Article

Construction of Intelligent Listening and Speaking Model for College Students with AI Empowerment

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Abstract: Against the backdrop of deep integration between educational digital transformation and artificial intelligence technologies, cultivating college students' English listening and speaking competencies has become a central focus in contemporary foreign language teaching reforms. Traditional English listening and speaking instruction consistently faces significant challenges, such as insufficient personalization, delayed feedback mechanisms, and monotonous learning scenarios. Consequently, these conventional methods fundamentally fail to meet the dynamic learning needs of digitally native college students who require highly interactive environments. To overcome these limitations, this study establishes an innovative, intelligent English listening and speaking model specifically designed for college students. The proposed framework is rigorously based on the output-driven hypothesis, comprehensible input theory, and an integrated teaching-learning-evaluation paradigm. By strategically leveraging advanced AI technologies—including intelligent speech recognition, large language models, and comprehensive learning analytics—the model adopts a systematic "smart diagnosis-scenario-based implementation-dynamic evaluation-iterative optimization" approach. Through meticulously explaining its theoretical foundations, core architectural design, practical implementation pathways, and robust safeguard mechanisms, this study demonstrates the model's efficacy. Furthermore, coupled with empirical validation through typical application cases, the findings indicate substantial improvements in student engagement and communicative proficiency. Ultimately, this research provides vital theoretical references and actionable practical pathways to effectively address persistent challenges in college English teaching, thereby significantly enhancing overall talent cultivation quality in higher education.

Keywords: artificial intelligence; college english; language teaching; personalized learning; educational technology

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1. Introduction

With the acceleration of globalization and the internationalization of higher education, English listening and speaking skills, as core competencies for cross-cultural communication, have become essential components of college students' comprehensive literacy [1, 2]. The College English Teaching Guidelines (2020 Edition) explicitly emphasize the importance of developing integrated online-offline teaching models to enhance students' autonomous learning abilities and practical application skills. However, current English listening and speaking instruction in universities faces three major challenges. First, there is an issue of homogenized teaching resources. Standardized listening materials and speaking tasks fail to accommodate students' varying language foundations, creating a situation where those with weaker foundations struggle to keep up, while advanced learners remain underdeveloped. Second, delayed feedback mechanisms pose significant obstacles. Large-class teaching makes individualized speaking assessments impractical, and listening exercises often provide only "correct/incorrect" feedback. This type of feedback lacks precise guidance on pronunciation, intonation, and pragmatic application, which is contrary to the "output-driven" principles of language acquisition. Third, there is a disconnection from real-world

contexts. Traditional teaching methods predominantly focus on textbook topics without simulating authentic workplace or academic communication scenarios. This leads to a "learning-dissemination gap" that fails to meet the career development needs of students, leaving them ill-prepared for real-world applications of their language skills.

Breakthroughs in artificial intelligence technology provide crucial technical support to address these challenges. Technologies such as intelligent speech recognition, personalized recommendations, and large language model dialogues enable tailored teaching approaches, real-time multidimensional feedback, and immersive scenario simulations. These advancements facilitate the creation of truly personalized learning experiences. By leveraging these innovations, English listening and speaking instruction is transitioning from teacher-centered models to student-centered approaches, and from mechanical drills to competency-based development. This shift aligns with the broader goals of modern education, which emphasize adaptability and practical skill acquisition. Against this backdrop, the establishment of AI-powered intelligent English listening and speaking systems for college students has become an inevitable trend in the reform of foreign language teaching in higher education [3, 4]. These systems not only address the limitations of traditional methods but also provide scalable solutions that cater to diverse student needs, ensuring that learners at all proficiency levels can achieve meaningful progress in their language skills.

