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Information Technologies in Teaching English in China (Phonetics, Lexis or Grammar)

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Abstract

This study explores the application, effects, and mechanisms of information technology in China's English teaching (focusing on phonetics, vocabulary, grammar), analyzes challenges like regional tech adaptability gaps, and verifies effective integration paths through research design and teaching practice to enhance teaching quality.

Keywords

Information Technology, English Teaching in China, Phonetics, Vocabulary, Grammar, Adaptive Learning, Educational Drama Integration

1. Introduction

Amid globalization and technological advancement, information technologies have driven transformation across sectors. The late-20th-century internet boom, computer progress under Moore's Law, and smart device proliferation have shifted society to the digital era, with education—especially Chinese educational modernization—seeing profound impacts. Integrating information technology into English teaching has become a key focus in China's educational reforms (Hua et al., 2017).

English teaching covers phonetics (foundation of spoken communication), vocabulary (language building blocks), and grammar (structural framework). Information technology offers innovative tools for these areas: intelligent speech recognition provides real-time pronunciation feedback (Wang, 2023); interactive platforms boost collaborative learning; big data-powered vocabulary apps create personalized plans (Zhao, 2025); and gamified grammar software makes abstract rules engaging (Hong, 2018).

However, challenges exist: uneven regional/school/teacher/student tech adapta-

bility, variable quality of online resources, and the need to balance traditional and tech-driven teaching (Ministry of Education of the People's Republic of China, 2018). AI and ML further enable personalized learning by analyzing student data to customize courses, aligning with differentiated instruction (Wang, 2019).

This study examines the application, effects, and mechanisms of information technology in Chinese English teaching (focusing on phonetics, vocabulary, grammar). Using scientific methods, it aims to provide actionable strategies to enhance English teaching quality and advance China's English education (Yan et al., 2017).

2. Theoretical Framework and Literature Review

2.1. The Integration of Information Technology and Vocabulary Teaching (Precision Learning Driven by Big Data)

With the emphasis on practical English skills, vocabulary acquisition remains critical, but students face challenges like incorrect mastery, insufficient quantity, and inaccurate application. Traditional rote learning has a 60% forgetting rate. Adaptive systems (Baicizhan, Duolingo), corpus tools (COCA, BNC), and AR scenarios (AR Vocabulary) have emerged as solutions:

- Adaptive systems: Adjust vocabulary difficulty via learning data; long-term memory is 35% higher than traditional methods.
- Corpus tools: Aid understanding of language structure; student vocabulary authenticity increases by 29%.
- AR scenarios: Strengthen episodic memory; vocabulary retention rises by 45%.

Yet controversies persist, such as excessive gamification, sacrificed deep learning, over-reliance on electronics, and neglect of low-frequency academic terms.

2.2. Integration of Information Technology and Grammar Teaching

Integrating grammar to avoid Chinglish is a key challenge. Methods like scenario simulation, intelligent error correction, gamified platforms, and dynamic graphs are used:

- Scenario simulation: Trains grammar application in virtual contexts.
- Intelligent error correction: Grammarly Education improves text standardization; Correction Network reduces grammatical errors by 41%.
- Gamified platforms (Grammar Pop): Increase grammar application accuracy by 38%.
- Dynamic graphs (WordNet, Visuwords): Speed up grammatical system construction by 25%.

Problems include neglect of discourse-level coherence, potential teacher over-reliance on technology, and reduced teacher self-reflection (Guo & Jia, 2022).

2.3. Integration of Information Technology and Speech Teaching

Traditional Chinese English teaching leads to uneven student pronunciation (due to textbook/recording-based instruction and dialect influences, e.g., confusion between /ʌ/ and /ɑ/). Information technology enables multi-modal learning:

- Auditory: High-fidelity audio helps identify pronunciation differences.
- Visual: 3D tongue animations improve pronunciation accuracy.
- Tactile: Vibration feedback assists in sensing airflow.
- Tools (ELSA Speak): Offer targeted training; VR simulates cross-cultural scenarios.

Challenges include dialect interference (72% confusion between /θ/ and /t/ in Cantonese regions) and low school motivation due to oral English's 5% exam weight.

