

# Contemporary Education Frontiers

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# Types and Characteristics of Students' Imagined Identities in AI-assisted English learning

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**Abstract:** With the rapid integration of artificial intelligence (AI) into primary education, AI tools are currently transitioning from serving as “auxiliary devices” to becoming “interactive partners” in students’ English language learning. Based on Norton’s identity theory, this study explored three main types of imagined identities: the Co-learner, the Playmate, and the Tutee. These identities were characterized by three core attributes: situational dependency, a positive emotional orientation, and dynamic constructiveness. The research has contributed to the theoretical discourse on student identity in AI-assisted language learning and provides practical implications for designing AI-supported English learning environments that foster adaptive and positive imagined identities among elementary school students.

**Keywords:** AI-assisted English learning; Elementary education; Imagined identity

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## 1. Introduction

In elementary English learning, AI tools, such as voice-activated conversational robots, gamified language apps, and adaptive feedback systems, have evolved from passive “teaching tools” into active “interactional agents”. These systems engage students in dialogues, role-plays, and collaborative tasks, going beyond traditional instructional support <sup>[1]</sup>. Unlike teacher-led or peer-based settings, AI offers a unique interactive experience: it is non-judgmental, responsive, and capable of tailoring linguistic input to individual proficiency levels <sup>[2]</sup>. Related studies have documented the positive impact of AI on various language domains, including vocabulary acquisition, grammar accuracy, and reading comprehension <sup>[3–5]</sup>. However, the majority of such research remains focused on quantifiable learning outcomes, paying limited attention to the internal and socio-affective processes that accompany students’ interactions with AI <sup>[6]</sup>. In particular, little is known about how young learners perceive their roles and construct their identities when engaging with AI as learning partners. Therefore, the present study draws on the concept of imagined identities to investigate the types and characteristics of elementary students’ identity construction within AI-assisted English learning environments <sup>[7]</sup>.

## 2. Imagined identity

The concept of imagined identities, originating from the field of second language acquisition (SLA), describes how



learners envision their future linguistic selves, who they hope or fear becoming within “imagined communities”<sup>[7]</sup>. These self-projections function not merely as aspirations but as powerful motivators that shape learners’ agency, guide their investment in learning, and contribute to a coherent self-concept across diverse social contexts. By extending this framework to student-AI interaction, this study aims to uncover the situated and dynamic self-understandings that influence students’ engagement with AI. This extension establishes an analytical basis for examining the identity-related dynamics that underlie their language learning behaviors<sup>[8]</sup>.

### **3. Types of students’ imagined identities**

Three distinct imagined identities emerge in elementary students’ AI-assisted interaction contexts, each characterized by unique formation contexts as well as distinct influences on students’ learning agency and investment.

#### **3.1. Co-learner**

The co-learner identity emerges when elementary students interact with AI tools designed to exhibit peer-like learning traits, where the AI functions as a “fellow learner” that shares uncertainties, proposes collaborative solutions, and aligns with the student’s cognitive level and learning pace. This identity is most likely to form in scenarios such as collaborative vocabulary exploration, where, when encountering difficult words like “butterfly” or “restaurant,” the AI may express confusion: “I always mix up the spelling of “butterfly”, do you want to try figuring out a way to remember it together? Maybe it can be split it into “butter” and “fly” ? Such shared uncertainty breaks the stereotype of AI as infallible, leading students to perceive it as a partner in knowledge exploration rather than a one-way instructor. Similarly, in dialogue practice, for example, when practicing daily English conversations about weekend activities. The AI might deliberately use simple language and admit limitations: “I’m still learning how to talk about weekend activities, can you tell me what you did on weekends, and I’ll try to follow your example to make a sentence?” This approach avoids pressuring students to “speak correctly” and instead frames the interaction as a mutual learning process, encouraging them to take on the role of “co-explorer” in conversational content.

In these processes, the Co-learner identity can activate students’ agency by shifting their role from passive completers to active collaborative learners. Students proactively initiate discussions about learning directions, contribute ideas to shared goals, and participate in regulating the pace of interaction, rather than merely following AI’s guidance. Meanwhile, the Co-learner identity creates a low-anxiety environment. They are more willing to dedicate extra effort to refining joint learning outcomes, retrying challenging tasks, and persisting through difficulties, the behaviors that reflect stronger investment in English learning.

#### **3.2. Playmate**

The Playmate identity emerges when AI serves as a recreational learning partner, incorporating game-like mechanics, and emotional responsiveness to align with students’ intrinsic desire for fun and social interaction. This identity tends to arise in the following learning scenarios: First, in gamified language task sequences. AI integrates English learning into progressive challenges supported by immediate feedback mechanisms: it may award virtual badges for vocabulary mastery or use engaging sound effects to reinforce correct answers. For example, verb-tense practice can be designed as a treasure hunt where students decipher English clues to advance, which turns repetitive drills into an adventurous quest and casting the AI in the role of a playful companion rather than an evaluative authority. Second, in immersive role-play interactions. AI adopts child-friendly personas, such as a fluffy animal guide or an animated character, and participates in simulated scenarios like “ordering food in a restaurant” or “caring for a pet”. Through expressive language and conversational reciprocity reminiscent of peer play, the AI may initiate imaginative prompts such as, “Let’s pretend we’re at the zoo. What’s the English name of that animal? I’ll guess what sound it makes!” Such narrative framing blurs the boundary between learning and play, encouraging students to assume the role of a co-playing collaborator.

In such contexts, the playmate identity strengthens student agency by shifting the focus from task compliance to voluntary participation. Children actively select activities that match their interests, all guided by personal enjoyment rather than external requirements. Simultaneously, this identity enhances learning investment: the emotional rapport built with the AI character, coupled with the intrinsic reward of playful achievement, promotes consistent engagement. As highlighted by Barab's (2008) theory of transformational play, this blend of play and education transforms passive knowledge acquisition into an active, meaning-rich experience, thereby fostering deeper engagement and improved retention <sup>[9]</sup>.

### **3.3. Tutee**

The tutee identity emerges when AI serves as a personalized tutor, offering targeted support, adaptive explanations, and step-by-step guidance that align with students' need for assistance in mastering language skills <sup>[3]</sup>. This identity typically develops in the following learning scenarios. For example, in targeted grammar difficulty remediation. When elementary students encounter challenging structures, such as third-person singular verb agreement or the use of prepositions indicating time, the AI does not simply correct errors but provides layered scaffolding. It begins by diagnosing mistakes, then offers simplified examples, and finally designs low-stakes practice tasks accompanied by real-time feedback. This "diagnose-guide-practice" cycle frames the AI as a reliable instructional partner, encouraging students to recognize their own knowledge gaps and adopt the role of a learner actively seeking help <sup>[4]</sup>.

Similarly, in scaffolded listening comprehension tasks. While engaging with English audio materials, the AI adapts to the student's comprehension level. If a question is answered incorrectly, it may slow the speech rate, chunk the audio into shorter segments, and clarify key vocabulary before proceeding. Such adaptive support mitigates the anxiety of misunderstanding and positions the AI as a patient tutor, prompting students to voluntarily seek further explanation, a core behavioral marker of the Tutee identity <sup>[5]</sup>.

As students shift from passively receiving feedback to actively seeking AI support, they develop a greater sense of ownership over their learning process. This proactive stance, in turn, is reinforced by the AI's responsive and non-judgmental scaffolding, which reduces learning anxiety and increases willingness to persevere through challenges. As Chen et al. (2021) note, this supportive dynamic lowers the affective filter, enabling students to invest more confidently and continuously in addressing their weaknesses, thereby intertwining agency and investment into a mutually reinforcing process <sup>[3]</sup>.

## **4. Characteristics of imagined identities**

Across the three types of imagined identities, some core characteristics emerge, reflecting the unique nature of AI-assisted learning and elementary students' developmental needs.

### **4.1. Situational dependence**

Imagined identities are not fixed; rather, they are activated and shaped by specific interactive scenarios designed by the AI-mediated interactions. For example, collaborative tasks may trigger a "co-learner" identity, while gamified challenges often evoke a "playmate" identity. This indicates that identity formation is highly dependent on the immediate interactive context created by the AI-mediated interactions, and different task designs prompt learners to adopt different self-positionings.

### **4.2. Positive emotional orientation**

The supportive and non-judgmental nature of AI-mediated interactions provides an emotionally positive foundation for identity construction. Unlike traditional classroom recitations that may induce anxiety, AI's patient feedback and ongoing encouragement effectively fulfill learners' needs for psychological safety and a sense of belonging. In such low-anxiety settings, students become more willing to take risks and experiment with language use. As a result, they tend to associate the learning process, and the identities they enact often associated with positive affective experiences such as curiosity,

enjoyment, and a sense of competence.

### **4.3. Dynamic co-construction**

Imagined identities are continuously negotiated and co-constructed through adaptive interactions between the student and the AI. The AI may adjust its dialogue strategies or task difficulty based on the student's responses, while the student, in turn, recalibrates their self-perception and behavior based on AI's feedback. For instance, when the AI poses questions seeking help, the student may shift from a "tutee" role to that of a "Co-learners". This two-way adaptation keeps identities fluid and evolving, highlighting their inherently dynamic nature.

## **5. Conclusion**

By analyzing students' imagined identities and their core characteristics in AI-assisted contexts, this study provides valuable implications for instructional designers and educators. To foster positive and adaptive imagined identities, AI learning environments should be intentionally designed. This includes creating scenarios that promote collaborative problem-solving to facilitate the co-learner identity, integrating gamified and narrative elements to evoke the playmate identity, and implementing adaptive, scaffolded feedback mechanisms to support the tutee identity. Through such identity-aware design, educators and designers can develop more engaging, effective English learning experiences that align with the cognitive and emotional developmental needs of students.

A limitation of this study is its specific focus on elementary-level English learning; future research could explore whether similar identity types emerge among older learners or in the learning of other subjects. Furthermore, longitudinal studies are needed to examine how these imagined identities evolve over time and how they ultimately influence long-term language learning outcomes.

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## **Disclosure statement**

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# Research on the Optimization Path of College English Teaching Mode with Artificial Intelligence Assistance

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**Abstract:** To further explore the optimization pathways for integrating artificial intelligence (AI) technology into university English teaching, this study proposed specific strategies by leveraging AI's advantages while addressing the limitations of traditional teaching models. These include innovating instructional methods through intelligent tools, optimizing teaching evaluations via data analysis, and expanding educational resources through online platforms. This research has demonstrated that AI-assisted teaching has effectively overcome the conventional pedagogical constraints, facilitating a paradigm shift from one-way knowledge transmission to interactive learning, from summative assessments to formative diagnostics, and from closed resource systems to open sharing platforms. This has provided a practical solution for enhancing the quality of university English education.

**Keywords:** Artificial intelligence; College English; Teaching optimization

**Online publication:** August 26, 2025

## 1. Introduction

The deepening of globalization has established English as the core tool for international communication, with university English education shouldering the crucial mission of cultivating talents with cross-cultural communication competence. However, traditional teaching models face numerous challenges in the information age, while the rapid development of AI technology offers new possibilities to address these difficulties. In this context, researching optimization pathways for AI-assisted university English teaching models hold significant theoretical and practical value, providing feasible solutions to advance English education reform.

## 2. The advantages of AI technology in college English teaching

### 2.1. Helps achieve personalized learning customization

AI creates personalized learning paths for students through precise analysis of their language proficiency, cognitive characteristics, and learning preferences. The intelligent system dynamically adjusts the difficulty level and presentation format of learning materials based on performance data from vocabulary tests, grammar exercises, oral dialogues, and other domains. Students with weaker foundations receive enhanced foundational grammar training and vocabulary



reinforcement, while those with stronger skills access advanced content like academic writing and critical reading. Additionally, the system identifies weaknesses in listening, speaking, reading, and writing skills and provides corresponding practice modules. For students with hearing impairments, it automatically increases speech recognition training sessions, adjusts audio playback speed, and offers supplementary background information to improve comprehension. This nuanced approach breaks free from the rigid “one-size-fits-all” teaching model of traditional classrooms, enabling each student to progress at their optimal pace and truly achieve personalized educational goals <sup>[1]</sup>.

## **2.2. It helps to enhance the fun of teaching interaction**

By integrating gamification elements into English learning through AI technology, students’ interest would be significantly boosted. Through virtual reality, an immersive English language environment is created where students feel as if they are in a real English-speaking country. They can order meals in virtual cafes or simulate airport check-in procedures, where these scenario-based interactive exercises are far more engaging than traditional textbook dialogues. Intelligent chatbots can assume various roles to facilitate instant communication among students, allowing them to ask questions anytime without worrying about embarrassing mistakes. This low-pressure practice environment encourages students to speak up confidently. Moreover, the system features incentive mechanisms like point rewards and level progression, with achievement badges earned after completing tasks satisfying their need for accomplishment. Additionally, augmented reality technology overlays word explanations on physical objects in classrooms. By scanning classroom items, students can see corresponding English expressions and pronunciation demonstrations. This innovative approach transforms monotonous vocabulary memorization into highly entertaining interactive experiences, turning learning into a pleasure rather than a burden.

## **2.3. Helps improve the richness of learning resources**

AI-powered learning platforms integrate vast multimodal resources, transcending traditional textbook limitations. Students no longer confine themselves to single-source knowledge frameworks but gain access to diverse authentic language materials including news reports, academic lectures, video clips, and podcast content. Smart recommendation algorithms automatically curate supplementary materials aligned with learners’ current themes: Business English students instantly access cutting-edge international case studies, while literature enthusiasts explore multi-perspective interpretations of classic works. Natural language processing technology converts complex texts into tiered reading materials, generating beginner, intermediate, and advanced versions of the same text to meet diverse learning needs. Voice synthesis technology provides standard pronunciation readings for text resources, enabling accessible learning for visually impaired students and commuters. Additionally, AI continuously updates content with real-time international current affairs, ensuring students always access language expressions that keep pace with contemporary developments while maintaining fundamental timeliness in learning materials.

# **3. The predicament of traditional college English teaching mode**

## **3.1. The single teaching method cannot meet the diverse needs**

Traditional English classrooms predominantly rely on teacher-led instruction, following rigid textbook content in chapter-based sequences. This approach struggles to accommodate varying student proficiency levels: academically strong learners often find repetitive material tedious, losing motivation for deeper exploration, while those with weaker foundations face learning anxiety due to accelerated pacing. Moreover, constrained by class schedules, teachers cannot provide differentiated instruction tailored to diverse needs, resorting instead to compromise solutions designed for average students. This uniform teaching model overlooks significant differences in learners’ cognitive styles, interests, and career aspirations. Essential skills like academic paper writing required by STEM students fundamentally differ from literary appreciation abilities pursued by foreign language majors. A single teaching method fails to address the increasingly

diverse learning demands <sup>[2]</sup>.

### **3.2. One-sided teaching evaluation cannot reflect the true level**

The current evaluation system overemphasizes final written exams, reducing language proficiency to mere memorization of vocabulary and grammar while neglecting core competencies like oral communication, practical interaction, and critical thinking. Students obsess over drilling answers to test scores, mastering exam techniques but failing to communicate fluently in real-world contexts, which is a phenomenon, where high scores mask weak skills. With assessments concentrated at semester ends, teachers miss opportunities to identify learning gaps and provide timely guidance, leaving students unable to adjust strategies based on feedback. Furthermore, subjective components like writing and speaking evaluations are conducted infrequently due to teacher constraints, leading to inconsistent grading standards and significant variations in assessments from different teachers for the same assignments. This single-dimensional, end-of-term evaluation approach fails to comprehensively demonstrate students' integrated language application abilities and provides insufficient data to inform instructional improvements.

### **3.3. Limited teaching resources are difficult to stimulate learning interest**

Traditional teaching materials remain predominantly paper-based, with content updates taking years to reflect linguistic developments. Students encounter examples and cases that often lack relevance to modern contexts. Classroom instruction relies heavily on teachers' verbal explanations and PowerPoint presentations, lacking multisensory engagement through audiovisual integration. Prolonged passive learning in this environment leads to fatigue. Teachers' instructional capabilities determine the depth and breadth of resource development, yet many are constrained by time and energy, resorting to outdated materials and failing to provide diverse extracurricular resources. Post-class assignments still predominantly consist of paper-based exercises, where repetitive fill-in-the-blank and multiple-choice questions diminish enthusiasm while lacking authentic communication scenario simulations. The scarcity of resources results in monotonous learning experiences, making it difficult for students to connect English studies with real-life applications or future careers, ultimately weakening their motivation <sup>[3]</sup>.

## **4. The optimization path of college English teaching mode with AI assistance**

### **4.1. Integrate intelligent tools to innovate teaching methods**

Teachers should deeply integrate AI tools into every phase of instructional design to transform classroom organization. During pre-class preparation, smart platforms deliver self-guided materials that automatically match reading materials or video explanations based on students' historical learning data. After completing preview assessments, the platform generates personalized reports highlighting knowledge gaps for teachers' reference. In class, teachers transition into designing and guiding learning activities, compressing lectures to one-third of total time while organizing collaborative inquiry sessions. AI writing assistants provide real-time grammar corrections and vocabulary suggestions, enabling students to complete English report drafts during group discussions with instant linguistic support. Teachers focus on cultivating critical thinking depth and logical structures. For example, in business English negotiation courses, students form groups using AI role-playing tools to simulate cross-border M&A negotiations. The system acts as a hypothetical opposing company representative, posing specialized questions while students apply learned business terminology and negotiation strategies. Post-class, the system generates data reports analyzing each student's expression fluency and professional vocabulary usage frequency. Teachers then address common issues in subsequent lessons based on these insights, achieving precise alignment between teaching content and students' actual needs. The integration of intelligent tools shifts instruction from one-way delivery to interactive co-creation, transforming traditional teaching methods.

#### **4.2. Optimize teaching evaluation by relying on data analysis**

Educators can leverage AI to continuously track students' behavioral data across all learning phases, thereby establishing a comprehensive and multi-dimensional evaluation system. The system meticulously records detailed information such as students' login times on the platform, exercise accuracy rates, number of revisions made, and participation enthusiasm in discussions, synthesizing this process-oriented data into visualized learning curve diagrams. Teachers can clearly identify which knowledge points students repeatedly struggle with and when their learning efficiency drops significantly, allowing them to adjust teaching priorities and tutoring methods accordingly. Intelligent speech analysis technology also provides holistic evaluations for students' oral assignments, not only assessing pronunciation accuracy but also analyzing speech rate, intonation, and other elements, ultimately generating detailed diagnostic reports. For instance, if a student's speech contains no grammatical or lexical errors but is flagged by the system for excessive speaking speed and lack of sentence pauses, both of which impair clarity, as teachers can instruct students to control their speaking pace accordingly. Evaluation has evolved beyond mere final score assessments into diagnostic feedback integrated throughout the learning process. This data-driven approach precisely identifies students' learning challenges, providing reliable evidence to enhance teaching quality<sup>[4]</sup>.

#### **4.3. Expand teaching resources with the help of network platforms**

Educators should proactively leverage global educational resources through online platforms to break down campus barriers and create open, diverse learning environments. By selecting English course videos from prestigious institutions like Harvard and Oxford through international open education platforms, teachers can supplement classroom materials, exposing students to diverse teaching styles and academic perspectives. Additionally, subscribing to English academic journals and media databases allows teachers to regularly update course materials, ensuring students stay current with disciplinary developments. Collaborative tools enable cross-temporal interactions: teachers can annotate student assignments in shared cloud documents, while students review feedback and refine their work asynchronously. For example, in academic writing courses, teachers using real-world research papers as case studies might select well-structured, rigorously argued articles from international journals published within the past three years. Students analyze these cutting-edge research outputs to learn how to structure literature reviews, present methodologies, and discuss findings. Teachers simultaneously upload accompanying writing templates and academic sentence banks, enabling students to reference these resources when completing their papers. This teaching design, grounded in authentic academic discourse, equips students with writing skills that meet international academic standards. The resource integration ability of the network platform makes the teaching content from closed to open, from static to dynamic, students have a broader vision and more rich learning opportunities, resource expansion has become the key support to improve the teaching quality.

#### **4.4. Use virtual scenarios to strengthen practical training**

Virtual reality (VR) technology creates a low-risk, highly immersive language practice environment for students, addressing the limitation of classroom teaching in providing authentic communication scenarios. Teachers can utilize established VR teaching software, allowing students to wear devices and enter a 3D simulated space to complete various communication tasks in an immersive setting. The system features dozens of scenarios including airport inquiries, hotel check-ins, business negotiations, and academic defenses. Each scenario is equipped with intelligent virtual characters that respond naturally to student answers, simulating real dialogue interactions like questioning, confirmation, and rebuttal. Students can repeatedly practice in the virtual environment, restarting immediately after mistakes without embarrassment. This low-cost trial-and-error approach encourages students to boldly express themselves.

For instance, in comprehensive English courses, when teaching job interview units, instructors need students to master English expression techniques for application scenarios. Students enter a virtual company office and face a simulated HR manager during job interviews. The examiner asks common questions like "Could you tell me about your educational



background?” in English. Students must organize fluent English responses to demonstrate their capabilities. The system evaluates them in real-time based on grammar accuracy, vocabulary richness, and completeness of answers. When students make grammatical errors like “I very like this job,” the system provides instant prompts. After the interview, a detailed language proficiency diagnostic report identifies shortcomings in using workplace expressions such as “responsible for”. Post-practice, students can review dialogue recordings and compare their performance with standard examples like “I graduated from...with a major in...” to identify weak areas. Virtual scenario training transforms abstract English language knowledge into concrete communication skills. Through simulated real-world practice, students accumulate practical English application experience, laying a solid foundation for fluent communication in authentic situations <sup>[5]</sup>.

#### **4.5. Adjust teaching strategies based on intelligent feedback**

The intelligent teaching system generates real-time feedback data, providing teachers with scientific evidence to dynamically adjust instructional strategies, transforming the previous crude approach of relying on experience. The system automatically aggregates students’ learning behavior data weekly, including mastery rates of key knowledge points, assignment quality, and online interaction frequency, forming visualized class performance analysis reports. When teachers reviewed these reports over the weekend and discovered that a class’s average accuracy rate in a specific grammar point was only 60%, significantly lower than other subjects, they decided to add a dedicated grammar lecture in the following week’s class and push relevant micro-lecture videos and targeted exercises through the platform. The system can also identify individual students’ learning difficulties.

When a student fails to submit assignments three times in a row or experiences a significant drop in test scores, the platform automatically sends alerts to teachers. Teachers then communicate with the student promptly to understand the reasons and provide personalized tutoring. For instance, when a teacher noticed a student’s reading comprehension scores remained consistently low despite normal vocabulary test results, the system analysis revealed excessive time spent on complex sentence analysis. Based on this, the teacher developed a specialized syntactic structure training plan for the student. After two weeks, the student’s reading speed improved significantly. Intelligent feedback establishes teaching decisions based on objective data, enabling teachers to accurately identify instructional blind spots, timely adjust teaching plans, and achieve continuous optimization and quality improvement in the teaching process.

### **5. Conclusion**

In conclusion, AI technology provides technical support and practical pathways for systematic transformation of university English teaching models. Optimization strategies have established a comprehensive application framework across dimensions including teaching methodologies, evaluation mechanisms, and resource development. The deep integration of intelligent technologies not only resolves structural limitations of traditional models but also reshapes teacher-student roles: educators transition from knowledge transmitters to learning designers, while students evolve from passive recipients to active explorers. This fundamentally transforms teaching processes from standardized to personalized, and from one-way to interactive. Future efforts should focus on monitoring ethical implications of AI in educational contexts, addressing potential humanistic neglect caused by technological dependency, and establishing mechanisms to balance technical rationality with pedagogical warmth. These measures will ensure AI becomes a powerful tool for enhancing English teaching quality in higher education institutions.

### **Disclosure statement**

The author declares no conflict of interest.

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# Research on the Application of Information Technology in Modern Construction Project Management

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**Abstract:** Against the backdrop of digital transformation, modern construction project management has an ever-growing demand for efficiency, quality, and risk control. This paper focuses on the application of information technology in this field and expounds on its significance in improving management efficiency, optimizing resource allocation, enhancing quality supervision, and strengthening risk early warning capabilities. It analyzes the current problems in technology application, such as insufficient depth and breadth of application, shortage of interdisciplinary talents, and imperfect data standards and security systems. Combined with practical application scenarios, targeted strategies are proposed from three dimensions: technology integration, talent cultivation, and security framework construction. This provides practical references for promoting the digital upgrading of construction project management and realizing the high-quality development of the industry.

**Keywords:** Information technology; Construction project management; BIM technology; Internet of things; Data security; Talent cultivation

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## 1. Introduction

As a pillar industry of the national economy, the construction engineering industry was undergoing profound changes in its management model along with the wave of digitalization. Traditional project management was relied on manual recording and experience-based decision-making, which has problems such as delayed information transmission, difficult data integration, and slow risk response. It is difficult to meet the development needs of large-scale and complex modern projects<sup>[1]</sup>. The application of information technology has provided a new way to solve these pain points. From the 3D visual management of BIM models to the real-time data collection of the Internet of Things, and then to the intelligent analysis and early warning of AI, information technology has penetrated into many links of engineering construction, materials, quality, and safety. Studying the application of information technology in construction project management can not only promote the improvement of management efficiency and quality but also inject impetus into the transformation and upgrading of the industry.

## **2. The significance of intelligent information technology in modern construction project management**

### **2.1. Improving management efficiency and accuracy**

In traditional project management, work such as drawing review, progress tracking, and data statistics mostly relies on manual operations, which are prone to information errors and omissions due to human mistakes. Moreover, cross-departmental information transmission requires multiple links and takes a long time <sup>[2]</sup>. Information technology can break this limitation. With the 3D model built by BIM technology, data from the entire process of design, construction, and operation and maintenance can be integrated. Design changes can be synchronized to all participants in real time, reducing communication costs. Progress management software automatically captures on-site construction data, compares and analyzes it with the planned progress, quickly identifies delayed nodes, and avoids delays and deviations caused by manual statistics.

### **2.2. Optimizing resource allocation and reducing costs**

Construction projects involve various resources such as human resources, materials, and equipment. The traditional allocation method is prone to problems of resource idleness or shortage, resulting in cost waste. Information technology can realize dynamic resource allocation through big data analysis. IoT devices collect real-time data on material consumption and equipment usage status at the construction site. The system automatically generates resource demand plans based on the project progress, avoiding inventory backlogs caused by excessive material procurement or cost losses caused by equipment idleness. In addition, AI algorithms can optimize the scheduling of construction personnel and reasonably allocate personnel according to the human resource needs of different processes, reducing human resource waste <sup>[3]</sup>.

### **2.3. Enhancing the level of project quality supervision**

Project quality supervision needs to cover the entire construction process. In the traditional model, quality inspection relies on on-site inspections by quality inspectors, which has shortcomings such as limited inspection scope and delayed problem detection. Moreover, quality data is mostly stored in the form of paper records, making traceability difficult. Information technology can realize comprehensive and digital quality supervision.

Monitoring equipment based on image recognition technology can automatically identify quality problems such as wall verticality deviations and non-compliant steel bar spacing, and push early warning information in real time. Quality acceptance data is directly uploaded to the management platform through mobile terminals, forming traceable electronic files, which facilitates later quality traceability and analysis.

### **2.4. Strengthening project risk early warning and response capabilities**

Construction projects face various risks such as geological disasters, construction safety, and schedule delays. Traditional risk management mostly relies on post-event handling and lacks forward-looking. Information technology can realize early risk warning through multi-dimensional data collection and intelligent analysis <sup>[4]</sup>. The AI video monitoring system can identify potential safety hazards such as construction personnel not wearing safety helmets and illegal high-altitude operations, and issue alarms immediately. The big data platform integrates meteorological and geological data, and combines with project progress simulation to predict the impact of natural disasters such as heavy rains and landslides on construction, and formulate response plans in advance.

## **3. Specific applications of information technology in construction project management**

### **3.1. Intelligent construction management**

BIM technology is the core tool of intelligent construction management. Its 3D visual model can integrate data such

as engineering design, construction plans, and progress plans to provide accurate guidance for construction. In the construction preparation stage, virtual construction is carried out through the BIM model to simulate the installation sequence of components and the operation path of equipment, and identify conflicts between design and construction in advance, such as pipeline collisions and insufficient space, to avoid on-site rework. During the construction process, the BIM model is connected with the actual on-site construction data. The construction progress and quality inspection results are uploaded in real time through mobile devices <sup>[5]</sup>. The system automatically compares the planned and actual progress, generates a progress deviation analysis report, and guides managers to adjust the construction plan. In addition, UAV technology also contributes to construction management. UAV aerial photography is used to obtain panoramic data of the construction site, quickly generate aerial maps of the construction progress, intuitively present the construction progress of each area, and provide data support for multi-department collaborative management.

### **3.2. Intelligent material management**

The Internet of Things technology provides a full-process tracking solution for material management. By pasting RFID tags or QR codes on material packaging, information such as the purchase time, specifications and models, and quality inspection reports of materials is recorded. When materials enter the site, staff scan the tags with mobile terminals to automatically complete material acceptance and upload data to the management platform, avoiding errors caused by manual recording <sup>[6]</sup>. During the material storage stage, the platform monitors the inventory quantity and storage location in real time. When the inventory is lower than the early warning value, it automatically generates purchase suggestions to prevent material shortages from affecting construction. During the material use process, the system tracks the flow of materials, records the material consumption in each construction link, compares the planned and actual material consumption, and timely detects material waste problems. Using big data analysis, the material purchase plan can be optimized based on historical material use data, reducing procurement costs and inventory pressure <sup>[7]</sup>.

### **3.3. Intelligent quality management**

Intelligent quality management based on image recognition and big data realizes the automation and standardization of quality inspection. In the concrete pouring process, high-definition cameras take real-time pictures of the pouring process. The image recognition algorithm automatically analyzes whether the concrete slump and pouring thickness meet the standards, and immediately notifies on-site managers when abnormalities are found. In steel bar construction, the AI system scans the steel bar installation images to detect the steel bar spacing, quantity, and binding quality, compares them with the specification requirements, and generates a quality inspection report, reducing the subjectivity and omissions of manual inspection <sup>[8]</sup>. During the quality acceptance stage, staff upload acceptance data and on-site photos through mobile terminals. The system automatically determines the acceptance result according to the preset acceptance standards and forms an electronic acceptance file, which is convenient for later quality traceability. The platform integrates quality data of various projects to form a quality database, providing data support for the quality optimization of subsequent projects and promoting the transformation of quality management from “post-event rectification” to “pre-event prevention”.

### **3.4. Intelligent safety monitoring**

AI video monitoring and personnel positioning technology build a comprehensive safety monitoring network. AI cameras are deployed in key areas of the construction site to identify illegal behaviors in real time, such as construction personnel not wearing safety belts, illegal operation of large equipment, and non-standard temporary electricity use. After identification, an acousto-optic alarm is triggered immediately, and the early warning information is pushed to the managers' mobile phones to realize real-time intervention of illegal behaviors. The personnel positioning system installs positioning chips on the safety helmets of construction personnel to track their positions in real time <sup>[9]</sup>. When personnel enter dangerous areas, the system automatically issues warnings. At the same time, managers can check the personnel distribution through the platform to ensure rapid evacuation in emergency situations. In addition, safety wearable devices



such as intelligent safety helmets can monitor the physiological data of construction personnel, such as heart rate and body temperature, and give timely reminders when the data is abnormal to prevent sudden health risks.

## **4. Current situation of information technology application in modern construction project management**

### **4.1. Insufficient depth and breadth of technology application**

At present, most construction enterprises still apply information technology at a basic level and have not realized full-process and in-depth integration. In the application of BIM technology, most projects only use it for modeling and drawing review in the design stage, and do not extend it to the construction progress management, cost control, and operation and maintenance stages, so the technical value is not fully exerted<sup>[10]</sup>. Although some enterprises have introduced technologies such as the Internet of Things and big data, various systems operate independently, and data cannot be interconnected, forming information silos. In addition, the scope of technology application is limited to large-scale projects. Small and medium-sized projects still adopt the traditional management model due to cost considerations, resulting in an unbalanced overall informatization level of the industry.

### **4.2. Severe shortage of professional interdisciplinary talents**

The informatization of construction project management requires interdisciplinary talents who not only master professional knowledge of construction engineering but also are proficient in information technology. However, the reserve of such talents in the current industry is seriously insufficient. Traditional project managers have rich on-site management experience, but their ability to operate and apply technologies such as BIM, the Internet of Things, and AI is weak, making it difficult for them to skillfully use information tools to carry out management work. Although information technology professionals are familiar with technical principles, they lack an understanding of the construction process and management needs of construction projects and cannot develop information solutions that are in line with the actual situation of the project.

### **4.3. Imperfect data standards and security systems**

There is no unified data exchange standard in the industry. The data formats of different enterprises and different software systems are incompatible, resulting in difficulties in data sharing. The statistical standards of project management data in different regions and departments are inconsistent, making it difficult to realize data integration and analysis at the industry level. Data security risks are increasingly prominent<sup>[11]</sup>. Construction project management involves sensitive data such as project drawings, cost budgets, and personnel information. Some enterprises lack perfect security protection measures, and there are risks of data leakage and tampering. Moreover, due to the imperfect data backup mechanism, in case of system failures or natural disasters, data loss is likely to occur, affecting the normal development of project management.

## **5. Application strategies of information technology in modern construction project management**

### **5.1. Promoting in-depth technology integration and system integration**

To address the problems of insufficient technology application depth and information silos, efforts should be made in both standard formulation and technology integration. First, industry associations should work with leading enterprises to formulate unified data exchange standards, clarify the format requirements and statistical standards for BIM models, progress data, quality inspection data or more, use to realize data interconnection between different software and enterprises<sup>[12]</sup>. For example, specify the component classification and attribute definition of BIM models to ensure that

model data can be directly imported into systems such as progress management and cost control.

In addition, promote the integrated application of BIM with technologies such as the Internet of Things, big data, and AI to build a full-process information management platform. In the platform, the BIM model serves as the core carrier, integrating on-site construction data and material consumption data collected by the Internet of Things. It optimizes the construction plan through big data analysis and realizes progress early warning, quality inspection, and safety risk identification with the help of AI algorithms. Enterprises are encouraged to customize the development of information solutions according to project needs, promoting the extension of technology application from the basic level to full-process management, covering the entire life cycle of project approval, design, construction, acceptance, and operation and maintenance.

### **5.2. Strengthening the cultivation and introduction of interdisciplinary talents**

To solve the talent shortage problem, a dual-track model of cultivation and introduction should be established. Universities should optimize the curriculum system, add courses such as BIM technology application, Internet of Things and engineering management, and big data analysis to the construction engineering major. At the same time, interdisciplinary majors should be set up to cultivate graduates with dual knowledge backgrounds. Enterprises need to strengthen cooperation with universities, establish internship bases, and allow students to participate in the information management of actual projects to improve their practical ability. Regular training for in-service personnel should be organized, covering technical operations, system maintenance, data analysis, etc., to ensure that managers can skillfully use information tools. In terms of talent introduction, enterprises should formulate preferential policies to attract information technology professionals to join the construction industry, and at the same time recruit high-end talents with dual backgrounds in construction engineering and information technology<sup>[13]</sup>. By establishing a talent incentive mechanism, rewards should be given to teams or individuals who have performed well in technology application and innovation to stimulate the enthusiasm and creativity of talents.