2. Core Theoretical Foundations

2.1. Output Drive Assumption

This hypothesis emphasizes the pivotal role of language output in driving language input, asserting that output serves as the cornerstone of language acquisition. Traditional teaching methodologies often focus on passive listening, which limits opportunities for active language production and hinders effective internalization of linguistic knowledge. To address this gap, the AI-powered model integrates intelligent oral practice sessions and scenario-based dialogues [5]. These features provide learners with extensive opportunities to engage in language output while receiving real-time feedback on pronunciation, grammar, and pragmatic usage. This iterative process of "output-feedback-correction-reoutput" fosters a comprehensive learning cycle, enabling students to refine their language skills systematically. By aligning with the core principles of language acquisition, this approach ensures a more dynamic and interactive learning experience, promoting deeper linguistic competence.

2.2. Comprehensible Input Theory

Krashen's "Input-Output Theory" highlights the importance of providing learners with input materials at the "i+1" level, where "i" represents their current proficiency and "+1" denotes content slightly above their existing capabilities. Traditional teaching approaches often face challenges in accurately evaluating learners' proficiency, leading to mismatched input material difficulty levels. By leveraging advanced learning analytics, AI models can construct detailed competency profiles for students, enabling the dynamic delivery of listening materials and speaking topics that align precisely with their individual needs. This approach ensures "precision input," optimizing both the efficiency and effectiveness of language acquisition processes.

2.3. Integrated Teaching-Learning-Assessment Concept

This philosophy underscores the seamless integration of teaching, learning, and evaluation, ensuring that assessment is embedded throughout the instructional process to enhance educational outcomes. The AI model employs a multifaceted approach combining "intelligent diagnosis, process evaluation, and outcome assessment," which enables the generation of tailored feedback and instructional recommendations by analyzing learning data in real time. This methodology facilitates "evaluation-driven teaching and learning," effectively addressing the longstanding challenge of the disconnection between instruction and assessment in traditional educational systems. By

leveraging advanced technologies, this approach fosters a more dynamic and responsive learning environment [6].

2.4. Personalized Learning Theory

Building upon foundational theories such as "Mastery Learning Theory" and "Multiple Intelligences Theory," this approach underscores the importance of tailoring teaching methods to accommodate the unique differences among students. By leveraging advanced AI systems, baseline data and learning behavior patterns of students are analyzed to construct a comprehensive three-dimensional learning profile. This profile encompasses critical dimensions such as language proficiency, cognitive styles, and emotional attitudes. Through the delivery of personalized learning resources and tasks, the approach ensures "teaching tailored to individual aptitudes," effectively addressing the diverse and dynamic learning needs of students in a systematic and adaptive manner [7].

3. AI-Enabled Construction of Intelligent Listening and Speaking Models for College Students in English Learning

3.1. Principles of Pattern Design

The Student-Centered Principle emphasizes the importance of addressing the specific needs of learners, focusing on the enhancement of listening and speaking skills while promoting self-directed learning. This approach is tailored to the habits of digitally native college students, who often prefer interactive and fragmented learning methods. The Technology Empowerment Principle leverages the advantages of artificial intelligence to provide intelligent diagnostics, personalized recommendations, real-time feedback, and dynamic evaluation, effectively addressing challenges inherent in traditional teaching methods. The Scenario Authenticity Principle involves the simulation of real-world contexts, such as workplace, academic, and daily communication scenarios, to strengthen the integration of learning and application, thereby improving students' ability to use language effectively. The Teacher-AI Collaboration Principle delineates the roles of educators and AI systems, with teachers focusing on instructional design, emotional guidance, and the development of higher-order thinking, while AI systems handle personalized tutoring, data analysis, and basic feedback, creating a complementary dynamic [8]. Finally, the Dynamic Optimization Principle ensures continuous improvement of teaching models by iterating based on learning data and feedback from both teachers and students, allowing adaptation to evolving educational needs.

3.2. Overall Architecture of the Model

This model is designed with four integral modules: "intelligent diagnosis," "scenario-based implementation," "dynamic evaluation," and "iterative optimization," which collectively establish a comprehensive closed-loop operational system. These modules work in synergy to ensure continuous improvement and adaptability, forming a robust framework for practical applications and theoretical advancements [9].

