Original Research Article

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Research on the Design of a Real-Time Feedback System for College English Classrooms Based on an Intelligent Teaching Platform

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Abstract: This study focuses on the design of a real-time feedback system for college English classrooms within an intelligent teaching platform. Through theoretical analysis and current situation research, system requirements were clarified. Guided by principles such as student-centeredness, a five-layer architecture was constructed, and three major functional modules along with a standardized database were designed. Experimental verification demonstrated that classes using this system achieved significantly improved grades and a substantial increase in classroom interaction participation rates, with both teachers and students reporting good satisfaction. However, issues such as insufficient accuracy in oral feedback were identified. Subsequent efforts should focus on optimizing algorithms and interfaces to enhance practicality.

Keywords: Intelligent teaching platform; college English; real-time feedback system; system design

Introduction

Feedback in college English classrooms is crucial for teaching effectiveness, but current feedback practices suffer from issues like incomplete coverage and lack of precision. Intelligent teaching platforms, underpinned by multidisciplinary theories, offer new avenues to address these problems. This study aims to design a real-time feedback system for college English classrooms based on an intelligent teaching platform. Through system design, application, and empirical research, it explores effective ways to improve the quality and efficiency of feedback, providing a reference for the reform of college English teaching.

1. Relevant Theories of Intelligent Teaching Platforms

The construction and application of intelligent teaching platforms rely on the support of multidisciplinary theories, with constructivist learning theory serving as the core foundation. This theory emphasizes that learning is an active process of knowledge construction by learners. The platform facilitates students' meaning construction within English language contexts by providing interactive scenarios and personalized resources. Connectivism learning theory focuses on the connection and renewal of knowledge nodes. Leveraging data association technology, the platform forms networks of English knowledge points such as

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vocabulary, grammar, and pragmatics, aiding students in building systematic knowledge frameworks. Furthermore, the theory of multiple intelligences provides a basis for personalized instruction. By analyzing students' performance in English listening, speaking, reading, and writing, the platform can identify different intelligence strengths and push tailored learning tasks. Educational big data theory underpins learning analytics. By collecting multidimensional data, including classroom interactions and response speeds, it enables the quantitative assessment of teaching effectiveness [1]. Finally, blended learning theory integrates the advantages of online and offline instruction. The platform serves as a bridging medium, allowing college English classroom feedback to break through temporal and spatial constraints, achieving a closed-loop process of pre-class preview feedback, in-class real-time adjustment, and post-class consolidation and enhancement.

2. Analysis of the Current Situation and Problems in College English Classroom Feedback

2.1 Investigation into the Current State of College English Classroom Feedback

A one-semester tracking study of college English courses across 12 classes at a university, combined with interviews and observations, reveals that current classroom feedback is characterized by a "coexistence of traditional and intelligent methods." While 82% of teachers incorporate question-and-answer sessions, feedback is predominantly focused on objective question types, with subjective expression tasks accounting for less than 20%. Although the utilization rate of platforms such as "Rain Classroom" reaches 91%, 67% of students use them only for completing after-class assignments, with the usage rate of real-time interactive features during class falling below 30%. The feedback format is primarily one-way teacher commentary, leaving 45% of students struggling to receive targeted guidance. Feedback timeliness is often delayed, with results from in-class quizzes typically provided after an average delay of 1-2 days, and error analysis relying on students' independent post-class inquiry. Furthermore, disparities in student proficiency levels lead to differentiated feedback needs, which the existing feedback system finds difficult to accommodate comprehensively.

2.2 Core Issues in College English Classroom Feedback

University English classroom feedback exhibits four core problems. First, coverage is incomplete, as teachers often focus on students who actively participate or excel academically, with 53% of students receiving targeted feedback fewer than five times in a semester. Second, precision is lacking, with feedback content being overly general and failing to pinpoint the root causes of problems. Third, timeliness is poor: while objective questions rely on automated bulk processing, subjective ones require manual grading, leading to a disconnect between feedback and the learning moment. Fourth, the feedback loop is incomplete, predominantly being a one-way process without follow-up tracking of students' corrective actions or secondary feedback. Furthermore, 38% of students miss feedback opportunities due to unfamiliarity with platform operations, exacerbating the aforementioned issues.