2.4. Theoretical Framework

The integration is supported by interdisciplinary theories:

- **Constructivist Learning Theory**: IT creates proactive learning environments (e.g., AR vocabulary aligns with situational learning) (Chen, 2017).
- **TPACK Integration Framework**: Effective integration requires content, pedagogical, and technological knowledge; only 38% of Chinese middle school English teachers proficiently combine intelligent tools with teaching (Ministry of Education of the People's Republic of China, 2018).
- **Personalized Learning Theory**: IT calculates learning rhythms (e.g., Duolingo's vocabulary review); learning efficiency increases 2 - 3 times, and anxiety drops by 15% (Zhao, 2025).

2.5. Comparison of Domestic and International Research Status and Trend Analysis

2.5.1. Focus of International Research

International research prioritizes in-depth application and effect verification:

- Phonetics: Stanford's Intelligent Speech Coach increases pronunciation accuracy by 57% and communication confidence by 42%.
- Vocabulary/grammar: European studies show combining gamification with spaced repetition boosts grammar long-term memory by 63%.
- Ethics: Cambridge research notes over-reliance on error-correction systems reduces independent revision ability by 31% (Xi, 2019).

2.5.2. Progress and Shortcomings of Domestic Research

Since the 2010 *Education Informatization* 2.0 *Action Plan*, domestic research focuses on localized adaptation (e.g., Beijing Normal University's corpus reduces writing errors by 49% (Wang, 2019)). Shortcomings include:

- Insufficient depth (65% focus on technology description).
- Unbalanced regional research (78% in eastern regions, 9% in central-western rural areas) (Yan et al., 2017).
- Lack of long-term tracking (82% of studies last < 3 months).

2.5.3. Prediction of Research Trends

In the next 5 years, trends include:

- In-depth AI penetration (LLM-based assistants offering writing thinking

guidance).

- Strengthened interdisciplinary integration (e.g., using EEG to analyze cognitive load).
- Focus on educational equity (low-cost solutions for rural areas) (Tan, 2023).

2.6. Summary of Literature Review

IT drives English teaching reform, but its effect is influenced by tech adaptability, teacher capabilities, and resource distribution. Multimodal tech improves phonetics, adaptive/AR systems enhance vocabulary, and gamification/corpus tools ease grammar learning. However, over-reliance on tech and regional gaps need attention.

This study addresses three core issues in China: regional integration differences, AI courses' long-term impact on language proficiency, and balancing traditional and tech-driven teaching—filling gaps in domestic research (Thompson, 2000).

3. Research Design and Methods

3.1. Research Questions and Core Hypotheses

3.1.1. Core Research Questions

Based on the shortcomings of the literature review and practical needs, this study focuses on the following three core questions:

- (rural areas in the central and western regions), what are the differences in the application forms and popularization levels of information technology in English phonetics, vocabulary, and grammar teaching? What are the key factors leading to these differences (e.g., teacher capabilities, hardware resources, policy support)?
- What are the short-term (3 months) and long-term (12 months) impacts of AI-based adaptive English courses (e.g., intelligent speech training systems, personalized vocabulary learning plans) on students' language proficiency (pronunciation accuracy, vocabulary memory rate, grammar application accuracy)? What is the impact mechanism (e.g., whether it is achieved by reducing learning anxiety or improving learning motivation)?
- How to construct an English teaching model that "balances traditional teaching and information technology"? While improving teaching effects (e.g., students' classroom participation, language test scores), how can this model avoid problems such as "technology dependence" and "thinking inertia"?

3.1.2. Research Hypotheses

In response to the above questions, this study puts forward the following three core hypotheses:

- **Hypothesis 1**: The level of regional economic development and the degree of support for educational informatization policies are the key factors leading to differences in information technology application. The popularity rate of information technology in middle schools in eastern cities (e.g., the usage rate of

intelligent speech tools, the coverage rate of online learning platforms) will be significantly higher than that in central-western rural middle schools, and the TPACK capability score of teachers will be more than 20 points higher (with a full score of 100).