3.2.1. Module 1: Intelligent Diagnosis and Hierarchical Design (pattern Starting Point)

Core Objective: The primary aim is to accurately assess and profile students' competencies to facilitate personalized teaching strategies that cater to individual learning needs. Data Collection: This involves the integration of two distinct types of data. Static data includes English proficiency scores obtained at enrollment, results from standardized tests such as CET-4/6, and outcomes from foundational language assessments. Dynamic data encompasses metrics such as classroom interaction patterns (e.g., frequency of engagement and response accuracy), post-class practice performance (e.g., listening accuracy rates, oral assessment scores, and practice durations), and resource utilization behaviors (e.g., preferred material formats and study schedules). Profile Development: Using advanced AI algorithms, three-dimensional learning profiles are constructed. These profiles include linguistic competency dimensions, which assess

listening comprehension, speaking proficiency, vocabulary mastery, and grammar accuracy. Cognitive style dimensions identify whether students are visual learners (favoring video-based materials), auditory learners (preferring audio-based resources), or kinesthetic learners (favoring interactive activities). Emotional attitude dimensions analyze factors such as learning motivations and anxiety levels, including tendencies to avoid oral practice [10]. Tiered Design: Based on these profiles, students are categorized into three tiers. The Foundation Tier, comprising students with underdeveloped skills and low motivation, focuses on skill consolidation through text-based materials supplemented with audio resources, such as audio-annotated reading materials and pronunciation correction videos, alongside progressive tasks like word shadowing and simple dialogue imitation. The Intermediate Tier, consisting of students with moderate proficiency and self-directed learning tendencies, emphasizes skill enhancement through video-based interactive resources, such as TED talks and virtual dialogue scenarios, and advanced tasks like topic discussions and short passage retelling. The Advanced Tier, which includes students with high proficiency and strong motivation, prioritizes application innovation through scenario-based, project-oriented resources, such as international conference role-playing and cross-cultural presentations, as well as challenging tasks like oral academic presentation demonstrations.

3.2.2. Module 2: Dynamic Multidimensional Evaluation (model Assurance)

Core Objective: The primary aim is to establish a comprehensive and integrated evaluation system that combines "formative assessment" and "summative assessment" to enhance instructional practices through data-driven evaluation. Formative assessment, also referred to as process evaluation, leverages AI technology throughout the entire learning process. This includes language proficiency evaluation, where real-time tracking of listening accuracy rates, speaking assessment scores, and practice duration is conducted to generate detailed daily learning reports. Additionally, learning strategy evaluation involves analyzing data on resource utilization and time allocation to assess the effectiveness of strategies, with recommendations provided for students employing inefficient learning methods. Emotional attitude evaluation is also incorporated, assessing learning emotions through classroom tone analysis and monitoring practice frequency [11, 12]. For students facing learning challenges, low-difficulty tasks and encouraging feedback are provided to foster a positive learning environment and improve engagement.

Terminal Evaluation, also known as outcome assessment, is implemented through AI-assisted teacher collaboration. Written assessments involve AI correcting listening multiple-choice questions, while teachers focus on grading subjective questions. Oral assessments are conducted with AI performing a preliminary evaluation of pronunciation, fluency, and content completeness, followed by a secondary review by teachers emphasizing pragmatic application, logical coherence, and intercultural awareness. Comprehensive evaluation integrates process data with outcome metrics to generate detailed student competency reports, highlighting individual strengths and areas requiring improvement. A robust feedback mechanism is employed, where AI generates personalized improvement reports with tailored resource recommendations. Simultaneously, teachers adjust instructional strategies based on class-wide data trends, such as increasing instructional hours to address issues like "insufficient intercultural expression." This dual feedback approach ensures both individual optimization and holistic instructional adjustments, fostering a more effective and adaptive learning environment.