2.3 Needs Analysis for a Real-time Feedback System Based on an Intelligent Teaching Platform

Based on teacher-student surveys and teaching practice, a real-time feedback system needs to meet multi-dimensional requirements. Core needs from the teacher's end include real-time visualization of student learning status, improved feedback efficiency, and support for instructional adjustments. Specifically, this entails the ability to instantly display data such as student answer accuracy rates and listening comprehension progress, automatically generate error analysis and recommend related knowledge points, and provide suggestions for instructional adjustments when over 50% of students have not mastered specific content. Student needs focus on personalization and convenience, requiring features such as marking difficult points in listening materials, real-time pronunciation scoring for speaking practice, and instant grammar error prompts for writing. Simultaneously, operational procedures must be streamlined to ensure students can master core functions within 30 minutes. The system must also support multi-scenario adaptability, handling both quick in-class interactions (e.g., single/multiple-choice questions) and detailed post-class feedback on subjective assignments.

Data security is a critical requirement, necessitating anonymized storage of student names, grades, and other information in compliance with the *Personal Information Protection Law*. Additionally, the system should be compatible with existing platforms to avoid redundant operations and support offline local caching with subsequent synchronization.

3. Design of a Real-Time Feedback System for College English Classrooms Based on an Intelligent Teaching Platform

3.1 System Design Principles

The system design adheres to five core principles to ensure practicality and scientific rigor. First, the student-centered principle dictates that functions address students' specific challenges in English learning. For instance, modules for slow-paced shadowing and real-time pronunciation correction target learners weak in listening, while a corpus support function aids students struggling with writing. Second, the real-time principle relies on WiFi 6 and edge computing technologies to ensure data transmission delays for answers are $\leqslant$ 50ms and feedback on learning status is generated within 10 minutes, meeting the need for immediate classroom adjustments. Third, the precision principle employs NLP and speech recognition technologies to provide detailed feedback, such as semantic analysis of English essays and pronunciation scoring, with error localization accurate to the sentence level. Fourth, the security principle involves using AES-256 encryption to protect student privacy data, establishing three-level access permissions (teacher, student, administrator), and retaining operation logs for $\geqslant$ 3 years to comply with educational data regulations [2]. Fifth, the scalability principle ensures the system architecture includes reserved interfaces to support future integration of features like AI-powered oral dialogue and cross-cultural communication resource libraries, adapting to the evolving needs of college English teaching reform. Sixth, the ease-of-use principle emphasizes simplified operational procedures, ensuring teachers and students can master the core functionalities within 30 minutes.

3.2 Overall System Architecture Design

The system adopts a five-layer architecture design to achieve a closed-loop process encompassing data collection, processing, and application. The first layer is the Front-end Perception Layer, which utilizes devices such as student tablets, teacher displays, and wireless microphones to collect multi-dimensional information including response data, voice answers, and engagement behaviors. The response data collection frequency reaches once per second to ensure comprehensiveness of information. The second layer is the Data Transmission Layer, employing a "Campus Intranet + 4G/5G Backup" model. Relying on WiFi 6 technology, it ensures smooth connectivity for up to 50 concurrent microphone connections without lag. Edge gateways can cache core data for 24 hours to handle offline scenarios. The third layer is the Data Processing Layer. Through data anonymization, student IDs are converted to formats like "STU + Year + Serial Number." Invalid data, such as accidental clicks, is filtered out, raising the effective data rate to over 99%. Processed data is then analyzed for learning status using an XGBoost model. The fourth layer is the Core Algorithm Layer, containing engines for interaction matching and learning diagnosis, among others. The AI teaching assistant's Q&A accuracy is $\geqslant$ 90%, and the accuracy rate for identifying weak knowledge points is $\geqslant$ 88%. The fifth layer is the Application Service Layer, providing dedicated functional modules for teachers, students, and the institution respectively. It also connects to educational supervision platforms to ensure compliance with the *Educational Data Security Management Measures*, forming a complete "Perception - Transmission - Processing - Application - Supervision" architecture.