### **5.3. Establishing and improving data standards and security frameworks**

Improving data standards and security systems requires advancing from three aspects: standard construction, security protection, and emergency support. Enterprises should actively participate in the standard formulation work organized by industry associations, put forward suggestions based on their own project experience, and promote the implementation of standards. A data management specification should be established within the enterprise to clarify the processes and requirements for data collection, storage, transmission, and use, ensuring the accuracy and consistency of data. Data security protection measures should be strengthened, and encryption technology should be used to ensure the security of data transmission and storage. For example, the SSL encryption protocol is used for the transmission of monitoring data at the construction site, and encrypted hard disks are used for the storage of sensitive data. User permission management should be improved, access permissions should be divided according to job responsibilities, and a multi-level approval mechanism should be set up to prevent unauthorized access. Regular network security testing should be carried out, and professional security service organizations should be introduced to check system vulnerabilities and prevent hacker attacks and virus intrusions. In addition, a data backup and emergency recovery mechanism should be established, using a combination of local backup and cloud backup to regularly back up project management data. A data security emergency plan should be formulated, clarifying the handling process and responsibility division in case of system failures and data leakage, to ensure the rapid recovery of data and system operation in case of emergencies and reduce losses.

## **6. Conclusion**

In conclusion, information technology has brought all-round improvements in efficiency, quality, and risk control to modern construction project management, and its importance has been widely recognized by the industry. Aiming at the

current problems in the application of information technology, such as insufficient depth and breadth of application, talent shortage, and imperfect data standards and security systems, these problems can be gradually solved by promoting in-depth technology integration, strengthening the cultivation of interdisciplinary talents, and establishing and improving the data security framework. This will promote the transformation and upgrading of the construction engineering industry towards intelligence, efficiency, and greenization.

## Disclosure statement

The author declares no conflict of interest.

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# An Empirical Study on the Influencing Factors of Academic Misconduct in Graduate Students—Based on the Comparison between “Double First-Class” non “Double First-Class” Universities

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**Abstract:** To address the current lack of targeted measures in graduate academic misconduct governance, this study analyzed 994 survey responses from students across four “Double First-Class” universities and 11 non “Double First-Class” institutions using SPSS 21.0’s linear regression method. Key findings reveal: (1) University type shows no significant impact on misconduct behavior, indicating uneven governance implementation; (2) “Double First-Class” universities misconduct is predominantly influenced by personal traits and faculty conduct; (3) Non “Double First-Class” institutions misconduct correlates with academic integrity awareness, institutional frameworks, and scholarly culture. Policy recommendations are proposed to enhance precision in misconduct governance, aiming to advance sustainable development in graduate education.

**Keywords:** Graduate students; Academic misconduct; Influencing factors

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## 1. Introduction

Graduate education, serving as a dual mission of cultivating high-caliber professionals and advancing scientific research, forms a cornerstone of China’s “Double First-Class” initiative. Addressing academic misconduct is crucial for its sustainable development. Preventing such misconduct among graduate students and fostering an ethical academic environment are vital to the success of this educational system.

Recent years have seen remarkable progress in China higher education: six mainland universities ranked within the QS World University Rankings by Subject (2025), with 436 disciplines securing positions in the ESI global top 1% (September 2025). While these achievements highlight China’s growing influence in global academia, recurring cases of academic misconduct continue to tarnish the reputation of Chinese higher education, drawing sustained attention from both domestic and international academic communities and the public<sup>[1,2]</sup>. There is still a certain distance from the postgraduate education that people are satisfied with.

Research on academic misconduct abroad began in the 1940s, while Chinese scholars started focusing on this field

in the 1990s, starting relatively late. The factors influencing academic misconduct have long been a hot topic among international researchers. In contrast, studies on the governance of postgraduate academic misconduct in China still predominantly focus on macro-level phenomenon descriptions, with limited attention paid to academic.

Empirical studies and theoretical analyses on factors influencing academic misconduct remain scarce, resulting in ineffective governance measures lacking targeted approaches. This study investigates factors affecting academic misconduct among graduate students through a questionnaire survey of 994 participants from 15 universities in Shaanxi Province.

Using SPSS21.0 linear regression analysis, the research not only enriches existing scholarship on academic misconduct in Chinese graduate education but also provides decision-making references to enhance the effectiveness of governance strategies.

## 2. Literature review

Academic misconduct includes plagiarism, falsification of experimental data, failure to cite sources of others' literature, failure to participate in projects, and so on.

The results are signed, the results completed by many people are claimed as their own, and plagiarism of others results are carried out<sup>[3-6]</sup>. With the increasing application of network information technology in the field of education, electronic dishonesty such as online selling or buying academic achievements, downloading and plagiarism has become increasingly prominent<sup>[7,8]</sup>. The emergence and development of new educational formats such as MOOC, online education, distance learning, blended teaching, and "micro-master" online degree programs have led to new forms and characteristics of academic misconduct.

Long-term research by foreign scholars indicates that academic misconduct among university students worldwide continues to spread across nations, The number of outstanding students involved is increasing<sup>[9-11]</sup>. This reflects the long-term, complex and urgent nature of the governance of academic misconduct, so it is necessary to carry out continuous and in-depth research.

International scholars have extensively examined how age, gender, academic year, grade ranking, average GPA, academic discipline, and parental education levels influence academic misconduct among college students. While multiple studies indicate male students are more likely to engage in academic dishonesty than their female counterparts, researchers have also highlighted gender socialization theory and structural theory perspectives, suggesting that women may demonstrate greater tolerance toward such behaviors compared to men<sup>[12]</sup>.

Due to varying levels of awareness regarding academic misconduct, master's students are more prone to engage in such behaviors than doctoral candidates. Cultural and ethnic backgrounds also significantly influence academic dishonesty among university students. For instance, Pakistani students, influenced by their tradition of valuing friendship, tend to be more tolerant of peers' academic misconduct<sup>[13-15]</sup>.

The personality traits of college students have a certain predictive effect on academic misconduct. Studies show that college students with strong self-control can inhibit the tendency to benefit and serve higher goals<sup>[16]</sup>. However, college students with sub-clinical psychopathy are more likely to engage in academic misconduct. Additionally, those who enjoy video games or possess sensation-seeking personality traits are more prone to such behaviors<sup>[16,17]</sup>.

Utilitarian value orientation has an important influence on college students' academic behavior. Different from the emphasis on knowledge memory in middle school and the emphasis on knowledge understanding in college, the postgraduate stage pays more attention to knowledge discovery and innovation<sup>[18]</sup>. The pressure of innovation, the pressure of employment and the increasing academic standards all pose challenges to the academic integrity of graduate students<sup>[19]</sup>. Some college students put the cart before the horse to achieve certain purposes, pursuing immediate results rather than the improvement of their abilities, are more likely to engage in academic misconduct<sup>[20]</sup>. For example, college students with performance goals are more likely to engage in academic misconduct than those with mastery goals<sup>[21]</sup>.

Furthermore, foreign scholars have deeply analyzed the internal mechanism of academic misconduct in college students from the perspectives of planned behavior theory, self-efficacy, social bond theory, self-determination theory, moral liberation theory and so on<sup>[22–24]</sup>.

The academic environment exerts a profound influence on academic misconduct among college students. The Honor Code, a traditional preventive and disciplinary measure against academic dishonesty, has been widely adopted by numerous American universities. According to Bernard E. Whitley's research, 50% of students at institutions implementing the Honor Code refuse to engage in academic misconduct, compared to 25% in those without such regulations<sup>[25]</sup>. But Charles A. Malgwi argues that punishment is more useful in practice than the rule of honor<sup>[26]</sup>. Teachers' attitude and behavior towards academic misconduct have a significant impact on students<sup>[27]</sup>. Studies have shown that while 90 percent of teachers say they have warned students about academic misconduct, only 9 percent of students say they have received warnings from teachers<sup>[28]</sup>. Teachers' indulgence, poor supervision, and unfair punishment of students' academic misconduct also led to the spread of academic misconduct<sup>[29]</sup>. Although education can enhance the cognition of academic norms, the traditional academic ethics education model based on knowledge transmission and subject-object education thought ignores the subjectivity of students, and the effectiveness of education is not strong<sup>[30,31]</sup>.

Comparative studies between different types of universities constitute a crucial perspective in China's higher education research. Significant differences exist between "Double First-Class" institutions and non- "Double First-Class" universities in graduate student demographics, anti-plagiarism governance systems, academic culture development, ethical education, degree criteria, and quality evaluation mechanisms. This raises critical questions: Does university type influence academic misconduct among graduate students? Are there distinct contributing factors across different educational institutions? Current research on these issues remains limited, necessitating further empirical investigation.

### 3. Design of the study

#### 3.1. Research subjects

This study examines master's students from four Double First-Class universities and 11 non-Double First-Class institutions in Shaanxi Province. 1,200 questionnaires were distributed, with 994 valid responses collected after processing (368 males, 37%; 626 females, 63%).

The valid response rate reached 82%. The survey included 8% valid responses. Among the participants, 206 individuals from Double First-Class universities (accounting for 20.72%, including Xi'an Jiaotong University with 40, Northwestern Poly-technical University with 42, Shaanxi Normal University with 56, and Northwest University with 68) and 788 from non-Double First-Class institutions (accounting for 79.28%, comprising Xi'an University of Architecture and Technology with 48, Shaanxi University of Science and Technology with 27, Xi'an University of Science and Technology with 62, Northwest University of Political Science and Law with 71, Xi'an Technological University with 85, Xi'an Petroleum University with 67, Xi'an Polytechnic University with 218, Xi'an University of Posts and Telecommunications with 51, Xi'an International Studies University with 58, Yanan University with 52, and Shaanxi University of Technology with 49 completed the survey.

#### 3.2. Design of survey tools

Given the unique characteristics, sensitivity, and hidden nature of academic misconduct, measuring such behavior among graduate students remains a significant challenge in research. Some scholars argue that exposed misconduct often represents only the tip of the iceberg compared to actual prevalence.

Most studies employ self-report methods, asking questions like "Have you engaged in academic misconduct?" or "Have your peers engaged in academic misconduct?"

However, these self-reported approaches struggle to fully capture the accurate picture. Other researchers conduct sampling inspections of specific groups theses or academic papers, but such samples are often limited in scope.

Psychological research indicates that academic misconduct is strongly context-dependent. By creating empathetic, stakeholder-driven moral dilemmas, we can obtain more accurate assessments. This study therefore developed a five-item scale to measure graduate students' academic attitudes and indirectly evaluate their potential tendencies toward misconduct.

As shown in **Table 1**, the scale explains 51.225% of respondent's academic attitudes with a Cronbachs Alpha coefficient of 0.759, demonstrating strong reliability.

**Table 1.** Reliability analysis of academic attitude measurement of graduate students

	Factor loading	Cronbachs alpha
Attitudes towards academic misconduct by classmates	0.658	
The attitude towards being ordered to leave school for cheating in postgraduate examinations	0.780	
The attitude of a graduate student who was denied his degree for repeatedly downloading assignments from the Internet	0.749	0.759
The attitude of the students around me who were punished for academic misconduct	0.779	
What you might do about your classmate's academic misconduct	0.594	
<i>P</i>		0.000
eigenvalue		2.561
Explained variance (%)		51.225

Based on a literature review and referencing academic misconduct scales developed by Roberts, Patty, and Muafia Munir, this study designed the "Postgraduate Academic Misconduct Influencing Factors Questionnaire" by integrating characteristics of Chinese graduate students. The questionnaire underwent Delphi method discussions and revisions among selected postgraduate students. It categorizes influencing factors into seven dimensions: personal efficacy, utilitarian value orientation, personality traits, awareness of academic norms, faculty behavior, academic systems, and academic environment (**Table 2**).

Items follow Likert scale format with five response levels from "strongly agree" to "disagree", coded as 1–5. Reliability analysis using SPSS21.0 showed Cronbachs alpha = 0.958, indicating strong reliability.

**Table 2.** Measurement table of factors influencing academic misconduct of graduate students

Dimension	Number of indicators	Example of measurement indicators
Individual effectiveness	3	Individuals are passive due to personal laziness or procrastination
Personal characteristics	3	Do it or don't, and if you don't get caught, you win
Academic institutions	3	Academic misconduct can be punished lightly
Academic atmosphere	4	People around me and seniors do this
Academic norm recognition	3	Lack of recognition and compliance with social norms
Teacher behavior	4	The teaching effect of the teacher is not good
Utilitarian value orientation	4	To be eligible for a scholarship

### 3.3. Research methods

This study utilized SPSS21.0 software for data analysis. The validity and reliability of the graduate academic attitude measurement scale were first assessed through factor analysis and reliability analysis. Subsequently, non-parametric tests were employed to compare academic attitude differences between "Double First-Class" universities and non "Double

First-Class” institutions. Finally, linear regression analysis was conducted to further examine how different dimensions influence academic misconduct behaviors among graduate students across various university types.

## 4. Research findings

### 4.1. Differences in academic attitudes of graduate students between universities with and without “Double first-class” construction

Before entering graduate studies, students’ academic attitudes are shaped by factors such as family background, social environment, and undergraduate experiences, forming a foundational structure that constitutes the internal basis for addressing academic misconduct in graduate education. This study employs non-parametric tests to analyze differences in graduate academic attitudes between “Double First-Class” universities and non- “Double First-Class” institutions (as shown in **Table 3**). The results reveal no significant differences in academic attitudes between these two types of universities, a conclusion that contradicts public perception. This finding highlighted that while “Double First-Class” universities excel in multiple fields, they face similar challenges in managing graduate academic misconduct as non- “Double First-Class” institutions. It also demonstrates consistent internal foundations for addressing academic misconduct among students, indicating that external factors influencing academic misconduct governance will significantly impact graduate students’ behavior.

**Table 3.** Analysis of academic attitude differences between graduate students in different types of universities

Type of higher education institution	N	Academic attitude of graduate students		Approximate significance (bilateral)
		Rank mean	Sum of ranks	
“Double first-class” universities	206	524.09	107963.50	0.128
Non-Double “first-class” construction universities	788	490.55	386551.50	

\* $P < 0.1$ , \*\* $P < 0.05$ , \*\*\* $P < 0.01$

### 4.2. Analysis of influencing factors of academic misconduct in graduate students

This paper uses linear regression to analyze the influence of personal efficacy, utilitarian value orientation, individual personality characteristics, academic norm cognition degree, teacher behavior, academic system, and academic environment on graduate students’ academic misconduct behavior (shown in **Table 4**).

**Table 4.** Analysis of factors influencing academic misconduct of graduate students

Model	Standard coefficient trial version	t	Sig.	Collinearity statistics VIF
(Constant)	-	16.590	0.000***	-
Individual effectiveness	-	-	-	-
Personal characteristics	0.177	3.391	0.001***	2.904
Academic institutions	0.171	3.855	0.000***	2.100
Academic atmosphere	-0.143	-3.160	0.002***	2.174
Academic norm recognition	0.134	2.570	0.010**	2.884
Teacher behavior	-0.090	-2.307	0.021**	1.629
Utilitarian value orientation	-0.077	-1.974	0.049**	1.639

\* $P < 0.1$ , \*\* $P < 0.05$ , \*\*\* $P < 0.01$



Beyond individual efficacy, factors such as graduate students' personality traits, utilitarian value orientations, and understanding of academic norms all particularly external elements like academic systems, scholarly environments, and faculty conduct collectively influence academic misconduct. Among these, academic systems exert the most significant impact on students' scholarly attitudes. These systems encompass regulations governing the definition, prevention, monitoring, punishment, and education regarding academic misconduct, along with their enforcement mechanisms. While international universities explicitly oppose academic misconduct through measures like orientation manuals and dedicated websites, Chinese institutions still maintain relatively vague definitions of such behavior. Institutional gaps persist, especially in unified awareness of misconduct consequences, coupled with lax supervision and lenient disciplinary actions that inadvertently encourage opportunistic tendencies and unethical practices. The notable effects of personality traits and academic climate further underscore the urgent need to strengthen scholarly culture development and enhance academic ethics education.

**Tables 5 and 6** present the influencing factors of academic misconduct among graduate students in “Double First-Class” universities and non “Double First-Class” institutions, revealing distinct differences between the two groups. Notably, personal personality traits and faculty behavior significantly impact academic misconduct in “Double First-Class” universities, reflecting their overall strengths in academic systems, scholarly environment, student efficacy, and value orientation. However, these institutions should focus on improving teaching quality through supply-side measures like enhancing instructional effectiveness, assigning tasks appropriately, and reducing external pressures that may induce academic misconduct. In contrast, graduate students in non “Double First-Class institutions show a significant correlation between their awareness of academic norms and misconduct behaviors, indicating insufficient depth and breadth in academic ethics education at non “Double First-Class” universities, as well as weak practical effectiveness. Additionally, these institutions must refine and optimize their academic systems and scholarly environments.

**Table 5.** Analysis of influencing factors of academic misconduct among graduate students in “Double First-Class” universities

model	Standard coefficient trial version	t	Sig.	Collinearity statistics VIF
(Constant)		9.224	0.000***	
Personal characteristics	0.245	3.249	0.001***	1.228
Teacher behavior	-0.224	-2.973	0.003***	1.228

\* $P < 0.1$ , \*\* $P < 0.05$ , \*\*\* $P < 0.01$

**Table 6.** Analysis of influencing factors of academic misconduct among graduate students in non “Double First-Class” universities

Model	Standard coefficient trial version	t	Sig.	Collinearity statistics VIF
(Constant)		14.716	0.000***	
Academic norm recognition	0.232	4.562	0.000***	2.196
Academic institutions	0.158	3.402	0.001***	1.831
Academic atmosphere	-0.147	-3.019	0.003***	2.002

\* $P < 0.1$ , \*\* $P < 0.05$ , \*\*\* $P < 0.01$

The disparity between the two indicates uneven development in China's postgraduate academic misconduct governance. Marked by the 2002 Ministry of Educations “Guidelines on Strengthening Academic Ethics” and the 2011

China Association for Science and Technology and Ministry of Education's "Notice on Promoting Scientific Ethics and Academic Integrity Education", China's postgraduate misconduct governance has progressed through two phases: establishing policy frameworks and fostering academic standards. The 2016 Ministry of Education's "Measures for Preventing and Addressing Academic Misconduct in Higher Education Institutions" marked a new phase.

However, this study reveals distinct factors influencing misconduct among postgraduates in Double First-Class universities versus non Double First-Class institutions. Non Double First-Class universities, in particular, face incomplete academic systems, insufficient awareness of academic norms, and inadequate policy implementation, with the second phase objectives remaining unfulfilled. Given these challenges and institutional gaps, targeted precision governance of postgraduate misconduct has become urgent and essential, requiring tailored approaches that address each university's unique characteristics.

## 5. Research conclusions and policy recommendations

### 5.1. Research conclusions

Through questionnaire surveys and data analysis of 994 graduate students from four "Double First-Class" universities and eleven non- "Double First-Class" institutions in Shaanxi Province, this study reveals three key findings

- (1) There is no significant difference in academic attitudes toward misconduct between these two groups, with no notable impact from university type on academic dishonesty.
- (2) Academic misconduct among graduate students stems from multiple factors, particularly the combined influence of personal personality traits, academic systems, and scholarly environment. The development of misconduct governance remains uneven across institutions, highlighting the persistent challenges in fostering academic integrity and moral education.
- (3) Distinct influencing factors exist between the two groups, necessitating targeted strategies to enhance the effectiveness of misconduct prevention measures.

### 5.2. Policy recommendations

Adopting a graduate-centered approach to enhance the effectiveness of academic misconduct governance. Academic integrity is both an inherent requirement of graduate education and a defining element of students' core competencies, forming the foundation for implementing socialist core values in this field. In addressing academic misconduct among graduate students, we should respect their autonomy by shifting focus from prohibitions to guidance and support for proper conduct. This aims to strengthen students' self-discipline and critical judgment through innovative concepts, platforms, models, content, and methodologies. Targeted measures should be implemented to address specific contributing factors across different universities, particularly leveraging supervisors and academic departments roles in misconduct prevention. By integrating ethical education into educational practices, we can effectively improve governance outcomes and steer graduate students' scholarly conduct toward positive development.

Promote supply-side reforms to enhance the governance capacity for academic misconduct in Double First-Class universities. Cultivating top-tier talent remains a defining feature of this initiative. Such talents must adhere to academic ethics and standards. Given that research achievements critically influence rankings in global academic benchmarks, including Shanghai Ranking, THE, US News, and QS, the excessive focus on these metrics inevitably strains the balance between academic research and talent development<sup>[32]</sup>. This also intensifies the pressure on graduate students, particularly doctoral candidates, to produce high-level innovative achievements. The study reveals that individual personality traits and faculty behaviors significantly influence academic misconduct among postgraduate students in Double First-Class universities. These factors manifest through unsatisfactory teaching performance, instructors (supervisors) failure to provide objective evaluations during academic activities, abrupt task assignments that hinder preparation, and tasks lacking substantive value. To address these issues, Double First-Class universities should align with global academic governance

standards for world-class institutions. By implementing comprehensive reforms in educational practices and talent development from the supply side, these universities can establish a holistic system for preventing academic misconduct across all personnel, processes, and stages. This approach will ultimately create a supportive environment for graduate students' academic growth.

Strengthen institutional support to address governance gaps in academic misconduct at non “Double First-Class” universities. This study reveals uneven development in China postgraduate academic misconduct governance, particularly evident in three aspects

- (1) Under-representation of postgraduates in understanding misconduct definitions, manifestations, and consequences across non “Double First-Class” institutions.
- (2) Acceptance of behaviors deemed non-crisis situations as usual, undermining academic integrity.
- (3) Universities simplistically equating misconduct detection to thesis plagiarism checks, adopting lenient or even permissive attitudes toward violations while neglecting enforcement.

The academic climate remains problematic, with misconduct tactics being widely circulated among students. Postgraduates, especially in humanities often reduce academic standards to merely avoiding 20% plagiarism rates, resorting to excessive text polishing. To address these issues, non “Double First-Class” universities must have criteria below.

- (1) Establish comprehensive governance frameworks
- (2) Enhance foundational infrastructure
- (3) Implement extensive academic ethics education to reinforce students' awareness of scholarly norms, thereby cultivating a robust academic culture rooted in ethical principles.

Thus, a good academic atmosphere with integrity and avoid a governance landscape of academic misconduct would be expected.

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# Research on Improving Pathways to Assessment Literacy of Chinese University EFL Teachers under Multidimensional Perspective

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**Abstract:** Grounded in a multidimensional framework, this research interrogates the conceptual dimensions, factors and developmental trajectories of assessment literacy among Chinese university EFL teachers. By systematically reviewing domestic and international literature, it distills four core constituents of assessment literacy, conceptions, knowledge, competence and attitudes; further explicates how their dynamic interplay shapes pedagogical progress. The research then constructs a four-layer model of factors that constrain or enable literacy growth: the individual, institutional, regional and technological strata. On this basis, it advances synergistic improving pathways: teachers' lifelong inquiry-oriented learning, evidence based institutional reforms coupled with resource provision, inter-university collaboration and joint standard setting within regions and educators, and university administrators with empirical guidance for cultivating a higher education foreign language assessment ecosystem that is learning centered, ethically regulated and technologically empowered.

**Keywords:** Assessment literacy; University EFL teachers; Improving pathways

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## 1. Introduction

In the context of globalization, higher education in foreign languages in China has been entrusted with the strategic mission of cultivating internationally competent individuals and intercultural mediators. Assessment, as a vital component of the teaching–learning system, depends for its effectiveness on the assessment literacy of foreign language teachers<sup>[1]</sup>. The paradigm shifts from traditional summative assessment to formative, pluralistic, and learning-oriented approaches requires teachers to simultaneously undertake four cognitive and ethical tasks: design, implementation, interpretation, and feedback application<sup>[2]</sup>.

Empirical studies have shown that teachers with high levels of assessment literacy can accurately diagnose individual student needs based on multidimensional evidence, dynamically adjust task complexity and feedback strategies, and significantly enhance student engagement and language proficiency<sup>[3]</sup>. Moreover, assessment activities themselves serve as a “professional laboratory” where teachers integrate knowledge from educational measurement, cognitive psychology, and subject pedagogy. This process enables them to expand their professional knowledge, enhance their sense of efficacy, and strengthen their professional identity through a continuous cycle of theory–practice–reflection.

Currently, China's national initiatives such as the "New Liberal Arts" and "Double First-Class" university construction programs have incorporated competencies such as innovation ability and intercultural communication into talent cultivation standards. This calls for the construction of a new ecology of higher education foreign language assessment that is learning-centered, balances process and outcome, and integrates ethical and technological governance. Teachers' assessment literacy is not only a key independent variable determining the success of this transformation but also a core indicator for evaluating the effectiveness of educational reform<sup>[4]</sup>. Therefore, an in-depth exploration of the conceptual dimensions, multidimensional influencing factors, and developmental pathways of foreign language teachers' assessment literacy in Chinese higher education can provide evidence-based support for policy-making, curriculum redesign in teacher education, and innovation in assessment governance. This has significant practical and theoretical value for promoting the high-quality development of higher education.

## **2. Components of assessment literacy among university foreign-language teachers**

The notion of assessment literacy was first coined by the American scholar Stiggins, who defined it as the qualities that teachers cultivate or refine through everyday teaching and assessment acts. With the continuous evolution of educational-assessment theory and practice, the connotation of assessment literacy has been progressively enriched. At present, the academic community generally regards assessment literacy as a comprehensive manifestation of teachers' knowledge, skills, attitudes and values in the process of instructional assessment. It covers teachers' understanding and application of assessment purposes, methods, instruments and results.

Conceptually, assessment conceptions constitute the core of assessment literacy, guiding teachers' assessment behaviors and decisions. University foreign-language teachers should adopt a student-centered conception that attends to learners' individual differences and all-round development, emphasizing the diagnostic, formative and developmental functions of assessment, and treating assessment as a vital means of facilitating student learning and growth rather than merely a judgement of learning outcomes<sup>[5,6]</sup>.

Assessment knowledge is the foundation for effective assessment. It embraces basic theories of educational measurement and evaluation, foreign-language teaching and learning, and language-testing theory<sup>[7]</sup>. Teachers need to understand the characteristics, applicability and limitations of different assessment methods and tools, and master the construction of assessment-indicator systems, the setting of assessment criteria, and the collection and analysis of assessment data. For instance, teachers must know how to design a scientifically sound foreign-language test that accurately measures students' linguistic knowledge and skills, and how to employ formative-assessment tools, such as classroom observation, learning journals and peer assessment, to track learning processes and progress.

Assessment ability is the key component of assessment literacy, encompassing the capacity to design, implement, interpret and utilize assessment results<sup>[8]</sup>. In terms of design, teachers should be able to select appropriate assessment modes and tools and formulate explicit criteria and indicator systems in line with instructional objectives and student characteristics. During implementation, they must skillfully apply various assessment methods, effectively collect assessment data, and ensure fairness, impartiality and objectivity<sup>[9]</sup>. When interpreting and utilizing results, teachers should accurately decode assessment data, analyze students' strengths and weaknesses, provide targeted feedback and suggestions, and adjust teaching strategies and methods accordingly to improve instructional quality.

Assessment attitude, reflecting the importance teachers attach to assessment and their associated values, is also an integral part of assessment literacy. A positive assessment attitude is manifested in teachers' conscientiousness towards assessment, respect and care for students, objectivity and fairness towards results, and an active pursuit of assessment improvement<sup>[10]</sup>. Teachers should recognize assessment as an indispensable segment of instruction and an important pathway for promoting both student learning and their own professional development, and thus devote themselves to assessment with a positive mindset.

### **3. Multidimensional factors influencing assessment literacy**

#### **3.1. Individual factors**

At the individual level, university foreign-language teachers' affective dispositions, teaching experience, educational background and training history all potentially shape their assessment literacy, which is gradually forged through continuous reflection on practice and proactive acquisition of theoretical knowledge. Research indicates that academic credentials per se are not a decisive determinant; they have not prevented these teachers from remaining active in English instruction or from continuously enhancing their assessment literacy<sup>[11]</sup>. An examination of their careers reveals a persistent thread of multifarious learning and training: study-abroad program, leadership of teaching-research projects, and multiple teaching awards. It is the habit of approaching practice with inquiry, and of using theory to address concrete problems, that underpins their improvement.

#### **3.2. Institutional management factors**

At the institutional level, several facets of administrative systems significantly affect the cultivation of teachers' assessment literacy. First, management systems exert orienting and constraining functions. When student examination scores or graduation rates are set as the dominant indices of teacher performance, assessment is narrowed into "score management", depriving teachers of the cognitive impetus to engage in formative or pluralistic evaluation. If appraisal schemes over-emphasize research output and teaching workload while neglecting qualitative scrutiny of assessment design and the use of results, teachers' resource allocation inevitably tilts toward visible products, marginalizing the development of assessment literacy<sup>[12]</sup>.

Second, the instructional environment constitutes an external support condition. A vibrant academic culture, characterized by peer assistance, experience sharing and collective reflection, supplies a "community of practice" within which teachers continually update assessment knowledge<sup>[13]</sup>. Meanwhile, digital technologies such as online platforms and learning-management systems can extend embedded, real-time assessment modalities; inadequate investment in such facilities deprives teachers of multimodal data, limiting the precision of diagnosis and feedback.

Finally, training mechanisms serve as crucial mediators, yet fragmented, overly theoretical, one-off lecture models prevail. Lacking needs-based staged courses, school-based practicums and impact tracking, this program hinders the translation of assessment knowledge into situated competence.

#### **3.3. Regional factors**

Regional cultural backgrounds and educational traditions exert a subtle yet profound influence<sup>[14]</sup>. In culturally conservative regions, outdated educational outlooks that stress knowledge transmission and memorization, and that prize examination pass rates, lead teachers to focus assessment on knowledge reproduction while neglecting students' innovation, practical skills and comprehensive qualities. In culturally open regions with progressive educational ideals, emphasis on individuality and creativity encourages diversified assessment; teachers more easily access advanced conceptions and are more willing to experiment, thereby facilitating the growth of assessment literacy.

The regional policy environment also plays a steering role. Policies that advocate quality-oriented education and all-round development, and that foreground process-oriented and pluralistic assessment, prompt institutions and teachers to prioritize the enhancement of assessment literacy and to explore new methods and technologies. Conversely, policies dominated by traditional examinations reinforce conventional mind-sets and constrain development. Moreover, the distribution of educational resources matters: resource-rich regions can offer abundant training, learning materials and practice platforms, whereas resource-poor regions leave teachers with few opportunities for learning or exchange, resulting in slower improvement.

#### **3.4. Technological factors**

With the rapid advance of information technology, online instruction has become widespread, furnishing teachers with



abundant assessment tools, online testing platforms, learning-management systems, interactive software and so forth<sup>[15]</sup>. These tools collect real-time data on study time, progress, assignment completion and discussion participation, supplying evidence for comprehensive and objective judgement. Teachers can thus diagnose problems promptly and give targeted feedback. For example, online tests instantly reveal mastery levels and auto-generated analytics visually expose strengths and weaknesses.

However, some teachers' inadequate familiarity with these tools prevents full exploitation, limiting the enhancement of assessment literacy. Online modes demand information-technology (IT) competence, basic computer operations, mastery of platforms and assessment software, and data-analysis skills<sup>[16]</sup>. Technologically unconfident teachers struggle to integrate new tools into daily assessment; they may be unable to design diversified online assessment activities or to interpret collected data effectively, thereby impairing assessment quality. Raising teachers' IT proficiency so that they can skillfully deploy technology in assessment is therefore a crucial task for promoting assessment literacy<sup>[17]</sup>.

## **4. Strategies for enhancing the assessment literacy**

### **4.1. Individual strategies**

University foreign-language teachers should embrace lifelong learning, recognizing that the enhancement of assessment literacy is an ongoing process. They should actively monitor the latest research findings and developments in educational assessment, and acquaint themselves with advanced conceptions, methods and technologies. Updating their knowledge base and broadening their assessment horizons can be achieved by reading professional books and journals, attending academic conferences, and enrolling in online courses. Teachers ought to delve into theories of educational measurement and evaluation, language testing, and foreign-language pedagogy, so as to grasp the essence and purposes of assessment and to master the characteristics, applicability and limitations of diverse methods and tools, thereby furnishing a solid theoretical grounding for practice.

Participation in varied training activities constitutes a major pathway. Institution or authority sponsored training program, usually delivered by specialized experts, offer systematic knowledge, practical opportunities and hands-on experience. Teachers may also join seminars and workshops to exchange experiences, share cases and collectively solve problems, thereby gaining multiple perspectives, stimulating innovative thinking and improving assessment competence.

Reflective practice is equally vital. After each assessment event teachers should scrutinize the data, question the appropriateness of indicators, the efficacy of methods and the validity of results, and identify weaknesses in their own literacy. Reflection enables timely adjustment of strategies and improvement of practice. Communicating with students to elicit their perceptions of assessment can further refine the system and enhance quality.

### **4.2. Institutional strategies**

Universities should refine their teaching-assessment management by establishing scientifically sound teacher-evaluation systems. When appraising teaching quality, student achievement, process performance and comprehensive development should all be considered; sole reliance on examination scores must be avoided. Including teachers' assessment literacy and performance in promotion and appraisal schemes can incentivize earnest engagement with assessment. Institutions should also increase resource allocation, earmarking adequate funds for assessment training and purchasing advanced tools, to create enabling conditions.

A positive academic culture should be fostered. Organizing peer observation allows teachers to learn from exemplary assessment practices; establishing communities of practice centered on assessment encourages collaboration on projects and research, nurturing mutual support and collective advancement. Infrastructure investment should introduce sophisticated technologies, online platforms, learning-management systems. To automate data collection and analysis, thereby raising efficiency and accuracy. Class sizes and teaching loads should be rationally controlled to afford teachers the time and energy to attend to individual learners and to improve assessment quality.

Systematic, sustained training programs are essential. Content must align with real teaching needs, integrating theoretical input with hands-on practice and case analysis. Delivery should be varied, lectures, group discussions, case studies, simulated assessments, to enhance interactivity and effectiveness. Follow-up and feedback mechanisms should track application and impact, allowing continuous refinement of content and modality to ensure that training durably promotes assessment literacy.

### **4.3. Regional strategies**

Regional education authorities should strengthen inter-university cooperation by creating shared platforms for the development of assessment literacy. Joint training programs can pool high-quality resources and invite renowned experts to raise quality. Regular forums for sharing experiences, successful cases and innovative practices can stimulate mutual learning and collective improvement.

Collaborative projects should be launched, joint research into assessment models suited to the region, cooperative development of tools and resources to achieve sharing and efficiency and to foster deep inter-institutional exchange, shaping a regionally synergistic developmental landscape and elevating overall literacy.

Authorities should also issue unified standards and requirements, guiding universities to prioritize assessment literacy. A monitoring mechanism should be instituted to conduct periodic evaluations, diagnose problems and propose improvements. Universities and teachers demonstrating outstanding progress should be publicly recognized and rewarded to exert demonstrative and leading effects, propelling region-wide advancement.

### **4.4. Technological strategies**

Authorities and institutions should intensify IT training to raise teachers' capacity to use technological tools for assessment. Training should cover basic computer operations, platform navigation, assessment software, and data analysis. Courses that integrate IT with assessment literacy should demonstrate how big-data analytics can personalize evaluation and how AI can automate marking and intelligent assessment, thereby enhancing efficiency and accuracy.

Investment in advanced tools such as online platforms, learning-management systems, assessment software should be increased. Teachers should be encouraged to explore and apply emerging technologies, and supported in conducting technology-based assessment research. A dedicated technical-support team should be established to troubleshoot problems, ensuring reliable operation and powerful backing for teachers' assessment work. Through technology enablement, teachers' assessment capabilities and efficiency can be upgraded, furnishing scientific, comprehensive and precise support for university foreign-language assessment.