3.2.3. Module 3: Iterative Optimization and Long-Term Mechanisms (model Extension)

Core Objectives: The primary aim is to continuously refine operational models to ensure their long-term effectiveness and adaptability. Data Iteration: The AI system systematically aggregates learning data and evaluation metrics on a regular basis. This includes analyzing model performance indicators such as improvement rates across various student tiers and engagement levels in teaching activities. Additionally, it identifies potential issues, such as suboptimal practice outcomes in specific scenarios or

low utilization rates of certain resources, to guide targeted improvements. Faculty-Student Feedback Iteration: Periodic surveys and interviews are conducted to gather comprehensive feedback from both faculty and students. This feedback focuses on teaching models, AI tools, and instructional activities, enabling the ongoing optimization of resource design, scenario configurations, and assessment criteria. Mechanism Enhancement Iteration: Based on operational outcomes, support mechanisms are enhanced to align with evolving model requirements. These enhancements include faculty training programs, technical assistance, and the strengthening of academic integrity protocols, ensuring the system remains effective and relevant over time.

3.3. Key Technology Support

Intelligent speech recognition and evaluation technology utilizes advanced deep neural networks to precisely identify students' spoken language pronunciation. This approach provides comprehensive scoring across multiple dimensions, including phonemes, intonation, fluency, grammar, and pragmatics, effectively addressing challenges related to delayed and inaccurate oral feedback. Large language model dialogue technology enables the creation of virtual conversational partners that simulate diverse real-world scenarios, such as professional, academic, and daily contexts. These dynamic, multi-round dialogues offer a stress-free environment for oral practice, helping learners overcome difficulties in speaking. Learning analytics technology collects and analyzes student learning data to construct detailed competency profiles, which support personalized resource delivery and targeted learning diagnostics, thereby enhancing precision teaching methods. Multimodal resource generation technology produces AI-generated texts, audio recordings, videos, and virtual environments tailored to various cognitive styles, significantly enriching instructional formats. Data visualization technology transforms learning and evaluation data into clear, intuitive charts, allowing educators to quickly assess student progress and refine teaching strategies for optimal outcomes.

4. Implementation Pathway and Safeguard Mechanisms for the Model

4.1. Implementation Path

During the preparatory phase, training programs will be conducted to enhance teachers' proficiency in operating AI tools, designing instructional patterns, and applying these tools in teaching scenarios. These programs aim to improve AI literacy and digital teaching capabilities while clearly defining the roles in human-machine collaboration. Existing AI tools, such as iFlytek Easy Listening, Tianxue Network, and Doubao AI, will be integrated, or a dedicated intelligent listening and speaking platform will be established to ensure seamless data interoperability and functional synergy. To meet the requirements of tiered teaching, a multi-modal, hierarchical listening and speaking resource library will be developed. This library will include foundational pronunciation resources, advanced scenario-based dialogue materials, and innovative academic exchange content. Continuous updates and optimizations will ensure the resources remain relevant and effective for diverse teaching needs.

During the pilot phase, specific pilot groups will be selected to evaluate the model's effectiveness. Two to three parallel classes with comparable English proficiency levels will be chosen, designating one as the experimental group (using the proposed model) and the other as the control group (employing traditional teaching methods). Teaching activities will follow a structured "pre-class---during-class---post-class" workflow. Learning data and feedback from both teachers and students will be recorded and analyzed regularly to assess the model's performance [13, 14]. Identified issues, such as inaccurate AI feedback, low student engagement, or technical challenges, will be addressed promptly. Adjustments will be made to the model design, resource allocation, and training content to resolve these challenges and enhance the overall implementation process.

During the implementation phase, the program will be promoted comprehensively across the university. Lessons learned from the pilot phase will be summarized to refine

operational models and support mechanisms. The program will be rolled out progressively, with dynamic adjustments made to address emerging challenges and evolving academic needs. This approach ensures the model aligns effectively with the diverse requirements of various academic disciplines and student proficiency levels. To encourage broader adoption, experience-sharing initiatives will be organized, including teaching achievement exhibitions and professional exchange events. These initiatives aim to facilitate knowledge transfer and inspire peer institutions to adopt and adapt the model for their specific educational contexts.

