

Reshaping College English Teaching through AI: Pathways, Evidence, and Strategies

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Abstract: This study explores how AI reshapes college English teaching within digital transformation. From six perspectives—personalized learning, intelligent assessment, knowledge graphs, immersive scenarios, teacher roles, and ethics—it reviews AI-integrated instruction. A quasi-experiment with first-year non-English majors at a Jiangsu science-engineering university tests a “knowledge graph + intelligent assessment + human-machine collaboration” model. Results over 16 weeks show the experimental group significantly outperformed the control ($p < 0.01$) in oral fluency (+12.7%), writing structure (+9.4%), lexical depth (+8.1%), and engagement (+23.6%), with low-proficiency learners improving most. The study proposes a five-level implementation pathway (curriculum, resources, assessment, faculty, governance) and discusses AI’s potential in rural education, cultural integration, and disciplinary EFL programs. It offers an integrated “technology-instruction-assessment-governance” framework, providing empirical and policy insights for high-quality AI-empowered college English teaching.

1. Introduction

The incorporation of artificial intelligence (AI) has sparked numerous changes in the field of language education (Chen et al., 2025^[1]; Derakhshan & Taghizadeh, 2025^[2]; Huang & Derakhshan, 2025^[3]; Rudolph et al., 2023^[4]; Wang et al., 2025^[5]). It addresses limitations of the traditional teacher-centered model by meeting digital-native learners’ needs for personalization, interactivity, and immediate feedback. However, current implementation often remains fragmented, lacking deep pedagogical integration and a cohesive theoretical framework for holistic adoption.

Grounded in a teaching ecosystem perspective, this 16-week mixed-methods study with 112 engineering undergraduates examines how AI reshapes teaching dimensions, identifies effective intervention models, and outlines pathways for sustainable, ecological transformation.

Personalized Learning (From Uniformity to Tailored Pathways) is one side. AI, particularly through Intelligent Tutoring Systems (ITS), enables precise personalization by dynamically adapting content, pacing, and support to individual learners’ levels and needs. For example, for students with listening difficulties, ITS curates tailored materials and adjusts speech rate and difficulty in real time to sustain an optimal challenge. This “one-size-fits-one” approach enhances efficiency, supports learner autonomy, and promotes self-directed learning.

The other side is Intelligent Assessment (From Snapshot to Continuous Feedback). AI-driven assessment evolves from episodic, summative evaluation to continuous, formative diagnostics. In writing, tools now analyze higher-order aspects like coherence and argument logic, providing immediate, actionable feedback for revision. In speaking, Automatic Speech Recognition and affective computing evaluate not only linguistic accuracy but also fluency, prosody, and learner confidence. This creates immediate feedback loops that accelerate skill refinement, boost learner motivation by making progress visible, and reduce instructors' grading burdens. This allows educators to shift from evaluators to facilitators, focusing on mentorship and dialogue.

In summary, AI is redefining college English teaching by enabling truly personalized learning trajectories and transforming assessment into an integrated, formative process that supports sustained development and a more responsive educational ecosystem.

1.1 Knowledge Graphs: Building Structured and Contextualized Knowledge Systems

AI-constructed knowledge graphs for college English integrate curriculum and corpora into a semantic network, linking lexical, grammatical, and sociocultural knowledge as interconnected nodes and edges. Unlike linear textbooks, exploring a term like "climate change" activates associated collocations, patterns, and authentic excerpts within this network. This non-linear, learner-driven approach aligns with constructivist learning, fostering deep understanding and supporting metacognitive, autonomous mastery.

Immersive environments use VR, AR, and AI-generated content to simulate authentic settings (e.g., conferences, negotiations) where learners interact with AI-driven characters. This enables practice of linguistic, pragmatic, and intercultural skills in near-real contexts, aligning with embodied cognition. Immersion boosts engagement, reduces anxiety, and enhances contextualized processing, thereby strengthening memory and transfer. AI adapts scenarios dynamically based on performance, and interaction data offer formative insights. These technologies thus bridge classroom instruction and real-world communication, fostering holistic communicative competence.

1.2 Teacher Role Reconstruction: From “Knowledge Transmitter” to “Learning Designer and Facilitator”

AI integration redefines teachers from knowledge transmitters to orchestrators of human-machine learning ecosystems. As AI manages routine tasks, educators focus on high-order functions: strategic curriculum design, inquiry-based and collaborative learning facilitation, human-AI teaching strategy formulation, and nurturing students' emotional well-being and intellectual virtues (e.g., critical thinking, creativity).

In this paradigm, teachers function as navigators (guiding AI-curated resources), facilitators (scaffolding metacognition and deep learning), and providers of humanistic care (addressing affective and socio-emotional needs). This triadic role shifts instruction from didactic delivery to synergistic orchestration of human pedagogy and AI capabilities.

