

Pathways of Human-Machine Collaborative Teaching Reform in College English Classrooms Driven by Generative AI

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Abstract: With the continuous advancement of the digital education strategy, generative AI has been gradually integrated into university classrooms, bringing brand-new opportunities for the innovation of college English teaching models. Traditional college English teaching has long been plagued by numerous problems, making it difficult to meet the demands of foreign language talent cultivation in the new era. To address the current teaching dilemmas, this paper takes human-machine collaborative teaching theory and precision teaching theory as theoretical support, systematically sorts out the core characteristics of college English teaching empowered by generative AI, and constructs reform pathways for human-machine collaborative college English teaching under generative AI from five dimensions: reconstruction of teaching subjects, innovation of teaching content, optimization of teaching procedures, upgrading of teaching assessment, and improvement of teachers' capabilities. The research findings facilitate the implementation of personalized and precise English teaching, and provide theoretical references and practical implications for digital teaching reform of college English in universities.

Keywords: Generative AI; College English; Human-Machine Collaboration; Teaching Reform; Precision Teaching

1. Introduction

Against the backdrop of the steady advancement of the digital education strategy, artificial intelligence has evolved from an auxiliary tool into a pivotal variable that shapes teaching decisions and learning pathways[1]. The rapid development of generative AI and its application in education are triggering profound structural transformations[2]. Centered on large language models, generative AI boasts strengths including intelligent interaction, content generation, data analysis and personalized adaptation, completely breaking the teaching boundaries of traditional classrooms and offering brand-new technical support and development paradigms for disciplinary teaching reform in higher education. For a long time, college English classrooms have commonly suffered from rigid teaching models, single teacher-student roles, learning burnout[3], insufficient differentiated instruction and outdated assessment methods, which fail to accommodate students' varied language foundations and learning needs. Amid the comprehensive advancement of the digital education strategy and the deepened development of Emerging Engineering Education and Liberal Arts Education, the reform and innovation of traditional English teaching have become urgent priorities. Promoting the transformation of human-machine collaborative teaching models with generative AI has become an inevitable trend to improve the quality and efficiency of college English teaching. Based on the technical features of generative AI and the philosophy of human-machine collaborative teaching, this study sorts out the internal logic behind the in-depth integration of intelligent technology and English teaching, enriches the theoretical system of college English teaching reform from a digital perspective, and offers theoretical references for localized research on human-machine collaborative teaching models. Meanwhile, focusing on real classroom scenarios of college English, it proposes human-machine collaborative reform pathways suitable for frontline teaching, resolves practical difficulties in traditional English teaching, helps teachers reshape their instructional roles and optimize teaching procedures, and enables students to achieve personalized and precise language learning.

2. Practical Dilemmas in College English Classroom Teaching

Despite the continuous progress of college English teaching reform amid the digital transformation of education, the inertial influence of the traditional teaching system remains prominent, and classroom teaching still features numerous shortcomings incompatible with the requirements of intelligent education and core competency cultivation.

2.1 Rigid Teacher-Student Roles in Traditional Teaching Models

Most current college English classrooms still adopt the conventional lecture-based teaching model with relatively fixed and monotonous overall teaching structures. During teaching, teachers dominate the classroom and complete fundamental teaching tasks including knowledge explanation, text analysis and exercise review based on textbooks. Students mostly passively receive knowledge, classroom interaction takes limited forms, and the space for independent thinking and language practice is drastically compressed. Long-term rigid positioning of teachers and students creates dull classroom atmospheres with little room for dynamic adjustment and flexible expansion of teaching processes. Distant teacher-student relationships[4] hinder efficient two-way teaching interaction and fail to fully stimulate students' initiative and creativity in language learning.

2.2 Lack of Personalized Learning and Differentiated Instruction

College English classrooms mostly adopt standardized collective teaching with inadequate attention paid to individual student differences[5]. Students exhibit wide disparities in English foundations, with distinct gaps in vocabulary reserves, listening and speaking proficiency, reading and writing capabilities, as well as divergent learning paces and demands. Uniform teaching schedules, content and objectives cannot satisfy stratified teaching requirements: students with weak foundations struggle to keep up with classroom progress, while advanced learners lack opportunities for extended learning. The pervasive one-size-fits-all teaching approach lacks targeted learning situation analysis and personalized guidance, resulting in persistent deficiencies in students' English proficiency.