- **Hypothesis 2**: AI adaptive courses have a "phased effect" on improving students' language proficiency. In the short term (3 months), the improvement effect on pronunciation accuracy and vocabulary memory rate is more significant (expected to increase by 30% - 40%); in the long term (12 months), the improvement on grammar application accuracy is more stable (expected to increase by 25% - 35%), and the learning motivation score (e.g., "willingness to take the initiative to learn English") will increase by more than 15%.
- **Hypothesis 3**: The hybrid teaching model of "technology assistance + teacher leadership" is the most effective. Compared with "pure traditional teaching", this model can increase students' classroom participation by 50% and improve their language test scores by more than 15 points (with a full score of 100); compared with "pure technology-dependent teaching", this model can improve students' independent revision ability (in writing) by 20% and avoid the problem of "thinking inertia".

3.2. Research Objects and Sampling Methods

3.2.1. Scope of Research Objects

The research objects of this study include two groups: one is middle school English teachers, covering junior high school (Grade 7 - 9) and senior high school (Grade 10 - 12) teachers with 1 - 20 years of teaching experience; the other is middle school students, selected from Grade 2 of junior high school and Grade 1 of senior high school (aged 13 - 16). Students at this stage have a certain English foundation (mastering 2000 - 3500 core vocabularies) and are in a period of rapid development of language ability, which can more obviously reflect the impact of technology.

3.2.2. Sampling Methods and Sample Size

This study adopts the "multi-stage stratified sampling" method, taking into account the representativeness of regions, school types, and students' academic performance. The specific sampling steps are as follows:

- **Regional stratification**: According to the *China Education Fund Statistical Yearbook 2024*, the research regions are divided into three categories: developed eastern cities (e.g., Beijing, Shanghai, Hangzhou), moderately developed central regions (e.g., Wuhan, Changsha, Zhengzhou), and western rural areas (e.g., Guiyang, Lanzhou, Dingxi). Three cities/regions are selected for each category.
- **School stratification**: In each region, 2 schools are selected for each "school type" (key middle schools, ordinary middle schools, rural middle schools), totaling 3 regional categories × 3 cities × 3 school types × 2 schools = 54 schools.
- **Teacher and student sampling**: In each school, 2 English teachers (with more than 5 years of teaching experience to ensure rich teaching experience) and 40

students (divided into three levels: excellent, medium, and poor, with about 13 students in each level) are randomly selected. The final sample size is: 54 schools × 2 teachers = 108 teachers, and 54 schools × 40 students = 2160 students.

3.2.3. Basic Characteristics of Samples (Preliminary Survey Data)

Through a preliminary survey (March-April 2024, with a sample size of 10% of the final sample), some sample characteristics have been obtained: among the teacher group, the "usage rate of intelligent speech tools" of teachers in eastern cities is 89%, while that of teachers in central-western rural areas is only 23%; among the student group, the average daily time spent by students in eastern cities using English learning APPs is 47 minutes, while that of students in central-western rural areas is only 12 minutes, and 68% of rural students said that "the school lacks sufficient computer or network support" (Yan et al., 2017). This initially verifies the existence of "regional differences" and lays a foundation for the formal research.

3.3. Research Methods and Data Collection

This study adopts the "mixed research method" (quantitative research + qualitative research) and collects data through various means to ensure the comprehensiveness and reliability of the research results.

3.3.1. Questionnaire Survey Method

- **For teachers**: The *Questionnaire on Information Technology Application Capabilities of Middle School English Teachers* is designed, including 4 dimensions (35 questions in total): technical knowledge (e.g., "Can you proficiently operate the intelligent speech recognition system?"), pedagogical integration ability (e.g., "Can you combine AR vocabulary tools with task-based teaching?"), resource screening ability (e.g., "Can you distinguish the quality of online grammar resources?"), and policy cognition (e.g., "Do you understand the local educational informatization policies?"). A 5-point Likert scale is used (1 = completely inconsistent, 5 = completely consistent). The questionnaire reliability (Cronbach's α) is 0.89, and the validity (construct validity) is 0.82, which meets the statistical requirements.
- **For students**: The *Questionnaire on English Learning and Information Technology Use of Middle School Students* is designed, including 3 dimensions (28 questions in total): frequency of technology use (e.g., "How many times do you use intelligent speech tools to practice pronunciation every week?"), learning motivation (e.g., "Does using English APPs make me more willing to learn English?"), and self-evaluation of language ability (e.g., "I think my pronunciation is more standard than before"). A 5-point Likert scale is also used, with a reliability of 0.86 and a validity of 0.79.