## **5. Conclusion**

This study has dissected the connotation of university foreign-language teachers' assessment literacy, clarifying that it embraces four intertwined dimensions, conceptions, knowledge, ability and attitude, which together constitute an organic whole. In examining the factors that influence its development, we adopted a four-layer lens: teacher individuality, institutional management, regional culture and technological support. Teachers' cognitive level, affective disposition and training experience play a foundational role; institutional policies, instructional climate and professional-development mechanisms exert orienting and constraining effects; regional cultural traditions, policy environments and resource distributions shape literacy in subtle ways; meanwhile, the rise of information technology presents both opportunities and challenges, with teachers' technological competence mediating the translation of digital tools into assessment practice.

Grounded in these findings, this study has proposed a multi-pronged set of strategies. At the personal level, teachers should espouse lifelong learning, actively participate in training and engage in sustained reflective practice. At the institutional level, universities should refine assessment-management systems, cultivate a supportive academic culture and provide rigorous, practice-embedded training. At the regional level, education authorities should foster inter-university



collaboration, initiate joint projects and institute monitoring-and-incentive mechanisms. At the technological level, systematic IT training and increased investment in assessment technologies are imperative.

It is hoped that these strategies will furnish useful reference for future developmental pathways of university foreign-language teachers' assessment literacy, and will ultimately contribute to the construction of a learning-centered, ethically and technologically sound assessment ecology in China's higher-education foreign-language program.

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# Missionary Strategies and the Transformation of Women's Vocational Education in China (1880s-1920s): Professionalization, Control and the Paradox of Empowerment

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**Abstract:** This paper critically reassesses a pivotal transformation in Protestant missions in China: the reconfiguration of female education from cultivating evangelistic auxiliaries to professionalizing women as foundational agents of the indigenous church. Moving beyond narratives of either benevolent modernization or cultural imperialism, it argues that this shift was a contingent and often contradictory response to internal institutional crises. Drawing on internal mission discourse, institutional reports, and pedagogical debates in *The Chinese Recorder and Missionary Journal*, the study traces a deliberate yet contested trajectory from instrumentalized training (1880s–1890s), aimed at producing compliant intermediaries, to an institutionalized model (1900–1920), designed to sustain ecclesial infrastructure. It highlights how Chinese women exercised agency, negotiating, subverting, and repurposing vocational frameworks, while transnational reformist ideas further complicated missionary ambitions. The paper concludes that this forty-year project embodies the central paradox of mission strategy: the attempt to devolve operational authority while retaining ideological control, a project continually reshaped by local actors and structural contingencies.

**Keywords:** Protestant missions; Female education; Vocational training; Agency; *The Chinese Recorder and Missionary Journal*

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## 1. Introduction: Re-reading a strategic pivot

The historiography of Protestant female education in China has long been caught between two powerful, yet ultimately limiting, narratives. The first, a legacy of mission apologetics, frames the expansion of girls' schools and vocational training as a benevolent, linear march of progress and liberation<sup>[1]</sup>. The second, influenced by postcolonial critique, views these same institutions primarily as instruments of cultural imperialism, imposing Western gender norms and disrupting indigenous social structures<sup>[2]</sup>. While Hunter illuminated the complex personal motivations of missionary women, and Dunch detailed the local dynamics of church formation, a crucial gap remains<sup>[3,4]</sup>. As Viswanathan argued in the context of British India, the power of colonial education lay not merely in its content but in its "mask of conquest", its institutional forms and classificatory schemes<sup>[5]</sup>. A parallel, rigorous analysis of the internal strategic logic and institutional technologies that drove the systematic, yet fractured, recalibration of female training in China between 1880 and 1920 is still needed.

This period demands focused study because it encompasses the collapse of the late-Qing polity, the Boxer crisis, and the foundation of the Republic, events that forced a fundamental re-evaluation of missionary methods. As Bays has shown, the concept of the indigenous church moved from theological abstraction to operational necessity during these years. However, the specific implications of this shift for the strategic deployment of female labor have been under-theorized <sup>[6]</sup>. Lutz's study documents the proliferation of schools but seldom dissect the tactical reasoning behind evolving curricular priorities for girls or the resistance they encountered <sup>[7]</sup>. This paper seeks to fill this gap by applying a more granular, policy-oriented analysis.

This paper argues that the transformation of female vocational training was a calculated, yet deeply contested, multi-stage response to the missionary enterprise's core strategic dilemmas. The period 1880–1920 saw a deliberate but uneven transition from a model of instrumentalization, where Chinese women were trained for narrow, immediate utility in evangelism to a project of institutionalization, where they were professionally formed to become the permanent administrative and social backbone of a self-propagating Chinese church. This was not an organic or coherent evolution but a series of tactical adaptations, riven with internal debate and consistently complicated by the agency of Chinese women and the influence of global models of reform <sup>[8]</sup>. By exposing this underlying strategic architecture and its fissures, this paper contributes a more nuanced understanding of how religious movements engineer social change and why their designs so often produce unintended consequences.

## **2. The tactics of penetration: The “gendered bridge” and its limitations (c. 1880–1900)**

### **2.1. The inner sphere and the strategic challenge**

The foundational strategic problem for late-Qing missions was one of access. The Nei, or inner, female-dominated sphere of Chinese society constituted a formidable barrier to evangelism. The initial missionary response, as documented in *The Chinese Recorder and Missionary Journal* (hereafter *The Chinese Recorder*), was not to dismantle this gendered segregation but to exploit it through a tactical instrumentalization of native women. The “Bible woman” was conceived as a specialized tool, a “gendered bridge” allowing the mission to project influence across a cultural frontier, a practice that resonates with what Sinha, in the context of British India, has called the use of “colonial intermediaries” <sup>[9]</sup>.

The economic and operational logic of this system was starkly clear. A text from 1885 calculates that the conversion of Chinese women, and by extension their families, largely relied on these native agents because the supply of foreign missionary ladies would never be large enough. This was a strategy of cost-effective scaling identified as the pragmatic “devolution” of work to indigenous agents. The training regimen was accordingly narrow, a pedagogy of limited agency designed to create a compliant, dependent auxiliary force. The 1887 report on the Berlin Foundling House in Hong Kong exemplifies this tactical mindset. Its goal of producing “useful house-wives” was a dual-purpose investment in stabilizing the nascent Christian community or staffing mission households, reinforcing what Kwok critically terms the “colonialist patriarchy” embedded in mission structures <sup>[10]</sup>.

### **2.2. Agency and limits: Chinese women navigate missionary expectations**

The model was neither perfectly efficient nor passively accepted. The reliance on these intermediaries created a principal-agent problem. Missionaries frequently lamented the “superstitions” and “unreliable” nature of their Bible women, revealing a gap between the ideal of a pliant tool and the reality of a human agent with her own cultural and social understandings <sup>[11]</sup>. Chinese women who entered this role were not blank slates. As the life of Mrs. Law of Canton, celebrated in 1924 for forty years of service, demonstrates, some parlayed this limited training into positions of significant influence. Beginning as a teenage teacher with her mother acting as a chaperone, she eventually became a prominent preacher and a member of the National Christian Council. Her career illustrates that Chinese females could skillfully navigate the physical and symbolic boundaries imposed upon them, transforming the gendered bridge into a path to autonomous authority unforeseen by its original architects.

### **3. The professionalization imperative: Engineering a sustainable church (c. 1895–1910)**

#### **3.1. From crisis to strategy: Lessons from the boxer uprising**

The turn of the twentieth century confronted missionaries in China with a profound strategic dilemma: the church's sustainability required local autonomy, yet the institutional structures remained heavily dependent on foreign oversight. The Boxer Uprising of 1900 starkly exposed the vulnerabilities of a community whose organizational and administrative capacities were externally imposed<sup>[12]</sup>. Within this context, the professionalization of female labor emerged as a deliberate, multi-faceted strategy intended to reconcile operational necessity with ideological control. The shift entailed more than curricular enhancement; it represented an epistemic recalibration in how missionaries conceived knowledge, authority, and social reproduction within the indigenous church.

#### **3.2. Formalization and bureaucratization of female labor**

Professionalization served a dual purpose: operational efficiency and symbolic legitimization. By introducing formalized pedagogical structures, standardized curricula, and certification systems, missions aimed to institutionalize authority in a manner that transcended individual personalities or idiosyncratic practices. Reports from the English Presbyterian mission in Swatow illustrate the intricate bureaucracy designed to monitor both moral comportment and pedagogical efficacy, reflecting an implicit recognition that control over women's training could operate as a vector for broader ecclesial stabilization. This approach parallels Weberian analyses of bureaucratic rationalization, wherein procedural rigor substitutes for personal authority in sustaining institutional coherence [13].

However, the process was neither uniform nor uncontested. Missionaries debated the relative weight of moral formation versus technical proficiency, revealing underlying epistemic tensions: whether education should primarily inculcate piety and obedience or cultivate professional competence capable of sustaining independent institutional networks. The transnational circulation of pedagogical models from North America and Europe, including Normal Schools and teacher training programs, intensified these debates. While missions selectively adapted these frameworks to Chinese realities, the very act of adaptation introduced internal inconsistencies: imported bureaucratic logic occasionally collided with local cultural norms, economic limitations, and students' aspirations.

#### **3.3. Empowerment and resistance: Graduates as agents of change**

Professionalization paradoxically created a locus of potential resistance. Graduates, imbued with pedagogical knowledge, administrative skills, and technical expertise, became increasingly aware of their capacity to influence institutional outcomes. While this was consistent with the mission's goal of building a self-propagating church, it also undermined hierarchical assumptions embedded in missionary ideology. The professionalization of female labor thus simultaneously reinforced and destabilized the missionary system: it facilitated the operational replication of ecclesial structures while cultivating a cohort of women whose autonomy, social knowledge, and mobility exceeded the parameters initially envisioned by foreign planners. The tension between empowerment and control, between technical skill and ideological compliance, underscores the intricate interplay of strategy, structure, and agency that defined the mission's professionalization imperative.

### **4. The productization drive: Vocational training as social stabilization (1900–1920)**

#### **4.1. Responding to social crisis: Vocational training as strategy**

The early twentieth century presented missions with unprecedented social challenges: political instability, urbanization, refugee crises, and widespread poverty necessitated a strategic recalibration of missionary interventions. In response, missionaries pursued the productization of female labor, a deliberate strategy that sought to integrate vocational training, moral education, and social stabilization into a unified institutional approach. This phase reflects an engagement with the intertwined objectives of economic utility, social discipline, and religious formation, positioning female vocational labor as



both an instrument and a site of governance <sup>[14]</sup>.

Institutions such as the Chefoo Industrial School (1899) and Foochow Industrial School (1914) exemplify this strategy. Students were trained in industrial and domestic skills, including textile production, embroidery, and household management, with the explicit dual aim of cultivating moral rectitude and contributing to local economic stability. These initiatives were not merely pedagogical but operational: the mission envisioned graduates as agents who could stabilize communities by mediating labor, instilling discipline, and promoting self-reliance, thereby extending ecclesial authority into daily life. The ideological justification drew upon the Social Gospel, emphasizing the moral and spiritual dimensions of labor, reflecting a moral-technical nexus central to Protestant reformist thought.

## **4.2. Knowledge transfer and hybrid adaptation**

The productization strategy was explicitly informed by transnational knowledge networks. The industrial curricula, moral pedagogy, and organizational structures were modeled after global precedents, including Booker T. Washington's Tuskegee Institute, North American industrial schools, and European vocational programs <sup>[6,8]</sup>. Yet, these imported models were selectively adapted to local conditions, producing a hybrid strategy that simultaneously reflected global norms and indigenous exigencies. The selective adaptation required ongoing negotiation between operational feasibility, cultural acceptability, and missionary objectives, highlighting the contingent nature of knowledge transfer in transnational mission networks.

## **4.3. Limits and unintended outcomes: Autonomy beyond control**

Despite the careful design, productization's efficacy was structurally constrained. Economic realities frequently undermined the goal of self-sufficiency. Reports from 1915–1919 emphasized persistent dependence on mission supervision, resource allocation, and market limitations, revealing a systemic fragility. Furthermore, the enhanced vocational skills of graduates paradoxically produced new challenges: women equipped with industrial and managerial expertise increasingly sought opportunities beyond mission households, undermining hierarchical control and demonstrating the limits of social engineering. In this way, productization exemplifies a central tension of missionary strategy: interventions designed to produce obedience and stability simultaneously generated autonomy and mobility, underscoring the contingent, negotiated outcomes of educational engineering.

Ultimately, productization illustrates the mission's dual objectives: moral formation and social management. By linking vocational skill to ethical discipline, missions sought to cultivate a population capable of sustaining both ecclesial and social order. Yet, the outcomes consistently exceeded, and at times subverted, the missionary vision, reflecting both the structural limits of externally imposed social strategies and the persistent agency of Chinese women. The productization drive thus represents a critical moment in which the interplay of institutional design, transnational knowledge circulation, and individual agency determined the complex trajectory of female vocational education in China.

# **5. Synthesis and contradiction: The “Christian home” as a contested biopolitical project**

## **5.1. Convergence of strategies: The Christian home as biopolitical project**

By the 1910s, the streams of instrumentalization, professionalization, and productization converged into the Christian Home, a biopolitical project designed to systematize female labor, domestic governance, and social formation. This project represents the apex of missionary ambition, merging pedagogical rigor, vocational skill, and moral oversight into a coherent framework for regulating household and community life. Professionally trained Chinese women were envisioned as agents of both social reproduction and ecclesial authority, tasked with extending missionary influence into the intimate, everyday practices of family and community life. Stoler's analysis of colonial domestic governance offers a comparative lens: the household functions as a laboratory where ideological, moral, and social norms are inculcated and monitored, reflecting the Christian Home's role as a deliberate instrument of population management and normative social engineering <sup>[14]</sup>.



The Christian Home illustrates the operationalization of biopower as conceptualized by Foucault <sup>[15]</sup>. Schools of Mothercraft codified domestic and vocational curricula encompassing childcare, nutrition, hygiene, and moral formation, producing households designed to instill discipline, obedience, and self-regulation. Missionaries treated domestic labor as both pedagogical and administrative, linking household management with broader ecclesial and social goals. Yet, the Christian Home was contested from its inception. Surveys in “The Chinese Recorder” during the 1920s revealed selective adoption: Chinese women engaged with missionary prescriptions pragmatically, adapting, negotiating, and occasionally resisting elements inconsistent with local cultural practices. Scott’s notion of “everyday resistance” illuminates these behaviors, demonstrating how agency persisted within and against ostensibly coercive institutional frameworks <sup>[16]</sup>.

## 5.2. Paradox and dual outcomes: Authority meets autonomy

The Christian Home further exemplifies the paradox of empowerment and constraint. While the institutionalization of training provided women with skills, authority, and knowledge, these very capacities enabled graduates to assert autonomy, seek salaried employment, or reconfigure domestic roles, challenging the missionary vision of household-centered governance. The project also generated unintended social stratification, more skilled or professionally trained women accrued greater social and economic leverage, reshaping the internal dynamics of both church and community.

Finally, the Christian Home must be interpreted as a site of complex negotiation between ideology, pedagogy, and agency. It illustrates how the fusion of moral, vocational, and domestic training functioned both as an instrument of ecclesial control and as a medium through which Chinese women exercised strategic initiative. By embedding vocational training within domestic and social governance, missionaries attempted to regulate life itself, yet the unpredictability of human action ensured that outcomes diverged from intentions. The Christian Home thus embodies the central contradiction of missionary strategy: the simultaneous production of authority and autonomy, compliance and resistance, order and contingency, highlighting the intricate interplay between institutional design, global reformist models, and local agency.

## 6. Conclusion: The limits of strategy and the power agency

The Protestant re-engineering of female vocation in China between 1880 and 1920 represents one of the most sophisticated and ambitious efforts at social and institutional transformation undertaken by missionary organizations in the modern era. Across four decades, missions experimented with a complex interplay of instrumentalization, professionalization, and productization, each phase representing an evolving attempt to reconcile operational necessity, moral formation, and the long-term sustainability of the indigenous church. The trajectory from using women as tactical instruments for access, to cultivating them as professionalized agents, and finally attempting to stabilize society through vocational training, reflects a remarkable capacity for strategic imagination. Yet, as the evidence shows, the coherence of this strategy existed more in missionary discourse and planning than in lived historical practice.

Instrumentalization initially sought to solve a tactical problem. Penetrating gendered spaces inaccessible to foreign missionaries. The creation of Bible women as “gendered bridges” exemplified a cost-effective, pragmatic approach to evangelism, yet this model was inherently unstable. The tension between missionary expectations and the agency of Chinese women immediately surfaced, revealing that even highly controlled frameworks could not fully constrain the aspirations, social intelligence, and cultural negotiation skills of the intended subjects. Professionalization emerged as a response to structural vulnerabilities exposed by the Boxer Uprising and other crises, aiming to standardize training and stabilize ecclesial governance. Productization, in turn, sought to embed missionary influence within the economic, domestic, and moral spheres of Chinese society. Across these stages, missionary planners continually sought to balance operational control with the empowerment of indigenous actors, a balance they never fully achieved.

The persistent agency of Chinese women complicates any teleological account of missionary success or failure. By leveraging skills, knowledge, and strategic acumen, women transformed constrained opportunities into sites of influence, autonomy, and social mobility. The paradox of Protestant female vocational education in China thus resides in

its dual nature: missions sought to control and standardize, yet the very structures designed to produce compliance also produced competence, authority, and self-determination. This dynamic underscore a broader lesson for the study of social engineering, education, and cross-cultural interventions: strategy and ideology are always mediated by human agency, local culture, and the contingencies of historical circumstance.

In conclusion, the forty-year re-engineering of female vocational education in China illustrates the complex interplay between institutional design, ideological ambition, and individual initiative. It highlights the limits of top-down strategy in contexts of cultural translation and underscores the unintended consequences of well-intentioned reformist interventions. By focusing simultaneously on missionary objectives and the lived experience of Chinese women, this study contributes to a more nuanced understanding of the paradoxical outcomes of Protestant missionary pedagogy, offering insights into the broader dynamics of power, knowledge, and agency in transnational religious history.

## Disclosure statement

The author declares no conflict of interest.

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# Language Ecology and Chinese Language Teaching in Mongolia: A Sociohistorical and Pedagogical Analysis

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**Abstract:** This study examines the interplay between Mongolia's unique language ecology and the development of Chinese language teaching (CLT) from the mid-20th century to the present. Drawing on documentary analysis, statistical data, and pedagogical surveys, it first delineates Mongolia's language ecosystem, shaped by geographical isolation, historical interactions with neighboring powers, ethnic homogeneity, and shifting geopolitical alliances, focusing on the status of Khalkha Mongolian, minority languages, and foreign languages, mainly Russian, English, and Chinese. Subsequently, it traces the three-stage evolution of CLT in Mongolia, that is to say, the initial phase (1957–1968), recovery phase (1973–1990), and booming phase (1990–present), analyzing how each stage responds to changes in the broader language ecology. The study also identifies key challenges in contemporary CLT, including teacher shortages, mismatched teaching materials, and uneven regional access, supported by quantitative data on student enrollment, teacher demographics, and institutional distribution. Finally, it proposes context-specific strategies to enhance CLT's alignment with Mongolia's language ecology, such as developing localized teaching materials, strengthening teacher training programs, and leveraging cross-border cultural exchanges. The findings contribute to a deeper understanding of language policy dynamics in Inner Asia and offer insights for optimizing CLT practices in multilingual as well as regional study contexts.

**Keywords:** Mongolia; Language Ecology; Chinese Language Teaching; Sociohistorical Evolution; Pedagogical Challenges

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## 1. Introduction

### 1.1. Research background

Mongolia, a landlocked country nestled between China and Russia, boasts a language ecology that reflects its complex historical, geopolitical, and cultural trajectories. As a key participant in China's Belt and Road Initiative, Mongolia's linguistic interactions with China have gained renewed significance in recent decades, making Chinese language teaching (CLT) a focal point of cross-border educational cooperation. However, CLT in Mongolia has not developed in a vacuum; its growth and challenges are deeply intertwined with the country's broader language ecology, defined as the dynamic interplay between languages, their speakers, and the social, political, and economic environments that shape language use <sup>[1]</sup>.

Historically, Mongolia's language ecology has long been shaped by three dominant forces. First, Khalkha Mongolian, the nation's official language, unites virtually the entire population. According to the 2023 census released by the

National Statistical Office of Mongolia, about 95 % of residents use Khalkha Mongolian as their primary language of daily communication, giving the language a powerful unifying role in national identity. Its official status is enshrined in the constitution and reinforced across education, media, the judiciary and other public spheres. Since the revival of the traditional vertical script in 1992, the coexistence of the Cyrillic alphabet and the historic script have further cemented Khalkha Mongolian's cultural symbolism. Second, the legacy of Russian linguistic influence remains deep seated. From 1921 to 1992, during the Soviet era, Russian was the sole compulsory foreign language in schools and universities, shaping an entire generation of scholars, engineers and medical professionals who still rely on Russian for academic exchange. Although the mandatory teaching of Russian was abolished after the Soviet collapse, the language continues to be used in scientific, technical and border-region contexts, especially where Mongolia's trade and infrastructure projects with Russia persist. Nevertheless, its overall share in the foreign language curriculum has been eclipsed by the rapid rise of English. Third, English has surged under Mongolia's "Third Neighbor" policy, which was introduced in the early 1990s to diversify diplomatic and economic ties beyond the two great neighbors, China and Russia. English is positioned as a global lingua franca and has become a compulsory subject in the national curriculum, reaching roughly 86% of public primary and secondary schools by 2022. The spread of English supports overseas study, international business, tourism and, more broadly, the formation of a younger generation with a more outward, looking worldview.

Despite growing academic interest in Mongolia's language policy and CLT practices, few studies have systematically linked CLT development to the country's language ecology <sup>[2-5]</sup>. This gap limits our understanding of why CLT faces persistent challenges as low enrollment in public schools, teacher shortages and how to tailor pedagogical strategies to Mongolia's unique context.

## **1.2. Methodology and data sources**

This study adopts a mixed-methods approach, combining qualitative documentary analysis with quantitative data analysis. As for the documentary analysis, this study has reviewed academic literature such as peer-reviewed articles, monographs and government reports concerning Mongolia's National Education Sector Strategy 2020–2030, as well as the institutional records of Confucius Institute annual reports to reconstruct the sociohistorical trajectory of CLT and language policy. As for the quantitative data analysis, we analyzed secondary data from multiple sources, including enrollment statistics from Mongolia's Ministry of Education, Culture, Science and Sports (2009–2023); teacher demographic data from the Chinese Language Teachers Association of Mongolia (2022); surveys of CLT practitioners conducted by the Mongolian National University of Education (2021) and language landscape data from Ulaanbaatar <sup>[6,7]</sup>.

## **2. Mongolia's language ecology: A multidimensional analysis**

### **2.1. Core components of the language ecosystem**

In our study, the Mongolia's language ecology is defined by four interconnected components: the Khalkha Mongolian (dominant national language), minority languages, foreign languages, and language ideologies. The following **Table 1** summarizes the key features of each component.



**Table 1.** Core components of Mongolia's language ecology (2023)

Component	Key Features
Khalkha Mongolian	<ul style="list-style-type: none"> <li>- Status: National and official language (Constitution of Mongolia, 1992, Article 8).</li> <li>- Usage: Spoken by 95% of the population; used in government, media, and public signage.</li> <li>- Script: Dual-script system (Cyrillic for official/educational use; traditional Mongolian script for cultural/ceremonial purposes).</li> </ul>
Minority Languages	<ul style="list-style-type: none"> <li>- Ethnic Groups: Kazakh (3.8% of population), Tuvan (0.7%), Russian (0.4%), and others.</li> <li>- Usage: Kazakh is the most widely used minority language, primarily in western provinces (e.g., Bayan-Ölgii). Most minority speakers are bilingual in Khalkha Mongolian.</li> <li>- Policy: Constitutional protection for minority language learning, but limited implementation (e.g., no mandatory minority language courses in public schools).</li> </ul>
Foreign Languages	<ul style="list-style-type: none"> <li>- Russian: Legacy language; mandatory in schools 1921–1992; now optional (taught in 7th grade onwards).</li> <li>- English: Dominant foreign language since 1990; mandatory in 5th grade onwards; used in business, tourism, and higher education.</li> <li>- Chinese: Optional; taught in 30+ universities and 20+ primary/secondary schools; concentrated in Ulaanbaatar.</li> </ul>
Language Ideologies	<ul style="list-style-type: none"> <li>- Nationalism: Emphasis on Khalkha Mongolian as a marker of national identity, linked to Genghis Khan and nomadic heritage.</li> <li>- Geopolitics: “Third Neighbor” policy prioritizes English to balance Russian/Chinese influence; ambivalence toward Chinese due to historical tensions (e.g., Qing-era control).</li> <li>- Pragmatism: Recognition of Chinese as an economic necessity (China is Mongolia's largest trade partner, accounting for 60% of exports).</li> </ul>

As shown above, the four interconnected components outlined in Table 1 collectively shape Mongolia's distinct and dynamic language ecosystem, reflecting a blend of national identity, historical legacies, and pragmatic adaptation to regional and global contexts. Khalkha Mongolian serves as the bedrock of this ecosystem, solidified by its status as the national and official language enshrined in the constitution. Its near-universal usage which is 95% of the population across government, media, and public spaces underscores its role in fostering national cohesion.

Their minority languages, represented primarily by Kazakh, Tuvan, and Russian, add diversity to the ecosystem but face constraints in visibility and institutional support. Kazakh's relative prominence in western provinces highlights regional linguistic variation, while the bilingualism of most minority speakers in Khalkha Mongolian reflects the dominant language's integrating role.

However, foreign languages in Mongolia are shaped by a mix of historical inertia and contemporary geopolitical/economic needs. Russian, a legacy of the 1921–1992 Soviet-influenced era, has transitioned from mandatory to optional, reflecting a shift away from past ideological ties while retaining some relevance in specific domains. English, by contrast, has emerged as the dominant foreign language, mandated from the 5th grade onward, driven by Mongolia's “Third Neighbor” policy, which is the effort to balance Russian and Chinese influence by aligning with global especially Western economic, educational, and cultural networks. Chinese, though optional, occupies a strategic niche taught in select schools and universities, it caters to Mongolia's economic reality with China accounts for 60% of its exports, positioning it as a pragmatic tool for trade and cross-border engagement.

## 2.2. Key shapers of the language ecology

According to the empirical studies, three factors of geography, history, and geopolitics have historically shaped Mongolia's language ecology.

### 2.2.1. Geographical isolation and homogeneity

Mongolia's vast, sparsely populated territory of 1.56 million km<sup>2</sup>, 3.5 million people has fostered linguistic homogeneity.

The country's steppe and desert landscapes limit population mobility, reducing contact between Khalkha Mongolian speakers and minority groups. As a result, Khalkha Mongolian has remained the dominant language, with little dialectal variation compared to other Mongolic languages, for example Buryat in Russia, Oirat in China. Geographical proximity to China and Russia has, however, ensured that Chinese and Russian remain influential foreign languages, particularly in border regions.

### 2.2.2. Historical legacies

Mongolia's language ecology bears the marks of three historical eras as follows.

(1) Qing era (1691–1911)

Chinese and Manchu exerted limited influence; traditional Mongolian script was used for administrative purposes.

(2) Soviet era (1921–1992)

The Soviet Union imposed Cyrillic script for Mongolian around 1944 and made Russian the mandatory foreign language. This policy eroded proficiency in traditional Mongolian script and created a generation of Russian-speaking elites.

(3) Post-Soviet era (1992–present)

Mongolia adopted a “multipolar” language policy, promoting English while partially reviving traditional Mongolian script. Chinese influence grew as Sino-Mongolian trade expanded.

### 2.2.3. Geopolitical shifts

Mongolia's “Third Neighbor” policy, launched in the 1990s, has significantly altered its foreign language hierarchy. By aligning with Western countries, Japan, and South Korea, Mongolia sought to reduce dependence on China and Russia. This policy manifested in language education. As a result, according to the Ministry of Education, English replaced Russian as the primary foreign language, with 86% of public schools offering English by 2020. Chinese, though economically critical, has been sidelined in public discourse, reflected in language landscape data, accounting for only 2.3% of Ulaanbaatar's public signage uses Chinese, compared to 51% for English and 4% for Russian<sup>[8]</sup>.

### 2.3. Current tensions in the language ecology

After conducting an in-depth educational survey and research on Mongolia's linguistic landscape, we have identified that Mongolia's language ecology faces three key tensions. That is to say, first, a script conflict arises from its dual-script system (Cyrillic vs. traditional Mongolian), which creates practical challenges. While 90% of the population uses Cyrillic in daily life, the government's 2015 “National Script” initiative to promote traditional Mongolian has had limited success due to low public demand; second, a foreign language hierarchy emerges as the prioritization of English has led to under investment in Russian and Chinese, and according to the Ministry of Education in 2022, only 30% of public schools offered Russian, and 15% offered Chinese; third, there is a tension between cultural and economic priorities, conflicting with the economic need for Chinese proficiency, and this tension is evident in Chinese language teaching (CLT) enrollment, as 73% of Chinese learners are in private schools, where parents prioritize economic outcomes over cultural concerns, released by Mongolian National University of Education, 2021<sup>[9]</sup>.

## 3. The evolution of Chinese language teaching in Mongolia: A sociohistorical perspective

To understand the dynamic trajectory of Chinese Language Teaching (CLT) in Mongolia, a sociohistorical lens is essential, one that situates its development within shifting political alliances, economic priorities, and cross-border relations over the past seven decades. CLT in Mongolia has not evolved in isolation; instead, its rise, suspension, recovery, and eventual boom have been deeply intertwined with the country's broader geopolitical choices and socio-economic needs. By



examining three distinct phases of its development, we can trace how external factors such as Sino-Mongolian diplomatic ties and global power shifts, and internal dynamics including educational policies and resource allocation have collectively shaped the role and scale of Chinese language education in Mongolia.

### 3.1. Stage 1: Initial phase (1957–1968) – Political drivers and early challenges

The first phase of Chinese Language Teaching (CLT) in Mongolia was driven by Sino-Mongolian political cooperation, following the establishment of diplomatic relations between China and Mongolia in 1949, this phase aimed to strengthen socialist solidarity between the two nations, with Mongolian National University (MNU) founding the first Chinese language program within its Foreign Language Department in 1957, a program that trained 52 Chinese translation experts over an 11-year period; institutionally, the scope was highly limited during this phase, as only one university (MNU) and one primary school offered Chinese instruction, with annual enrollment restricted to approximately 100 students according to MNU Archives, 1965; the curriculum focused heavily on translation and political terminology, which reflected the overarching socialist agenda, and textbooks were adapted from Chinese-language materials used in the Soviet Union with minimal localization to suit Mongolia's specific context; in terms of teacher supply, all CLT instructors were sponsored by the Chinese government, as Mongolia had no local Chinese language experts at the time; this phase came to an abrupt end in 1968, however, due to the deterioration of Sino-Mongolian relations, political tensions resulted in the suspension of all Chinese language programs, and Chinese teachers were recalled to China <sup>[10,11]</sup>.

### 3.2. Stage 2: Recovery phase (1973–1990) – Stabilization and slow growth

CLT resumed in 1973, following a partial thaw in Sino-Mongolian relations. MNU reinstated its Chinese language courses, initially offering them to Mongolian language majors as an elective. In 1975, the university reintroduced its Chinese translation program, and by 1987, China had resumed sending government-sponsored teachers to Mongolia <sup>[12]</sup>. Key developments in this phase include the following situations.

#### (1) Enrollment growth

According to the statistics of Ministry of Education, the Annual enrollment increased from 50 students in 1973 to 200 in 1990, with most students concentrated in MNU and a small number of vocational schools.

#### (2) Curriculum adjustments

Greater focus on practical language skills to support limited Sino-Mongolian economic cooperation. Textbooks remained primarily imported from China, but some local adaptations were made; for example, adding Mongolian-Chinese glossaries.

#### (3) Teacher training

According to the statistics of Chinese Language Teachers Association of Mongolia, 1990, a small number of Mongolian teachers began to receive training in China, though Chinese-sponsored teachers still accounted for 70% of CLT instructors. Despite this recovery, CLT remained marginalized due to the Soviet Union's continued influence. Russian remained the dominant foreign language, with 90% of public schools offering Russian compared to only 5% offering Chinese <sup>[13]</sup>.

### 3.3. Stage 3: Booming phase (1990–Present) – Economic drivers and expansion

The collapse of the Soviet Union in 1991 marked a turning point for CLT in Mongolia. As Mongolia shifted to a market economy and strengthened economic ties with China, demand for Chinese proficiency surged. According to the data released by the Ministry of Education, by 2023, over 30 universities and 20 primary/secondary schools offered Chinese instruction, with enrollment exceeding 10,000 students. **Table 2** presents key data on CLT enrollment by school type (2009–2025), highlighting the rapid growth in private institutions.

**Table 2.** Chinese language learners in Mongolia by school type (2009–2025)

School Type	2009–2010 (Number, %)	2014–2015 (Number, %)	2019–2020 (Number, %)	2022–2025 (Number, %)
Public Universities	1,151 (63.3%)	1,320 (58.7%)	1,580 (55.2%)	1,820 (52.0%)
Private Universities	668 (36.7%)	920 (41.3%)	1,280 (44.8%)	1,680 (48.0%)
Public Primary/Secondary	1,580 (32.8%)	1,850 (35.1%)	2,120 (37.6%)	2,450 (40.1%)
Private Primary/ Secondary	3,240 (67.2%)	3,420 (64.9%)	3,520 (62.4%)	3,650 (59.9%)
Total	6,639 (100%)	7,510 (100%)	8,500 (100%)	9,590 (100%)

Table 2 illustrates the changing landscape of Chinese Language Teaching (CLT) enrollment across different school types in Mongolia from 2009 to 2025. Public universities, which once held a dominant position with 63.3% of enrollment in 2009–2010, saw their share gradually decline to 52.0% by 2022–2025. In contrast, private universities experienced a notable upward trend, increasing from 36.7% to 48.0% over the same period. For primary and secondary education, public institutions also saw a rise in their proportion, going from 32.8% to 40.1%, while private primary/secondary schools, despite still having a larger share, witnessed a decrease from 67.2% to 59.9%. This shift aligns with the broader trends in Mongolia's education sector. As Mongolia embraced a market economy and deepened economic ties with China, the demand for Chinese proficiency soared. The establishment of Confucius Institutes played a crucial role in expanding CLT, with these institutions, along with Confucius Classrooms, accounting for 30% of total CLT enrollment by 2025.

## 4. Challenges in contemporary Chinese language teaching

### 4.1. Teacher shortages and qualification gaps

Despite the growth in CLT, Mongolia faces a severe shortage of qualified instructors. **Table 3** summarizes teacher demographics and qualifications in 2025.