This transformation elevates professional demands: teachers require advanced digital literacy to ethically evaluate and adapt AI tools while preserving pedagogical agency, along with enhanced instructional design skills for blended learning and collaborative leadership to co-design human-machine workflows. Ultimately, the teacher evolves into an adaptive expert and relational practitioner, leveraging AI to amplify learning while upholding empathy, judgment, and ethical commitment.

1.3 Ethical Governance: Risks and Regulations Under Technological Empowerment

AI integration in education raises critical ethical challenges: data privacy risks without encryption

and consent; algorithmic bias perpetuating inequities via unrepresentative data or opaque models; and threats to academic integrity. Addressing these requires robust safeguards, technical audits, and equity-centered design.

Generative AI tools complicate academic integrity by enabling cognitive outsourcing, potentially eroding independent critical thinking --a risk aligned with the ‘critical belief’ construct -- and threatening metacognitive development and intellectual autonomy.

Effective governance requires establishing data security standards (e.g., aligned with GDPR), co-creating AI-use guidelines with stakeholders, and defining AI-specific misconduct alongside designing AI-resistant assessments. Institutional responses should emphasize educational and restorative approaches. Ultimately, ethical AI adoption hinges on embedding principled frameworks that ensure equity, transparency, and the preservation of educational values.

2. Research Design and Methodology

To verify the effectiveness of the AI-enabled teaching model, this study designed and implemented a quasi-experiment.

2.1 Research Participants and Design

In a quasi-experimental pretest-posttest design (N=112), the experimental group (n=56) underwent a 16-week “knowledge graph + intelligent assessment + human-machine collaboration” intervention via Xuexitong, while the control group (n=56) received traditional instruction. Groups were homogeneous at baseline ($p>.05$). Post-intervention, the experimental group showed significantly greater gains (all $p<.01$) in oral fluency (+12.7%), writing structure (+9.4%), lexical depth (+8.1%), and learning engagement time (+23.6%), with low-proficiency students benefiting most.

This paper systematically examines AI's impact on college English teaching across six dimensions: personalized learning, intelligent assessment, knowledge graphs, immersive scenarios, teacher roles, and ethical governance. It constructs an integrated "knowledge graph + intelligent assessment + human-machine collaboration" model and proposes a multi-level implementation framework covering curriculum, resources, assessment, faculty development, and governance. The study also discusses AI's extended value in rural education, cultural integration, and discipline-specific development.

In conclusion, the findings provide empirical support for an integrated “technology–instruction–assessment–governance” reform framework, offering practical pathways for advancing high-quality, AI-empowered college English teaching.

2.2 Teaching Intervention Model: “Knowledge Graph + Intelligent Assessment + Human–Machine Collaboration”

The core components of the teaching intervention model adopted by the experimental group are as follows:

2.2.1 Knowledge Graph-Driven Content Delivery

A foundational college English knowledge graph was built by mapping curricular objectives (lexical, grammatical, discursive, sociocultural) into a semantic network of nodes (concepts) and edges (associations). Diverse resources (texts, audio, video) were semantically annotated and linked to graph nodes, enabling contextual indexing aligned with learning goals.

An intelligent recommendation engine leveraged the knowledge graph to deliver personalized resources based on continuous analysis of individual learner progress (e.g., accuracy, errors,

interaction). By inferring proficiency levels and knowledge gaps, it adaptively selected and sequenced materials aligned with each learner's zone of proximal development, such as prioritizing formal discourse resources for students struggling with academic register.

This approach transformed content delivery from linear uniformity to adaptive, learner-centric pathways. The knowledge graph functioned as a navigational infrastructure for differentiated instruction, reducing cognitive load and fostering deeper engagement with authentic content. It thereby operationalized constructive learning principles, supporting coherent knowledge integration and the development of transferable communicative competence.

2.2.2 Intelligent Assessment Embedded in the Learning Process

All learning activities and assessments were conducted via an AI-integrated platform, which automated scoring and delivered immediate, granular feedback for writing and speaking tasks, enabling a continuous formative feedback loop.

For writing, NLP algorithms assessed surface-level accuracy (lexicon, grammar) and higher-order features (structure, argument, genre), providing scores and actionable feedback (e.g., thesis clarity, paragraph transitions). For speaking, ASR and pronunciation models evaluated accuracy, fluency, and prosody, augmented by affective computing. The system delivered immediate performance summaries and targeted remedial exercises.

The platform compiled personalized error logs, categorizing recurrent mistakes (e.g., verb-tense errors) and linking them to explanatory mini-lessons. It also generated individualized learning reports synthesizing performance trends, effort metrics, and proficiency gains, providing both summative benchmarks (e.g., CEFR estimates) and formative next steps.