2.3 Assessment Systems Lagging Behind Core Competency Cultivation

Current college English teaching assessment still centers on summative evaluation with rigid and one-sided overall assessment frameworks. Teaching assessment predominantly focuses on final written examinations, prioritizing the evaluation of students' theoretical knowledge memorization and written test-taking abilities, leading to disconnection between assessment and teaching processes[6]. There is insufficient evaluation of core competencies including oral expression, cross-cultural communication, language application and autonomous learning. Assessment procedures lack full-process tracking and documentation of students' classroom performance, learning attitudes and competency improvements, ignoring their phased progress and dynamic changes. The single and rigid assessment format cannot fully reflect students' comprehensive English proficiency, nor can it reversibly drive classroom teaching toward the objectives of core competency cultivation.

2.4 Deficiencies in Teachers' Intelligent Literacy and Technical Application Capabilities

With the popularization of intelligent educational technologies, college English teaching has raised higher standards for teachers' digital teaching capabilities. Some English teachers still adhere to traditional teaching philosophies and hold limited awareness and acceptance of intelligent teaching technologies. Most teachers only master basic multimedia operations and lack proficiency in applying generative AI to teaching, unable to optimize teaching procedures with intelligent technologies. Meanwhile, universities lack sound training systems for improving English teachers' intelligent literacy, with training content disconnected from actual classroom teaching. This prevents teachers from deeply integrating intelligent technologies with listening, speaking, reading and writing instruction in English, restricting the implementation and promotion of intelligent teaching models.

3. Core Characteristics of Human-Machine Collaborative Teaching Driven by Generative AI

Generative AI transforms the monotonous teaching form of traditional college English, and human-machine collaborative teaching features distinctive attributes of intelligence, dynamism,

precision and diversification, offering brand-new support for resolving practical dilemmas in English teaching.

3.1 Dual-Teacher Collaboration as Teaching Subjects

Following the intervention of generative AI in classrooms, college English teaching establishes a new dual-teacher collaborative education framework integrating human teachers and intelligent tools, realizing complementary and optimized teaching functions. Instead of undertaking all teaching work, teachers mainly shoulder core responsibilities including instructional design, value guidance, learning situation monitoring and humanistic tutoring, focusing on cultivating students' cross-cultural literacy and critical thinking capabilities. Generative AI takes over repetitive and auxiliary teaching tasks, efficiently completing Q&A, oral pronunciation correction, material sorting and exercise generation and other routine work. The two parties perform their respective duties and cooperate closely, effectively compensating for the limitations of traditional classrooms such as teachers' constrained energy and insufficient tutoring coverage.

3.2 Dynamic Generation of Teaching Content

Human-machine collaborative teaching breaks the static limitations of traditional college English teaching reliant on fixed textbooks and enables dynamic, scenario-based generation of teaching content. Traditional English teaching content is rigid and outdated, disconnected from real language application scenarios. Supported by generative AI, teachers can generate diversified and real-life English corpora in real time according to classroom teaching progress, students' learning levels and current pragmatic scenarios. Teaching content is no longer confined to inherent textbook systems, capable of aligning with contemporary development and practical communication demands, enriching classroom teaching resources, returning language teaching to authentic application, and enhancing the flexibility and practicality of teaching content.

3.3 Precise Adaptation of Teaching Procedures

Equipped with robust data collection and analytical capabilities, generative AI shifts college English teaching from standardized instruction to data-driven personalized precision teaching. Traditional classrooms struggle to accurately capture each student's learning weaknesses and characteristics, making individualized instruction unattainable. AI records students' learning behaviors including classroom responses, oral practices and after-class assignments throughout the process, sorting out students' knowledge gaps, learning habits and competency deficiencies through big data analysis. Based on precise learning situation data, the system can automatically match adaptive learning tasks and training materials, designing exclusive learning pathways for students at different levels and aligning teaching procedures with individual student demands.

3.4 Diversified and Three-Dimensional Teaching Assessment

Human-machine collaborative teaching revamps the traditional single assessment model and constructs a three-dimensional assessment system combining process evaluation and value-added evaluation. Generative AI tracks full-process learning data such as students' classroom participation, daily exercises and language output throughout the learning journey, enabling dynamic recording and process assessment of students' learning status to offset the one-sidedness of summative evaluation. Furthermore, AI conducts vertical comparisons of data across different stages to analyze dynamic changes and growth margins of students' competencies, implementing scientific value-added evaluation. This diversified assessment model can comprehensively reflect students' integrated language proficiency and accurately measure teaching effectiveness.

4. Specific Reform Pathways of Human-Machine Collaborative College English Classroom Teaching Driven by Generative AI

Combining practical dilemmas in English teaching and core characteristics of human-machine collaborative teaching, this section constructs reform pathways from five dimensions including teaching subjects, teaching content, teaching procedures, teaching assessment and teacher development, leveraging the technical advantages of generative AI to comprehensively advance the intelligent

transformation of college English classrooms.