**Table 3.** Demographics and qualifications of Chinese language teachers in Mongolia (2025)

Category	Public schools (n = 120)	Private schools (n = 80)	Confucius institutes (n = 3)
Nationality			
Mongolian	78 (65.0%)	42 (52.5%)	9 (45.0%)
Chinese (Sponsored)	22 (18.3%)	28 (35.0%)	10 (50.0%)
Chinese (Private)	20 (16.7%)	10 (12.5%)	1 (5.0%)
Qualifications			
PhD	2 (1.7%)	1 (1.3%)	3 (15.0%)
Master's Degree	28 (23.3%)	15 (18.8%)	12 (60.0%)
Bachelor's Degree	88 (73.3%)	62 (77.5%)	5 (25.0%)
TESOL/CLT training	30 (25.0%)	22 (27.5%)	18 (90.0%)
Teaching experience			
< 3 Years	52 (43.3%)	45 (56.3%)	7 (35.0%)
3–10 Years	58 (48.3%)	30 (37.5%)	10 (50.0%)
> 10 Years	10 (8.3%)	5 (6.3%)	3 (15.0%)

The table indicates the demographics and qualifications of Chinese language teachers across public schools, private schools, and Confucius Institutes (CIs) in Mongolia in 2025. In terms of nationality, Mongolian teachers are the most represented in public schools (65.0%), while the proportion of Chinese (sponsored) teachers is highest in CIs (50.0%). Regarding qualifications, a stark contrast exists in advanced degrees: only 23.3% of public-school teachers and 18.8% of private school teachers have a master's degree, whereas 60.0% of CI teachers do. Moreover, formal TESOL/CLT training is much more prevalent in CIs, with 90.0% of teachers having received it, compared to just 25.0% in public schools and 27.5% in private schools. In terms of teaching experience, a significant portion of teachers in public (43.3%) and private (56.3%) schools have less than 3 years of experience, while CI teachers have a more balanced distribution, with 50.0% having 3–10 years of experience. These data align with the identified gaps: low qualification levels, lack of pedagogical training, and high turnover in public and private schools, which hinder the effective delivery of advanced Chinese courses and innovative teaching methods, unlike in CIs where teachers are more qualified, better trained, and more experienced.

## 4.2. Mismatched teaching materials

Most CLT materials used in Mongolia are imported from China, with little adaptation to local needs. A 2021 survey of 150 CLT teachers found that 85% use textbooks designed for Chinese domestic students or international students in China. 70% reported that these textbooks lack content relevant to Mongolia such as Sino-Mongolian trade, nomadic culture, making it difficult to engage students. 60% noted a shortage of materials for beginner learners, particularly children, leading to reliance on ad-hoc lesson plans.

The lack of localized materials is compounded by the absence of a national CLT curriculum. Each school develops its own syllabus, leading to uneven quality. Public schools typically offer 2–3 hours of Chinese weekly, while private schools offer 4–6 hours.

## 4.3. Uneven regional access

CLT is highly concentrated in Ulaanbaatar, Mongolia's capital. In 2022, 82% of CLT students lived in Ulaanbaatar, compared to 18% in rural areas, released by the Ministry of Education, 2022. This imbalance is driven by two factors as follows.

### (1) Institutional concentration

90% of CLT institutions, both universities and private schools of CIs are located in Ulaanbaatar. Rural areas have only 2–3 CLT programs per province, primarily in vocational schools.

### (2) Teacher shortages in rural areas

Rural schools struggle to attract qualified teachers, as most prefer to work in Ulaanbaatar for higher salaries and better living conditions. As a result, 70% of rural CLT classes are taught by part-time teachers with no formal training according to the Mongolian National University of Education, 2021.

## 5. Conclusion

Mongolia's language ecology is a dynamic system shaped by history, geopolitics, and cultural ideologies. Chinese language teaching, as a component of this system, has evolved from a politically driven initiative in the 1950s to an economically critical skill in the 21st century. However, CLT faces significant challenges, including teacher shortages, mismatched materials, uneven regional access, and negative language ideologies.

To address these challenges, stakeholders must adopt a context-specific approach that aligns CLT with Mongolia's unique language ecology. By developing localized materials, strengthening teacher training, expanding rural access, and promoting cross-border exchanges, CLT can be transformed from a "peripheral" foreign language program to a core component of Mongolia's multilingual education system. This transformation will not only enhance Sino-Mongolian educational cooperation but also contribute to the broader goal of linguistic in Inner Asia.

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# Mode Construction of Red Music Culture Integrating into Vocal Music Teaching in Colleges and Universities from the Perspective of “Ideological and Political Curriculum”

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**Abstract:** The concept of “Curriculum Ideological and Political Education” advocates the integration of curriculum and ideological and political education, and achieves the unity of knowledge imparting and value leading. Red music culture bears many values and injects ideological and political connotation into vocal music teaching in colleges and universities. From the perspective of “course ideological and political education”, this paper discusses the internal logic of the integration of red music culture into vocal music teaching in colleges and universities, and constructs an integration model from three aspects: target orientation, content reconstruction and method innovation, and constructs a guarantee system from three dimensions: resources, teachers and evaluation, aiming at providing practical reference for the implementation of “course ideological and political education” in vocal music teaching in colleges and universities, and promoting the organic integration of professional education and ideological and political education.

**Keywords:** Ideological and political course; Red music culture; Practical guarantee for the construction of vocal music teaching mode in colleges and universities

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## 1. Introduction

“Course Ideological and Political Education” aims to integrate ideological and political education into all kinds of course teaching, so that courses can play a role in educating people. Vocal music teaching in colleges and universities is an important part of art education. It is necessary not only to improve students’ singing and appreciation ability, but also to convey mainstream values through artistic appeal and help students establish correct three views. Red music culture originated from the development practice of China, and its melody contains feelings of home and country, which is in deep agreement with the goal of “ideological and political education in curriculum”. However, vocal music teaching in colleges and universities pays more attention to the skill training of red works, and does not dig deep into the ideological and political connotation. Therefore, this paper, based on the “ideological and political course”, explores the path of integration of the two, so that the red melody can be integrated into teaching, and “educating people with aesthetic education and



educating people with culture” can be achieved.

## **2. Red music culture into the logical basis of vocal music teaching in colleges and universities**

From the perspective of “course ideological and political education”, the integration of red music culture and vocal music teaching in colleges and universities has a solid logical support, which is reflected in the unity of value objectives, content carriers and acceptance mechanisms.

On the value goal, the two are highly compatible. Red music conveys core values in the form of art, such as “March of the Sword” which highlights the integrity of “defending the country and defending the country” and “We Workers Have the Power” which conveys the spirit of struggle, which is consistent with the goal of “ideological and political education” to cultivate new people in the times. If vocal music teaching in colleges and universities only focuses on skills, it will be thin. Red music builds a bridge between “skill training” and “spiritual cultivation”, making vocal music classroom a hidden ideological and political position.

In terms of content carrier, it has good adaptability. Red music works are both artistic and ideological, and can visualize abstract ideas. The lyrics of “Singing Erlang Mountain” match the passionate melody to reproduce the spirit of military and civilian attack; Jiangshan interprets the concept of “people first” by singing. These works make the ideological and political elements audible and sensible, and provide natural materials for the integration of ideological and political education into vocal music teaching.

On the acceptance mechanism, the two are highly complementary. “Ideological and political course” pursues “moistening things silently”, and red music eliminates alienation by melody resonance. Students are first moved by the melody of Ode to Coral, and then understand the lyrics to realize revolutionary optimism; First attracted by the melody of Pilgrim’s Road, and then deepen the recognition of dedication through building stories. This process of “emotional experience-cognitive deepening-behavioral consciousness” meets the requirement of “hidden infiltration” and makes ideological and political education more acceptable to students <sup>[1]</sup>.

## **3. The mode construction of integrating red music culture into vocal music teaching in colleges and universities from the perspective of “course ideological politics”**

### **3.1. Establish a “three-dimensional progressive” target system and anchor the direction of integration**

Under the guidance of the concept of “course thinking and politics”, it is necessary to build a progressive target system of “skill acquisition-cultural cognition-value concise” to integrate red music culture into vocal music teaching in colleges and universities, and form a closed loop of education from skill training to spiritual shaping.

On the skill acquisition level, it focuses on the singing skills and artistic expression of red music works, and designs differentiated training content according to the style of the works. For example, singing “March of the Sword”, through short and powerful articulation and sonorous rhythm, trains students’ explosive voice and conveys their fighting passion; Singing “The Rising Sun on the Grassland”, with the help of stretching breath control and bright timbre, show the love of grassland children for their hometown, and practice the stability of mid-low and transparent conversion of high-pitched areas. This kind of skill training is closely related to the emotion of the work. When dealing with the long sound of “Coral Tree in Red Spring” in Ode to Coral, the requirement of long breath will guide students to experience the spirit of revolutionary optimism and make “expressing feelings with sound” become the internal logic <sup>[2]</sup>.

On the level of cultural cognition, students are guided to deeply interpret the historical context and artistic genes of red music works. In teaching, combined with the background of the creation of works, this paper analyzes its relationship with social changes. Explain “Singing Erlang Mountain”, show the historical images of Sichuan-Tibet highway construction,



and explain how the lyrics record the hardships and dedication of road construction soldiers and civilians; This paper analyzes “Entering a New Era” and explains how melodies connect with historical processes in musical language in connection with the return of Hong Kong and the Three Gorges Project. This interpretation can make students realize that red music is not only the singing material, but also the “sound mark” of the times, and establish a historical identity with red culture.

On the level of value conciseness, we are committed to transforming the spiritual core of red music into the value pursuit of contemporary youth. On the basis of singing and understanding, guide students to make contemporary connections. From the labor rhythm of “We Workers Have Strength” to the craftsman spirit of “Made in China 2025”, from the multi-melody of “Love China” to the community consciousness of “national unity and family”. By sharing the theme of “Spirit of the Times in Red Melody”, students will naturally combine the lyrics with the story of the struggle of the builders of the Qinghai-Tibet Railway when discussing the singing of “Heavenly Road”, so that their personal artistic ideals can resonate with the development needs of the country<sup>[3]</sup>.

### 3.2. Build a “two-axis linkage” content framework to consolidate the foundation of integration

Focusing on the three-dimensional goal, we will build a curriculum content system with two axes of “professional axis” and “ideological and political axis”, so that the artistic characteristics of red music and ideological and political connotation are closely intertextual and echo each other.

The professional axis focuses on the training of vocal techniques of red music works and is arranged according to the gradient of “basic-advanced-comprehensive”. In the basic stage, select works with both ideological and artistic values, such as “Anti-University Song” and “On the Songhua River” (simplified version), and integrate anti-University spirit and national crisis consciousness into breathing and articulation training; In the advanced stage, solo passages such as Ode to Yan ‘an and On the Jialing River are introduced, and the emotional coherence of voice area conversion is trained by combining lyric melody with narrative lyrics. For example, On the Jialing River, “I must go back, go back from under the enemy’s bullets”, which needs to show grief and firmness by comparing strength and weakness; In the comprehensive stage, with chorus works such as “Ode to the Ancestor” and The Yellow River Cantata (excerpts) as the core, collective cooperation is strengthened through multi-voice harmony training, so that students can experience the artistic expression of “unity of mind” in the interweaving of voices. Every professional node is embedded with ideological and political elements, such as “listening to the voice and obeying the whole” in chorus, which is the practice of collectivism spirit<sup>[4]</sup>.

The ideological and political axis takes the spiritual decoding of red music works as a clue and advances synchronously with the professional axis. The skill training is interspersed with “red music micro-lecture hall”: when learning the March style of “Anti-University Song”, tell the spirit of anti-University motto and understand the revolutionary cohesion contained in “unity is strength”; When practicing the lyric melody of Jiangshan, the ruling concept of “Jiangshan is the people” is explained in combination with the lyrics. At the same time, a special module “Spectrum of Red Music Times” is set up to sort out the context of works according to the new democratic revolution, socialist construction and new era. For example, March of National Salvation, Good Socialism and the Power of Rejuvenation form a “spiritual inheritance chain” to help students understand the inheritance of red spirit.

The two axes are deeply linked through the logical chain of “work analysis-skill training-spiritual refining”. For example, in the teaching of “Affectionate Land”, the professional axis focuses on the lyric skills of “combination of gas and sound” to guide students to show their attachment; Through the discussion of the relationship between “land and people”, Ideological and Political Axis analyzes the pure heart of lyrics metaphor. This allows students to master singing skills, deepen their understanding of “feelings of home and country”, and realize the symbiosis and integration of “skill” and “Tao”<sup>[5]</sup>.

### 3.3. Innovative “three-dimensional immersion” teaching methods, activate the integration process

Using the three-dimensional immersion teaching method of “situation-experience-creation”, students can naturally

integrate the ideological and political connotation in the practice of red music art and avoid blunt preaching<sup>[6]</sup>.

Create a situational field of “history-emotion-art”. In teaching *Flowers in May*, the historical scene of “flowers cover the blood of people with lofty ideals” is restored with the help of the images of the “December 9” movement in 1935 and the fragments of students’ petition diaries. Then the teacher plays the folk melody with the guitar, guiding the students to sing softly and feel the tragic “we want to be masters and die in the battlefield”, and constructing the emotional situation; Finally, in the singing training, students are instructed to deal with the phrase “Flowers bloom all over Yuan Ye in May” with the skill of “starting with the sound of air and advancing gradually”, so that artistic expression and historical emotion can resonate at the same frequency.

Carry out “Red Music Re-creation” experience activities. Encourage students to keep the core spirit and make artistic innovation: add the rhythm of waist and drum in northern Shaanxi to “Military-civilian Production” and strengthen labor enthusiasm with bright percussion music. When adapting, teachers guide students to grasp the scale of “keeping integrity and innovation”. For example, the adaptation of *Liuyang River* requires that the dialect charm of “several bends” be preserved, and piano accompaniment can be added to enhance lyricism, so that innovation can become the “contemporary expression” of the red spirit.

Carry out the teaching mode of “interdisciplinary collaborative decoding”. Jointly design teaching links with teachers of ideological and political science, history and literature: analyze the selected section of Jiang Jie, *I Contribute Youth to Communism*, and vocal music teachers guide students to master the skills of “high-pitched voice and gas-voice conversion” to show loyalty; Ideological and political teachers analyze Jiang Jie’s spiritual strength in the face of torture from the perspective of “belief and sacrifice”; History teachers supplement the background of underground party struggle before liberation in Chongqing; Literature teachers interpret the symbolic meaning of lyrics. The collision of multi-disciplinary perspectives allows students to accurately control the voice tension when singing, deeply understand the value connotation of “fighting for truth”, and realize the double promotion of art and value cognition<sup>[7]</sup>.

## **4. The practical guarantee of the integration of red music culture into vocal music teaching in colleges and universities**

### **4.1. Build a multi-dimensional resource system and build a solid foundation for integration**

Red music culture has diversity, which can create a three-dimensional resource structure of “digital resources + physical exhibition + technical interaction”. Systematically sort out the red vocal music works in different periods, and build a digital resource library of “theme classification-style characteristics-technical analysis”, including high-definition music scores, multi-version singing audio, creative background images and so on. For example, *The Yellow River Cantata* is equipped with digital scanned notes of composers’ creation, a photo collection of battlefield performances during the Anti-Japanese War, and comparative videos of voice processing performed by different choirs. At the same time, collect the music objects of the revolutionary period, such as the music scores published in “*Jiuwang*” daily, the performance programs of old artists and more, and make a scene display in the campus exhibition hall to enhance the sense of historical substitution.

Introduce intelligent interactive technology to optimize resource presentation and develop “Red Music Immersion System”. With the help of AR technology, scanning the music score of “*March of the Sword*” can present virtual scenes: composer Mai Xin was inspired by witnessing the anti-Japanese parade on the streets of Shanghai, the passionate picture of the troops singing in 1937 and the historical image of the Great Wall’s anti-Japanese war, thus realizing the deep connection between music notation and historical context. This kind of visual resources can stimulate learning interest and naturally permeate the spirit of the work in technical training<sup>[8]</sup>.

### **4.2. To build a professional teacher echelon, and strengthen the integration ability**

Teachers are the core of teaching implementation, and they need both vocal professional ability and red culture

interpretation ability. Improve teachers' quality through the three-dimensional training mode of "special research-practical investigation-collaborative teaching and research". Set up a training course of "ideological and political integration of red music", invite party history experts to interpret the time value of "Singing the Motherland", and music theorists analyze the corresponding relationship between melody ups and downs and national feelings; Organize teachers to travel to Jinggangshan, Zunyi and other revolutionary holy places to collect local red ballads and turn them into teaching materials; Establish an interdisciplinary teaching and research team, with vocal music, ideological and political education and history teachers jointly designing the teaching plan. For example, in the teaching of Ode to Coral, vocal music teachers guide coloratura skills and emotional control, and ideological and political teachers interpret the belief symbol of "blooming in the fire" to form a joint force for educating people<sup>[9]</sup>.

Implement the "tutorial system" training plan and give play to the leading role of senior teachers. Set up a "Red Music Education Studio" to teach practical strategies such as "excavating spiritual connotation in national singing training" and "cultivating cooperative consciousness in duet rehearsal" through demonstration classes and teaching reflection sharing, so as to help young teachers grow professionally.

### **4.3. Establish a developmental evaluation system and clarify the integration orientation**

Construct an evaluation system of "process monitoring-multi-dimensional feedback-growth file" to realize the transformation from "skill assessment" to "literacy assessment". The evaluation content covers three dimensions: the professional dimension pays attention to the singing techniques of red works, such as the high-low conversion and emotional tension treatment of Jiangshan; The cultural dimension examines the understanding of historical context, such as analyzing the era orientation of "the leader of carrying forward the past and opening up the future" in Entering a New Era; The practical dimension evaluates the cultural communication ability, such as the planning quality of campus red ballads singing activities and the contemporary interpretation of spiritual connotation.

Adopt the mode of "dynamic recording-multiple evaluation": track the learning process through the teaching platform and save the process materials such as classroom discussion records and works adaptation plans; Professional judges, ideological and political teachers and community representatives are invited to participate in the final evaluation. For example, after singing "Love China", students explain the unity implication in multi-ethnic tone integration, and the judges comprehensively score from the dimensions of technical completion, emotional authenticity and value transmission. This evaluation method gives consideration to both professional development and spiritual inheritance, and guides students to form a conscious sense of inheritance of red culture<sup>[10]</sup>.

## **5. Conclusion**

It is of great value and significance to integrate red music culture into vocal music teaching in colleges and universities from the perspective of "course ideological and political education". By defining the three-dimensional goal, reconstructing the dual-axis integration content system, innovating the situational experience teaching method and constructing the practice guarantee system, the deep integration of red music culture and vocal music teaching in colleges and universities can be realized, so that students can inherit the red spirit and shape correct values while improving their vocal music skills, and provide strong support for cultivating musical talents with both morality and art and promoting the ideological and political construction of vocal music courses in colleges and universities.

## **Disclosure statement**

The author declares no conflict of interest.

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# Research on the Application of “Three-Wheel Cycle” Progressive Vocal Music Basic Training Mode under the Background of Digital Intelligence

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**Abstract:** Under the wave of digital intelligence technology, vocal music education has ushered in a new opportunity for reform. There are some disadvantages in traditional vocal music teaching, such as “separation between theory and practice” and “fragmentation of knowledge system”, which need to be solved urgently through model innovation. This paper focuses on the reconstruction of teaching mode driven by digital intelligence technology, and puts forward a “three-wheel cycle” progressive vocal music course model. This model relies on the deep integration of online resource platform and offline training space, and builds a knowledge closed loop of “self-learning before class-intelligent interaction in class-accurate feedback after class” with the help of tools such as “vocalist” intelligent practice APP and learning pass. Through the first round of consolidating basic theory and core skills, the second round of deepening theoretical expansion and skill strengthening, and the third round of promoting project-based practice and independent inquiry, the problem of insufficient knowledge systematization of vocal music courses is systematically solved, and the traditional tendency of “emphasizing skills over theory” is promoted to provide a practical example for the digital and intelligent transformation of vocal music education.

**Keywords:** Number intelligence; Three rounds of circulation; Vocal music course; Mixed teaching; Model of instruction

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## 1. Introduction

At the moment when digital intelligence technology deeply reshapes the educational pattern, vocal music teaching is undergoing a profound transformation from the traditional “one-way teaching” mode to the innovative “intelligent collaboration” mode. There are some limitations in traditional vocal music teaching: there is no effective carrier for pre-class preparation, so it is difficult for students to grasp the foundation firmly; Interaction in class depends on teachers’ personal experience, and the accuracy is insufficient. After-class training cannot get timely feedback, and skills improvement is limited.

However, the emergence of intelligent tools has broken the time and space barriers and created conditions for personalized teaching. The “three-wheel cycle” progressive curriculum model is characterized by “online + offline” mixed teaching. With the help of mathematical intelligence tools, the links before, during and after class are closely connected in series, and a complete teaching closed loop is constructed. This model not only adheres to the core characteristics of vocal



music teaching that emphasizes practice, but also improves the systematicness and efficiency of teaching by technical means, which opens up a new direction for the intelligent reform of vocal music courses.

## **2. The core framework of the “three-wheel cycle” progressive vocal music curriculum model**

The “three-wheel cycle” progressive curriculum model is supported by digital intelligence tools, and a mixed teaching system of “online resource platform + offline training space” is constructed. The three stages are closely connected, forming a complete closed loop of “input-internalization-output”.

### **2.1. Stage objectives and logical association**

The first round focuses on “Introduction to Basic Cognition and Skills”, aiming to help learners build a systematic theoretical framework of vocal music and master the basic norms of core skills such as breathing and vocalization. With the help of structured learning of online courses and intelligent vocal practice APP, abstract concepts such as “breath control” and “resonance position” are transformed into perceptual audio data and action guidance. The second round is devoted to “deepening the integration of theory and skills”.

Through intelligent interaction and group training in class, the scattered knowledge points in the basic stage are connected in series to solve the problem of “knowing what it is but not knowing why”, such as analyzing the resonance differences of different singing methods by combining acoustic principles. The third round takes “practical innovation and ability transformation” as the core, and guides learners to use digital intelligence tools to complete personalized works creation or performance through project-driven tasks, so as to realize the internalization and transfer of knowledge.

The three stages do not exist in isolation, but in a spiral cycle, the first round of learning provides the cognitive basis for the second round, the second round of deepening practice accumulates experience for the third round of innovative application, and the problems found in the third round guide the targeted reinforcement of the first two rounds in the opposite direction, forming a dynamic adjustment mechanism of “detection-feedback-optimization”<sup>[1]</sup>.

### **2.2. The integration and application of digital intelligence tools**

In the process of model construction, the choice and application of mathematical intelligence tools should conform to the characteristics of vocal music. Online resource platform integrates structured course video, music theory question bank and classic case base. Learners can preview and review according to the progress through platforms such as Learning Link, and the system automatically records the learning trajectory and generates weak point analysis. Professional APPs such as “Vocalist” and “Open Voice Practice” focus on skill training, and feedback data such as pitch deviation and breath stability in real time through audio analysis technology. For example, if there is “excessive tension of laryngeal muscles” during vocal practice, the app will simultaneously prompt relaxation methods and push targeted exercises<sup>[2]</sup>.

The off-line training space is equipped with intelligent recording equipment and interactive teaching system. During the class, you can use tools such as Deepseek to instantly retrieve materials of acoustic principles to help explain. After class, you can show the training results from the media through video numbers and WeChat official account, forming a full chain record of “learning-practicing-exhibition”. The integration of these tools is not a simple technical pile-up, but serves the teaching goal of “concretization of theory, digitization of skills, and immediacy of feedback”, making digital intelligence truly a booster for ability training<sup>[3]</sup>.

## **3. The first cycle: the foundation of basic theory and core skills**

The core of the first cycle is to build a “theory-skill” double-base framework, and realize “standardized cognition and

accurate introduction” with the help of mathematical intelligence tools, laying a solid foundation for subsequent learning.

### 3.1. The systematic design of online autonomous learning

Colleges and universities can build modular online courses based on learning platforms, and disassemble the basic theory of vocal music into sub-modules, such as the basis of music theory, the principle of vocalization and auditory training. Each module includes micro-videos, graphic handouts and interactive exercises. For example, in the module of “Vocalization Principle”, the linkage between vocal cord vibration and resonance cavity is demonstrated by animation, and with the “vocal cord relaxation exercise” of “Vocal Musician” APP, learners can verify the vocal cord state during abdominal breathing through the APP immediately after watching the video, and the system will automatically compare the standard waveform, mark the problems such as “insufficient breath support” and push the corrected video.

In order to avoid fragmentation of autonomous learning, the platform can set up “learning path navigation” and recommend personalized learning order according to the initial test results of learners. If the test shows “poor pitch recognition”, give priority to the “hearing training” module and the “pitch correction game” of the APP, and enhance learning interest through gamification design. The progress and data of online learning are synchronized to the teacher’s side, and teachers can grasp the common problems such as “most learners have a vague understanding of the concept of mixed voice singing” through the background, so as to find the key points for teaching in class <sup>[4]</sup>.

### 3.2. Introduction to the precision of offline training

Offline training focuses on the standardized training of core skills, and realizes “immediate feedback and immediate correction” with the help of intelligent recording equipment and interactive system. For example, in the “breathing training”, after the learner completes a slow breathing practice, the system will automatically generate an analysis report on the duration and smoothness of breathing, and the teacher will explain the “relationship between diaphragm force and breath stability” in combination with the report, and retrieve relevant anatomical data for auxiliary explanation through Deepseek.

When practicing in groups, learners use APP to record each other’s vocal exercises, and after uploading to the platform, they can get the “skill radar map” generated by AI, which can visually display the scores of dimensions such as pitch, rhythm and breath. The group can discuss about “how to improve breath stability”, and the teacher will focus on the common shortcomings in the radar map. This mode of “data feedback + targeted guidance” can effectively avoid the ambiguity of “evaluation by feeling” in traditional teaching, and let beginners quickly master the skill specification <sup>[5]</sup>.

## 4. The second cycle: the deep expansion of theory and the strengthening of skills

The second cycle aims to break the bottleneck of “theory suspension and skill machinery”, promote “knowing what it is and knowing why it is” by means of digital intelligence, and realize the deep support of theory to skills.

### 4.1. The deepening design of intelligent interaction in class

In-class teaching can adopt the mode of “problem-driven + tool-assisted” and explore questions around the setting of “how theory guides skill optimization”. For example, in the teaching of “resonance control”, first let learners try to sing the same phrase with different resonance cavities and record the comparison with recording equipment; Then, the spectrogram is extracted by audio analysis software to show the frequency difference between “head cavity resonance” and “chest resonance”, and the “overtone characteristics corresponding to different resonances” is explained by combining the acoustic research data queried by Deepseek.

In the interactive session, the offline teaching system can be used to carry out the activity of “skills breakthrough”: the system randomly plays audio clips of different singing methods, and learners need to judge the use of the resonant cavity through the “spectrum analysis” function of APP, and explain the basis in the group. Teachers view the analysis results

of each group in real time through the background, and explain the typical mistakes such as “confusing the resonance between nasopharyngeal cavity and oral cavity” in a targeted way, combining with the demonstration videos in the online resource library, so that theoretical knowledge can be naturally integrated into the skill analysis process<sup>[6]</sup>.

## **4.2. Scenario training of offline skill integration**

In order to strengthen the comprehensive application of skills, offline training can design “situational tasks”, such as “choosing a suitable singing method for a melody and explaining the reasons”. Learners need to use the “Musician” APP to simulate the effects of different singing methods in combination with the theory of “applicable scenes of different singing methods” in online courses, and upload them to the platform after recording, with a text explanation of “selection basis”. Other learners can leave messages on the platform for discussion, while teachers will comment from two aspects: “theoretical application” and “skill performance”, and the comment data will be automatically incorporated into personal learning files.

This kind of training breaks the split state of “theory is only emphasized in theory class and skill is only practiced in skill class”, and the two are closely bound by mathematical intelligence tools, so that learners can gradually form the thinking habit of “guiding practice with theory and feeding back understanding from practice”. For example, when learners compare “the resonance difference between Bel Canto and folk singing”, they will naturally review the resonance cavity theory learned in the first round and realize the active transfer of knowledge<sup>[7]</sup>.

## **5. The third cycle: project-based practice and independent exploration and innovation**

The third cycle aims at “application promotes internalization”, and promotes the transformation from “theory-skill” to “ability-accomplishment” through project practice and achievement display, which embodies the ultimate value of digital intelligent teaching.

### **5.1. Independent inquiry design of project practice**

Colleges and universities can design projects and tasks such as “individual works creation” and “small vocal performance” to encourage learners to combine the previous two rounds of theory and skills accumulation and choose their own themes and forms. For example, when creating “Vocal Music Fragments on Campus Life Theme”, learners need to use the musical form knowledge learned in online courses to conceive melodies, polish the singing details repeatedly through the “Musician” APP, inquire about “Emotional Expression Skills of Campus Theme Works” with the help of Deepseek, and record the “Theory Application Log” during the creation process and upload it to the platform to form a process file.

During the implementation of the project, the platform provides a “collaborative space” and supports the division of labor among groups, some people are responsible for melody creation, while others focus on singing performance. By sharing documents in real time to synchronize progress, teachers can track the completion quality of each link through background data, and timely push related resources such as “harmony configuration” and “emotional processing”. This kind of independent inquiry is not completely laissez-faire, but through the “invisible guidance” of mathematical intelligence tools, so that learners can deepen their understanding of knowledge in solving practical problems<sup>[8]</sup>.

### **5.2. The results of the display and feedback of the whole chain closed loop**

The results of the project can be displayed from media such as video number and WeChat official account, forming a complete closed loop of “creation-display-evaluation”. After the learners upload their works, the platform will automatically count the data such as broadcast volume and interactive comments, and generate an “achievement analysis report” combining teacher evaluation and peer evaluation, pointing out the advantages and disadvantages of the dimensions such as “theoretical application innovation” and “skill performance stability”.

For example, a learner’s work is well received because of the high degree of agreement between emotional expression and melody style, and the report will be related to the theoretical knowledge point of “singing and emotional matching” in

the second round of circulation, suggesting that he can further explore “emotional processing skills of works with different styles”; If the work has the problem of “unstable rhythm”, the “rhythm training” module of the first cycle and the “beat correction exercise” of APP will be automatically pushed to realize the precise connection of “achievement feedback-problem location-resource push”.

## **6. The construction of digital intelligence guarantee mechanism**

### **6.1. Resource dynamic updating mechanism**

Online course resources need to establish a “quarterly update” system, combine the development of vocal music discipline and learners’ feedback, and supplement the contents of “research on new singing methods” and “progress of intelligent vocal practice technology”; The training libraries of apps such as “Musician” need to update the practice tracks and evaluation criteria regularly to keep pace with industry practice. Colleges and universities can unite vocal music teachers and technicians to form a resource renewal team to ensure the professionalism and timeliness of the content.

### **6.2. Teachers’ mathematical literacy cultivation mechanism**

Through “special training + practical discussion”, teachers’ ability to apply mathematical intelligence is improved. The training contents include learning the data analysis function of general platforms and the teaching application of audio processing software, etc. At the same time, regular “cases sharing sessions on mathematical intelligence teaching” are held to exchange practical experience such as “how to explain resonance principle with spectrum diagram”, so as to promote teachers’ transformation from “knowledge imparting” to “technology integration guide”<sup>[9]</sup>.

### **6.3. Multi-evaluation system construction**

The evaluation needs to break through the limitation of “single skill assessment”, and construct a multi-dimensional evaluation model combining online learning data, such as module completion rate and APP practice score, offline training performance such as skill radar chart and group discussion contribution and project achievements, such as work innovation and theoretical application depth. The evaluation results are presented in the form of “ability growth curve”, which allows learners to intuitively see the progress track of dimensions such as “mastery of music theory” and “skill proficiency”<sup>[10]</sup>.

## **7. Conclusion**

Under the background of digital intelligence, the “three-wheel cycle” progressive vocal music course model is designed with the spiral design of “foundation-deepening integration-innovative application”, which integrates digital intelligence tools into the whole teaching process. It solves the problems of fragmentation of traditional teaching theory and lagging skill feedback, and also retains the essence of vocal music education’s artistic perception and emotional expression. The core of this model is to integrate “online + offline” and “data + experience” and build a closed loop of “learning-practice-application-evaluation” to help learners improve their theory and skills. In the future, the development of digital intelligence technology can explore new scenes such as “meta-cosmic training space”, but we should stick to the initial intention of “technology serving education”, so that vocal music education can not only keep pace with the times in digital intelligence, but also keep the core of art education and cultivate compound talents with theoretical depth, skill precision and artistic temperature.

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# Global Dialogue on Local Knowledge: Exploration of Multimodal Translation Teaching Practice for Yantai Intangible Cultural Heritage (ICH) Empowered by AIGC

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**Abstract:** The international exchange and communication of Intangible Cultural Heritage (ICH) culture in Yantai, Shandong, China is of great significance for spreading Chinese culture and enhancing cultural confidence. Through the combination of local knowledge of Yantai ICH, multimodal translation and AIGC-empowered teaching, we constructed a six-step model diagram of AIGC-empowered multimodal translation practice and analyzed the application of the model in multimodal translation teaching practice. The research shows that although there are great challenges in translation teaching in the era of AIGC, this model can improve the translation teaching and cultivate students' technical literacy; Current training of translation talents require more abilities, such as translation and proofreading, prompt editing, technical application, and AI collaboration team capabilities. This will be an attempt to integrate ICH into multimodal translation teaching, providing reference for multimodal translation teaching practice.

**Keywords:** Local knowledge; AIGC empowerment; Yantai ICH; Multimodal translation teaching

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## 1. Introduction

Globalization and digitization present unprecedented opportunities and challenges for cross-cultural transmission of local knowledge. While digital technologies enable diverse channels for Intangible Cultural Heritage (ICH) dissemination, effectively conveying cultural connotations, emotional resonance, and embodied characteristics through translation remains a critical pedagogical challenge <sup>[1]</sup>. Since the implementation of *Convention for the Safeguarding of the Intangible Cultural Heritage* by the UNESCO, translation's bridging role has intensified, yet traditional teaching models reveal significant limitations addressing ICH's unique textual properties.

Conventional ICH translation instruction emphasizes linguistic transformation and semantic equivalence, inadequately addressing ICH's multimodal nature, integrating visual, auditory, and kinesthetic dimensions that embody region-specific

cultural memory and values. Yantai ICH exemplifies this complexity: artistic forms of “Jiaodong Steamed Cake”, choreography of “Haiyang Yangko Dance”, and spatial compositions of “Yantai Paper Cutting” contain rich nonverbal symbolism inadequately captured through text translation. Traditional pedagogy confines learning to classroom lectures, limiting authentic engagement and cross-cultural competencies.

Recent Artificial Intelligence Generated Content (AIGC) advances offer transformative possibilities<sup>[2]</sup>. Generative AI enables multimodal content creation including image generation, video editing, audio processing, supporting immersive learning environments. However, current AIGC applications in translation pedagogy concentrate on general or specialized domains, lacking systematic exploration of ICH-specific instruction integrating local knowledge communication with multimodal translation competence development.

This study addresses this gap by constructing a six-step AIGC-empowered multimodal translation model using Yantai ICH, facilitating effective global dialogue of local knowledge through innovative pedagogical practices.

## 2. Theoretical framework and literature review

### 2.1. Core concepts

Local knowledge encompasses not only place, time, and class but also the mood, events bearing local characteristics connected to local imagination<sup>[3]</sup>. In translation, local knowledge transmission faces fundamental challenges, such as cultural-specific items like customs, terminologies and imagery often lack direct target-language equivalents, and risking cultural connotation “dilution” or “distortion”.

Multimodal translation transcends traditional language-centered paradigms, treating multimodality in text generation and dissemination as both object and destination<sup>[4]</sup>. Multimodality denotes comprehensive utilization of multiple symbolic modes to generate meaning<sup>[5]</sup>. Here, linguistic symbols constitute merely one modality within multimodal networks, while nonverbal symbols such as images, sounds, colors can function as equally vital meaning-making resources with representational, modal, and compositional capacities<sup>[6,7]</sup>.