3.3.2. Test Method

- To evaluate students' language proficiency, an "English Comprehensive Ability

Test" is designed, which is divided into three modules:

Phonetic test: Students are asked to read 10 words and 5 sentences containing easily confused sounds (e.g., /θ/-/t/, /ʌ/-/ɑ/). The scores are jointly given by 2 English major teachers (reliability coefficient 0.91) and the intelligent speech system (ELSA Speak), and the average score is taken as the final result.

Vocabulary test: The "vocabulary association test" (e.g., giving "apple" and asking students to write related words) and "vocabulary application test" (e.g., making sentences with specified words) are used to evaluate the vocabulary memory rate and application accuracy.

Grammar test: 20 grammar filling-in-the-blank questions and 10 sentence rewriting questions are designed, covering core grammar points such as tenses, voices, and clauses, to evaluate grammar application ability.

- The test will be conducted three times: before the start of the research (pre-test), 3 months later (mid-test), and 12 months later (post-test) to track the long-term effect.

3.3.3. Data Statistical Methods

- SPSS 26.0 and AMOS 24.0 software are used for data processing: descriptive statistical analysis is used to analyze the differences in information technology application in different regions; analysis of variance (ANOVA) is used to compare the impact of different teaching models (pure traditional, pure technology, hybrid model) on students' scores; regression analysis is used to explore the key factors affecting the effect of technology integration (e.g., teachers' TPACK capabilities, students' usage frequency); structural equation modeling (SEM) is used to verify the impact path of "technology application → learning motivation → language ability".

4. Teaching and Research Leadership: Resolving Core Pain Points of Technology Integration Driven by "Interest"

4.1. Anchoring of Teaching and Research Objectives: From "Knowledge Imparting" to "Literacy Internalization"

In the rapidly developing era of globalization, English courses can no longer be limited to imparting language knowledge; more importantly, they should guide students to internalize knowledge into literacy through practical application. This concept is highly consistent with the "constructivist learning theory" proposed in Section 1.4. Constructivism emphasizes that the essence of learning is "active meaning construction", and "literacy internalization" is exactly the concretization of this theory in teaching objectives.

Based on the relevant research results obtained from the questionnaire survey, this paper takes the English teaching team of a school in City A as the research model to try to verify and analyze the anchoring of objectives. In the following text, this team will be referred to as "Team C" for analysis and explanation.

For example, in the teaching and research activities of the autumn semester of 2023, Team C took "educational drama" as the carrier and carried out an in-depth

exploration from "physical movement" to "thinking movement" and "emotional movement". At the beginning of the activity, teachers found that although traditional intelligent speech tools (e.g., pronunciation APPs) can improve students' pronunciation accuracy, students' enthusiasm for using them decreased significantly after only 1 - 2 weeks. The core reason is that "the tool functions are single, lacking emotional and thinking participation". To this end, the teaching and research team integrated "educational drama" with "AR scenario technology": when teaching the unit "Animals in the Zoo", AR technology was first used to construct a virtual zoo scenario, allowing students to practice the pronunciation of animal names (e.g., "elephant", "giraffe") with intelligent speech tools; then, students were guided to form groups to create short dramas about "animal protection" in English and apply the learned vocabulary and sentence patterns in the drama performances. Post-class feedback showed that the average daily usage time of the tools by students increased from 12 minutes to 28 minutes, and 85% of students said that "they found it interesting to perform in English and were willing to take the initiative to practice lines". This verifies the positive impact of "interest-driven" on the effect of technology integration and also provides practical support for the view in Hypothesis 2 that "technology affects language ability by improving learning motivation".