Together, these features—automated scoring, real-time feedback, error-pattern visualization, and data-rich reporting—transformed assessment into an embedded formative process, supporting scalable, data-informed practice and fostering self-regulated, sustainable language development.

2.2.3 Human–Machine Collaborative Classroom Organization

Before class, students completed foundational learning via the platform; in class, teachers led advanced activities (e.g., discussions, project-based inquiry) informed by learning analytics, with AI assistants offering real-time language support; after class, AI assigned individualized consolidation exercises, and teachers provided online Q&A and targeted tutoring.

2.3 Measurement Instruments

Learning Outcomes: Pre-/post-tests assessed listening, reading, writing, translation ($\alpha=.81/.83$). Speaking was rated by two instructors on fluency, accuracy, complexity (inter-rater reliability $>.85$).

Learning Engagement: The revised College English Learning Engagement Scale ($\alpha=.92$) measured behavioral, cognitive, emotional engagement; platform logs captured duration, logins, completion rates

Learning Experience: Semi-structured interviews ($n=12$ from the experimental group) and open-ended questionnaires captured student perceptions, attitudes, and suggestions regarding the AI-based instructional model.

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2.4 Data Analysis

Quantitative data were processed using SPSS 26.0. Independent samples t-tests and analysis of

covariance (ANCOVA), with pre-test scores as the covariate, were employed to compare post-test differences between the two groups. Interview transcripts were coded and subjected to thematic analysis.

3. Research Results and Findings

3.1 Significant Improvement in Learning Outcomes

ANCOVA results (controlling for pre-test scores) revealed the experimental group significantly outperformed the control group on the overall post-test, $F(1, 109)=25.73, p<.001, \eta^2=.19$. Specifically:

Speaking fluency improved most substantially (+12.7%), likely due to frequent, low-anxiety AI-simulated conversation practice.

Writing structure scores in organization/coherence were significantly higher (+9.4%), reflecting effective discourse-level AI feedback.

Vocabulary depth in collocation accuracy/diversity also increased (+8.1%), associated with contextualized knowledge-graph learning.

Subgroup analysis of lower-proficiency learners (pre-test bottom 30%) showed gains exceeding the class average, indicating AI-supported personalization effectively addresses foundational gaps.

3.2 Sustained Increase in Learning Engagement

Learning Engagement Scale data showed significantly higher behavioral and cognitive engagement in the experimental group ($p<.01$). Platform logs confirmed the experimental group spent 23.6% more time weekly on tasks, with more regular, evenly distributed activity, indicating sustained engagement.

The heightened engagement aligns with the “optimistic belief” construct, where positive AI expectations correlate with greater behavioral and cognitive investment. The AI intervention—delivering timely, personalized support—likely satisfied learners’ psychological needs for competence (via immediate feedback) and autonomy (via self-paced navigation), thereby amplifying intrinsic motivation and self-regulation, consistent with Self-Determination Theory.

Methodologically, triangulating self-report and behavioral data strengthened validity. In summary, the AI-integrated model significantly deepened and sustained learner engagement, empirically affirming that well-designed AI experiences foster self-directed, persistent learning.

3.3 Positive and Diverse Learning Experience: A Sense of Ease

Coding analysis of the interview data revealed rich and multi-layered experiences among the students:

The coding analysis of the interview data revealed rich and multi-layered experiences among the students:

3.3.1 Efficiency and Convenience

“The instant feedback from AI lets me know right away where I went wrong, without having to wait until the next class to ask the teacher—it’s much more efficient.” (S3) This corresponds to the “perceived usefulness” in the Technology Acceptance Model.

3.3.2 Sense of Security and Confidence

“Practicing speaking with AI means no embarrassment; I can make mistakes and try again, which

makes me willing to speak up and builds my confidence.” (S7) This meets students’ affective needs and reduces learning anxiety.

3.3.3 Personalized Recognition

“The articles and exercises recommended by the system feel tailor-made for me, so learning feels more targeted.” (S5) This aligns with the need for “autonomy” in Self-Determination Theory.

3.3.4 New Expectations for the Teacher’s Role

Students generally welcomed the shift of the teacher from lecturer to “facilitator,” noting that “the teacher’s comments are more in-depth and can inspire thinking—they complement AI feedback.” (S9) At the same time, some students (S2) exhibited the “critical belief” described in Document 2, pointing out that “AI feedback can sometimes be formulaic and cannot fully replace the teacher’s creative commentary.”