### 2.2. Literature review

The first category is on multimodal translation of ICH. The research on cross-cultural communication of ICH is undergoing a paradigm shift from a single text to multimodal integration. Generative AI has the potential in enhancing audience immersion as well as the improvement of communication efficiency though there are difficulties faced in multimodal practice that needs solutions<sup>[8,9]</sup>. In the practical aspect, multimodal corpus platform for ICH that integrates data storage, VR interaction, and teaching functions can deepen the dissemination effect of ICH and modalities such as text, image, and sound collaborate to construct cultural meaning<sup>[10,11]</sup>. In the technical aspect, not matter the advantages of multimodal AI translation in promoting ICH, the path of AI-empowered cultural heritage activation, or the multimodal attention modal that provides support for ICH identification, various AI-empowered ways were explored to promote the dissemination of ICH<sup>[12–14]</sup>. However, these studies mostly focus on macro strategies or specific case studies, and the integration of AIGC systems into local multimodal translation teaching for ICH is still relatively weak. The integration of the technical context of AIGC and multimodal fusion was not fully realized<sup>[15]</sup>.

The second category is on the application of AI in translation teaching. AI is profoundly transforming the paradigm of translation teaching. These studies include the innovative application of LLMs in translation evaluation and corpus analysis, AI translation technology that can significantly improve translation accuracy and teaching efficiency, generative AI that can effectively correct translation errors, enhance cultural understanding ability, and provide immediate feedback, and the value of AI that may limit students’ cross-cultural communication skills and creativity development<sup>[16–19]</sup>. However, there are still shortcomings in current research: lack of multimodal translation of ICH that is integrated into AI translation teaching, insufficient attention paid to the inheritance and dissemination of local knowledge in the context of global dialogue; and little systematic teaching plans for ICH in specific regions.

Therefore, this study deeply integrates the theory of multimodal translation of ICH with AIGC technology to systematically explore the teaching model of multimodal translation of ICH so as to provide a new paradigm for cultivating talents in ICH communication and promote the creative transformation and innovative development of local knowledge.

### 3. Construction of multimodal translation practice teaching model empowered by AIGC

Since this study aims to promote global dialogue on local knowledge with translation viewed as a dialogue process of cultural equality exchange and understanding, the teaching model positions AIGC technology as a cognitive “scaffold” to assist students in breaking through language and writing limitations through its content generation. The project-based translation of Yantai ICH is transformed into a comprehensive practical task that integrates symbol systems such as text, images, videos, and audios, which can guide students to explore cross-cultural expression strategies of local knowledge in real situations.

With the rapid development of AI technology, although some of the translation steps have incorporated the assistance of AI, the core basic structure of the translation process has not undergone substantial changes, and translators still occupy a central position in the core part of the translation process. Currently, the translation process is gradually shifting towards a model of “human intelligence (HI) and AI symbiosis”. The “human-in-the-loop” translation model will be the future trend of translation modes in the future <sup>[20]</sup>. On this basis, Nida’s (2004) four-step translation process was utilized, which are analysis, transformation, recombination, and verification, as the foundation, with the core feature of “human-AI collaboration”, and integrate the characteristics of multimodal translation and culture to reconstruct the traditional translation model <sup>[21]</sup>. A six-step cyclic model was constructed in this study that covers context interpretation, cultural analysis, translation transformation, inspection and verification, translation optimization, and model training (Figure 1).

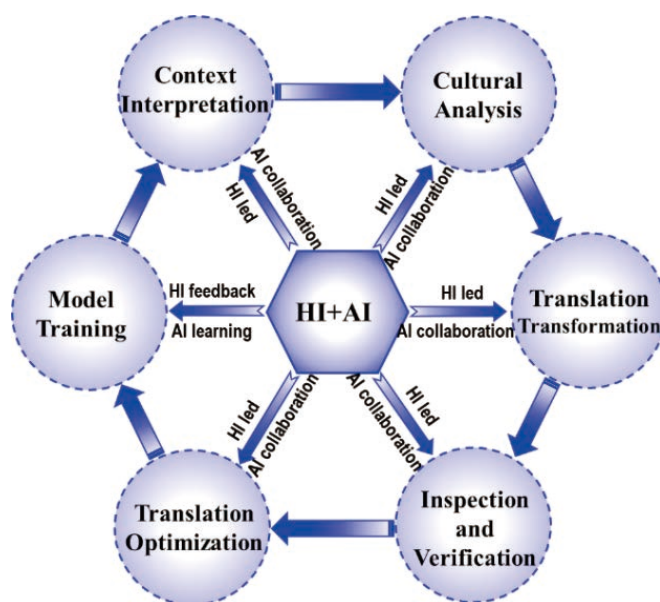


Figure 1. Six-step model diagram of AIGC empowered multimodal translation practice.

In the context interpretation step, the translator with the assistance of AI collaborated gets the explanation on the background information, professional knowledge, contextual imagery of the original text. In the cultural analysis step, the translator requests the AI to analyze and interpret the relevant culture of the original text to analyze the cultural elements that may be involved in the original text, and further prepare for cultural understanding in translation conversion. In the

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translation transformation stage, the translator edits prompts based on the context and translation purpose of the original text and AI translates and transforms the original text into multimodal forms such as other languages, images, videos, audio, etc.

In the inspection and verification step, the translator uses AI and the assistance of translation technology to verify whether the multimodal forms of AIGC conform to the original text. In the translation optimization step, the translator edits optimization prompts for AI to reoptimize the previously generated multimodal content until they meet the requirements of the original text and target language. In model training step, the translator continuously optimizes the AI's performance and this ongoing refinement prompts the system to enhance its multimodal output quality. Through iterative feedback, the AI learns and imitates, thereby accumulating knowledge and mastering style transfer in translation.

## 4. Teaching practice and case analysis

### 4.1. Overview of teaching practice

Taking the translation project of Yantai ICH in translation teaching as a case, we design a project-based translation teaching framework. There are various forms of Yantai ICH in Yantai such as folk literature, folk music, folk dance, traditional handicrafts, folk art, and folk customs<sup>[22]</sup>. The translation task requires not only translating the text, but also generating corresponding ICH forms based on the text description. When designing corresponding translation teaching activities, teachers decompose the project into six teaching modules, corresponding to each link of the six-step cycle model. Each module is equipped with one classroom teaching and one after class translation practice activity, and students collaborate in groups of 4–5 to complete the translation project.

### 4.2. Typical case analysis

In the teaching process teaching, the teacher clarifies the technical tools required for each step, such as professional terminology databases, corpus retrieval tools, etc. In the project analysis stage, the teacher guides students to adopt a six-step translation cycle process, and propose targeted solutions through self-learning the language style of the original text. Students will explore how to translate the original text into multimodal content.

The specific teaching steps are as follows:

#### (1) Context interpretation

Teacher guides students to use AI to output the background of three Yantai ICH “Haiyang Yangko Dance”, “Longkou Handmade Thread Weaving Skills” and “Laizhou Jade Carving”. Teacher helps students to edit their own prompts with their background, features, forms, origins, etc. involved. AI output in this step can help the translator and AI understand more about the original text.

#### (2) Cultural analysis

The teacher guides students to analyze the cultural elements involved in the three Yantai ICHs with the help of AI, so as to help the translator and AI understand the content and interpretation of cultural elements before translation. For example, “Haiyang Yangko Dance” is a dance part of folk community performance, and it is performed at the Spring Festival Temple Fair, etc. These will lay the foundation for the subsequent translation of text.

#### (3) Translation transformation

The teacher guides students to output different forms of text content through AI in a multimodal format with proper edited prompts according to the features of original texts. It is also very necessary for teachers and students to choose appropriate generative AIs. The more detailed your prompts are, the more perfect the output will be. The outputs of “Longkou Handmade Thread Weaving Skills (Traditional Handicraft)” and “Laizhou Jade Carving (Folk Art)” are as follows (**Figure 2**)<sup>[23]</sup>. The output video of “Haiyang Yangko Dance” shows as follows (**Figure 3**)<sup>[24]</sup>.





**Figure 2.** ERNIE Bot 4.5 Turbo generated pictures of Yantai ICH “Longkou Handmade Thread Weaving Skills” (Left) and “Laizhou Jade Carving” (Right).



**Figure 3.** TianGong AI generated video of “Haiyang Yangko Dance” (Screenshot).

#### (4) Inspection and verification

In this step, teachers guide students to verify and check the graphics, videos, and other materials generated by AI. Using online terminology databases, official website information, computer-aided translation software, online search tools, and translation search technologies, students verify the output translated text, image credibility, and videos. After verification, guided by the teacher, students summarize the shortcomings of the output to prepare for future improvement and optimization.

#### (5) Translation optimization

Under the guidance of the teacher, students reorganize the shortcomings of AI output, and further optimize the generation of “Longkou Handmade Thread Weaving Skills” and “Laizhou Jade Carving” images, as well as “Haiyang Yangko Dance” videos, which can enhance students’ profound understanding of Yantai ICH, promote the international dissemination of the ICH, and achieve dialogue between Yantai’s ICH knowledge and the world.

#### (6) Model training

In this step, the teacher guides students to feed the text, images, videos, and other content generated in the multimodal translation project and let generative AI learn the original texts of Yantai HCI “Longkou Handmade Thread Weaving Skills”, “Laizhou Jade Carving”, and “Haiyang Yangko Dance” in Chinese and English as well as the textual descriptions and corresponding generated images, and the textual descriptions and corresponding generated videos. Then, generative AI will be smoother and more optimized when encountering similar multimodal translations in the future.

Throughout the teaching process, teachers guide students to use generative AI and related tools for multimodal translation practice. The characteristics follows in three aspects.



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- (1) Teachers and students always actively interact with AI, and generative AI always provides feedback, and learns with them;
  - (2) Generative AI continuously enriches its performance in assisting teachers and students with the output and input;
  - (3) The multimodal translation project-based teaching empowered by AIGC has opened a new window for translation practice teaching, which not only cultivates teachers AI literacy, but also cultivates students' ability and literacy to apply generative AI for multimodal translation practice.

## **5. Discussion**

### **5.1. Teaching effectiveness**

The Yantai ICH project-based translation practice empowered by AIGC is of great effectiveness. First, in terms of creativity, teachers guide students to explore independently the ways to complete multimodal translation practice with generative AIs. In the project-based practice of Yantai ICH multimodal translation, students edit prompts according to the requirement of translation tasks combined with their own creativity. For example, many characters and different background colors are designed for the “Haiyang Yangko Dance” dance video. That is because this creativity can stimulate students' higher-order thinking and enhance their learning experience <sup>[2]</sup>. Second, in terms of cross-cultural communication, the multimodal translation form of Yantai ICH empowered by AIGC not only allows target language readers to read the description of original text, but also conveys multimodal content, which allows them to intuitively experience Yantai ICH. This not only promotes cross-cultural communication, but also greatly improves the dissemination of Yantai ICH, further achieving dialogue between local ICH and global culture. Third, in terms of teaching and learning, this type of translation practice like the Yantai ICH multimodal translation practice project not only greatly enriches teaching methods and improves teaching efficiency, but also exercises students' translation and ability in proofreading and generative AI application as well as the cultivation of their translation literacy and AI literacy. More importantly, this type of translation practice can deepen students' understanding of Chinese ICH and enhance their cultural confidence.

### **5.2. Challenges in multimodal translation teaching**

Although generative AI is helpful for the multimodal ICH translation practice empowered by AIGC, there are still disadvantages, such as misunderstanding of meaning, cultural misinterpretation in ICH translation <sup>[9]</sup>. Challenges in multimodal translation teaching are obvious.

- (1) Some translation teachers may be inadequate in translation technology, search ability, technical literacy, and AI literacy. So strong translation practice teaching and search abilities and being proficient in editing prompts to generate AIGC will be the basic requirement for translation teachers.
- (2) Some students may not be skilled in the application of generative AI. Multimodal translation ability, the ability to edit prompts, technical literacy, and AI literacy will become daily used in translation study.
- (3) The challenges of the requirement for hardware and software in multimodal translation teaching also appears. The classroom used for teaching needs not only multimedia, but also computers connected to the Internet as well as various AI models.
- (4) The ethical issues related to AI will be another challenge. It is very necessary for teachers to guide students correctly to generate corresponding multimodal content, but not overly rely on AI models.

### **5.3. Ability reconstruction**

For students who can successfully complete project content and achieve project teaching objectives, AIGC empowered multimodal ICH translation needs to reconstruct students' translation abilities. We suggest that it is necessary to reconstruct the following students' abilities to meet the teaching objectives: The ability to accept new technologies and AI in translation practice; The ability to review the details of multimodal content generated by generative AI; The ability to

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apply various generative AI and edit prompts properly; and teamwork ability under AI collaboration. Only by mastering these basic abilities can students smoothly further improve their corresponding literacy, such as political literacy, language literacy, cultural literacy, and audience awareness<sup>[15]</sup>. Only then can we cultivate the translation talents needed by society in the AIGC era.

## 6. Conclusion

The multimodal translation practice in the era of AIGC have brought various possibilities to the teaching of translation courses. Based on related studies, this study has integrated local knowledge and multimodal translation. Taking Nida's four-step translation method as the core foundation, we construct a six-step model diagram of AIGC-empowered multimodal translation practice, analyze the basic teaching steps of project-based practice in multimodal translation of Yantai ICH, and summarize the teaching effectiveness, challenges, and translation abilities that students need to reconstruct of this teaching model. There were implications of this study:

- (1) It is very necessary to implement translation teaching reform with the advanced AI technology and the latest industry trends combined
- (2) Local knowledge such as ICH should be very appropriate part to consider for the reform of translation teaching, which can stimulate students' interest in learning and enable local knowledge to engage in global dialogue
- (3) Incorporating traditional Chinese culture can not only promote the international dissemination of local culture, but also enhance students' cultural confidence.

Although there are shortcomings in this study, such as the need for taking empirical research for the six-step multimodal translation practice model, the insufficient details of the model in inaccurate optimization of multiple iterations of generated content, and the lack of detailed discussion on the evaluation of translation course teaching. Further research can refine the course teaching evaluation of the multimodal translation model, optimize the content through multiple iterations, and conduct empirical research prove the multimodal translation teaching model empowered by AIGC, laying the foundation for the cultivation of translation talents in the era of AIGC.

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# Innovation in Corporate Internal Control and Auditing in the Big Data Environment

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**Abstract:** Against the backdrop of the accelerating digital economy, the corporate operating environment is characterized by high complexity and uncertainty. The widespread application of big data technology has fostered the deep integration of information flow, value flow, and resource flow, presenting new challenges and opportunities for corporate internal control and audit models. Based on relevant research findings domestically and internationally, combined with typical corporate practice cases, this paper systematically explores how big data technology drives the intelligent restructuring of corporate internal control systems and the digital transformation of audit processes. Research indicates that by building data driven risk early warning mechanisms, promoting process automation and platform integration, strengthening data governance capabilities, and cultivating interdisciplinary audit talent, enterprises can significantly enhance organizational agility, compliance levels, and governance effectiveness. Simultaneously, this paper also identifies current practical obstacles such as data security, lack of standards, and technical barriers, and proposes corresponding countermeasures. It aims to provide theoretical support and practical pathways for advancing the high-quality development of corporate internal control and audit models.

**Keywords:** Big data; Corporate internal control; Intelligent auditing; Digital transformation; Risk management and control; Organizational agility

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## 1. Introduction

With the continuous deepening of global digitalization, emerging information technologies such as big data, cloud computing, and artificial intelligence are profoundly reshaping corporate management paradigms and governance structures. Supported and driven by technological advancements, corporate internal control and audit systems are gradually gaining the technical capability to shift from “post event supervision” to “real time monitoring”, from “static control” to “dynamic response”, and from “partial review” to “full process penetration”. In recent years, institutions in the international accounting and auditing fields have consistently focused on the impact of digital technologies on corporate governance mechanisms, emphasizing topics such as intelligent risk control, automated auditing, enhanced data transparency, and optimized organizational structures. In technologically advanced developed countries, research and practice in this area are relatively leading. These attempts at digital transformation have not only significantly improved corporate operational management efficiency but also enhanced organizational agility and risk resilience by strengthening the information acquisition and processing capabilities of internal controls<sup>[1]</sup>. Some large enterprises in the United



States have widely adopted blockchain technology and automated audit platforms, effectively controlling audit costs and improving compliance assurance levels while enhancing financial reporting transparency and fraud identification capabilities. In financial institutions such as banks, the use of cloud computing and machine learning technologies to design fuzzy algorithms has achieved breakthrough application value in audit sampling, anomaly detection, and trend prediction <sup>[2]</sup>.

Research in China is also gradually deepening. Using large state-owned enterprises as samples, studies analyze the efficiency improvements brought by ERP integration and automated financial data collection during the upgrade of internal audit systems, while also pointing out that insufficient standardization, data silos between departments, and a shortage of professional talent remain constraining factors <sup>[3]</sup>. Some enterprises have further explored the application potential of data mining and distributed architecture in economic activity analysis, internal control evaluation, and risk early warning, emphasizing the enabling role of the “strategy-behavior-performance” closed-loop management mechanism for audit innovation <sup>[4]</sup>. In summary, achieving high-quality corporate development can rely on the construction of intelligent audit platforms, data-driven management models, and interdisciplinary talent teams. However, technological changes also bring new governance challenges, including increased data security risks, lagging compliance frameworks, insufficient system interoperability, and structural imbalances in human resources. Therefore, this paper aims to systematically review the theoretical basis, practical pathways, and real-world challenges of corporate internal control and audit innovation in the context of big data, proposing forward-looking reform directions and development strategies <sup>[5]</sup>.

## **2. Intelligent restructuring of corporate internal control empowered by big data**

### **2.1. Digital transformation and intelligent upgrade of management processes**

The core advantages of big data technology lie in its capabilities for large-scale data collection and storage, deep integration and consolidation of multi-source heterogeneous data, and efficient real-time data analysis and dynamic feedback mechanisms. In practical corporate applications, by fully deploying Enterprise Resource Planning (ERP) systems, widely installing Internet of Things (IoT) sensing devices, and establishing unified information integration and data middle platforms, enterprises can achieve “end-to-end” automated data collection from front end business touchpoints to back-end management functions.

This builds a dynamic, scalable data asset pool covering the entire value chain, laying a solid foundation for intelligent analysis and decision support. From a global practice perspective, many leading enterprises have gradually embedded big data technology deeply into their internal control systems, achieving digital mapping and intelligent management of key control points. Taking General Electric Company as an example, the company built an intelligent audit platform that runs through the entire business process, integrating data sources from various dimensions such as financial accounting, production operations, asset management, and compliance monitoring. With the help of advanced data visualization and intelligent analysis tools, management can monitor the operational status of various business units in real time, promptly identify potential risks, and issue warnings. After the platform was put into use, efficiency in identifying abnormal events improved, and the audit cycle significantly shortened, not only greatly enhancing the transparency of corporate financial information but also substantially improving overall operational efficiency. In the financial industry, a large commercial bank in Australia deeply integrated its existing ERP system with a cloud-based audit system, achieving unified collection and automated intelligent verification of cross-regional, cross-departmental transaction data. This efficiently handles a large number of repetitive, rule-based review tasks.

Combined with machine learning models, the system can automatically identify and flag high-risk transaction clues, significantly reducing costs associated with manual intervention and effectively minimizing operational errors. Domestically in China, Haier Group’s creation of the “IoT Financial Management and Control Platform” is a typical example. This platform integrates multiple functional modules such as financial sharing, full lifecycle contract management, procurement payment management, and fixed asset inventory, effectively breaking down information



barriers and data silos that previously existed between departments. It enables precise positioning and real-time warning of key risk points.

The audit team can conduct targeted verification and in-depth analysis based on multi-dimensional risk reports automatically generated by the system, thereby greatly enhancing corporate governance standardization and management decision support capabilities. Furthermore, a number of large domestic enterprises in China are actively exploring the integrated model of “Financial Shared Service Center + Intelligent Internal Control Platform”. By consolidating information on human resources, capital, materials, and business processes, they are building a data driven internal control system that runs through the entire corporate operation process<sup>[3]</sup>. This model enables internal control managers to dynamically adjust resource allocation and optimize governance strategies based on the data analysis results output by the system, thereby effectively promoting the transformation of core businesses towards greater agility and intelligence, and continuously enhancing the enterprise’s adaptability and competitive advantage in a complex market environment.

## **2.2. Proactive and systematic upgrade of risk management**

Traditional risk management models primarily rely on static historical data and managerial experience, exhibiting significant lag in risk identification and response, as well as limitations in analytical perspective. In contrast, big data technology, through distributed computing frameworks, multi-dimensional association rule mining, and high-precision predictive modeling methods, endows enterprises with more systematic and forward-looking risk perception and assessment capabilities, thereby promoting a shift in risk management from passive response to active early warning. Existing research shows that if enterprises can effectively integrate internal operational data with external multi-dimensional data sources such as macroeconomic indicators, industry fluctuations, public sentiment dynamics, and policy and regulatory changes, they can construct risk matrices and early warning indicator systems with self-learning and dynamic update capabilities. Such models can not only identify conventional business risks but also respond quickly to systemic risks and sudden events, enhancing the enterprise’s operational resilience in complex environments. Taking credit risk management in the banking industry as an example, using fuzzy set theory and ensemble learning algorithms for multi-dimensional real time credit assessment of loan clients has become mainstream, using big data analysis to improve the granularity of customer risk classification.

Compared to traditional scorecard models, the ability to assess bad debts, detect fraud, and identify abnormal transactions has been significantly enhanced, providing an important reference for the implementation of intelligent risk control in financial scenarios. In industrial practice, Alibaba Group actively promotes the “Digital and Intelligent Connection” strategy, relying on the Alibaba Cloud platform to build cross-system data pathways and fully integrate data interfaces from internal business systems with external suppliers and partner financial institutions. This system achieves “end-to-end” visual monitoring of capital flow, information flow, and logistics in supply chain finance activities, supports dynamic assessment and early intervention of credit risks for upstream and downstream enterprises, thereby greatly enhancing the risk response speed and control precision of the entire ecosystem. It is important to note that although the data-driven risk control model has significant advantages, long-standing issues such as departmental barriers, system silos, and lack of standards have severely constrained the integration and utilization efficiency of corporate data resources. To address this challenge, in the big data environment, building an enterprise-level unified data center, establishing cross-system standardized interface protocols, and improving data sharing and permission management mechanisms have become key measures to enhance overall risk management effectiveness.

In this context, international mainstream ERP software vendors such as SAP and Oracle have deeply integrated data middle platform functions into their new-generation products, supporting the collaborative operation and real-time interaction of core modules such as finance, human resources, procurement management, and asset operations. Such platforms not only connect business and financial data links but also provide a solid technical foundation for building an integrated internal control system that combines business and finance and responds dynamically, further promoting the evolution of risk management towards digitalization and intelligence.

### **3. Practical challenges in data security and compliance governance**

#### **3.1. Data privacy protection and information security risks**

Although big data enhances information utilization efficiency, its widespread circulation also increases the risks of data leakage, misuse, and privacy infringement. In recent years, major global economies have successively introduced strict data regulations, such as the EU's General Data Protection Regulation (GDPR), China's Cybersecurity Law, Data Security Law, and Personal Information Protection Law, imposing clear compliance requirements on corporate data collection, storage, transmission, and use. Regulatory agencies have also strengthened their scrutiny of audit data security. Bodies like the U.S. Securities and Exchange Commission (SEC) and the UK Financial Reporting Council (FRC) require enterprises to ensure controllable data access permissions, traceable operations, and encrypted storage of sensitive information during the audit process. Enterprises need to establish sound data governance systems, implement data classification and tiered management, enforce the principle of least privilege, end-to-end encryption, and off-site backup mechanisms to guard against dual threats from internal personnel and external attackers.

#### **3.2. Lack of standards and system interoperability barriers**

Currently, some industries in China have not yet formed unified standards in areas such as audit information system interface standards, data format definitions, and metadata management, leading to difficulties in seamless connection between different systems and affecting the effectiveness of automated auditing and cross-platform data analysis. For example, inconsistent data structures between financial systems and business systems often result in high costs for audit data cleansing and low processing efficiency. Targeted solutions mainly include: first, industry associations taking the lead in formulating universal data standards and interface specifications; second, encouraging software developers to follow open architecture design principles to enhance system compatibility; third, promoting the establishment of regional or industry-level audit data exchange platforms to facilitate information sharing and collaborative governance. Building an open and interconnected data ecosystem can unlock the application potential of big data in the auditing field.

#### **3.3. Technical barriers and the digitalization dilemma of SMEs**

Compared to large enterprises with ample funds and advanced technology, the vast number of Small and Medium-sized Enterprises (SMEs) generally face more severe challenges in promoting intelligent auditing and digital transformation. These problems are in insufficient initial capital investment, making it difficult to afford the high costs of software and hardware procurement and system deployment; weak existing information infrastructure, with varying data standards across departments creating numerous "information silos"; and a severe shortage of interdisciplinary professionals proficient in both data technology and auditing. SMEs still rely heavily on manual bookkeeping and paper document flow as the core basis for auditing. Although some business processes have been digitized, the overall digital transformation process lags significantly. This phenomenon not only leads to low efficiency in financial data processing but also severely restricts the enterprise's ability to timely identify and warn of operational risks. Therefore, it is necessary to explore the construction of a multi-party collaborative, layered support system. First, the government should actively play a role in policy guidance and support, substantially lowering the digital threshold for SMEs through special financial subsidies, targeted tax reductions, technology upgrade rewards, etc., incentivizing them to actively connect to public cloud service platforms led by the government or industry alliances, acquiring advanced technological capabilities in a lightweight "pay-as-you-go" model. Second, professional third-party service providers can develop and promote modular audit toolkits tailored to the actual needs and affordability of SMEs. These toolkits should support rapid network deployment and perform basic data analysis tasks such as reconciliation, verification, compliance checks, and risk indicator monitoring, enabling SMEs to take the first step in intelligent risk control at a relatively low cost.

## **4. Practical pathways for intelligent audit innovation**

### **4.1. Application of intelligent audit platforms and data analysis tools**

Traditional audit models primarily rely on sampling checks, suffering from limited coverage, strong subjectivity, and low efficiency. Intelligent audit platforms supported by big data technology are gradually replacing manual verification, achieving automation, intelligence, and scalability in audit work. International “Big Four” accounting firms such as PwC, Deloitte are widely use professional data analysis tools like ACL and IDEA, combined with blockchain technology to ensure the immutability and traceability of audit evidence. Some enterprises have also built “audit sandbox” environments, integrating internal and external multi-source data for simulation analysis and anomaly detection in an isolated environment, ensuring the security and independence of the audit process. Representative domestic enterprises are also actively promoting intelligent audit construction. Taking Huaneng Group’s establishment of the “Audit Sharing Cloud Platform” as an example, this platform integrates core business data such as finance, contracts, and engineering projects, realizing the online, visual, and traceable nature of the audit process. The system supports automatic comparison of budget execution, contract fulfillment, and fund flows, promptly identifying deviations and generating warning alerts, significantly improving audit response speed and governance effectiveness.

### **4.2. Construction of continuous auditing and automated monitoring mechanisms**

Traditional audits are mostly annual or quarterly periodic checks, making it difficult to cope with high-frequency, concealed fraudulent activities. Continuous auditing, relying on big data technology, achieves all-weather, full-scale monitoring of key corporate business processes, covering the entire process of “prevention - in-process control - post event accountability”. Huawei is a typical case. Its big data analysis system implements real-time monitoring of high-risk links such as procurement, contracts, and payments. Once suspicious behaviors like price anomalies, missing approvals, or duplicate payments are detected, the system immediately triggers warnings and pushes them to the risk control department. This mechanism has significantly reduced the incidence of fraud and continuously improved compliance management levels. Subsequently, the application of artificial intelligence and machine learning algorithms in anomaly detection, trend prediction, and pattern recognition can be further promoted, driving auditing from “passive response” to “active prediction”. Simultaneously, industry alliances are encouraged to build open audit platforms to promote data circulation and technology sharing, comprehensively enhancing the overall governance capability of the industrial chain.

### **4.3. Organizational structure and competency transformation of the audit team**

The implementation of intelligent auditing relies not only on technical tools but also requires synchronous transformation of organizational structure and talent composition. Traditional auditors mostly have backgrounds in finance and accounting but often lack skills in data analysis, programming, and understanding information systems. In this field, overseas universities have already established interdisciplinary courses such as “Data Auditing”, “Information System Auditing”, and “AI and Risk Management” to cultivate compound talents with both technical capabilities and business insight. Some leading domestic enterprises have also intensified internal training, organizing auditors to learn tools like Python, SQL, and Tableau, promoting the team’s transition to a technology and business dual-driven model. Enterprises should establish dedicated audit technology teams responsible for the development, maintenance, and optimization of intelligent audit systems; simultaneously, they should optimize performance appraisal mechanisms, incorporating data analysis capabilities into the career development evaluation system for auditors to stimulate organizational innovation vitality.

## **5. Conclusion**

This paper systematically explores the theoretical logic and practical pathways for corporate internal control and audit innovation in the big data environment. Research shows that digital technology is reconstructing the underlying logic of corporate governance: internal control is evolving from static rules to dynamic responses, and the audit function is

shifting from “post-event error detection” to “whole-process prevention and control”. Through process intelligence, risk datafication, platform integration, and talent composability, enterprises can effectively cope with the complex and changing operating environment, enhancing compliance, transparency, and organizational agility. Simultaneously, technological progress also accompanies new governance challenges. Issues such as data security, lack of standards, system silos, and talent gaps still need to be resolved through policy guidance, industry collaboration, and corporate independent innovation. In summary, internal control and audit innovation in the big data era is not only a technological upgrade but also a comprehensive renewal of the governance system. Adhering to the equal importance of technology drive and institutional guarantee will provide the greatest auxiliary utility for corporate sustainable and high-quality development.

## Disclosure statement

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# Innovating Curriculum Systems for Railway Intelligence: Construction and Practice of the AITL Layered Model

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**Abstract:** With the rapid advancement of artificial intelligence (AI), traffic engineering is undergoing a critical transformation that requires restructuring both its knowledge framework and talent cultivation model. Traditional railway-related curricula struggle to address highly complex and real-time problems such as transportation organization, train control, and capacity prediction, resulting in fragmented competencies, outdated modules, and misalignment between instructional content and operational needs. As a data-intensive and safety-critical subsystem, modern railway operations increasingly rely on AI for train control, dispatch scheduling, operational optimization, and digital infrastructure management, calling for systematic curriculum reform. In response, this study examines global teaching practices and technological trends and proposes the AITL Layered Curriculum Model, a three-stage competency pathway encompassing technology internalization, scenario transfer, and intelligent creation. The model establishes an integrated instructional content chain, a task-driven mechanism, and an AI-enabled experimental platform embedded in representative railway scenarios. Multi-scenario virtual teaching experiments verify that the AITL model effectively mitigates fragmented curriculum organization, insufficient task embedding, and unclear competency progression, providing a systematic, transferable, and evaluable framework that aligns with the intelligence-oriented transformation of railway traffic engineering and offers broader applicability to transportation education.

**Keywords:** Artificial intelligence; AITL layered curriculum model; Railway systems; Traffic engineering; Curriculum reform

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## 1. Introduction

With the rapid integration of artificial intelligence (AI) into railway transportation systems, core operational processes, such as train scheduling, traffic control, signal management, and equipment maintenance are undergoing profound transformation. A technological system centered on intelligent construction, smart equipment, and intelligent operations is reshaping the fundamental logic of railway transportation. Consequently, the pedagogical paradigm of traffic engineering is shifting from traditional rule-based and experience-driven control models toward data-driven and intelligence-oriented



operational modes. This paradigm shifts places higher demands on the cultivation of traffic engineering talent particularly in railway-oriented programs in the areas of data modeling, algorithm development, system integration, and real-time decision-making. As a result, existing curricula still dominated by theoretical instruction and static models urgently require structural reconstruction to address the emerging needs posed by AI-enhanced railway systems <sup>[1]</sup>.

However, faced with the rapid iteration of AI technologies, curriculum updates in current university traffic engineering programs remain slow and insufficient. Course content is still centered on traditional theoretical instruction, and knowledge related to AI applications in railway scenarios has not yet formed a coherent and systematic chain. This leads to fragmented capability development: although students acquire basic knowledge in train operation organization, signal interlocking, and similar subjects, they lack the ability to integrate AI technologies into real-world railway operational problems for modeling and deployment <sup>[2]</sup>. Existing research indicates that establishing a “course–competency–task” mapping mechanism, supported by knowledge graphs, can significantly enhance the adaptability of traffic engineering curricula in the era of intelligentization <sup>[3]</sup>.

At the policy level, General Secretary Xi Jinping emphasized the need to accelerate the deep integration of AI with education in his congratulatory letter to the International Conference on Artificial Intelligence and Education <sup>[4]</sup>. National strategic documents such as China’s Education Modernization 2035 and the 14th Five-Year Plan for Railway Science and Technology Innovation explicitly call for the adoption of AI and other frontier technologies to systematically traffic engineering and to optimize talent cultivation systems in the railway sector <sup>[5,6]</sup>.

In terms of pedagogical practice and theoretical exploration, a growing body of domestic and international research has proposed innovative pathways, focusing on task-driven mechanisms, multimodal interactive platforms, and the integration of deep learning models. For example, Yang et al. (2025) developed a three-layer nested task chain driven by large language models to construct a progressive competency structure <sup>[3]</sup>. Zhang et al. (2025), using a multimodal teaching platform, conducted comparative experiments demonstrating the positive impact of AI-assisted tools on higher-order cognitive abilities <sup>[2]</sup>. Agrahari et al. (2024), in their comprehensive review of AI-driven adaptive traffic signal control, highlighted AI-supported optimization mechanisms as a central component of intelligent traffic and railway systems <sup>[7]</sup>. Schleiss et al. (2024), from the perspective of systemic education reform, argued that AI curriculum integration must involve coordinated adjustments of organizational mechanisms, competency goals, and adoption strategies, and emphasized the need for transferable analytical frameworks to support continuous educational evolution <sup>[8]</sup>.

Although these studies collectively point toward emerging paradigms characterized by task-driven learning, multimodal interaction, and deep-learning-based system integration, existing efforts are mostly confined to isolated instructional elements or tool applications. They fall short of offering a comprehensive reconstruction of railway traffic engineering curricula grounded in a progressive competency-generation logic, nor do they provide validated models for systematic curriculum redesign.

To address these shortcomings, this paper proposes the “AITL Layered Curriculum Model” tailored to railway traffic engineering, a three-stage competency development framework consisting of technology internalization, scenario transfer, and intelligent creation. The model systematically integrates curriculum structure, task chains, and platform-support mechanisms, offering a holistic pathway for restructuring traffic engineering curricula in the context of AI-driven railway innovation.

## 2. Core problem analysis and structural diagnosis

### 2.1. Lag in educational system responsiveness

With the accelerated penetration of emerging technologies such as intelligent connectivity, the transportation industry is placing increasingly stringent competency requirements on practitioners <sup>[9]</sup>. However, a systemic mismatch has emerged between the traditional instructional paradigm and the professional abilities now required in intelligent railway operations, specifically real-time perception, dynamic decision-making, and multi-objective coordinated optimization. This mismatch

signals an urgent need for structural transformation in higher education.