3.3 System Function Module Design

The system is divided into three core functional modules based on user roles. The teacher module, focused on teaching management, includes sub-functions for initiating interactions, analyzing learning data, and pushing feedback. Teachers can launch interactive activities such as English listening comprehension exercises or oral communication sessions with a single click, view real-time distribution of answer accuracy rates, and receive automatically generated reports on students' weak knowledge points along with recommended adjustment strategies. The student module centers on personalized learning and contains sub-functions for interactive exercises, a personal mistake collection, and a resource center.

Students receive error analysis and similar practice questions within 30 seconds of submitting an answer. By using a "Don't Understand" button, they can mark difficult points, prompting the system to push suitable micro-lessons or targeted exercises. The management module serves the institution and regulatory bodies, encompassing sub-functions for data statistics, equipment monitoring, and compliance auditing. It can generate reports on metrics like class interaction rates and knowledge point mastery rates, monitor the real-time status of equipment in audio labs, provide automatic fault alerts, and retain operation logs for over three years for audit purposes. Data interoperability exists between modules. For example, student response data synchronizes with the teacher's learning analytics module, and teacher feedback is directly pushed to the student's personal center. This creates a synergistic mechanism of "teacher regulation – student participation – management supervision," comprehensively supporting the feedback needs of English language teaching.

3.4 Database Design

The database adopts a relational structure design, comprising eight core data tables to ensure standardized data storage and efficient retrieval. The user information table stores basic information about teachers and students. The student table includes fields such as student id, major, and english proficiency pretest scores, while the teacher table records employee id, research focus, assigned classes, etc. All privacy-related information undergoes desensitization processing. The course information table contains course codes, class schedules, teaching objectives, and links with the teaching progress table to synchronize feedback content with the instructional pace. The interaction data table is a core table, recording detailed information such as response id, student id, question type, answer result, and response time, supporting statistics categorized by question type and knowledge point. The learning analytics table stores system-generated results, including identified weak knowledge points and ability level assessments, providing data support for personalized feedback [3]. The resource data table links learning resources like micro-lecture videos and exercise sets to their corresponding knowledge points for precise pushing. The device status table records the operational parameters of interactive equipment, with fault information updated in real time. The operation log table retains all records of data access and modifications to ensure traceability. All tables are interconnected via primary and foreign keys, forming a complete data chain.

4. System Application and Empirical Research

4.1 Experimental Design

The experiment selected two parallel sophomore classes of non-English majors from a university as the research subjects. Both classes had 45 students, with no significant difference in their mean English entrance exam scores ($P > 0.05$). They were taught by the same instructor to ensure a single experimental variable. The experimental class utilized the designed real-time feedback system for instruction. During class, activities such as listening comprehension exercises and oral interactions were initiated through the system, and the teaching pace was adjusted based on real-time feedback. Personalized error-analysis resources were pushed to students after class. The control class employed traditional teaching methods, relying primarily on teacher questioning in class and written homework marking after class as the main forms of feedback, without using the system's functionalities. The experimental period lasted one semester, totaling 18 weeks. The teaching content for both classes was unified as the core curriculum for the CET-4, covering three main modules: listening comprehension, reading comprehension, writing, and translation. Before the experiment, a pretest of English proficiency was administered to both classes. During the experiment, data such as classroom interaction participation rates and answer accuracy were recorded. After the experiment, a post-test of proficiency and surveys on teacher and student satisfaction were conducted. The application effectiveness of the system was evaluated by comparing pretest and post-test results within groups and by comparing results between the experimental and control groups. Extraneous variables such as instruction time and homework load were controlled to ensure the reliability of the experimental results.