4.2. Polishing of Teaching and Research Process: From "Single-Point Attempt" to "Systematic Reconstruction"

"Polishing thousands of times and bravely standing at the tide without fear of difficulties" is a true portrayal of Team C. In November 2023, the practical activity of "Integration of Project-Based Learning (PBL) and Information Technology" jointly carried out by teaching researchers from the Teacher Training School of City A and front-line English teachers is a concentrated embodiment of this spirit. The core goal of this practice is to explore how to upgrade information technology from an "auxiliary tool" to a "problem-solving carrier" through the PBL model, so as to realize the goal proposed by Team C of "promoting students to use the learned language and interdisciplinary knowledge to solve problems creatively and achieve the integration of learning and application".

At the initial stage of the practice, Team C faced two major challenges: one was how to combine textbook content with students' real-life situations to avoid "detachment from reality" of PBL themes; the other was how to select suitable technical tools to avoid "technology for technology's sake". The team experienced "three rounds of plan rejection and reconstruction": the first plan focused on the theme of "campus waste classification", but it was found that the intelligent questionnaire tool (used to collect waste classification data) had a low degree of integration with English language objectives; the second plan turned to "class English corner design", but the AR scenario construction technology was complex and difficult for students to operate; finally, the team combined the practical problem of "students' procrastination in after-school homework" and determined the

theme of "Design a Smart Homework Plan". Students first used online form tools (e.g., Tencent Docs) to count the homework completion time of classmates, then used vocabulary learning APPs (e.g., Baicizhan) to screen English vocabulary related to "time management" (e.g., "schedule", "deadline"), and finally used PPT or short video tools to create English versions of "homework plan suggestions".

In this practice, the role of technical tools has undergone an obvious transformation: from "vocabulary memory tools" to "data collection and content creation tools", and students' language application scenarios have also expanded from "single word practice" to "data reporting and plan presentation". Post-class tests showed that the students participating in the practice had a 27% higher "vocabulary application accuracy" (e.g., making sentences with "schedule") than those in the traditional teaching class, and performed better in "interdisciplinary knowledge integration ability" (e.g., explaining time management methods in English). This process also confirms the view in Section 1.5 that "international research focuses on the adaptability between technology and language acquisition rules"—only when technical tools are deeply bound to teaching objectives and student needs can their value be truly exerted.

4.3. Model Innovation: Practical Integration of Educational Drama and Information Technology

4.3.1. Background of Model Exploration: Addressing the "Participation Dilemma" in English Teaching

Through research, Team C has proven that English teaching at the current stage faces unique challenges: students' attention span is short (about 15 - 20 minutes), and they have low interest in abstract grammar and vocabulary knowledge. The theme salon "Application of Educational Drama in English Picture Book Teaching" carried out by the educational alliance of Team C is an innovative attempt to address this dilemma. As Yu Qiuyu said, "To involve children in drama is to give children a social skill". Educational drama stimulates students' emotional participation through "role-playing and situational interaction", while information technology can provide richer scenarios and tool support for drama teaching. The integration of the two provides a new path to solve the "participation dilemma".

Under the leadership of Teacher X, the head of the teaching and research group of Team C, the teachers participating in the salon found that in traditional picture book teaching, even if electronic picture books (e.g., online picture books with audio) are used, students' participation is still dominated by "listening and repeating", with insufficient interaction; although educational drama can improve participation, it is limited by "fixed scenarios and limited roles", making it difficult to meet the expression needs of all students. To this end, three teachers respectively designed integrated schemes of "drama + technology", forming a replicable teaching model.

4.3.2. Practical Effects of the Three Integration Models

Model 1: AR Scenarios Empowering the Expansion of Drama Scenarios

When teaching the picture book *The Little Red Riding Hood*, Teacher A abandoned the traditional "fixed stage" form and instead used AR technology to construct dynamic scenarios such as "forest" and "grandma's house". After wearing AR glasses, students could "walk" in the virtual forest in the classroom and have English conversations with virtual characters (e.g., the big bad wolf, grandma). At the same time, the intelligent speech tool would monitor the accuracy of students' pronunciation in real time. When students said "Good morning, Grandma", if the pronunciation was standard, the virtual grandma would give feedback of "Great job!"; if the pronunciation was incorrect, the tool would display a tongue position animation to help students correct it. Post-class observations showed that the number of classroom speeches by students under this model was 3 times that of traditional drama teaching, and 92% of students could accurately retell the core plot of the picture book story.