Yet, current railway-oriented curricula in universities remain dominated by static methodologies and exhibit pronounced lag and misalignment.

At the technical level, instruction continues to rely on classical four-step models and associated tools (e.g., TransCAD in “Transportation Planning”), focusing primarily on long-term OD forecasting and route planning. These tools are inherently ill-suited for intelligent railway systems, which demand minute-level dispatching and real-time responsiveness.

At the pedagogical level, most courses still follow a linear “teacher-lecture → verification experiment” approach (e.g., TrainPlan-based timetable exercises). Learning tasks are largely limited to rule reproduction and computational exercises, offering little support for developing competencies in dynamic strategy generation under complex operational scenarios.

At the assessment level, grading remains centered on final examinations and static lab reports, lacking continuous observation of student performance in model development, parameter tuning, and real-time decision-making, the key abilities in AI-enhanced railway systems.

This lag in educational response results in a widening gap between industry demands and academic preparation, undermining the cultivation of high-quality railway transportation professionals.

## **2.2. Structural fragmentation in current curriculum systems**

Against the backdrop of railway system intelligentization, deep structural fragmentation has emerged across content organization, competency development, instructional scenarios, and technical platforms. This fragmentation is not merely a surface-level misalignment; it reflects a systemic disharmony that constrains the development of competent, interdisciplinary transportation engineers.

### **(1) Fragmented knowledge architecture**

Artificial intelligence, big data analytics, and related critical knowledge remain insufficiently integrated into core railway courses such as Railway Transportation Organization, Train Operation Control, and Railway Signaling Systems. These elements typically appear as isolated or “inserted” content modules, lacking vertical continuity and horizontal integration. Consequently, students fail to develop a coherent cognitive framework for understanding railway systems as complex, intelligent infrastructures.

### **(2) Misaligned competency development**

Existing instructional tasks continue to prioritize static knowledge transfer and rule verification, rather than problem-driven and scenario-based learning. Although students master foundational theories and operational skills, they lack training in crucial areas such as model construction, algorithm adaptation, and system deployment, limiting their progression from “tool use” to “system-level problem solving”.

### **(3) Inadequate instructional scenario designs**

Most laboratory environments still rely on static timetable software incapable of simulating dynamic operational conditions such as passenger surges or equipment failures. This restricts students’ exposure to real-world uncertainties and diminishes their ability to develop dynamic, adaptive strategies.

### **(4) Lack of integrated teaching platforms**

Existing platforms are technologically siloed. Many university labs adopt closed tools (e.g., TrainPlan), making it difficult to integrate mainstream AI frameworks (TensorFlow, PyTorch) or railway simulation tools (RailSys, OpenTrack). This creates a disconnect between algorithm development and operational simulation, hindering the translation of academic learning into engineering practice.

Based on the diagnosis above, this study proposes the AITL Layered Curriculum Model, which integrates a three-stage competency generation pathway, technology internalization, scenario transfer, and intelligent creation, to restructure teaching content, task mechanisms, and platform support for railway traffic engineering education.

### 3. AI-Driven structured design of the traffic engineering curriculum system

In the context of the deep integration of artificial intelligence into railway transportation systems, the reform of traffic engineering curricula can no longer rely on fragmented or localized adjustments; instead, it requires comprehensive, systematic, and structurally coherent reconstruction. Based on the AITL (AI-Traffic Layered) three-stage curriculum model, this chapter proposes a structured design scheme for railway-oriented traffic engineering programs from three dimensions: curriculum system construction, instructional organization and platform support, and multi-dimensional evaluation combined with industry–academia collaboration. The overall design scheme is presented in **Table 1**.

**Table 1.** AI-driven curriculum design for railway engineering

Reform dimension	Three-stage AITL curriculum system	Teaching organization & platform support	Evaluation & industry collaboration
Core content	-Technology internalization layer: building mathematical foundations & AI literacy -Scenario transfer layer: algorithm adaptation & railway system integration -Intelligent creation layer: innovative modeling & multi-objective optimization	-Cross-disciplinary collaboration -Task-driven organization -Full-process guidance; integrated “AI + railway” lab platform -Learning-behavior analysis	-Stage-based evaluation -Comprehensive assessment -Industry expert feedback

#### 3.1. Construction of the AITL three-stage curriculum system

##### 3.1.1. Technology internalization layer: Building mathematical foundations & AI literacy

The technology-internalization stage serves as the starting point of the AITL curriculum system. Its central objective is to guide students in shifting from traditional traffic-engineering modes of thinking toward intelligent, algorithm-driven problem-solving paradigms. To achieve this, courses at this stage must strengthen foundational knowledge in mathematics, statistics, and physics, while also helping students develop a systematic understanding of core AI tools and methods. This foundation is essential for supporting subsequent modeling tasks and system-integration activities in complex railway scenarios.

##### 3.1.2. Scenario transfer layer: Algorithm adaptation & railway system integration

The scenario-transfer stage represents the intermediate phase of the AITL curriculum system. Its core objective is to enable students, after having mastered foundational AI techniques, to transfer these methods into specific railway operation and dispatching scenarios and establish a closed-loop capability of “technology–scenario–feedback”. This stage places strong emphasis on aligning algorithms with the operational logic of railway systems so that students not only know how to use models but are also able to adapt algorithmic structures and tune parameters according to real operating environments and constraints.

In terms of course arrangement, this stage can be integrated into the mid-to-late instructional segments of Traffic Control and Management, Railway Transportation Organization, and Traffic Simulation. Learning tasks are designed around representative railway operation scenarios, such as improving sectional capacity, optimizing strategies for delay recovery, and dynamically adjusting marshalling yard operation plans. Supported by simulation platforms such as RailSys or OpenTrack together with AI frameworks like TensorFlow and PyTorch, students complete the full workflow from data prediction and control-strategy training to system deployment and validation.

##### 3.1.3. Intelligent creation layer: Innovative modeling & multi-objective optimization

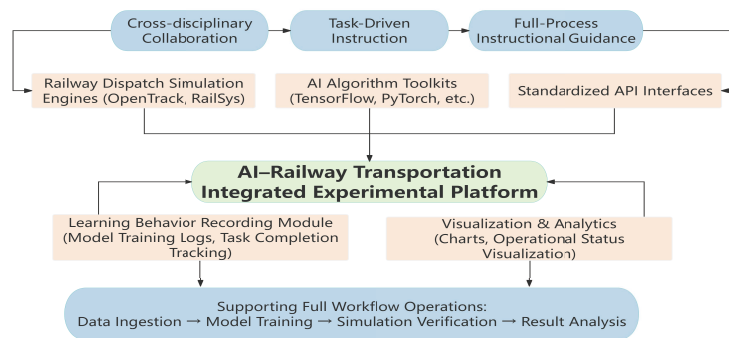
The intelligent-creation stage constitutes the highest level of the AITL curriculum model. Its central aim is to cultivate students’ abilities to independently tackle open-ended and complex railway-system problems that involve system innovation, integration, and multi-objective coordinated optimization. At this stage, instruction no longer prescribes fixed algorithmic frameworks or predetermined data-handling procedures; instead, students are required to begin from the global

operational logic of railway systems and complete the entire process from problem abstraction to model development, solution implementation, and performance evaluation.

In practice, this stage can be incorporated into the advanced modules of courses such as Railway Transportation Organization, Traffic System Modeling, and Urban Rail Transit Operation Management, and may also serve as the core component of graduation projects or innovation-training programs. Typical project themes include multi-route coordination optimization in high-speed railway networks, coordinated signal control in urban rail transit systems, and developing digital-twin-based platforms for railway operation simulation and prediction. During this process, students are expected to apply advanced techniques such as deep learning, graph neural networks, and multi-agent reinforcement learning to conduct system-state modeling, dynamic prediction, intelligent control, and holistic optimization.

### 3.2. Teaching organization & platform support pathway

To ensure the effective implementation of the AITL three-stage curriculum system within railway-transportation programs, it is essential to integrate cross-disciplinary collaboration, task-driven learning, and unified experimental platforms into a coherent instructional architecture. A virtual-simulation teaching platform needs to be developed accordingly <sup>[10]</sup>. The overall framework is shown in **Figure 1**.



**Figure 1.** Teaching and platform framework.

In terms of instructional organization, the system adopts an approach characterized by “cross-disciplinary collaboration, task-driven design, and full-process guidance”. Cross-disciplinary collaboration refers to the joint participation of faculty from railway transportation engineering, computer science, and control engineering in designing and delivering courses, ensuring both theoretical depth and technological relevance. Task-driven design takes complex problems drawn from real railway operations as the primary project carriers and embeds them throughout the semester in alignment with the three stages of the AITL curriculum model. Full-process guidance is achieved through a cyclical mechanism of task assignment, staged feedback, and final presentation, offering students targeted support and technical scaffolding at key learning milestones.

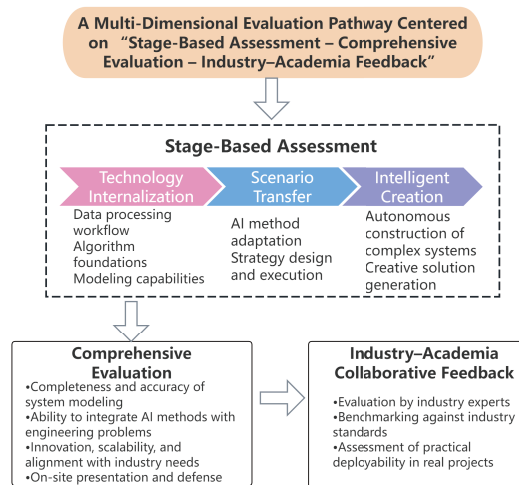
With respect to platform development, an integrated experimental environment combining AI technologies with railway-transportation scenarios is constructed. By integrating railway simulation software such as OpenTrack and RailSys with AI frameworks such as TensorFlow and PyTorch, and equipping the system with a visualization interface, the platform supports full-range laboratory operations. It provides standardized data interfaces for timetables, real-time operational data, and sectional capacity information, while also supporting custom algorithm embedding, thereby enabling seamless linkage between algorithmic models and railway operational scenarios.

Additionally, the platform incorporates a module for learning-behavior tracking and visualization. This module records students’ complete operational traces during model development, parameter tuning, and task execution. It furnishes instructors with process-based evaluation data while simultaneously generating personalized learning-feedback reports for students, thereby forming a data-driven instructional cycle of “task release–process monitoring–iterative feedback”.



### 3.3. Multi-dimensional evaluation & industry collaboration

In the implementation of the AITL curriculum system, evaluation serves not only as a means of measuring learning outcomes but also as a mechanism for driving continuous pedagogical improvement and fostering capability development. To achieve the systematic aims of curriculum reform, this study establishes a multi-dimensional evaluation pathway centered on “stage-based evaluation, comprehensive assessment, and industry–academia collaborative feedback”. The structure of this evaluation pathway is shown in **Figure 2**.



**Figure 2.** Multi-dimensional evaluation pathway.

Stage-based evaluation runs throughout all three stages of the AITL model, aligning closely with the competency goals of each phase. In the technology-internalization stage, evaluation focuses on students’ grasp of data-processing workflows, algorithmic principles, and problem modeling. In the scenario-transfer stage, assessment emphasizes students’ ability to adapt AI methods to actual railway operating conditions, with particular attention to the rationality of strategy design and operational performance. In the intelligent-creation stage, evaluation targets students’ capacity for autonomous system construction and innovative problem solving. Forms of assessment include process logs, model documentation, simulation analysis, and group presentations, emphasizing procedural, holistic, and traceable evaluation to encourage iterative refinement of methods and solutions.

Comprehensive project assessment is typically conducted at the end of the semester or upon completion of major milestone tasks and requires student teams to complete system-level projects encompassing solution design, algorithm implementation, and simulation-based validation. Evaluation considers performance in operational efficiency, energy consumption, and system stability, while also emphasizing scalability, deployability, and alignment with industry requirements. Project presentations and oral defenses foster communication and collaborative skills while providing precise feedback for instructional enhancement.

The AITL evaluation system incorporates an industry–academia collaboration Feedback mechanism, establishing sustained partnerships with railway enterprises and research institutes. Industry experts participate in scheme evaluations and task design at key instructional stages, offering professional guidance and industry-oriented feedback, while also supporting pilot testing and applied transformation of outstanding student projects. This mechanism strengthens the linkage between educational objectives and industry needs and promotes the integration of the “education chain, talent chain, and industrial chain”, thereby providing institutional support for the sustained optimization and practical impact of railway traffic engineering education.



## 4. Teaching reform practice strategies: implementation of the AITL model for railway traffic engineering

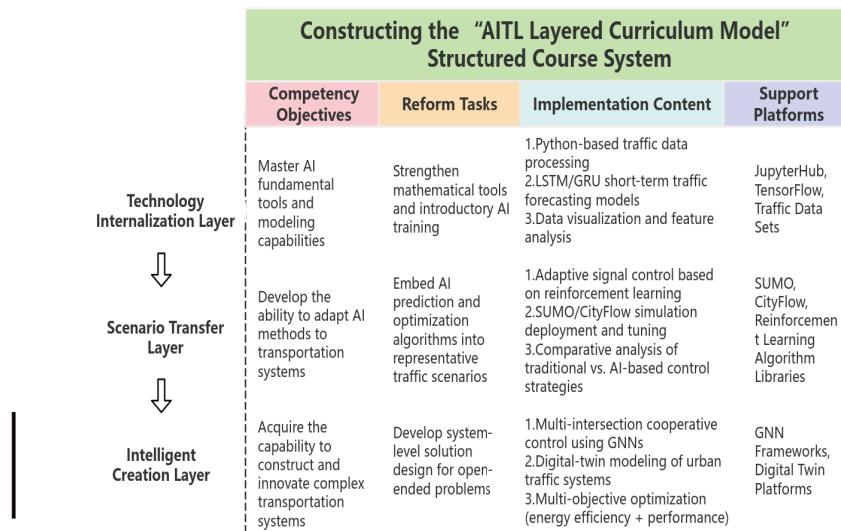
This chapter centers on the core theme of “reconstructing the railway traffic engineering curriculum system under AI empowerment” and provides a systematic exposition based on the three-stage capability development pathway of the AITL model. The main content includes an in-depth analysis of the operational characteristics and talent requirements of the railway industry under intelligent transformation, followed by a clarification of the direction for deeply integrating teaching reform with the intrinsic features of railway systems. Guided by the sequence of “technology internalization–scenario transfer–intelligent creation”, the chapter systematically establishes an implementation plan for curriculum-content chains, task sequences, and instructional-support mechanisms, ultimately forming a promotable and assessable pedagogical reform paradigm.

### 4.1. Alignment of reform orientation with railway industry characteristics

To align with the operational logic of the railway industry and its competency requirements for future professionals, this section focuses on the restructuring of instructional organization. Under the framework of the AITL three-stage model, teaching shifts from traditional “linear instruction” centered on isolated knowledge modules to “task-chain-oriented instruction” driven by complex problems and anchored in capability development.

Specifically, the restructuring of instructional organization is reflected in three aspects: course content is adjusted around representative railway-system problems so that the same category of problem forms a coherent pathway of knowledge expression and capability training across multiple courses; task design evolves from isolated knowledge-point exercises to systematic engineering problem-solving, emphasizing consistency in task objectives, data interfaces, and evaluation criteria; and laboratory systems are integrated into a unified technological platform so that all teaching activities take place within a consolidated environment, effectively resolving platform fragmentation and improving instructional feedback efficiency and validation accuracy.

The following sections unfold how the teaching task chain is embedded within specific courses and how competencies are progressively achieved along the three stages of the AITL model, as illustrated in **Figure 3**.



**Figure 3.** Structure of the AITL layered curriculum model.

### 4.2. Implementation pathway for staged teaching tasks

Driven by competency goals, teaching reform must overcome the limitations of traditional organizational models and

promote systematic restructuring of task design and evaluation mechanisms. Based on this, and grounded in the three-stage AITL model, this section presents an instructional task-chain implementation scheme suitable for railway traffic engineering programs.

#### **4.2.1. Technology internalization stage: Curriculum and task structure**

The technology-internalization stage is generally scheduled for the first to third semesters. It is centered on core courses such as Traffic Engineering, Railway Transportation Organization, and Railway Signaling and Control, supplemented by laboratory components in Traffic Control and Management. The emphasis is placed on cultivating students' ability to express railway-system logic mathematically and on introducing them to the initial use of AI tools. Instruction focuses on training students to analyze railway problems through a data-oriented perspective. Representative tasks include performing timetable data cleaning and structural processing using Python and the Pandas library; applying LSTM models to predict peak-hour traffic density; and using Matplotlib or Plotly to visualize bottleneck sections in train operations.

Through these tasks, students are expected to comprehend the essential operational rules of railway systems and transform them into computational and analytically tractable problem models. The teaching platform records students' full workflows, including data processing steps, model-training logs, and visualization outputs, serving as the primary basis for process-oriented evaluation and ensuring mastery of foundational competencies in "structured representation of railway problems".

#### **4.2.2. Scenario transfer stage: Curriculum and task structure**

This stage is scheduled for the fourth to fifth semesters and is integrated with courses such as Traffic Simulation, Dispatching Command and Control, and Traffic Big Data Analytics. Its main objective is to cultivate students' ability to transfer and apply modeling skills to representative railway operating scenarios. Learning tasks emphasize "strategy adjustment under operational constraints". For example, students construct a high-density train-dispatching simulation environment in RailSys and apply reinforcement learning methods (such as DQN) to optimize departure intervals and route allocations. In designing reward functions, they must incorporate real-world constraints such as block signaling rules, station-platform resource utilization, and response delays in train-control systems.

Students compare AI-optimized solutions with fixed-timetable strategies on the platform and conduct quantitative evaluation using metrics such as punctuality rate, sectional saturation, and mean delay time. The platform provides automated performance comparison and disruption-recording functions to track students' development in strategy transfer and rule adaptation. This stage aims to help students understand the systemic significance of "railway rules as algorithmic constraints", enabling a cognitive shift from "being able to build models" to "being able to model within constraints".

#### **4.2.3. Intelligent creation stage: Curriculum and task structure**

This stage is concentrated in the sixth semester and the graduation design phase, involving advanced courses such as Traffic System Modeling, Urban Rail Transit Operations Management, and Intelligent Decision-Making for Integrated Transportation. Students are guided to construct railway-system optimization models with real deployment potential. Tasks are oriented toward "system-level complex problems" and are characterized by a high degree of openness and uncertainty. Typical project themes include developing a high-speed railway network state-prediction model based on graph neural networks; designing an integrated dispatching strategy that balances energy consumption, punctuality, and system resilience using multi-agent reinforcement learning; and building a simulation platform for coordinated operation between urban rail transit and intercity railway systems.

This stage emphasizes cultivating students' abilities in system integration and cross-module thinking. The platform requires students to submit comprehensive deliverables integrating "data flow-model logic-simulation feedback", and incorporates peer review and industry expert evaluation to enhance assessment objectivity and professionalism. Final outcomes should demonstrate both innovation and verifiability, marking the key transition from academic learning results

to “quasi-engineering products”.

## 5. Conclusion

This study takes AI-enabled educational reform in railway transportation engineering as its starting point and reconstructs the logic of competency formation through the development of the AITL (AI-Traffic Layered) curriculum model tailored to the needs of the railway industry. Centered on the progressive sequence of “technology internalization–scenario transfer–intelligent creation”, the model restructures and optimizes the curriculum system for railway transportation programs, redesigns the task chain, and systematically constructs the framework for instructional content, project-driven mechanisms, and integrated experimental platforms, thereby achieving deep alignment between pedagogical concepts and engineering practice.

The research outcomes are reflected in three main aspects:

- (1) It proposes a structured reconstruction scheme for the railway transportation curriculum system based on the logic of competency development, breaking through the limitations of isolated modules and outdated content in traditional curricula.
- (2) It develops an experimental environment that integrates railway simulation platforms with AI algorithm frameworks, providing technological support for realism, interactivity, and process-oriented evaluation in teaching.
- (3) It establishes a multi-stage task chain that spans from basic tool usage to system-level innovation, offering a transferable and assessable operational paradigm for future curriculum reform.

Future work may be further advanced in the following four directions.

- (1) Promoting empirical teaching research by implementing small-scale trials in real classroom settings, integrating student behavioral data with process-based evaluation to develop a quantitative assessment system, and scientifically verifying the effectiveness and scalability of the AITL model;
- (2) Strengthening the platform’s data-integration capabilities by enabling data interoperability between the teaching platform and operational systems such as railway dispatching and equipment monitoring, thereby constructing an integrated cycle of “data–model–decision–feedback” to enhance the real-time and authentic nature of instructional training;
- (3) Exploring vehicle–infrastructure coordination and multimodal transport scenarios under the framework of intelligent transportation systems, extending instructional scenarios from railway transportation alone to integrated transport systems, and cultivating students’ abilities in system-level planning and coordinated optimization for future multimodal environments <sup>[11]</sup>.
- (4) Deepening interdisciplinary teaching mechanisms by refining collaborative-teaching models involving university faculty and industry experts, systematically exploring pathways for integrating AI technologies into railway-specialty courses, and promoting dynamic optimization and systematic upgrading of the curriculum.

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# A Study on the Construction Paths for a Positive Academic Ethos in Universities under the “Five-Education Paralleled” Policy

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**Abstract:** Academic ethos is the very foundation of a university and a key metric of its educational quality. Under the guidance of the “Five-Education Integration” policy, although the construction of academic ethos in universities has been incorporated into core work, prominent issues persist, such as the fragmentation of the five educational elements, an excessive emphasis on intellectual education, and scattered construction measures. Supported by the Marxist theory of comprehensive human development, collaborative governance theory, and educational evaluation theory, this study deeply analyzes the internal correlation between the “Five Educations” and the construction of academic ethos, sorts out the practical dilemmas in their current integration process, and explores specific construction paths.

**Keywords:** Five-education paralleled; University academic ethos construction; Fostering virtue through education; Collaborative education

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## 1. Introduction

In the new journey of building a modern socialist country in all respects, education, as a fundamental plan for the nation and the Party, always has the fundamental task of fostering virtue and nurturing talent. “Five-Education Integration”, as a core concept for deepening education and teaching reform, is not only a breakthrough in traditional education models but also sets new contemporary requirements for the construction of academic ethos in universities.

Academic ethos is the foundation of a university’s operation and the soul of its development, centrally embodying the university’s spirit and core values. It is not only a scholarly and learning atmosphere jointly shaped by faculty and students but also a key benchmark for measuring the effectiveness of education and the quality of talent cultivation. Its construction effectiveness directly relates to whether the goal of the “Three-All Approach” (all personnel, all processes, all dimensions) can be realized<sup>[1]</sup>. A positive academic ethos can stimulate students’ intrinsic motivation for learning, improve the quality of talent cultivation, and also cultivate campus civilization and promote the connotative development of universities. Deeply integrating the “Five-Education Integration” concept into the construction of academic ethos, leading value orientation through moral education, consolidating the academic foundation through intellectual education, strengthening



physical and mental support through physical education, cultivating humanistic character through aesthetic education, and tempering practical ability through labor education, to build a multi-dimensional, synergistic academic ethos ecosystem has become both the inherent logic and the imperative of higher-education reform in the new era.

Currently, although universities in China generally regard the construction of academic ethos as key to their operation, they still encounter many structural difficulties in the practice of deep integration of the “Five Educations”. Some universities continue the traditional inertia of “emphasizing intellectual education while neglecting physical, aesthetic, and labor education”, with academic ethos construction mostly revolving around academic performance, leading to the inability of the five educations to form a joint educational force; other universities lack long-term planning for academic ethos construction, often resorting to short-term, campaign-style measures. When faced with the impact of campus subcultures like “lying flat” and “involution”, they often fall into passivity due to inadequate response mechanisms<sup>[2]</sup>.

Against this backdrop, exploring the construction of a positive academic ethos in universities from the perspective of “Five-Education Integration” holds significant theoretical and practical importance. Although existing research has separately discussed the connotations of the “Five Educations” and the paths for academic ethos construction, systematic research in the intersectional field of the two is still in an exploratory stage, suffering from shortcomings in theoretical construction<sup>[3-5]</sup>. Simultaneously, by focusing on the current deficiencies in synergy and integrity in academic ethos construction, it explores operable path solutions to provide specific guidance for universities in optimizing the top-level design of academic ethos construction, helping to solve practical problems such as the disconnection between teaching and educating, and students’ insufficient intrinsic motivation for learning<sup>[6,7]</sup>.

## 2. Core concept definitions and theoretical foundations

“Five-Education Integration” is the core of the educational policy with Chinese characteristics in the new era. It is not a simple superposition of moral, intellectual, physical, aesthetic, and labor education, but an organic whole aimed at the fundamental goal of “promoting the comprehensive development of people”, emphasizing that each education dimension mutually permeates the others to form a synergistic whole. A positive academic ethos in universities is a core component of campus culture, a concentrated expression of the common learning attitudes, behavioral habits, and value pursuits formed by all faculty and students in long-term educational, teaching, and academic activities.

From a theoretical perspective, the construction of a positive academic ethos in universities under the “Five-Education Integration” framework needs to be supported by three core theories.

The Marxist “theory of comprehensive human development” is the fundamental guide. This theory holds that human development is the unified development of physical and mental faculties, morality and aesthetics, labor ability, and comprehensive qualities, opposing the fragmentation and one-sidedness of human development. “Five-Education Integration” is the concrete embodiment of this theory in the educational practice of the new era.

Collaborative governance theory is an important methodology. This theory emphasizes the formation of governance synergy to solve complex problems by integrating diverse actors, coordinating multi-party resources, and improving collaborative mechanisms. It requires leveraging collaborative governance theory to build cross-departmental and cross-field collaboration mechanisms, break down resource barriers and departmental divisions, and ensure that the “Five Education” elements can be systematically integrated into all links of academic ethos construction<sup>[8]</sup>.

Educational evaluation theory is the key guidance. This theory requires universities, in their evaluation of academic ethos, to include the value expression of moral education, the effectiveness of physical training, the level of aesthetic literacy, the practical results of labor education, and the academic performance of intellectual education into the evaluation scope. Through scientific evaluation, it guides faculty and students to attach importance to the synergy of the “Five Educations”, thereby promoting the formation and consolidation of a positive academic ethos<sup>[9]</sup>.

### 3. The internal correlation between “five-education integration” and university academic ethos construction

“Five-Education Integration”, as the core concept of educational reform in the new era, has a profound internal correlation with the construction of academic ethos in universities, the two are highly isomorphic in their educational goals, both pointing to the realization of the fundamental task of “fostering virtue and nurturing talent”.

From the value dimension, moral education, as the foremost of the “Five Educations”, provides direction and guidance for the construction of academic ethos. The education on ideals and beliefs and academic moral norms it contains can guide students to establish a value orientation of “learning for national development and social progress”, fundamentally reversing the utilitarian tendency of learning motivation and solidifying the spiritual foundation of academic ethos construction; intellectual education, as the core carrier of academic ethos construction, directly shapes students’ learning behavior of “diligent learning, good thinking, truth-seeking, and earnest practice” through professional knowledge transmission and academic ability cultivation <sup>[10]</sup>.

From the dimension of functional complementarity, physical education provides physical and mental guarantees for academic ethos construction. It extends the academic ethos from a “mere pursuit of knowledge” to a “comprehensive development with humanistic warmth”, preventing the academic ethos from falling into a rigid and mechanized trap; labor education, as the link between theory and practice, allows students to deepen their understanding of knowledge and enhance their ability to solve practical problems through forms of labor such as professional practice and social service <sup>[11]</sup>. At the same time, it cultivates a learning attitude of “respecting labor and being down-to-earth”, addressing the dilemma of “emphasizing theory over practice” in traditional academic ethos <sup>[12]</sup>.

From the perspective of synergistic coexistence, the driving force of “Five-Education Integration” on academic ethos construction is not a linear superposition of elements, but a networked ecological effect of mutual penetration and mutual empowerment (as shown in **Figure 1**). This ultimately achieves dual empowerment and synergistic efficiency between “Five-Education Integration” and academic ethos construction, building a university educational ecosystem where “comprehensive education” and “positive academic ethos” resonate in unison <sup>[13]</sup>.



**Figure 1.** Synergistic ecosystem for talent cultivation through “five-education integration”.

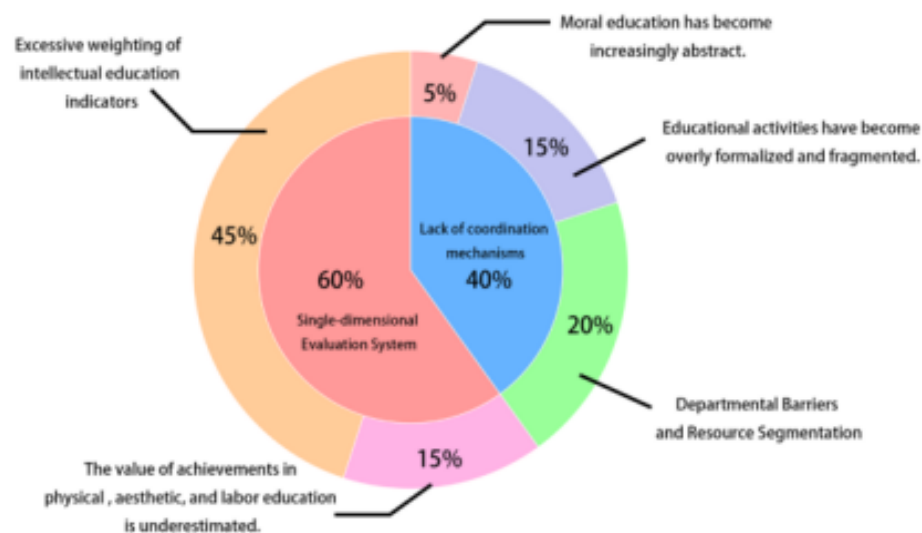
### 4. Current status and problems in university academic ethos construction

With the continuous advancement of the “Five-Education Integration” educational policy, the construction of academic ethos in universities has gradually broken through the limitations of the traditional singular intellectual education orientation and is exploring a multi-dimensional, synergistic educational direction. Most universities have recognized the core value of “Five-Education” integration for shaping academic ethos: At the moral education level, they attempt to strengthen value guidance through carriers such as “Curriculum Ideology and Politics” (Kecheng Sise) and thematic

education, aiming to solidify the spiritual foundation of academic ethos construction; in the field of intellectual education, they promote the connection between knowledge transmission and innovation ability cultivation through platforms like scientific research training and disciplinary competitions, which has, to a certain extent, activated students' enthusiasm for academic exploration; the educational functions of physical, aesthetic, and labor education have also received preliminary attention<sup>[14]</sup>. This aligns with the academic judgment that “under the background of ‘Five-Education Integration,’ the four-dimensional dynamic structure of academic ethos construction is gradually forming”<sup>[15]</sup>.

However, when examined against the requirements of deep integration of the “Five Educations”, current university academic ethos construction still faces many structural and deep-seated problems, which have been widely revealed in academic research<sup>[6,7]</sup>.

Lack of holistic synergy in the “Five Educations”. Most universities have not yet broken free from the inertia of “intellectual education dominance”. Teaching activities are concentrated on knowledge transmission and fail to effectively excavate the values of physical health, aesthetic elements, and labor practice within professional courses. This results in the nurturing and supporting roles of physical, aesthetic, and labor education on the academic ethos being unable to be fully exerted, forming a governance dilemma of “single-point breakthroughs but overall imbalance”. As shown in **Figure 2**, the singular nature of the evaluation system is the key root cause of this pattern evaluation standards centered on intellectual education indicators such as GPA and university admission rates have relegated physical, aesthetic, and labor education to “marginal links” in academic ethos construction.



**Figure 2.** Challenges faced by the integration of “five educations” in current university academic ethos construction.

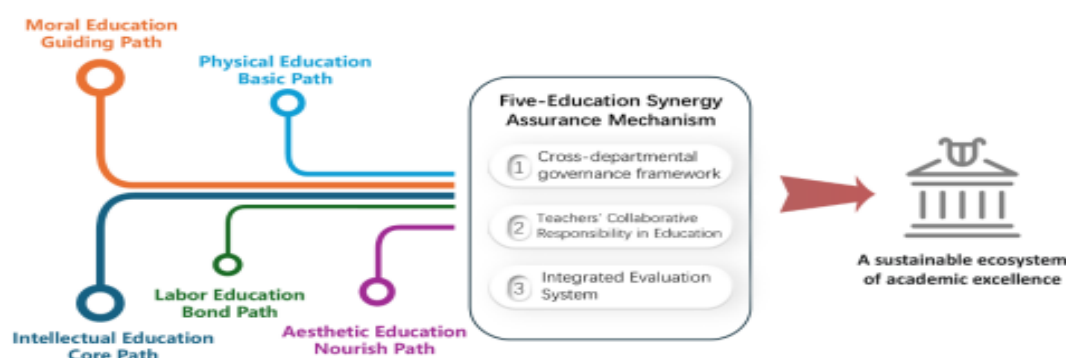
The guiding role of moral education has become abstract. Some universities fail to organically integrate moral education with academic cultivation. They either conduct moral education only through specialized ideological and political courses or completely ignore value guidance in professional teaching, leading to the weakening of moral education's spiritual support for the academic ethos.

Insufficient depth in the integration of physical, aesthetic, and labor education. Practices related to physical, aesthetic, and labor education mostly exist as scattered activities. Their educational effectiveness is often weakened due to uneven resource allocation and the form a listic nature of activities, failing to be truly internalized into students' learning habits and scholarly attitudes.

Absence of synergistic mechanism guarantees. The mechanisms required for “Five-Education” integration, such as cross-departmental collaboration, resource sharing, and evaluation incentives are not yet sound.

## 5. Path construction for a positive academic ethos in universities under “five-education integration”

The cultivation of a positive academic ethos requires the deep integration of the core values and practical requirements of moral, intellectual, physical, aesthetic, and labor education to form a unified, organic educational force, pushing the construction of academic ethos from external regulation to internal consciousness. As shown in **Figure 3**, this path system is a “Five-in-One” synergistic model.



**Figure 3.** The “five-in-one” synergistic path model for building a positive academic ethos under “five-education integration”.

### 5.1. Leading with moral education to solidify the value foundation of academic ethos construction

As the soul of “Five-Education Integration”, the core value of moral education lies in providing directional guidance and spiritual motivation for academic ethos construction, using value guidance to solve problems such as students’ utilitarian learning motives and weakened ideals and beliefs. This can be advanced in two aspects: First, deepen value guidance and education on ideals and beliefs. Universities need to use “Curriculum Ideology and Politics” as a starting point to promote the deep integration of ideological and political education with the characteristics of professional disciplines. Relying on “one-stop” student community education platforms, they should carry out thematic open classes on faith, such as “Inheriting the Revolutionary Spirit and Bravely Undertaking the Youth Mission”, and organize advocacy activities like “Great Country Craftsmen Enter Campus”. Through the stories of model workers and craftsmen achieving success and serving the country with their skills, students are guided to closely link their personal studies with national needs and industry development. Simultaneously, build a three-tiered ideological guidance system featuring “college coordination—teacher leadership—role-model students”. Second, strengthen the academic integrity and behavioral norms system.