4.2. Safeguard Mechanism

Faculty Support: Establishing a robust training mechanism is essential to organize periodic professional development programs focused on AI education and digital teaching methodologies. These initiatives aim to enhance educators' expertise and adaptability in integrating advanced technologies into their teaching practices. Forming dedicated research teams can facilitate the exploration of instructional model applications and pedagogical innovations, addressing practical challenges encountered in teaching environments. Additionally, improving incentive systems by incorporating AI-enhanced teaching performance into faculty evaluations can significantly boost engagement and motivation among educators. Technical Support: Developing a stable and intelligent teaching platform is crucial to ensure data security and system reliability, minimizing technical disruptions during instruction. Establishing technical support teams can provide timely assistance to resolve user issues with AI tools and platforms. Continuous monitoring of AI technology trends and implementing new tools can further optimize platform functionalities, enhancing instructional effectiveness. Resource Support: Increasing funding for resource repository development, platform maintenance, and faculty training programs is vital. Collaborating with industry partners and research institutions can integrate real-world scenarios and premium AI tools into educational practices [15, 16]. Encouraging faculty and students to actively participate in resource creation can diversify content types and improve compatibility, fostering a more dynamic and inclusive learning environment.

4.3. Academic Integrity Assurance

Establishing clear guidelines for the use of AI tools is essential to prevent academic misconduct, such as the misuse of AI-generated speech content or plagiarism in assignments [17]. Institutions should prioritize strengthening integrity education to help students understand the appropriate role of AI tools as aids for learning rather than replacements for independent study. During evaluation processes, educators should incorporate data on students' learning progress to ensure a comprehensive assessment of academic outcomes. This approach safeguards fairness in evaluations and prevents AI-generated content from undermining the integrity of academic assessments.

5. Model Optimization Strategies

5.1. Deepen Human-Machine Collaborative Evaluation to Enhance Assessment Accuracy

A dual-track evaluation system combining "AI preliminary assessment" and "teacher review" has been implemented to ensure a more accurate and comprehensive evaluation process. The AI component focuses on objective metrics such as pronunciation, fluency, and grammatical accuracy, while teachers assess subjective aspects including pragmatic appropriateness, logical coherence, emotional tone, and cultural nuances. By integrating manual annotations into algorithmic models, the system continuously refines the AI's ability to interpret deeper levels of oral expression. This iterative approach enhances the scientific rigor and breadth of evaluations, fostering a more holistic understanding of language proficiency.

5.2. Strengthening Guidance for Self-Directed Learning to Avoid Technological Dependence

In instructional design, it is essential to incorporate an "AI-free error correction and free expression" phase. This phase encourages students to independently complete oral

outputs before utilizing AI tools for comparative revision. Such an approach fosters the development of self-monitoring and self-reflection skills, which are critical for effective learning. Educators should guide students to understand AI's role as a supportive learning aid rather than a replacement for independent thinking and practice. This strategy promotes a balanced development of technological proficiency alongside language competence, ensuring that learners do not become overly reliant on technology for their academic progress.

5.3. Improve Hardware and Platform Construction to Ensure Learning Equity

Schools should prioritize the enhancement of multimedia classrooms, language laboratories, and comprehensive wireless network coverage to establish a stable and inclusive AI learning environment for students. Additionally, the development of lightweight mobile learning applications is essential to minimize device configuration requirements. This approach ensures that students from economically disadvantaged backgrounds or those with limited access to advanced equipment can benefit from intelligent listening and speaking resources. By addressing these disparities, educational institutions can effectively narrow the digital divide and promote equitable learning opportunities for all students.

