and accuracy of word use; we adopt self-evaluation, mutual evaluation of students and teacher evaluation to enhance the guidance of evaluation.

Final evaluation (30%): We design word tests consistent with CET question types. We focus on examining application ability rather than mechanical memory. We adopt AI automatic scoring combined with teacher manual review to ensure the objectivity and accuracy of results.

We feed the evaluation results back to teachers and students in real time through visual reports.

We provide a basis for teaching adjustment and learning optimization.

3.3 Core Implementation Mechanisms for "Integrated Learning and Application"

1) Immediate Transformation Mechanism: AI builds an instant closed loop of "learning-application". For example, after students learn the use of the word "sustain", they immediately complete the dialogue task containing the word in the simulated business negotiation scene. AI gives real-time use feedback to strengthen memory and knowledge transfer.

2) Contextualized Construction Mechanism: We integrate vocabulary learning into specific task scenes such as CET-4 translation, oral discussion and academic writing. Driven by tasks, words are transformed from "knowledge" to "ability".

3) Dynamic Adaptation Mechanism: AI analyzes students' word learning data such as exercise accuracy and use error types in real time. It evaluates the "integration degree of learning and application". It dynamically adjusts the difficulty of learning resources, task types and feedback methods. It ensures the synchronous progress of learning and application..

4. Implementation Pathways and Supporting Mechanisms for the Model

4.1 Practical Implementation Pathways

1) Preliminary Preparation Stage

Technology Platform Setup: We select or develop an AI teaching platform with functions such as word knowledge graph, intelligent diagnosis, scene generation, personalized recommendation and intelligent evaluation. We make sure that it can meet the needs of the mode.

Teacher Training and Empowerment: We carry out special training on AI technology application, "integration of learning and application" teaching concept and mode operation. We improve teachers' digital teaching ability.

Student Guidance and Adaptation: We help students get familiar with the AI teaching platform through pre-job training and operation demonstration. We help them understand the concept of integration of learning and application and cultivate independent learning awareness.

2)Teaching Implementation Stage

Phase 1 (Weeks 1-4): We carry out AI intelligent diagnosis and goal setting. Teachers conduct word basic test and learning style analysis. They determine students' hierarchical goals and initial learning paths. They carry out word knowledge graph learning and basic scene use exercises. They help students lay a solid vocabulary foundation.

Phase 2 (Weeks 5-10):We carry out comprehensive application and evaluation feedback. We focus on oral interactive practice, writing training and exam-related task training. The AI platform provides real-time feedback to help students optimize learning effects. Teachers organize group cooperative learning such as thematic discussion. They promote word use and communication among students.

Phase 3 (Weeks 11-16): We carry out in-depth application and summary evaluation. We carry out CET simulated exams and expand scene word use tasks. We use diversified evaluation system to comprehensively evaluate learning effects. We adjust teaching strategies according to evaluation results and carry out targeted remedial teaching.

2) Summary and Optimization Stage

Reflection on Teaching Effectiveness: The teaching and research team collects problems and suggestions in the implementation of the mode through teaching logs, student questionnaires, classroom observation and other ways.

Model Iteration and Optimization: We revise hierarchical goal standards, content resources, method application and evaluation index weight according to practical feedback. We enhance the adaptability of the mode.

Experience Sharing and Promotion: We sort out the application cases and implementation experience of the mode. We form a reproducible teaching plan and promote it within the school and even in a wider range.

4.2 Supporting Mechanisms

1) Technical Support: The school sets up a special technical support team. They solve platform problems in a timely manner. They continuously optimize platform algorithms and improve the accuracy of word recommendation and feedback evaluation.

2) Resource Support: The school sets up a teaching resource development team. They update college English word exam topics and scene teaching resources regularly. They ensure the timeliness and effectiveness of content.

3) Institutional Support: The school formulates supporting incentive policies. They encourage teachers to participate in the teaching reform of "integration of learning and application"; they establish a teaching quality monitoring mechanism. They regularly evaluate the implementation effect of the mode.

4) Collaborative Support: The school strengthens cooperation with AI technology enterprises. They realize the accurate connection between teaching needs and technology research and development; they build an inter-school exchange platform. They promote the sharing of mode implementation experience.

5. Research Significance and Future Prospects

5.1 Research Significance

1) Theoretical Significance

The AI-supported "integration of learning and application" teaching mode constructed in this study breaks through the cognitive limitations of the traditional "separation of learning and application". It enriches the theoretical system of AI education application. Based on social constructivism, output hypothesis and other theories, this study takes the lead in systematically building a four-dimensional theoretical framework of "goal-content-method-evaluation" for "integration of learning and application"; it puts forward the technology integration path of "word knowledge graph + scene generation + intelligent drive". It provides a new theoretical perspective for the deep integration of language teaching and artificial intelligence; it improves the dynamic evaluation logic of "integration of learning and application". It provides a new method for evaluating language teaching effect.

2)Practical Significance

Under the background of digital education strategy, the practical application of this mode has important value. For students, personalized learning support and scene-based use training improve the efficiency of word learning and CET-4 scores. They also strengthen the overall English ability of students. For teachers, AI tools reduce the burden of repetitive teaching work. They provide data support for accurate teaching and promote professional development of teachers[8]. For colleges and universities, the promotion of this mode can drive the overall optimization of college English teaching methods. It improves the quality of talent training and responds to the national requirements of higher education digital reform.

5.2 Future Prospects

The teaching model constructed in this study requires further refinement through practice. Future research can deepen exploration in three directions:

1)Technological Optimization: We can introduce more advanced AI technologies such as emotional computing and virtual reality. They can enhance the reality of teaching scenes and emotional interaction. They can also optimize students' learning experience; we can improve personalized recommendation algorithms. We can improve the matching accuracy of teaching content and students' needs.

2)Practical Expansion: We can expand the application scope of the mode from CET-4 vocabulary teaching to the comprehensive teaching of listening, speaking, reading and writing. We can build a complete college English "integration of learning and application" teaching system; we can carry out inter-school cooperative practice. We can verify the adaptability of the mode in

different types of colleges and universities and formulate a targeted implementation plan.

3)Theoretical Deepening: We can combine empirical research to verify the impact of the mode on students' word use ability, learning motivation and other variables. We can further optimize the mode framework; we can in-depth explore the adaptation differences of the mode for students with different learning styles. We can improve the personalized support mechanism.

6. Conclusion

This study constructs a four-dimensional AI-supported "integration of learning and application" teaching mode including "objectives, content, methods and evaluation". This study aims at the core problem of "separation of learning and application" in traditional college English teaching. It combines the characteristics of AI technology with the needs of CET vocabulary teaching. Through hierarchical goal setting, visualized content organization, intelligent method innovation and diversified evaluation feedback, the mode realizes the deep integration of theory, technology and practice. It effectively solves the three problems of separation of theory and practice, separation of skills and context, and insufficient human-computer cooperation. The designed implementation path takes into account feasibility and flexibility. It provides a direct reference for college English teaching reform. In the future, with the continuous progress of AI technology and the deepening of teaching practice, this mode will be further improved and optimized. It will provide stronger support for improving the quality of college English teaching and cultivating high-quality English talents.

Acknowledgement

This research was financially supported by the 2025 Education Project of Liaoning Provincial Social Science Planning Fund, which researches on "The Construction and Empirical Study of 'Integration of Learning and Application' Teaching Model for College English Empowered by Artificial Intelligence" (L25DED004).

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