### 5.2. Centering on intellectual education to enhance the professional quality of academic ethos construction

As the core carrier of academic ethos construction, universities need to transition from “knowledge transmission” to “ability cultivation” through teaching reform, research integration, and precise support, building an academic ecosystem of “loving learning, being good at thinking, seeking truth, and innovating”. Specific paths include: First, deepen innovation in teaching content and methods. Second, construct an integrated system of “teaching—research—competition”. Increase the openness of key laboratories and research platforms to undergraduates, implement the “Undergraduate Research Training Program”, support students in participating in faculty research projects, and encourage the formation of interdisciplinary science and innovation teams; simultaneously, rely on disciplinary competitions to build an “promoting learning through competition” platform, combining competition requirements with course objectives, and guiding students to enhance their innovation and teamwork abilities during competition preparation. Third, improve precise academic support services. Build a full-chain support system of “learning situation diagnosis—early warning intervention—tracking feedback” based



on data analysis.

### **5.3. Grounding in physical education to enhance the physical and mental support for academic ethos construction**

Physical education provides physiological and psychological guarantees for sustained and efficient learning by tempering willpower and cultivating team spirit. Its core lies in internalizing physical exercise into students' conscious habits and lifestyles. This can be approached from two aspects: On one hand, build a diversified system of physical education courses and activities. In addition, normalize activities like "morning run check-ins", "fun sports meets", and "campus hiking check-ins". Combine physical exercise with community cultural construction, for example, by forming "sports groups" based on dormitories to create an atmosphere of mutual assistance in exercise. On the other hand, establish a process-oriented physical education evaluation and incentive mechanism. Change the tendency in traditional PE evaluation to "emphasize final tests over daily process". Incorporate indicators such as morning exercise participation rates, sports club activity duration, and physical health standard compliance progress into the student comprehensive quality evaluation, assigning a certain credit weight.

### **5.4. Nurturing with aesthetic education to enhance the humanistic literacy of academic ethos construction**

Aesthetic education enriches the spiritual connotation of the academic ethos through aesthetic experience and cultural immersion, cultivating students' innovative thinking and humanistic sentiment, and achieving the educational effect of "supplementing virtue with aesthetics, transforming people with aesthetics". This can be promoted through two main paths: First, promote the deep integration of aesthetic education and professional courses. At the same time, invite experts from the art field to give special lectures such as "Intangible Cultural Heritage and Aesthetic Innovation". Second, create an immersive campus aesthetic education atmosphere. By transforming aesthetic skills into social services, deepen the understanding of "beauty and responsibility" and thereby cultivate a learning attitude of "seeking truth, admiring beauty, and striving for excellence".

### **5.5. Bonding with labor education to strengthen the practical orientation of academic ethos construction**

As the bridge connecting theory and practice, the core value of labor education lies in cultivating students' pragmatic work style and sense of responsibility through labor practice, addressing the academic ethos deviation of "emphasizing theory over practice, knowledge over skills". This can be advanced in two aspects: On one hand, build a "professional + labor education" characteristic practice system. Design differentiated labor practice content according to the professional characteristics of different disciplines, allowing labor education and professional learning to be linked. On the other hand, improve the labor education evaluation and incentive mechanism. Formulate "Detailed Rules for Evaluating Student Labor Literacy", converting indicators like labor practice duration, quality of results, and reflection reports into quantifiable "labor credits" and incorporating them into the comprehensive quality evaluation system; promote selection activities like "Labor Star" and "Practice Expert", strengthening positive incentives through forms like "labor achievement exhibitions" and "practice experience sharing sessions"; at the same time, establish labor literacy files as an important reference for awards, evaluations, and internship recommendations, guiding students to form a learning style of "respecting labor and being diligent in practice".

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# An Empirical Study on the Characteristics of the Number of Bicycles Parked on Blind Paths in Beijing and the Optimization of Urban Road Distribution Based on Mathematical Models

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**Abstract:** To address the issue of the lack of protection of the rights of visually impaired people due to the occupation of blind paths by shared bikes in Beijing, this study, based on spatial analysis and mathematical modeling methods, integrates multi-source data to explore the spatio-temporal characteristics and distribution patterns of bike parking on blind paths. Through comparative analysis of different areas such as the core area, suburbs, and areas around subway stations, the spatial differences and key influencing factors of the occupancy rate of blind paths were identified, and a three-dimensional optimization model of “demand-facility-policy” was constructed. The study found that the occupancy rate of blind paths within 1 km of metro hubs and CBDS was recorded 47–62% higher than in other areas, and the rate of illegal parking in areas covered by electronic fences decreased by more than 80%. Based on the empirical results, a road optimization plan of “zoned control + technology empowerment + supply and demand matching” is proposed to provide theoretical support and practical paths for balancing barrier-free access and the development of shared bikes.

**Keywords:** Road space optimization; Government-enterprise collaborative governance; Barrier-free access guarantee

**Online publication:** August 26, 2025

## 1. Introduction

### 1.1. Research background

Blind paths, as a core component of urban accessibility facilities, are the “lifeline” for safeguarding the travel rights of visually impaired people. Since the implementation of the Law on the Construction of Barrier-Free Environment, the coverage rate of blind paths in Beijing has reached a relatively high level, with the coverage rate of blind paths on main and secondary roads in the core area reaching 98%<sup>[1]</sup>.

However, with the popularization of shared bikes, although the “last mile” travel problem has been solved, the problem of random parking has not been completely solved, and the occupation of blind paths has become a common occurrence - the occupancy rate of blind paths at stations such as Qianmen Subway Station and Huixin West Street South Entrance Station often reaches 100%, which seriously neglects and threatens the safety of the visually impaired.

Current research has mostly focused on a single dimension, either on the standardization of the blind path facilities themselves, or on the optimization of shared bike scheduling, lacking a systematic empirical analysis of the spatial conflict between the two <sup>[2]</sup>.

This study quantifies conflict features through mathematical modeling, providing a new perspective for the refined allocation of urban road space resources, with dual values of social equity guarantee and traffic efficiency improvement.

## 1.2. Subjects and scope of study

Focusing on the spatial relationship and management system of blind paths and shared bikes within the Beijing metropolitan area, it covers the functional areas of six major urban districts (Dongcheng, Xicheng, Chaoyang, Haidian, Fengtai, Shijingshan). A range of 500 meters around 42 key subway stations (such as Xizhimen Station and Qingnian Road Station) and 1km around core business districts such as Wangfujing CBD and Financial Street, covering high-density office and commercial POI clusters. Daily data for typical quarters of 2024 (March to May, September to November) were also selected to focus on the differences in parking during peak hours (7:00–9:00, 17:00–19:00) and off-peak hours, in line with the need to track trends in the occupancy rate and complaint rate of the blind path, taking into account both the typicality of the problem and regional differences.

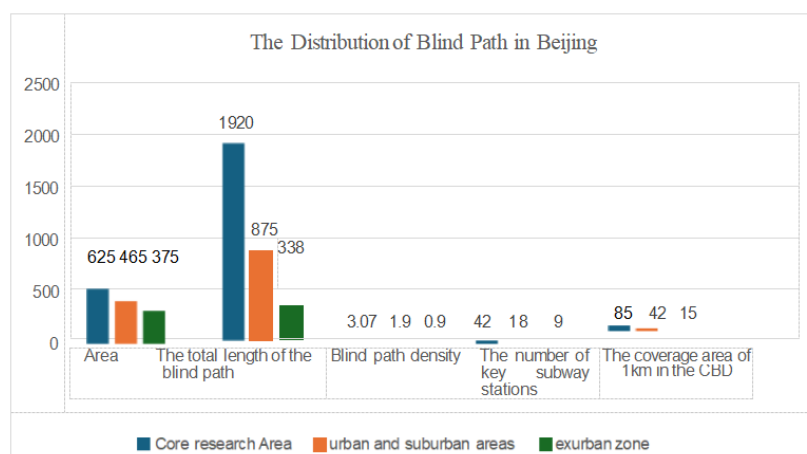
## 1.3. Research methods and data sources

A combined approach of data research and modeling was adopted: New vehicle and usage data were obtained through publicly available government data and census data of blind path facilities from the Chinese Academy of Sciences and Beijing University of Civil Engineering and Architecture; real data were obtained by measuring occupancy rates at 42 key subway stations in different time periods from 2023 to 2025 and by analyzing parking volume and illegal parking rates in governance cases such as Songjiazhuang Hub and Jiuxianqiao Sub-district. Use Excel and Python Scikit-learn to organize the data and build a model quantified by the distribution trend factor.

# 2. Distribution data of shared bikes and blind paths

## 2.1. Data on the distribution of blind paths

According to **Figure 1**, the distribution of blind paths in Beijing shows a significant gradient of urban functions, forming a decreasing pattern of “core - near suburbs - far suburbs”, which is highly matched with the regional population density and the concentration of core functions. This difference is in line with the orientation of “Priority for barrier-free access in the core area” in urban planning and is highly matched with the regional population density and the concentration of core functions.



**Figure 1.** The distribution of blind path in Beijing.

## 2.2. Shared bike distribution data

There is a total of three operating enterprises in the city (Meituan, Hellobike, and Didi Qiguo). In 2024, the cumulative number of rides throughout the year reached 1.144 billion, with an average daily riding volume of 3.1258 million, representing a year-on-year growth of 5.12%. In 2024, the average daily turnover rate of vehicles was 3.31 times, with an average daily operation and maintenance force of 2,791 people and an average daily vehicle dispatch of 177,000 times.

## 3. Distribution trends

### 3.1. Time dimension

#### 3.1.1. Intraday fluctuations

Two peaks are formed during the morning rush hour (7:00–9:00) and the evening rush hour (17:00–19:00), and the occupancy rate of the blind path is 3–4 times higher during the peak period than during the off-peak period. Take Songjiazhuang subway station as an example. During the morning rush hour, there are more than 1,400 bicycles parked around the blind path, and more than 30% of them occupy the space of the blind path<sup>[3]</sup>.

#### 3.1.2. Annual changes

Over the past five years, the problem of occupation of the blind path has shown a trend of “first worsening and then improving”. From 2019 to 2022, the proportion of unpressurized blind paths in the core area dropped from 78% to 65% due to the surge in the number of bicycles deployed<sup>[4]</sup>. After 2023, with the promotion of electronic fence technology and the launch of the “100-day Campaign”, the proportion of unpacked bikes rebounded to 72%, and the number of complaints dropped by 23.9%.

### 3.2. Spatial dimensions

#### 3.2.1. Circle distribution

With CBD as the core, it presents a “dense core-decreasing periphery” circle structure. The average occupancy rate of the blind path within 1 km of the CBD was 58%, dropped to 32% within 1–3 km, and was less than 15% beyond 3 km, confirming the significant impact of commercial activity intensity on parking behavior<sup>[5]</sup>.

#### 3.2.2. Node aggregation

High-value clusters formed around transportation hubs and public service facilities. Within 500 meters of 42 key subway stations, the occupancy rate of blind paths is 62% higher than that in non-node areas, with the most prominent problem being at hub points such as Songjiazhuang Station and Xizhimen Station where the three rail lines converge.

#### 3.2.3. Regional differences

The occupancy rate of blind paths in the core areas (Dongcheng and Xicheng) (47%) is significantly higher than that in the suburbs (Tongzhou and Daxing) (18%), but the combined problem of “dead-end” and occupation of blind paths in the suburbs is more prominent.

## 4. Overview of the differences and reasons

### 4.1. Regional parking differences

**Table 1.** Regional parking differences

Comparison dimensions	Core area	Suburban areas (Tongzhou, etc.)	Far suburbs (DaxingHuangcun, etc.)
Blind path density km/km <sup>2</sup> 3.2		1.8	0.9
Occupancy rate of blind paths at subway entrances (%)	68	41	23
Frequency of illegal parking within 1 km of CBD	12.3 times per day	5.7 times a day	2.1 times a day
Electronic fence coverage (%)	92	65	38
Response time (minutes)	15–30	30–60	60–90

## 4.2. Analysis of key causes of regional parking differences

### 4.2.1. Imbalance between supply and demand

The parking space gap around the subway entrances in the core area is 40–60%, and the seven exits of Songjiazhuang Station can only meet 50% of the parking demand, causing users to “squeeze in” the blind paths<sup>[6]</sup>. While there is ample space in the suburbs, there is both insufficient and uneven distribution of bicycles, which leads to illegal parking in some areas.

### 4.2.2. Location and function differences

The core area is densely populated with commercial and office POIs, with an average daily footflow of 30,000 to 50,000 people. The shared bike turnover rate is 2.8 times that of the suburbs, and the short-term parking pressure far exceeds the carrying capacity of the facilities. Hospitals, scenic spots and other locations have peak occupancy periods due to concentrated dwell times<sup>[7]</sup>.

### 4.2.3. Policy implementation gradient

More than 90% of key locations in the core area have been covered by electronic fences, and illegal parking will face non-lock-up and joint disciplinary actions; In the suburbs, the coverage rate offences is less than 40%, and the human operation and maintenance force is weak, resulting in the weakening of policy binding force.

### 4.2.4. Facility planning flaws

The blind paths in some areas are unreasonably designed (e.g., the blind path at Heping West Bridge subway station turns 6 times every 5 meters), which overlaps with the parking demand area and poses an inherent conflict risk; The lack of connection between the new and old urban blind paths further exacerbates the parking chaos.

## 5. Discussion and suggestions

### 5.1. Core findings

#### 5.1.1. Effectiveness of technical means

Electronic fence systems play a decisive role in regulating parking. After the implementation offence management in Jiuxianqiao Sub-district, the occupancy rate of blind paths dropped from 67% to 12%; Songjiazhuang Hub has achieved a fundamental improvement in the problem of random parking through the “fence + sniffing + operation and maintenance linkage” model, confirming that technology empowerment is the core path to conflict mitigation.

#### 5.1.2. Significance of impact factors

Geodetector analysis shows that the number of residential POIs (explanatory power  $q = 0.68$ ), distance from subway stations ( $q = 0.62$ ), and coverage of electronic fences ( $q = 0.57$ ) are the three dominant factors affecting the occupancy rate



of blind paths, consistent with the research conclusion of the Institute of Geography of the Chinese Academy of Sciences on the characteristics of shared single vehicle sources <sup>[8]</sup>.

### **5.1.3. The significance of policy coordination**

The “100-day Campaign” of the Municipal Commission of Transport and the implementation of enterprise operation and maintenance responsibilities have formed a synergy, achieving a favorable situation where “the number of rides increased by 3.84% while the number of complaints decreased by 23.9%”, indicating that single governance is difficult to be effective and a multi-subject coordination mechanism needs to be established <sup>[9]</sup>.

## **5.2. Future urban spatial planning optimization scheme**

### **5.2.1. Zoned and classified layout of parking spaces**

Within 1 km of the CBD in the core area, adopt the “densified electronic fence + three-dimensional parking” model, referring to the experience of Tiantan East Gate Station, add one dedicated parking area every 50 meters, with capacity configured 1.2 times the peak demand <sup>[10]</sup>. In the suburbs, the “dispersed layout + shared parking space” model is adopted, and tidal parking spaces are set up in the idle spaces of residential areas and commercial complexes.

### **5.2.2. Separation of blind paths from parking spaces**

Re-plan blind path routes to avoid high-frequency parking areas such as subway entrances and shopping mall entrances <sup>[11]</sup>. For built sections, a rigid protective boundary is formed by physical isolation measures such as adding barrier posts and raising the edge of the blind path <sup>[12,13]</sup>.

### **5.2.3. Special design for hub nodes**

For a three-rail junction hub like Songjiazhuang, a “bicycle parking area at the station exit” is planned to be setup, with multiple bicycle racks 3 meters away from the blind path and an operation and maintenance dispatch center for real-time dredging.

### **5.2.4. Technology in coordination with parking control**

Promote the “Bluetooth Road studs + high-altitude sniffing” system, and implement non-lock-up, charging and credit punishment mechanisms for parking in no-parking zones.

### **5.2.5. Reward system to stimulate public participation**

Promote the “clearing illegal parking for cycling vouchers” mechanism and setup a “barrier-free supervision” mini-program to receive citizens’ reports.

## **5.3. Limitations of research**

### **5.3.1. Data availability constraints**

There is a lack of continuous monitoring data on blind path parking across the city. Existing analyses rely on typical site surveys and historical data inferences, making it difficult to achieve refined spatio-temporal modeling. The publicly available Mobike data only covers a short-term sample from 2017 and does not reflect the policy impact in recent years.

### **5.3.2. Model simplification**

Quantification of commuting demand uses an average assumption of “40 km/day”, without considering travel differences among different occupations and age groups; The influence of random factors such as weather and holidays on parking behavior was not included <sup>[14,15]</sup>.

### 5.3.3. Insufficient scheme validation

The optimization proposals are based on the generalization of existing cases and model deduction, lacking empirical tests from large-scale pilot projects, and their suitability in different regions needs further validation.

## Disclosure statement

The author declares no conflict of interest.

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# The Internal Logic and Path Exploration of News Communication in the Era of Intelligent Media

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**Abstract:** The advent of the intelligent media era has profoundly transformed the landscape of news dissemination. This paper conducts an in-depth analysis of the inherent logic of news communication in this new age, examining its characteristics through technological empowerment and evolving user demands. It addresses pressing challenges including the proliferation of misinformation, algorithmic bias, and privacy security issues in contemporary news dissemination. The study proposes optimization strategies focusing on technological innovation, content quality enhancement, reconfiguration of user relationships, and empowerment through media literacy education. By emphasizing the foundational role of educational initiatives in strengthening the communication ecosystem, this research aims to provide theoretical support and practical guidance for the healthy development of news dissemination in the intelligent media era. These efforts seek to better serve societal needs and audiences while adapting to evolving demands of our time.

**Keywords:** Intelligent media era; News communication; Internal logic; Exploration of meaning; Problems; Strategies; Media literacy education

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**Online publication:** August 26, 2025

## 1. Introduction

With the rapid advancement of emerging technologies like artificial intelligence, big data, and the Internet of Things, the news media landscape has entered the intelligent media era. These smart technologies have deeply integrated into every aspect of news production, distribution, and reception, fundamentally reshaping the ecosystem of information dissemination. While the era of intelligent media has achieved unprecedented expansion in speed, reach, and depth of news coverage, it also presents new challenges and issues. A thorough examination of the inherent logic and development pathways of news communication in this era, particularly optimization strategies incorporating educational dimensions holds significant importance for understanding industry trends and driving innovation and transformation in the field.

## 2. The significance of news communication research in the era of intelligent media

### 2.1. Theoretical significance

Enriching the theoretical framework of journalism and communication studies. The era of intelligent media has introduced

groundbreaking communication models and phenomena such as algorithmic recommendations and AI-powered content creation. Researching these emerging trends not only expands the scope of journalism studies but also infuses traditional theories with fresh perspectives, driving theoretical innovation and development. By analyzing the operational mechanisms of intelligent technologies, which deepen the understanding of fundamental theoretical issues like the communicator-audience relationship and information flow dynamics<sup>[1]</sup>. Furthermore, integrating media literacy education into research frameworks will help refine the theoretical system of communication studies within the context of intelligent media.

This interdisciplinary framework creates opportunities for cross-disciplinary research. In the age of smart media, news communication integrates multiple fields including computer science, data science, and sociology. The incorporation of media literacy education further highlights the cross-disciplinary value of pedagogy and psychology. Such research breaks down disciplinary barriers, providing comprehensive theoretical perspectives and research methodologies to address complex real-world challenges<sup>[2]</sup>.

## **2.2. Practical significance**

To guide the transformation and development of news media. Traditional news media face intense competition in the era of intelligent media and need to explore new growth areas through digital and intelligent reforms. Relevant research can provide practical guidance for media organizations to utilize smart technologies to optimize production processes and enhance content quality. It also clarifies the integration path of media literacy education, helping media leverage educational functions and strengthen industry competitiveness.

Enhancing the professional competence of journalists. The era of intelligent media imposes a composite requirement of “professional skills + technical literacy + educational awareness” on journalists. They must not only master traditional news gathering and editing techniques but also possess technical application and data analysis capabilities, while being able to guide audiences in improving media literacy<sup>[3]</sup>. Relevant research can clarify the development direction of practitioners’ competencies, promote reforms in journalism education, and cultivate high-quality talents that meet the demands of the new era.

Protecting public information rights and enhancing media literacy. In the age of smart media, citizens face challenges like information overload and rampant misinformation. Thorough research on communication pathways helps regulate dissemination patterns and improve information quality. By integrating media literacy education, we can empower people to discern information and protect privacy, safeguard their right to access authentic and valuable content, and ultimately promote social information equity.

## **3. Problems in news communication in the era of intelligent media**

### **3.1. False information and reduced information credibility**

In the age of smart media, information spreads rapidly with low barriers to entry. Some self-media outlets fabricate fake news to boost traffic, while intelligent algorithms fail to effectively identify misinformation, fueling its proliferation. For instance, after trending events, unverified rumors quickly emerge online, misleading public perception and undermining media credibility<sup>[4]</sup>. Compounding this chaos is the public’s insufficient media literacy and lack of discernment in identifying false information.

### **3.2. Algorithmic bias and information narrowing**

Algorithmic recommendation has become the cornerstone of news distribution in the intelligent media era. However, data biases and poorly designed algorithms often lead to recommendation bias. Some systems excessively promote homogeneous content, trapping users in “information cocoons” that restrict access to diverse information sources, thereby limiting public cognitive horizons and compromising the quality of social information exchange<sup>[5]</sup>. As audiences lack understanding of algorithmic logic, they struggle to break free from algorithmic constraints, underscoring the urgent need

for media literacy education.

### **3.3. Privacy infringement and data security issues**

The news dissemination process involves the collection, storage, and analysis of massive user data. However, some media and platforms have vulnerabilities in data management, leading to privacy breaches. Unscrupulous businesses illegally exploit private data for marketing and fraud, while cross-border data flows also pose potential risks<sup>[6]</sup>. Furthermore, users' weak data security awareness and lack of self-protection capabilities have become key factors contributing to the frequent occurrence of privacy violations.

### **3.4. Journalism professionalism is under attack**

Smart technologies have automated and fragmented news production processes. Some practitioners have become overly reliant on these tools, leading to weakened fundamental skills like interviewing and investigative reporting. Media outlets prioritize timeliness over truthfulness and objectivity<sup>[7]</sup>. Robot-generated articles often lack depth and humanistic touch, failing to meet audiences' demand for high-quality journalism. Meanwhile, journalism education has lagged behind industry development, with curricula failing to adequately integrate technology applications and media literacy education. This disconnect between talent cultivation and practical needs has created a significant gap in the field.

## **4. Optimization strategies of news communication in the era of intelligent media**

### **4.1. Technological innovation and rational application**

To advance AI technology development and application, news media should increase investments in artificial intelligence, refine robot-generated content algorithms, and leverage technologies like image recognition and video analysis to enhance production quality and efficiency<sup>[8]</sup>. Simultaneously, optimizing algorithmic recommendation systems through human oversight will establish a content review mechanism. This ensures diverse and objective recommendations while empowering users with autonomous selection rights, effectively breaking through the "information cocoon"<sup>[9]</sup>.

By exploring the integration of emerging technologies, leveraging blockchain to enhance news traceability and ensure content authenticity and immutability, while utilizing VR and AR to boost immersive journalism experiences<sup>[10]</sup>. By embedding educational elements into tech applications, such as pairing algorithmic recommendations with privacy protection and information verification content, and transform technology into a vehicle for media literacy education.

### **4.2. Content and quality improvement**

Adhere to the principle of news authenticity, establish and improve a strict information verification mechanism, and conduct cross-verification from multiple angles on news leads and interview content<sup>[11]</sup>. Be alert to the risk of false information brought by intelligent technology, and strengthen the professional judgment and ethics of practitioners.

By prioritizing in-depth reporting and exclusive content creation by organizing professional teams to investigate trending events and social issues, crafting premium content with core competitive advantages<sup>[12]</sup>. By leveraging our media strengths, we implement differentiated content strategies to establish a unique brand identity<sup>[13]</sup>. Furthermore, we integrate media literacy education into our content, such as explaining algorithmic principles and misinformation identification methods in news reports, thereby maximizing the educational value of our content.

Strengthen the humanistic care of news, pay attention to the audience's emotions and needs, and abandon the distorted mentality of putting traffic first<sup>[14]</sup>. In disaster coverage, respect the feelings of victims and spread information through a warm and humane perspective to achieve social value appreciation<sup>[15]</sup>.

### **4.3. User relationship reconstruction and education guidance**

Establish a robust user feedback mechanism to collect suggestions through social media, comment sections, and surveys,



enabling timely adjustments to communication strategies<sup>[16]</sup>. Encourage user participation in news production by launching initiatives like ‘Citizen Journalists’ to leverage user-generated content (UGC), thereby enhancing user engagement and fostering a sense of community<sup>[17]</sup>.

Target users’ personalized needs through big data analysis of their interests and behavioral patterns to develop customized communication strategies<sup>[18]</sup>. Implement differentiated media literacy education for different demographics: deliver cybersecurity awareness through short-form videos for teenagers, and provide guidance on identifying misinformation for middle-aged and elderly groups, thereby enhancing educational effectiveness.

An interactive platform for user education will be established. Media can popularize knowledge about information identification, privacy protection and algorithm cognition to users through online lectures, interactive questions and answers, public service advertisements and other forms, so as to improve the media literacy of the whole people.

#### **4.4. Industry norms and supervision improvement**

To establish industry standards for news dissemination in the era of intelligent media, news industry associations should clarify regulatory requirements for production, distribution, and data usage processes, while formulating algorithm recommendation industry standards to ensure algorithmic fairness<sup>[19]</sup>. Relevant government departments should improve regulatory mechanisms, intensify crackdowns on illegal activities such as disinformation and privacy violations, and standardize data collection, storage, transmission, and usage practices<sup>[20]</sup>.

To strengthen industry self-regulation, media organizations should establish content review committees and data security management systems to protect user data<sup>[20]</sup>. Simultaneously, reforms in journalism education should be promoted. Universities should optimize curriculum design by introducing courses such as artificial intelligence applications, algorithm ethics, and media literacy education, while enhancing practical teaching to cultivate versatile professionals with professional expertise, technical competence, and educational awareness.

To establish a comprehensive media literacy education system, we will create an educational framework characterized by “government leadership, media promotion, school implementation, and social collaboration”. The government will introduce supportive policies and enhance resource allocation. Schools will integrate media literacy education into the national education system, cultivating students’ ability to discern information and use it safely from the foundational education stage. Media organizations will leverage their platform advantages to provide high-quality educational resources. Through collective participation from all sectors of society, we will foster a positive educational environment.

In summary, the era of intelligent media has brought tremendous opportunities for news dissemination while presenting significant challenges. To promote healthy development in news communication, we must implement comprehensive measures including technological innovation, content quality enhancement, user relationship restructuring, and industry regulation improvements. Of particular importance is integrating media literacy education throughout the entire communication process. By refining educational systems, strengthening content education functions, and establishing interactive educational platforms, we can elevate public media literacy. Only through the coordinated efforts of technology, content, and education can news dissemination better fulfill its social functions in the intelligent media era, effectively promoting information dissemination and fostering harmonious social development.

#### **Disclosure statement**

The author declares no conflict of interest.

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# Intelligent Agent Programming Platform Empowering Project-Based Learning: A Practical Study for Non-Majors

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**Abstract:** Aiming at the programming technical barriers faced by non-major students in AI literacy education courses, this paper constructs an integrated “demand-technology-outcome” teaching framework with the intelligent agent programming platform as the core tool, combined with the concept of project-based learning. By analyzing the pain points of non-major students in programming learning, a teaching process of “intelligent agent assistance + interdisciplinary collaboration” is designed, and a multi-dimensional intelligent evaluation system is established. With non-major students in normal universities as the practice objects, this model can significantly reduce the threshold for programming entry, improve students’ creative transformation ability and team collaboration literacy, and provide a replicable practical path for AI literacy education of non-major students in higher education.

**Keywords:** Intelligent agent programming platform; Project-based learning; Non-majors; AI literacy education; Vibe coding

**Online publication:** August 26, 2025

## 1. Introduction

In the context of digital transformation, programming ability has become a basic literacy for interdisciplinary innovation. The Ministry of Education’s “Action Plan for Artificial Intelligence Innovation in Colleges and Universities” clearly requires “promoting the integration of artificial intelligence with other disciplines and professional education”. However, programming learning for non-computer majors still faces three contradictions: first, the disconnection between the “grammar-first” knowledge teaching model in traditional teaching and students’ “application-oriented” learning needs; second, the conflict between complex development environment configuration and beginners’ technical fear; third, the gap between single course learning and real scene problem-solving ability training.

The emergence of intelligent agent programming platforms provides new possibilities for solving the above contradictions. Such platforms reduce programming technical thresholds through intelligent functions such as natural language interaction, automated code generation, and real-time error repair. Wu Yishun’s research based on the Coze platform shows that intelligent agent-assisted teaching can effectively improve programming learning effects for cross-level students<sup>[1]</sup>. On this basis, this study focuses on non-major student groups, exploring how to deeply integrate intelligent agent programming platforms with project-based learning to build a new teaching paradigm of “learning by

doing and using”.

The innovations of this study are: first, proposing the concept of “lightweight PBL” for non-major students, decomposing complex projects into operable micro-tasks; second, establishing a collaborative mechanism between intelligent agent platforms and PBL, clarifying the enabling paths of AI in project topic selection, technical implementation, and outcome optimization; third, forming a transferable teaching implementation framework through empirical cases of innovation and entrepreneurship courses.

## 2. Core concepts

### 2.1. Project based learning (PBL)

Project-based learning is a student-centered teaching methodology whose core lies in guiding students to respond to real, complex problem challenges, and actively constructing knowledge and developing skills in the process of completing a complete project. A typical PBL process includes five key links: “determining the project-planning the scheme-implementing the inquiry-displaying the results-reflecting and improving”, forming a closed loop emphasizing iteration and growth.

Compared with the traditional teaching model focusing on knowledge imparting, PBL has three typical characteristics: situational authenticity, that is, projects originate from real problems in real life or professional fields; process inquiry, emphasizing students’ independent exploration and collaboration rather than passive acceptance of answers; result visualization, requiring the project to finally produce specific works that can be displayed and evaluated. For non-major students, PBL can effectively stimulate their intrinsic learning motivation and promote their in-depth integration and creative application of interdisciplinary knowledge, which is an ideal carrier for cultivating innovative ability<sup>[2]</sup>.

### 2.2. Intelligent agent programming platform (Vibe coding)

Vibe Coding is an AI-driven programming assistance platform specially designed for non-professional groups, integrating four core components: large language model (LLM), intelligent code generator, domain knowledge base, and real-time debugging tools, constructing a closed-loop support system of “natural language interaction-technical solution generation-full-process assistance”. Its core value lies in “reducing technical thresholds and focusing on creativity itself”. Through functions such as natural language to code conversion, automatic completion, and one-click operation, students without programming foundation can quickly realize their ideas. The zero-code prototype function of Vibe Coding platform can directly convert text descriptions into interactive interfaces, which can significantly reduce 65% of technical barriers. At the same time, based on the analysis of students’ learning behaviors, it provides accurate error prompts and optimization suggestions. The platform’s intelligent agent can simulate the role of a “one-on-one tutor”, providing scaffolding support when students get stuck instead of directly giving answers. It transforms the traditional “thinking-coding-debugging” serial process of programming into a parallel process of “conception-generation-iteration”, shortening the creative realization cycle.

## 3. Practice design

Based on the core characteristics of Vibe Coding intelligent agent programming platform and the learning laws of non-major students, a four-stage teaching implementation process of “project incubation-technical implementation-result optimization-display and reflection” is designed (**Figure 1**). Each stage constructs a collaborative mechanism of “teacher guidance + intelligent agent assistance + student leadership”, realizing a full-link closed loop of “creativity-prototype-result-growth” through cyclic iteration, solving the technical barriers, practice fragmentation and reflection absence problems of non-major students in PBL.



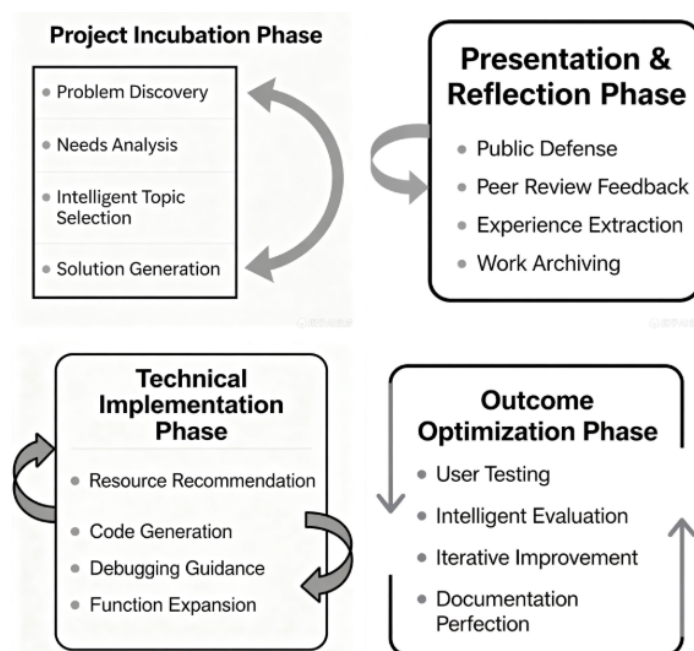


Figure 1. PBL teaching implementation flowchart for non-major students.

### 3.1. Project incubation phase

This phase focuses on the starting point of creative implementation from 0 to 1, helping non-major students avoid common problems such as “empty topic selection” and “low feasibility” through a three-step process of “direction guidance-intelligent evaluation-solution generation”. Teachers, together with “university-government-enterprise” collaborative ecological resources, build a multi-field topic selection direction library, covering three categories: social demand, professional integration, and hot innovation, associated with current policy orientation and industry trends. At the same time, teachers guide students to use the “user portrait method” to disassemble needs through case teaching. After students submit initial ideas, the intelligent agent programming platform conducts quantitative evaluation from three dimensions: feasibility, innovation, and value matching. After evaluation, a feasibility report is generated, marking the directions to be optimized. At the same time, based on the evaluated ideas, the intelligent agent automatically generates preliminary implementation plans, including functional module disassembly, technical path suggestions, resource lists, etc. Teachers make minor adjustments to the plan in this link, guiding students to supplement, ensuring that the plan has both innovation and implementability<sup>[3]</sup>.

### 3.2. Technical implementation phase

Aiming at the core pain point of “programming fear” among non-major students, this phase adopts a strategy of lightweight technical intervention, allowing students to understand technical logic in “learning by doing” rather than passively receiving code through the model of “core function priority-prompt guidance-independent selection optimization”. Teachers guide students to disassemble project functions according to the MVP (Minimum Viable Product) principle, giving priority to realizing core modules. Vibe Coding synchronously pushes the adapted code template library, classified by function, with natural language descriptions attached to each template, so that non-major students do not need to understand code syntax, but only need to select templates and supplement demand details. After generating initial code, if students encounter runtime errors, the intelligent agent programming platform adopts a three-step guidance method of problem location prompts, optimization idea guidance, and optional display of reference code instead of directly giving answers, avoiding the intelligent agent directly replacing students’ thinking. For projects requiring technical collaboration, the platform provides connection to source code collaboration management warehouses such as Gitee, supporting real-time code sharing and modification suggestion marking between non-major and major students.