4.1 Pathway of Subject Reconstruction

To address rigid teacher-student roles in traditional classrooms, generative AI is adopted to build a dual-teacher collaborative teaching model, redistribute classroom teaching responsibilities, transform the one-way knowledge transmission model, and form a brand-new classroom education framework featuring two-way interaction and human-machine complementarity.

(1) Clarify human-machine responsibilities to reshape primary and auxiliary classroom teaching roles. Teachers focus on high-order teaching work including instructional design, humanistic cultivation and thinking guidance, concentrating on fostering students' critical language thinking and cross-cultural literacy. Generative AI undertakes basic, procedural auxiliary teaching tasks such as language error correction, knowledge Q&A and exercise distribution. Clear division of human-machine responsibilities avoids overlapping or missing functional roles, ensuring orderly and efficient classroom teaching.

(2) Highlight students' dominant status with intelligent tools. Teachers can utilize intelligent tools to carry out diverse classroom activities including real-time Q&A, situational dialogues and group drills, providing students with ample space for language expression and practice. AI can respond to students' learning demands around the clock and answer questions promptly, breaking the temporal and spatial constraints of traditional classroom interaction. Continuous human-machine interaction fully stimulates students' learning initiative and effectively embodies students' dominant position in classrooms.

(3) Conduct collaborative teaching research to transform rigid lecture-based mindsets. Universities can organize English teachers to hold group seminars based on AI teaching application cases, analyzing implementation essentials and optimization directions of human-machine collaborative classrooms. Through exchange and learning, teachers break free from the fixed thinking of single lecture-based teaching and proactively explore new intelligent teaching approaches. Accumulated continuous teaching research helps teachers adapt to intelligent teaching reforms and develop flexible and innovative classroom instruction mindsets.

4.2 Pathway of Content Innovation

To resolve homogenized and insufficient differentiated traditional teaching content, generative AI is utilized to dynamically generate teaching resources, break the limitations of fixed textbooks, and match teaching content to students' learning gaps to remedy deficiencies in stratified instruction.

(1) Generate stratified supporting learning materials based on learning situation data. In light of individual student differences, intelligent gradient and stratified learning materials are generated to accommodate the learning demands of students with weak, intermediate and advanced proficiency. Stratified materials cover vocabulary, grammar, listening, speaking, reading and writing targeted training, which can specifically remedy students' learning deficiencies and align teaching content with personalized student development needs.

(2) Create scenario-based practical corpora by constructing authentic linguistic contexts. Content in traditional textbooks features monotonous scenarios and delayed updates, disconnected from real language application contexts. Integrating daily communication, business exchanges and academic seminars and other diverse scenarios, AI dynamically generates authentic and idiomatic linguistic materials. Incorporating scenario-based corpora into classroom teaching can cultivate students' on-site language application capabilities and help them overcome the dilemma of "mute English".

(3) Build personalized resource libraries by integrating diversified materials. AI screens and integrates high-quality online courseware, foreign readings, film and television materials, academic corpora and other diversified resources, classifying and optimizing scattered materials. Meanwhile, resource library content is dynamically updated according to classroom teaching progress and student learning demands. Systematic resource libraries provide regular teaching support for teachers and students, satisfying diverse demands of stratified instruction and autonomous learning.

4.3 Pathway of Procedure Optimization

Leveraging generative AI's data collection and analytical capabilities to cover the entire pre-class, in-class and post-class teaching procedures, data-driven precision teaching is realized to customize

exclusive personalized learning pathways for students.

(1) Pre-class intelligent diagnosis to accurately identify knowledge gaps. Teachers release pre-class preview assignments and basic test exercises via AI, and the system automatically collects and intelligently analyzes student response data to precisely locate deficiencies in students' vocabulary, grammar, listening and speaking capabilities. Based on diagnostic results, key and difficult teaching points are clarified and targeted classroom teaching plans are designed, eliminating blind teaching from the source and improving classroom teaching precision.

(2) In-class human-machine interaction to accommodate multi-level learning demands. Combining pre-class learning situation data, teachers design stratified classroom tasks, interactive exercises and situational training via AI. Foundational consolidation tasks are assigned to students with weak foundations, while extended advanced content is arranged for high-achieving learners. AI tracks students' classroom responses and interactions in real time, dynamically adjusting task difficulty and training rhythms to ensure students at all levels gain adaptive learning experiences in class.