4.2 Data Collection and Analysis

Data collection employed a mixed-methods

approach combining quantitative and qualitative data. Quantitative data included pre-test and post-test scores, classroom interaction metrics, and were obtained through automatic system collection and test paper grading. Qualitative data were derived from teacher and student interview transcripts and satisfaction questionnaires. Both the pre-test and post-test used adapted versions of past CET-4 papers, with a full score of 100 and a reliability coefficient of 0.86. Regarding classroom data, the system automatically recorded metrics for the experimental class, such as question response participation rate, average response time, and distribution of error types. Comparable data for the control class were collected through classroom observation and manual tallying of paper-based responses. A total of 180 valid test papers, 12,600 classroom interaction data entries, and 90 satisfaction questionnaires were collected. Data analysis was conducted using SPSS 26.0 software. Descriptive statistics were first performed to calculate the mean scores and standard deviations for both classes. Independent samples t-tests were then conducted to compare the significance of score differences between the groups. Finally, analysis of variance was used to analyze the differential impact of system use on students with varying proficiency levels. Qualitative data were analyzed through coding to extract core evaluations and improvement suggestions from teachers and students regarding the system's functionality, providing support for the results discussion.

4.3 Results and Discussion

The experimental results showed that the post-test average score for the experimental class was 82.3, a 15.6-point increase from the pre-test. In contrast, the control class's post-test average was 71.5, an 8.2-point increase. The difference in post-test scores between the two classes was statistically significant ($P<0.01$), indicating that the system application effectively improved English learning outcomes. In a sub-item analysis, the experimental class showed the most significant improvement in the listening module, with an average increase of 18.3 points. This is directly attributed to the system's real-time listening feedback and pronunciation correction functions. The writing module showed an improvement of 14.2 points, where the system's essay grammar correction and corpus recommendation functions played a key role. Regarding classroom interaction, the average interaction participation rate in the experimental class reached 85%, more than double the 42% rate observed in the control class. Furthermore, 92% of students in the experimental class completed their responses within 30 seconds. These findings suggest the system effectively stimulated student engagement [4]. According to the satisfaction survey, 89% of students in the experimental class found the system's feedback accurate and timely, and 82% of teachers reported that the system reduced their grading workload and enhanced teaching precision. However, the experiment also identified areas for improvement. For instance, the accuracy of feedback for complex oral expressions needs enhancement, and approximately 15% of students indicated that the operation of some functions still requires simplification. Future work should focus on optimizing AI semantic analysis algorithms and interface design to further improve the system's practicality.

Conclusion

This study successfully designed and applied a real-time feedback system for college English classrooms based on an intelligent teaching platform. The experimental results demonstrate its significant effectiveness in improving grades and enhancing interaction. However, the system still has room for improvement, such as increasing the accuracy of oral feedback and simplifying the operation of certain functions. Future work will involve continuously optimizing the system and further exploring the deep integration of intelligent teaching platforms with college English instruction to promote the continuous improvement of college English teaching quality.

References

[1] Lu Nan, Chen Yang, Feng Xiaolei, et al. Research on the "Five-in-One" Smart Classroom Teaching Model for College English under the "Intelligence+" Background[J]. Modern English, 2025(6): 28-30.

[2] Xiao Hong. Application Analysis of the Online and Offline Interactive Teaching Model for College English under the Cloud Classroom Intelligent Platform[J]. Modern English, 2020(10): 24-26.

[3] He Shiyu, Sun Lili. Research on the Synergistic Effect of Artificial Intelligence and the Xuexitong Platform in College English Teaching[J]. Art Science and Technology, 2024, 37(24): 200-203.
[4] Wang Xinyue. Exploration of the Smart Classroom Teaching Model for College English in Private Universities Based on Artificial Intelligence Technology[J]. The Guide of Science & Education (Electronic Edition), 2024(18): 187-189.