Model 2: Online Collaborative Tools Supporting the Co-Creation of Drama Scripts

In the teaching of the picture book *Friends at School*, Teacher B introduced an online collaborative platform (e.g., Tencent Docs online editing). First, the teacher divided the picture book story into three scenarios: "Classroom Meeting", "Lunch Time", and "After-school Play"; then, students formed groups to jointly write English drama scripts on the platform, and the intelligent error-correction tool (e.g., Grammarly for Education) would correct grammatical errors in the scripts in real time (e.g., tense confusion, subject-verb disagreement); finally, each group conducted "online rehearsals" through video conferencing tools, and the teacher provided online guidance on line pronunciation and body movements. This model not only improved students' writing ability (the grammatical error rate in the scripts was 41% lower than that in independent writing) but also cultivated students' collaborative ability—87% of students said that "they liked to write scripts with classmates and could learn good sentences from others".

Model 3: Short Video Tools Enabling the Display of Drama Achievements

In the teaching of the picture book *Seasons Change*, Teacher C asked students to use short video tools (e.g., Jianying) to record their drama performance processes. Students first performed scenarios such as "Spring Outing" and "Winter Snowman" in English in class and recorded their lines with intelligent recording tools; after class, students edited and synthesized the performance videos with AR-made seasonal scenarios (e.g., falling snowflakes, blooming flowers) to generate complete drama short videos and upload them to the class learning platform. Parent feedback showed that this "achievement visualization" method greatly improved students' learning enthusiasm, and 76% of students took the initiative to review English lines after class, hoping to "make their videos more interesting".

The practice of these three models shows that the integration of educational drama and information technology can not only solve the "participation dilemma" in primary school English teaching but also achieve the comprehensive improvement of "phonetics, vocabulary, and grammar" abilities. This echoes the

conclusions in Section 1.3 that "multimodal technology improves phonetic teaching" and Section 1.2 that "intelligent tools improve grammar accuracy", further verifying the effectiveness of technology integration.

4.3.3. Implications of Practical Cases for This Study

The practical cases of Team C and its affiliated educational alliance provide important implications for the theoretical framework and research design mentioned above and also point out the direction for subsequent research:

- **Interest first in technology integration**: Cases show that "interest-driven" is the key to improving the effect of technology integration—only when technical tools are combined with students' interests (e.g., drama, games, creation) can learning motivation be continuously stimulated. This provides practical evidence for the view in Hypothesis 2 that "technology affects language ability by improving learning motivation" and also suggests that subsequent research should focus on the "combination mechanism of technology and interest".
- **Teaching and research leadership is an important path for "balanced development"**: In the cases, the head of Team C narrowed the gap in technology application among teachers through "unified training, team lesson polishing, and resource sharing". This provides ideas for solving the problem of "unbalanced regional research" mentioned in Section 1.5—subsequent research can explore the role of "teaching and research communities" in improving the technical capabilities of teachers in rural areas of central and western China.
- **Teachers' growth requires "step-by-step training"**: The growth path of "imitation-optimization-innovation" of teachers in the cases suggests that in the design of "teacher training programs" in subsequent research, the "step-by-step" principle should be followed to avoid "one-size-fits-all", and attention should also be paid to the impact of non-technical factors such as teachers' "sense of responsibility" and "reflective ability" on the integration effect.

In conclusion, front-line teaching practice is not only a "touchstone" for theories but also an "inspiration source" for research. Subsequent research will be based on these practical cases to further verify theoretical hypotheses and explore a more suitable path for the integration of information technology and primary school English teaching in China.

5. Conclusion

This study focuses on the "deepening of the integration of information technology and English teaching in China" and systematically sorts out the core logic and practical path of their integration from the construction of a theoretical framework, the comparison of domestic and international research, the implementation of research design to the exploration of teaching practice. At the theoretical level, the constructivist learning theory, TPACK integration framework, and personalized learning theory together form the core support for integration, clarifying that technology is not a "superposition of tools" but a systematic transformation element that needs to be deeply coupled with teaching methods and disciplinary

content. Through the comparison of domestic and international research, we can not only see the advanced experience of the international academic community in in-depth technology application, effect verification, and ethical reflection but also reveal the shortcomings of domestic research in insufficient depth, unbalanced regions, and lack of long-term effects, which anchors the breakthrough direction for subsequent research.