(3) Post-class intelligent review to customize targeted improvement plans. The system aggregates all learning data including pre-class preview, classroom interaction and after-class assignments, conducts comprehensive reviews of students' learning conditions, and sorts out phased learning problems. Combined with students' deficiencies, personalized after-class exercises, extended materials and review content are intelligently pushed, forming a closed-loop model of classroom learning, intelligent review and targeted improvement to continuously consolidate students' English foundations.

4.4 Pathway of Assessment Upgrading

To address one-sided and delayed traditional teaching assessment, generative AI is adopted to construct a full-process, three-dimensional assessment system integrating process evaluation and value-added evaluation, aligning with the cultivation objectives of English core competencies.

(1) Record the full learning process via intelligent tools. The system automatically records multi-dimensional data including students' completion rate of pre-class preview, classroom interaction participation, oral practice performance, quality of after-class assignments and autonomous learning duration. Comprehensive data retention fully restores students' entire learning journeys, transforming the traditional single assessment model reliant solely on final exam scores and providing comprehensive, authentic data support for integrated evaluation.

(2) Introduce value-added evaluation to measure margins of comprehensive competency improvement. Generative AI vertically compares student learning data across different stages to accurately capture dynamic changes in linguistic foundations, oral expression, reading and writing capabilities. Instead of judging students' proficiency against fixed standards, it focuses on their growth margins and progress to objectively measure learning outcomes and competency improvements, fully respecting individual differences in student development.

(3) Realize closed-loop teaching improvement through joint human-machine teaching evaluation. Combining the dual strengths of AI quantitative intelligent assessment and teachers' artificial comprehensive evaluation, both data objectivity and humanistic comprehensiveness are considered to fully judge students' development of English core competencies. Meanwhile, teaching processes are reviewed in reverse based on assessment results, deficiencies in instructional design, content setup and classroom implementation are sorted out, and teaching plans are dynamically adjusted to achieve closed-loop teaching optimization effects of promoting teaching and learning through assessment.

4.5 Pathway of Teacher Capacity Development

Teachers' intelligent literacy serves as the core foundation for the implementation of teaching reforms. Systematic training, regular teaching research and concept renewal are adopted to comprehensively improve English teachers' capabilities in AI teaching application and consolidate the foundation of human-machine collaborative teaching reforms.

(1) Launch special training to master AI classroom application skills. Targeting college English teaching scenarios, special instructional training covering practical content including AI corpus generation, learning situation analysis, stratified teaching and intelligent assessment is carried out. Formalized theoretical lectures are discarded in favor of classroom practical teaching drills, guiding teachers to proficiently operate various intelligent teaching tools. Systematic training remedies teachers'

deficiencies in intelligent technology application and improves their practical teaching capabilities in human-machine collaborative classrooms.

(2) Build communication platforms to research new collaborative teaching models. Relying on on-campus teaching research activities, inter-university exchanges, online seminars and other diversified platforms, excellent AI English teaching cases, classroom implementation methods and teaching optimization experience are shared. Through mutual exchange and learning, teachers draw on each other's strengths to explore human-machine collaborative teaching models compatible with their personal teaching styles. Sustained teaching research exchanges accelerate the implementation of intelligent teaching models and enrich practical pathways for intelligent college English classroom instruction.

(3) Update educational philosophies to establish human-machine symbiotic thinking. Through special lectures, philosophy presentations and case studies, teachers are guided to correctly recognize the educational value of generative AI and abandon rigid traditional teaching mindsets. Teachers are directed to clarify the educational logic of human-machine collaboration, recognize the auxiliary empowering role of AI, and proactively optimize teaching procedures with intelligent technologies. Advanced educational philosophies guide teaching practices and support the long-term advancement of intelligent teaching reforms.

5. Conclusions

Against the backdrop of the digital transformation of education, this study focuses on the in-depth integration of generative AI and college English classroom teaching, systematically analyzes practical dilemmas of college English teaching in teaching models, personalized cultivation, assessment mechanisms and teacher capabilities, summarizes brand-new characteristics of human-machine collaborative teaching in educational subjects, teaching resources, teaching procedures and teaching assessment, and constructs systematic human-machine collaborative teaching reform pathways from five dimensions: subject reconstruction, content innovation, procedure optimization, assessment upgrading and teacher development. This research effectively responds to the homogenization and superficiality of traditional English teaching, and provides clear, operable reform ideas for the implementation of human-machine collaborative models in college English classrooms. Future research will further explore teaching ethics, data security and students' AI dependency issues arising from intelligent technology application, improve supporting guarantee mechanisms, and further enhance the scientificity and standardization of college English teaching reforms empowered by generative AI.

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