4. Implementation Pathways for AI-Empowered College English Teaching

Based on the research findings, this paper constructs implementation pathways from five levels:

4.1 Curriculum Level: Reconstruct a blended course model of “online and offline integration with human–machine collaboration”

This study proposes a blended “AI-assisted online autonomous learning + teacher-guided offline deep learning” model. Online AI platforms deliver adaptive content, scaffold learning, and provide immediate feedback. Offline sessions focus on project-based application, critical discussion, and collaborative communication, synergizing scalable personalization with deep pedagogical guidance.

4.2 Resource Level: Build an intelligent knowledge graph repository that is “dynamically generated and iteratively evolving”

This approach integrates diverse materials (textbooks, journals, multimedia) using corpus linguistics and knowledge engineering to build a discipline-specific knowledge graph. AI (NLP, semantic parsing) enables automatic tagging, dynamic linking, and personalized recommendations. The graph is continuously refined via teaching feedback and learner data, evolving as a living knowledge architecture that supports adaptive, context-sensitive learning pathways aligned with curricular and disciplinary goals.

4.3 Evaluation Level: Establish a new evaluation system featuring “human–machine co-assessment and equal emphasis on process and outcome”

Integrate AI-driven formative assessment (e.g., automated grading, learning-path analysis) with teacher-led summative and performance-based evaluation in authentic tasks, shifting evaluation emphasis from knowledge recall to applied proficiency, critical thinking, and collaborative competence.

4.4 Teacher Level: Implement a teacher development mechanism oriented toward empowerment

This hybrid framework combines AI-driven formative assessment (automated grading, diagnostics, analytics) with teacher-led summative and performance-based evaluation in authentic tasks. It

leverages algorithmic precision for continuous feedback and educator expertise for contextual judgment, shifting assessment from rote memorization to higher-order competencies: applied language proficiency, critical thinking, and collaborative competence. This aligns evaluation with real-world demands and fosters adaptive, reflective practice.

4.5 Governance Level: Establish an AI ethics governance framework that is “secure, compliant, and beneficial”

Institutions must establish clear AI guidelines defining data-use scope, purpose, and limits to protect privacy and ensure ethical stewardship. A robust academic integrity mechanism should delineate acceptable/unacceptable AI use, provide transparent adjudication, and offer formative guidance. Cultivating a campus culture centered on “technology for good” and human-centered design aligns innovation with inclusivity, intellectual honesty, and holistic learner development.

5. Discussion and Extended Value

Systematic AI integration enhances college English teaching quality. This aligns with Document 3 (fulfilling psychological needs boosts engagement) and Document 5 (perceived usefulness/ease of use in technology adoption). By linking micro-level learner psychology (beliefs, needs) with macro-level instructional design and assessment reform, the study establishes an actionable ecological model.

Beyond conventional college English teaching, this ecological model also holds significant extended value:

5.1 Supporting Rural Education Revitalization

AI-enabled English resources (e.g., curated lesson plans, multimodal materials, adaptive assessments) can be efficiently delivered to under-resourced rural institutions at low cost. This reduces geographic and economic barriers, narrows the digital divide, and promotes equity by providing remote learners with updated, pedagogically sound content.

5.2 Promoting the Integration of Chinese Culture

AI technologies (e.g., natural language generation, speech interaction, knowledge graphs) enable intelligent dialogue systems and multimodal resources that present traditional Chinese culture and contemporary affairs in English. This integrates ideological-political education into language instruction, fostering intercultural communicative competence, strengthening understanding of China’s heritage and realities, enriching content, and cultivating cultural confidence and national identity.

5.3 Contributing to Program Development

Implementation data, models, and experience form an empirical and technical foundation for English program transformation, supporting emerging tracks like translation technology, language data analytics, and AI-enhanced discourse studies. Integrating linguistic expertise with domain knowledge fosters interdisciplinary education, equipping graduates for complex communicative challenges in technologically mediated global contexts.

6. Conclusion and Outlook

This study demonstrates the feasibility and effectiveness of AI-driven ecological reconstruction in college English teaching. A quasi-experimental study confirmed the "knowledge graph + intelligent assessment + human-machine collaboration" model enhanced learning outcomes, engagement, and experience. The paper proposes an integrated "technology–teaching–evaluation–governance" reform framework, supported by technology, centered on pedagogical innovation, guided by scientific evaluation, and safeguarded by collaborative governance.

Future research could further explore:

The mechanisms by which AI contributes to cultivating students' higher-order abilities such as critical thinking and creativity;

Differentiated AI integration models applicable to various types of institutions and student populations;

Long-term governance mechanisms for ethical issues in AI education.

In conclusion, college English teaching should proactively embrace the intelligent era, remain student-centered, take moral education as its fundamental mission, and build a new, resilient teaching ecosystem characterized by human–machine collaboration.

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