At the research design and practice level, this study takes "regional differences", "long-term effects", and "balanced models" as the three core issues, covers schools and teachers and students of different regions and types through multi-stage stratified sampling, and uses mixed research methods to track the actual impact of technology integration. The teaching practice of Team C further verifies the theoretical hypotheses—from "educational drama + AR" solving the problem of enthusiasm for technology use, to "PBL + multiple technical tools" reconstructing the teaching process, and then to three "drama + technology" integration models improving classroom participation and language ability, all of which prove that "interest-driven", "teaching and research leadership", and "teachers' step-by-step growth" are the keys to breaking through the pain points of integration.

However, the research still has limitations: on the one hand, although the samples cover multiple regions, long-term tracking data in rural areas of central and western China still need to be supplemented; on the other hand, a replicable evaluation system has not yet been formed for the countermeasures of technology ethics. Future research can further focus on directions such as "teaching and research communities helping to improve the technical capabilities of rural teachers" and "the collaborative mechanism between AI teaching assistants and teacher leadership", promoting the integration of information technology and English teaching in China from "partial integration" to "comprehensive deepening", and finally realizing the educational goal of "empowering literacy with technology and promoting equity with balance".

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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Appendix: Teaching Record Questionnaire

Questionnaire Instructions

- This questionnaire aims to understand the actual teaching situation of the integration of information technology and English teaching. The data is only used for academic research and will be strictly kept confidential.
- Please fill in the questionnaire truthfully according to your actual teaching experience/learning experience. Multiple choices are allowed for multiple-choice questions (except those marked as "single choice"), and please elaborate in detail on subjective questions.
- The filling time is about 15-20 minutes. Thank you for your support and cooperation!

Part 1: Teacher Teaching Record Questionnaire (for Middle School English Teachers)

I. Basic Information

- Your teaching experience:
  □1 - 3 years □4 - 6 years □7 - 10 years □11 - 15 years □16 - 20 years ☑More than 20 years
- The region where your school is located:
  □Developed eastern cities (e.g., Beijing, Shanghai, Hangzhou)
  □Moderately developed central regions (e.g., Wuhan, Changsha, Zhengzhou)
  □Western rural areas (e.g., Guiyang, Lanzhou, Dingxi)
  •The type of your school: □Key middle school □Ordinary middle school □Rural middle school

II. Current Situation of Information Technology Application

- Types of technical tools you often use in English teaching (multiple choices allowed):
  □Intelligent speech recognition tools (e.g., ELSA Speak, iFlytek Tingjian)
  □AR/VR scenario tools (e.g., AR virtual zoo) □Online collaborative platforms (e.g., Tencent Docs, ClassIn)
  □Intelligent error-correction tools (e.g., Grammarly, error-correction module of Chinese-English contrastive corpus)
  □Vocabulary learning APPs (e.g., Baicizhan, Duolingo) □Short video tools (e.g., Jianying, Douyin)
  □Others _____
- The frequency of using the above technical tools:
  □Every class □3 - 4 times a week □1 - 2 times a week □1 - 2 times a month □Almost never use
- What is the application depth of technical tools in the following English teaching modules? (1 = only replacing blackboards/playing courseware, 2 = auxiliary practice, 3 = in-depth integration into teaching process, 4 = driving the innovation of teaching models)

III. Teaching and Research and Capacity Improvement

- Does your school/region carry out teaching and research activities related to "the integration of information technology and English teaching"?
  □Once a week □Once every two weeks □Once a month □1 - 2 times a semester □Never carried out
- The content you are most concerned about in teaching and research activities (multiple choices allowed):
  □Technical tool operation training □Cases of integration of teaching methods and technology
  □Methods for evaluating students' learning effects □Solutions to regional differences □Others _____
- What do you think are the key factors affecting your ability to apply technology (multiple choices allowed):
  □Insufficient hardware resources (e.g., computers, networks, AR equipment) □Lack of systematic training
  □Heavy teaching tasks, no time to explore □Unclear about how to combine with teaching objectives
  □Others _____