5.4. Strengthening Teachers' Digital Literacy Training to Enhance Instructional Competence

To enhance educators' instructional competence, it is essential to establish a standardized and tiered training system focused on AI teaching proficiency. This system should encompass key areas such as the operation of intelligent platforms, the interpretation of educational data, the design of differentiated instructional strategies, and the management of human-machine collaborative classrooms. Teachers should be encouraged to actively engage in teaching research initiatives and instructional competitions, fostering the integration of AI technology into English listening and speaking instruction. Such efforts aim to strengthen educators' ability to innovate in digital teaching methodologies and adapt to evolving educational technologies.

5.5. Enrich Scenario Resource Libraries to Enhance Content Practicality and Occupational Relevance

To address the talent development requirements across diverse academic and professional disciplines, specialized scenario-based resources have been meticulously developed. These resources encompass areas such as academic English, workplace English, cross-border communication, and professional English expression. Examples include business negotiations, interview dialogues, academic presentations, and cross-border services. By integrating these targeted scenarios into listening and speaking training, the content becomes more closely aligned with students' prospective career paths [18]. This approach ensures a dual enhancement of both "language proficiency" and "professional competence," fostering practical skills that are directly applicable to occupational contexts.

6. Conclusion and Prospects

Supported by the Output-Driven Hypothesis, Understandable Input Theory, and the integration of teaching-learning-evaluation with personalized learning theories, this study developed a comprehensive four-module closed-loop AI-powered English listening-speaking model for college students, structured as "Intelligent Diagnosis---Scenario-Based Implementation---Dynamic Evaluation---Iterative Optimization." This innovative model addresses critical challenges in traditional listening-speaking instruction, including insufficient personalization, delayed feedback, limited scenarios, and low speaking practice frequency. By leveraging advanced AI technologies, it significantly enhances students' English listening-speaking proficiency, learning autonomy, and classroom engagement while simultaneously reducing teachers' workload. This dual benefit fosters a transformative shift toward more precise, efficient, and personalized teaching approaches. Furthermore, the model promotes a deeper integration

of technology into pedagogical practices, ensuring that students receive tailored learning experiences that align with their individual needs and goals. The findings underscore the importance of adopting intelligent systems to bridge gaps in traditional methodologies, paving the way for scalable and sustainable improvements in foreign language education.

In practice, the teaching model must adhere to foundational principles such as human-computer collaboration, tiered instruction, data-driven approaches, and the seamless integration of learning with application. To maximize operational effectiveness, institutions should focus on refining evaluation systems, optimizing resource development, enhancing digital literacy among faculty and students, and ensuring robust hardware infrastructure support. These measures collectively contribute to the continuous improvement of AI-driven educational frameworks. Moreover, AI technology serves as a pivotal enabler for reforming college English listening and speaking instruction, offering tools to create more engaging and effective learning environments. Establishing a scientifically sound intelligent teaching model is essential for achieving high-quality foreign language education in higher education institutions. This approach aligns with the broader goals of modern education, emphasizing adaptability, inclusivity, and the cultivation of globally competent graduates equipped to navigate the complexities of cross-cultural communication in the new era.

With the continuous advancement of technologies such as large language models, multimodal interaction, virtual simulation, and affective computing, AI applications in English education are poised to become increasingly profound, intelligent, and emotionally engaging. Future research should prioritize the development of AI-enhanced virtual reality (VR/AR) immersive listening and speaking scenarios to simulate highly realistic cross-cultural communication environments. Adaptive learning systems powered by emotion recognition can dynamically adjust task difficulty and feedback methods based on students' emotional states, fostering a more personalized and responsive learning experience. Additionally, promoting inter-institutional resource sharing and regional collaboration will be instrumental in establishing standardized, scalable AI-powered English listening and speaking teaching frameworks. Concurrently, future studies must address critical issues such as AI teaching ethics, data security, academic integrity, and long-term learning outcome tracking. Striking a balance between technological empowerment and humanistic education is vital to ensuring that artificial intelligence genuinely serves students' comprehensive development in language proficiency, critical thinking skills, and cross-cultural competence. This balanced approach will provide robust support for cultivating internationally competent interdisciplinary talents capable of thriving in an increasingly interconnected world.

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