### 3.3. Outcome optimization phase

This phase focuses on the iterative upgrade “from prototype to finished product”, helping non-major students improve project practicality and accumulate “problem-solving” methodology through “intelligent testing-cyclic improvement-knowledge precipitation”. After completing the core function development, the intelligent agent programming platform simulates real user scenarios for automated testing with optimization suggestions attached. After students make the first round of modifications according to the test report, they can submit the intelligent agent test again until core problems are solved. In this process, teachers focus on “non-technical optimization”, such as guiding students to conduct real user research and balancing “function richness” and “technical complexity”. For technical bottlenecks encountered in iteration, teachers can contact enterprise technical mentors to provide online guidance. Vibe Coding automatically records students’ iteration process and generates a personal knowledge base in the format of “problem description-solving steps-code modification records”. The knowledge base supports keyword retrieval, helping students form a closed loop of “encountering problems-solving problems-precipitating experience” and improving their ability to solve problems independently in the future.

### 3.4. Presentation and reflection phase

This phase breaks the traditional “teacher single scoring” model through “multi-dimensional evaluation-in-depth reflection-result archiving”, comprehensively measuring students’ ability growth, and laying a foundation for subsequent project optimization and result transformation. A multi-evaluation model of “teacher scoring + student mutual evaluation + intelligent agent evaluation + enterprise review” is adopted, and a comprehensive ability evaluation report is generated after evaluation, marking students’ strengths and areas for improvement. At the same time, the intelligent agent programming platform assists students in transforming results into intellectual property rights and innovation and entrepreneurship.

## 4. Conclusion and outlook

Based on the pain points of innovation and entrepreneurship education for non-major students, this paper constructs a teaching framework of intelligent agent programming platform empowering PBL. Through technical dimension reduction, ecological support, and evaluation optimization, it solves the problems of non-major students’ “difficulty in creative implementation, lack of practical guidance, and lack of result transformation”. This model can improve the technical implementation rate and result quality of non-major students, providing a new path for innovation and entrepreneurship education of non-major students in higher education.

Future research can be further deepened in the following aspects: first, exploring the adaptation strategies of intelligent agent platforms in PBL projects with different disciplinary backgrounds; second, deepening the application of AI in process evaluation and establishing more accurate student ability growth portraits; third, promoting “university-enterprise” collaboration, introducing more real industry problems into the classroom, allowing students to face more complex challenges with the assistance of intelligent agent platforms.

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# Bringing OBE-PBL to Life in the Multilingual Spanish Classroom: A Qualitative Reflection on Our Curriculum Reform Journey

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**Abstract:** This paper qualitatively traces a three-year Spanish curriculum shift from grammar focus to an OBE-PBL blended model. Driven by employer feedback and student disengagement, three graduate capabilities, campus tour, email negotiation, cultural brochure, were set and teaching was reverse-engineered around public projects. Teacher talk gave way to facilitation; accuracy yielded to communicative effect. Persistent tensions include coverage anxiety and grading norms, while value is evidenced by voluntary attendance and alumni uptake. Administrative flexibility, collegial support and trust in exit outcomes sustain the reform more than technological novelty.

**Keywords:** OBE-PBL; Spanish higher education; Outcome-based education; Project-based learning; Qualitative reform

**Online publication:** August 26, 2025

## 1. Introduction

For several years the Spanish program followed a syllabus whose implicit logic was both clear and constraining: grammatical forms were introduced in sequence, rehearsed through controlled exercises, and finally assessed in discrete-item tests. The arrangement produced respectable grade distributions, yet it also generated a growing sense of disconnection. Visitors from partner institutions, employers at the annual language fair, and administrative staff who process Erasmus paperwork all reported the same phenomenon: students who had obtained high marks were often reluctant to initiate or sustain spontaneous exchanges when the context departed from the textbook script. Inside the classroom the pattern was equally visible. Learners attended, took notes, photographed the slides, and left. When asked in corridor conversations how they perceived the course, many replied that Spanish felt like “another box to tick” on the way to the degree. Grammatical accuracy had been cultivated; communicative confidence had not.

The university's broader digital transformation strategy intensified rather than resolved the tension. Investment in learning-management systems, mobile-friendly interfaces and data-driven dashboards was announced with legitimate pride, but the technological surplus merely underlined the pedagogic deficit. A sleek platform cannot, by itself, convert declarative knowledge into interactive capacity. Staff-room discussions began to center on a single question: if the institution is willing to equip us with collaborative software, high-speed wireless access and multimedia repositories, why

does the classroom still sound like a recitation of rules that were codified decades ago? The unease was not provoked by technology; it was exposed by it.

Two additional pressures shaped the context. First, labor-market stakeholders repeatedly stated that they needed graduates who could solve immediate, unpredictable problems in the target language: guiding a Spanish-speaking visitor whose flight had been cancelled, renegotiating a service contract by email, or explaining local regulations to an anxious parent at the international office. Second, students themselves, especially those who had returned from Erasmus placements, asked why the course had not prepared them for the contingency and improvisation that characterize real-language use. Their reflections suggested that the syllabus was training them to display knowledge about Spanish rather than to do things with Spanish. The distinction is subtle but decisive, and it underpins the reconceptualization reported in this paper.

Faced with these signals, the teaching team decided to intervene, not by acquiring new hardware, but by re-examining the curricular logic itself. The decision was principled and pragmatic: principled, because the gap between stated graduate attributes and actual learning processes had become intellectually indefensible; pragmatic, because the university already possessed the minimal digital infrastructure necessary for a blended format. What was missing was a coherent pedagogic framework that placed purposeful, public-facing language use at the center of every weekly cycle.

Outcome-Based Education provided the first coordinate. If the program could agree on three exit capabilities, for example, guiding a bilingual campus tour, resolving an administrative problem by email, and producing a cultural guide, then each classroom moment could be judged by its contribution to those capabilities. Project-Based Learning supplied the second coordinate, because it organizes learning around the creation of artefacts or events that are presented to an audience beyond the teacher. The combination suggested a blended rhythm: concise face-to-face input followed by sustained online collaboration, iterative drafting, and a public showcase. No statistical validation was envisaged; the aim was simply to document, in a disciplined qualitative manner, what such a realignment would look, sound and feel like after three academic years.

The present paper therefore offers a descriptive account of the transition. It avoids numerical claims, preferring instead to record recurring situations, typical utterances, and the evolving stance of both teachers and learners. The narrative is intended as a mirror for other programs that sense a comparable mismatch but are uncertain about the first practical step. By making the graduate outcome rather than the grammatical item the organizing principle, we moved from a syllabus that celebrated coverage to a workshop that valued encounter, negotiation and revision. Whether the new shape is sustainable, and whether it can survive different institutional temperaments, remains to be seen; what is already observable is that the language now circulates in the room long after the bell has sounded.

## **2. From unease to decision: The intellectual genesis of an OBE-PBL realignment**

Stagnation rarely announces itself with dramatic failure; it seeps in through the quiet repetition of routines that once seemed efficient. For several academic cycles the Spanish strand had achieved respectable grade distributions, yet the equilibrium was fragile. Lectures began on the half-hour with a concise exposition of a grammatical subsystem, proceeded through annotated examples, and concluded with lock-step exercises designed to elicit the target form. Students complied, submitted, and departed. To the external examiner the transcript appeared healthy; to the internal observer the pulse was weakening. Attendance sheets recorded presence, but not sustained intellectual involvement; rubrics celebrated accuracy, yet employers continued to report hesitation when graduates faced unscripted exchanges. The unease was compounded by digital artefacts that magnified the contrast: institutional dashboards celebrated “innovation” while the lived classroom experience remained stubbornly sequential, teacher-centered, and rule-bound. What had once passed for methodological clarity now revealed itself as a defensive enclosure within which both teacher and learner could feel safe, but from which neither could glimpse the contingent reality of language use beyond the campus gates.

The first public symptom of stagnation surfaced during the annual language fair. A regional logistics firm recounted

a routine incident: a Spanish-speaking client arrived to collect merchandise, the appointed graduate interpreter withdrew into silence when the conversation moved from scheduled collection times to an unexpected documentation query, and the transaction had to be re-routed through a bilingual secretary who had never studied Spanish formally. The anecdote was delivered without malice, yet its implications were corrosive. The employer was not criticizing linguistic inaccuracy; he was identifying an absence of strategic composure under conditions of uncertainty. Similar messages arrived from partner institutions, alumni offices, and even academic colleagues who supervised Erasmus placements. The refrain was consistent: our graduates could describe the language, but they could not reliably accomplish tasks with it. Inside the department the mirror was held up during curriculum-review sessions. When asked to list the competencies that a finalist should be able to demonstrate, staff produced inventories of chapters covered, tenses explained, and essay titles set. No one spontaneously mentioned the ability to host a visitor, to re-negotiate a deadline, or to summarize a local regulation for a non-Spanish-speaking peer. The syllabus was measuring its own internal sequence rather than any verifiable external utility.

Student voices, when solicited, confirmed the diagnosis. In anonymous written feedback they praised the clarity of handouts and the punctuality of marking, but in corridor conversations they reduced the course to a credentialing ritual. “Spanish is another box to tick,” became a common refrain. The phrase was not uttered in hostility; it was an accurate description of a structure in which grammatical proof replaced purposeful performance. The digital layer added irony rather than remedy. University slogans celebrated “future-ready graduates” and “technology-enhanced learning”, yet the virtual space replicated the face-to-face asymmetry: weekly folders uploaded by the instructor, downloaded by the students, and seldom revisited <sup>[1]</sup>. Forums remained empty unless participation points were attached; chat groups filled with administrative queries about deadlines rather than debates about meaning. Technology had increased the speed of transmission without altering the direction of authority.

It was against this background that a collective re-reading of educational traditions began. Outcome-Based Education (OBE) provided an initial coordinate <sup>[2]</sup>. If the program could agree on a small set of verifiable abilities that a graduate ought to possess, then every pedagogical decision could be judged by its contribution to those abilities. Project-Based Learning (PBL) supplied the second coordinate, because it organizes learning around the creation of artefacts or events that are presented to an audience beyond the teacher. The convergence of OBE and PBL suggested a disciplinary logic in which language is not a curriculum topic to be covered but a resource to be deployed. Grammar would still be taught, yet its relevance would be contingent upon the communicative problem at hand. Assessment would still occur, yet its primary referent would be the quality of the outcome achieved rather than the accuracy of the linguistic display isolated from context.

The department undertook a deliberate process of distillation. Employer interviews, alumni reflections, and faculty debates were sifted for recurring situations in which Spanish might reasonably be expected to function on campus and in the neighboring community. Three capabilities emerged with consistent clarity: first, the ability to host a bilingual visitor for approximately thirty minutes, providing orientation information and responding to spontaneous queries; second, the capacity to resolve a straightforward administrative problem by email (for example, a change in accommodation, a delayed document, or a rescheduled appointment) without reverting to English; third, the production of a short cultural guide (roughly one thousand words) that could be handed to incoming exchange students or local institutions. Each outcome demanded different genres, registers and interactional moves; each was verifiable by an external interlocutor who possessed no professional obligation to the department. Once the triad was accepted, the remaining task was to reorganize time, resources and evaluation so that every student repeatedly rehearsed, revised and ultimately performed these capabilities in public settings <sup>[3]</sup>. What had begun as a diffuse unease had crystallized into a focused decision: the program would be engineered backwards from the moment in which a graduate stand before a Spanish-speaking interlocutor and is expected to act competently, courteously and without recourse to English. The grammar cathedral would give way to an OBE-PBL workshop in which coverage was subordinated to encounter, and accuracy to agency.



### 3. Re-designing the semester through OBE-PBL logic

Once the graduate capabilities had been ratified, host a bilingual visitor, resolve an administrative problem by email, and produce a short cultural guide, the syllabus had to be re-engineered so that every week contributed demonstrably to those outcomes. The decision to adopt an OBE-PBL structure was less a cosmetic adjustment than a systemic inversion<sup>[4]</sup>. Instead of selecting grammatical items and then inserting communicative tasks as illustration, we began with the final performance and traced a reverse path to the first-class meeting. Each term was therefore built around one public-facing project whose completion would be visible to an external audience and whose linguistic, strategic and cultural demands would encapsulate the targeted capability<sup>[5]</sup>. The remainder of the curriculum was subsequently pruned or re-ordered so that no activity existed merely for its own sake; grammar explanations, lexical inventories and phonetic drills were retained only insofar as they could be justified as resources for the impending project.

The first step in the backward design was to specify the exact nature of the public moment. For the “bilingual visitor” outcome, the culminating event became a ninety-minute campus tour delivered to a mixed group of Spanish-speaking guests from a partner institution. The tour had to include historical background, safety instructions, and spontaneous responses to questions about student services. Because the visitors’ schedule was fixed months in advance, the date of the final performance was immovable; all prior deadlines were plotted from that anchor point. The same logic governed the other two terms: the email exchange outcome was verified by an authentic message thread with a Latin-American administrative office that confirmed internship placements, while the cultural guide outcome concluded with a printed brochure handed to incoming Erasmus students during orientation week<sup>[6]</sup>. In each case the external recipient’s expectations were non-negotiable, thereby preventing the project from collapsing into a classroom simulation whose criteria could be relaxed at the last moment.

With the terminus established, the weekly rhythm was constructed as a recurring five-phase cycle rather than as a sequence of topical units. Phase One, lasting twenty to thirty minutes, offered concise conceptual input directly relevant to the impending task: formulaic routines for welcoming guests, genre conventions of institutional emails, or lexicogrammatical resources for describing architectural space. Phase Two moved immediately to collaborative planning; students drafted itineraries, allocated roles, or outlined brochure sections while the instructor circulated as a consultant rather than a source of right answers. Phase Three, conducted largely outside formal contact hours, involved field work: measuring distances for the tour, interviewing librarians about opening hours, or photographing sites for the brochure. Phase Four consisted of rehearsal or iterative drafting in the online environment, where asynchronous peer commentary was mandatory before any material could be submitted to the teacher. Phase Five was the live showing: the tour, the email thread, or the printed brochure, always in the presence of an external stakeholder whose signature or verbal acceptance constituted the minimal condition for success. The cycle then recommenced at a higher level of complexity, ensuring that linguistic accuracy and strategic sophistication were revisited rather than assumed to be cumulative.

The blended architecture that supported this cycle was deliberately minimalist<sup>[7]</sup>. The existing learning-management system hosted a single folder for each cohort, subdivided into five chronological slots corresponding to the phases described above. No additional plug-ins, analytics packages or proprietary authoring tools were introduced. A common chat group functioned as the informal spine of the process: students posted queries about lexical choice, shared photographs of signage that puzzled them, and coordinated rehearsal times. The instructor’s presence in the chat was reduced to daily scheduled windows so that authoritative answers did not drown out peer negotiation. Face-to-face sessions were reserved for high-stakes rehearsal and for collective troubleshooting when a group encountered an impasse. The ratio of physical to virtual contact therefore shifted from the traditional two-hours-in-class-plus-one-hour-at-home to an alternating pattern in which the locus of activity was determined by the nature of the task rather than by the timetable grid.

Pruning the syllabus proved more contentious than installing the cycle. Established topics such as the historical present, the morphology of the past-perfect subjunctive, or the phonetics of inter-vocalic /d/ were retained only when a direct line could be drawn to the forthcoming project. If the campus tour script did not require the past-perfect subjunctive, the item was postponed to a later term whose project might activate it. Conversely, routine formulae for polite refusal,

previously relegated to a supplementary handout, were promoted to center stage because the external visitor was known to ask about closing times and capacity limits. The principle of “just-in-time grammar” replaced the principle of “just-in-case grammar,” thereby collapsing the traditional distinction between language and skills modules<sup>[8]</sup>. Vocabulary lists were generated by students themselves as they walked the campus, inspected the internship agreement, or interviewed the Erasmus coordinator. Lexical gaps were posted in the chat group overnight, and negotiated solutions were consolidated in class the following morning. The teacher’s role shifted from authoritative dispenser of rules to strategic editor who ratifies or reformulates student-generated material in relation to the project’s communicative constraints.

Assessment was re-aligned with equal rigor. Because the final product was public, failure carried an external cost that no teacher could mitigate retroactively. Intermediate deadlines therefore acquired genuine weight. A draft itinerary that misidentified the library closing time was returned for correction before the tour took place; an email message containing an ambiguous date was revised until the partner institution confirmed understanding. Marks were awarded only when the external stakeholder’s acceptance had been documented. Rubrics were co-constructed in class by analyzing authentic samples of campus tours, institutional emails and tourist brochures, identifying recurrent moves, and translating those moves into criteria that students themselves would apply during peer review<sup>[9]</sup>. The process made explicit the department’s definition of quality: clarity, accuracy and appropriateness were judged by their capacity to secure the desired response from a non-captive audience.

By the end of the first implementation cycle the new architecture had stabilized without recourse to additional expenditure or proprietary systems. The learning-management system contained five sequential folders, the chat group archived over two thousand messages, and the external recipients had signed the necessary acceptance forms. More importantly, the ratio of student talk to teacher talk had inverted: whole-group segments rarely exceeded fifteen minutes, while collaborative planning and asynchronous drafting accounted for the bulk of contact time. Grammar was still taught, but it emerged from the draft-revision loop rather than from a pre-emptive lecture. The semester had been re-designed, not merely supplemented, by the imperatives of OBE-PBL logic.

## **4. What changed in practice under OBE-PBL**

The most visible shift occurred at the lectern. Under the former grammar-centred regime the teacher’s role had been clearly scripted: introduce the rule, illustrate it, invite mimicry, correct deviations, and assign further exercises. Within the new OBE-PBL architecture this sequence lost its primacy<sup>[10]</sup>. Faced with a cohort preparing to receive Spanish-speaking visitors in eight weeks, the instructor could no longer afford to deliver a monologue on the historical present and trust that transfer would occur later. Instead, the first-class meeting was devoted to modelling the stance of a guide: how to greet a party at the gate, how to manage overlapping questions, how to signal a change of direction while walking backwards. Explanation was replaced by demonstration; accuracy was judged by the immediate intelligibility of the message rather than by conformity to an abstract paradigm. Subsequent sessions were organized around strategic questioning rather than declarative telling. The teacher intervened to elicit contingency plans” What will you say if the lift is out of order?” or to time the rehearsal so that peer feedback could be incorporated before the next iteration. Authority remained intact, but its expression moved from the transmission of rules to the orchestration of cycles of draft, feedback and revision.

Students experienced an equally pronounced recalibration. In earlier semesters many had adopted a defensive strategy: commit the correct form to memory, reproduce it when summoned, and avoid improvisation that might expose uncertainty. The public nature of the upcoming tour removed that safety net. A visitor who asks for the nearest ATM does not award points for verbal agility; he simply wants intelligible directions. Consequently, learners began to treat language as a negotiable commodity rather than a fixed inventory. Rehearsals were punctuated by requests for confirmation: “Sería mejor decir ‘suba’ o ‘sube’ si el ascensor está estropeado?” Peer responses were immediate and functional rather than normatively prescriptive. The shift from rehearsing correctness to negotiating meaning was most evident during the field-work phase, when small groups roamed the campus with voice recorders, collecting authentic questions from

maintenance staff and security officers<sup>[11]</sup>. These recordings were transcribed and compared with the draft scripts, leading to spontaneous lexical expansion and syntactic simplification. The textbook, once the default authority, became a reference tool consulted only when interpersonal negotiation reached an impasse.

The altered division of labor did not eliminate difficulty; it relocated it. Time pressure emerged first. The immovable date of the external visit meant that intermediate products, including route maps, lexical glossaries, safety disclaimers, had to be finalized earlier than in a traditional syllabus, where the lecturer could simply extend the deadline if the cohort lagged behind. Collaborative work raised issues of fairness. When five students produced a single brochure, the allocation of individual marks risked rewarding free riders or, conversely, penalizing competent contributors who happened to be paired with weaker peers<sup>[12]</sup>. Unequal digital access compounded the problem: not every learner owned a device capable of editing shared documents during peak hours, and some relied on prepaid data bundles that expired before the final online rehearsal. These challenges were not marginal; they threatened the credibility of the OBE-PBL cycle by exposing hidden variables that the grammar-centered model had kept invisible.

Coping strategies evolved through iterative reflection rather than through top-down policy. The simplest yet most effective adjustment was to advance the project launch by two weeks, effectively inserting a buffer that absorbed technical delays without compromising the external deadline. Rubrics were co-constructed in class through analysis of authentic samples: students examined an official city brochure, identified moves such as “historical background,” “practical information,” and “safety advisory,” and translated these into weighted criteria<sup>[13]</sup>. Because the same students would later apply the rubric to their peers, the exercise possessed genuine stakes and reduced the perception of arbitrariness. To mitigate digital inequality, offline submission corners were re-instated: a physical folder in the departmental office accepted hard-copy drafts that were scanned by administrative staff and uploaded to the shared repository within twenty-four hours. The solution re-introduced paper, but it guaranteed that no learner was excluded from the iterative feedback loop on grounds of connectivity<sup>[14]</sup>.

Perhaps the most profound change was affective. In previous cohorts, anxiety had peaked the night before the final examination; in the re-designed sequence, tension was distributed across the semester, but it was accompanied by a measurable increase in self-reported agency. Students spoke of “owning the script,” of feeling “responsible for every word,” and, most tellingly, of being “curious about what the visitor would actually ask.” Curiosity, once the privilege of the motivated few, became a structural feature of a course in which the outcome was unknown in its detail until the live moment. The teacher, meanwhile, reported a paradoxical relief: the abdication of omniscience, no longer needing to predict every lexical query, was replaced by the satisfaction of watching learners rehearse solutions that the instructor had not foreseen. The OBE-PBL alignment had not eliminated the asymmetry of expertise; it had transformed it into a shared problem-solving enterprise whose temporary resolution was guaranteed by the calendar, but whose definitive shape emerged only in the presence of an interlocutor who mattered<sup>[15]</sup>.

## **5. Ongoing tensions and early signals of worth in OBE-PBL implementation**

The re-design has not dissolved institutional gravity; it has merely shifted its point of application<sup>[16]</sup>. Coverage anxiety still surfaces at mid-semester, when the calendar reveals that several textbook chapters remain untouched and that the subjunctive mood has been encountered only fleetingly in a brochure draft. The unease is no longer voiced as “we are behind schedule”; it is articulated as “will they still recognize the subjunctive when they meet it next year?” a question that exposes how deeply the grammar-centered sequence is woven into professional identity. Institutional marking norms constitute a second residue. The registrar’s system demands a single numerical grade for each student every four weeks. An OBE-PBL cycle produces a trail of external acceptances, peer-feedback logs and revised artefacts, but the algorithm still expects a percentage. The translation is possible, yet it feels like a retro-fitting rather than a natural expression of what has been learnt. A third, unexpectedly stubborn, dilemma is physical. Rooms built for forty-five listeners generate unbearable acoustic overlap once eight groups rehearse a tour simultaneously. The resulting cacophony drives some students back into

whispered English, not because they lack Spanish, but because they cannot hear themselves think.

Against these lingering frictions, qualitative signals of worth have begun to accumulate. Attendance at optional drop-in sessions has risen from a handful to over half the cohort, and the conversations are now student-initiated rather than teacher-announced. Alumni emails arrive without solicitation: a graduate now working in logistics forwards a thank-you note from a Peruvian client, adding simply, “I used the campus tour script as my template.” The Student Union has twice invited the cohort to embed their cultural brochures in the official orientation pack, an act of uptake that no rubric could have guaranteed. Most telling, perhaps, is the changed tone of end-of-term oral defense<sup>[17]</sup>. Previously the viva gravitated toward meta-linguistic commentary (“I chose the preterit because...”); today the same ritual opens with the question, “What did your visitor actually say, and how did you respond?”, a shift that places communicative effect ahead of grammatical justification.

Sustaining the OBE-PBL orientation appears to depend on three contextual conditions. Administrative flexibility is essential: the program leader must continue to approve calendar shifts when external visits move, and to tolerate mid-semester gaps in coverage without invoking audit anxiety. Collegial support provides the second pillar; without a critical mass of staff willing to trade chapter security for project uncertainty, individual teachers revert to the grammar sequence the moment cohort performance wavers<sup>[18]</sup>. The third condition is continuous conversation with students. Capabilities are not internalized in a single cycle; they need to be named, rehearsed, and reflected upon in subsequent projects so that the link between exit outcome and weekly effort remains explicit rather than tacit.

## 6. Conclusion

The migration from a grammar cathedral to an OBE-PBL project workshop has rendered the classroom noisier, less predictable, and manifestly more alive. Continuity does not require heroic innovation; it demands steady trust in the exit outcome, a disciplined willingness to relinquish teacher centrality, and a modest but reliable digital spine that archives drafts without fetishizing analytics. Future plans are intentionally low-key: invite colleagues from other languages to pool projects, subject the graduate capability list to annual peer review, and record emerging stories rather than aggregate metrics. If these conditions are met, the syllabus will keep unfolding backwards from the moment a graduate stand before a Spanish-speaking interlocutor and is expected to act competently, courteously, and without retreat into English.

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# A Study on Translation Strategies for Red-Culture-loaded Words in Northeast Anti-Japanese United Army Literature: A Case Study of Kanglian 1st Division

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**Abstract:** Northeast Anti-Japanese United Army literature serves as a vivid documentation of the history of the Northeast Anti-Japanese United Army. It encompasses diverse genres including novels, poetry, biographies, plays, as well as films and television dramas. Against the backdrop of China's cultural outreach strategy, translating and disseminating Northeast Anti-Japanese United Army literature holds profound contemporary significance. Among these works, red culture-loaded words, as unique cultural symbols formed through the historical accumulation of Northeast ethnic groups, possess deep research value. Therefore, this paper aims to analyze the English translation of Sun Chunping's novel Kanglian 1st Division. By apply Eugene Nida's classification criteria for culture-loaded words and grounded in functional equivalence theory, it examines translation difficulties and summarizes translation methods and techniques for various types of red-culture-loaded words, contributing to the international dissemination of red culture.

**Keywords:** Northeast Anti-Japanese United Army literature; Red-cultural-loaded words; Functional equivalence Theory; Literal Translation; Liberal Translation

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## 1. Introduction

Since the 18th National Congress of the Communist Party of China, "cultural confidence" has become the core guiding principle for cultural development in the new era. Promoting Chinese culture to the world is an essential path to achieving cultural confidence. As a valuable asset of socialist culture with Chinese characteristics, red culture carries unique historical memories and spiritual essence.

Among these, the Northeast Anti-Japanese United Army culture represents a vital component of red culture under the leadership of the Communist Party of China, featuring distinct regional characteristics and significant research value. As core vehicles for cultural transmission, culture loaded words encapsulate specific historical contexts and regional cultures. The cultural differences and communication challenges encountered during their English translation constrain the international dissemination of red culture.

Therefore, this article takes Sun Chunping's *Kanglian 1st Division* as its core corpus. By integrating Eugene Nida's classification criteria for culture-laden words and the theory of functional equivalence, it conducts an in-depth comprehensive analysis of the translation of red-culture-loaded words has been conducted to explore how to accurately translate various red culture-laden words in Northeast Anti-Japanese League literature, achieving a transition from linguistic equivalence to cultural equivalence, thereby enhancing the international dissemination of red culture.

## 2. Literature review

### 2.1. Definition and classification of red-culture-loaded words

#### 2.1.1. Definition

The concept of culture-loaded words was introduced by Guozhang Xu, who defined culture-loaded words as vocabulary carrying the unique connotations of specific cultures<sup>[1]</sup>. These words reflect the distinctive patterns of activity accumulated by particular ethnic groups throughout their historical development, exhibiting significant differences from other groups. Professor Wenzhong Hu emphasized cultural distinctiveness in his definition, characterizing them as lexical items belonging to a specific group's cultural domain that directly or indirectly reflect its cultural traits<sup>[2]</sup>. American scholar Mona Baker proposed a broader definition, suggesting that any cultural concept or entity unfamiliar to speakers from other cultural backgrounds can be considered a culture-loaded word. These concepts can be concrete or abstract, which encompassing everything from food utensils to religious customs<sup>[3]</sup>.

Essentially, culture-loaded words are linguistic expressions bearing the temporal and spatial imprint of a specific linguistic community. They convey unique cultural concepts and entities of a particular group, often serving as the most sensitive and direct linguistic carriers of that group's traditional customs and historical heritage.

Red-culture-loaded words are a derivative form of culture-loaded words. Liting Fu posits that red-culture-loaded serve as concrete carriers of the unique historical period of the Chinese Revolution<sup>[4]</sup>. Therefore, red-culture-loaded can be defined as vocabulary or phrases rooted in the historical processes of China's revolution, construction, and reform. They function as linguistic symbols that embody specific red spiritual connotations and cultural ideological attributes.

#### 2.1.2. Classification

Scholars have classified cultural-loaded words based on different criteria, forming distinct framework systems: Eugene Nida divided them into five major categories, namely the material cultural load words, ecological cultural load words, linguistic cultural load words, sociocultural load words, and religious cultural load words<sup>[5]</sup>. Peter Newmark categorized culturally loaded vocabulary into five types<sup>[6]</sup>.

- (1) Ecological
- (2) Material culture
- (3) Sociocultural
- (4) Organization, customs, activities, procedures, concepts
- (5) Gestures and habits

Li Jianjun proposes three categories: material cultural load words, conceptual cultural load words, and behavioral cultural load words. Cheng Chen and Zhou Yufen classify cultural load words into four major categories: folklore involving daily rituals and life traditions; religion encompassing beliefs and worship; historical facts covering events, figures, and institutions; and arts related to music, dance, and theater<sup>[7]</sup>.

In this article, we adopt Eugene Nida's classification framework for cultural-loaded words as our core framework which exhibits systematic and scientific characteristics, making it highly compatible with the textual features of *Kanglian 1st Division*, which combines historical documentary elements with regional cultural specificity. Based on actual textual corpus analysis, religious cultural loaded words were found to have no direct connection to revolutionary culture. Therefore, this study makes targeted adjustments to Nida's classification, categorizing the red culture-laden words

in *Kanglian 1st Division* into four types: red material culture-loaded words, red ecological culture-loaded words, red linguistic culture-loaded words, and red social culture-loaded words.

## 2.2. Relative research at home and abroad

### 2.2.1. Research on the translation of anti-Japanese united army literature

Northeast Anti-Japanese United Army literature serves as a vivid historical record of the region's resistance forces. It encompasses diverse genres including novels, poetry, biographies, plays, films, and television dramas. As a significant topic at the intersection of revolutionary literature translation and regional cultural dissemination, research on the translation of Anti-Japanese United Army literature is closely tied to China's strategy of promoting its revolutionary culture internationally.

From a developmental perspective, research on Anti-Japanese United Army literature translation has two core phases. The 1980s-early 21st century was the "Practice and Preliminary Systematization Phase", focusing on classic works' translations like Xiao Hong's *The Field of Life and Death* (Translated by Haowen Ge) and Xiao Jun's *The Village in August* (Translated by Evan King). Scholars analyzed their reception and translators' strategies, e.g. Gao's domestication of Northeast vernacular balancing readability and cultural specificity, and controversies over Evan's over-weakened revolutionary narratives. This phase relied on case studies, lacking systematic theoretical frameworks and resulting in fragmented strategy summaries.

Since the 21st century, research on the translation of Anti-Japanese United Army literature has entered a "phase of specialized deepening". Scholars have begun to employ translation theory to conduct in-depth deconstructions of translation practices, with research focus gradually shifting toward core issues such as the translation of culturally loaded words, ideological transmission, and cross-cultural adaptation. Domestic scholars primarily draw upon functional equivalence theory and domestication/translation theories to explore translation approaches for unique elements within Anti-Japanese United Army literature.

Some studies also examine translation practices for non-fiction literary forms like Anti-Japanese League ballads and martyrs' letters, emphasizing their unique value in conveying revolutionary spirit. For instance, comparative analyses of multilingual translations of Yang Jingyu's "Military Song of the First Route Army of the Northeast Anti-Japanese League" explore the balance between preserving rhythmic patterns and conveying spiritual essence.

Notably, scholars have introduced a philosophical hermeneutics perspective to enrich the translation theory of Anti-Japanese Alliance documents. As composite texts, these documents integrate informational, appellative, and expressive functions. Their translation can be achieved through three interpretive pathways: "author-centered theory" reconstructs historical context, "text-centered theory" addresses distancing, and "reader-centered theory" achieves fusion of perspectives<sup>[8]</sup>. Philosophical hermeneutics further establishes an "understanding-interpretation-reconstruction" chain: analyzing translation realities, interpreting differences through theoretical analysis, and constructing adaptive strategies that integrate historical context with target-language cognition, thereby deepening theoretical depth<sup>[9]</sup>.

Moreover, existing research exhibits significant gaps: First, studies have primarily focused on a handful of classic works, with limited attention given to recent translations of full-length novels and biographical literature on the Anti-Japanese United Army; Second, there is scant exploration of deeper issues such as translators' decision-making mechanisms and the ideological manipulation of translations, indicating room for greater research depth. Overall, while a preliminary foundation for the translation studies of Anti-Japanese United Army literature has been established, substantial scope for expansion remains in terms of research scope, theoretical depth, and methodological innovation.

### 2.2.2. Research on the translation of red-culture-loaded words

Discussions within the international academic community regarding the translation of red-culture-loaded words primarily revolve around classical translation theories. Eugene Nida's functional equivalence theory established the core theoretical foundation, emphasizing that translation should prioritize reconstructing "dynamic equivalence" centered on target reader

comprehension rather than rigidly adhering to formal equivalence. This aligns with the historical documentary nature and red connotations of terms laden with red culture<sup>[5]</sup>.

Lawrence Venuti further developed the theories of domestication and foreignization, stressing that translators must achieve domestication of the source language while also accommodating the linguistic characteristics of the target culture<sup>[10]</sup>. Mona Baker proposed multiple strategies for addressing lexical mismatches, such as generic translation and cultural substitution, offering guidance for translating red culture-laden vocabulary<sup>[3]</sup>.

Despite the absence of systematic specialized research, these theories still provide methodological guidance for translation practice.

Domestically, research on translating red-culture-loaded words has established a “practice-oriented, regionally focused” paradigm and exhibits an increasingly strong interdisciplinary development trend. Since the early 21st century, scholars have concentrated their research on specific contexts of red texts, including the translation of red tourism materials (e.g., in Jiangxi, Heilongjiang, Shaanxi), red songs (e.g., “Red Songs of Longshan”), and revolutionary literary works (e.g., *The Field of Life and Death*). Youya Zhou and Yonghe Xiao proposed a composite strategy combining literal translation, liberal translation, and adapted translation, tailored to the characteristics of red tourism texts<sup>[11]</sup>.

Lin Zou emphasized that the translation of red-culture-loaded must adhere to principles of authority, accuracy, standardization, and consistency<sup>[12]</sup>. With the convergence of ecological translation studies and functional translation theory, interdisciplinary development has emerged: Yanshi Liu proposed the “three-dimensional conversion” method from an ecological translation perspective, advocating adaptive adjustments across linguistic, cultural, and communicative dimensions to optimize translations of complex red texts like revolutionary songs<sup>[13]</sup>.

In summary, although research on red-culture-loaded words of the research on interpreting tourism texts and historical documents has comparative matured, while specialized studies on translation strategies for culture-loaded words in literary works remain scarce.

### 2.3. Functional equivalence theory

The theory of functional equivalence was proposed by an American translation theorist, who emphasized that translation should not be confined to word-for-word correspondence but should focus on conveying the functional meaning of language. He categorized “functional equivalence” into distinct levels, with “dynamic equivalence” occupying a central position, meaning the response of the target audience to the translation should be substantially equivalent to the response of the original audience to the source text.

Consequently, functional equivalence theory advocates that translators should flexibly adjust strategies, achieving translation effectiveness by integrating the cultural context and linguistic conventions of the target language<sup>[5]</sup>.

This core theory aligns closely with the translation demands of red-culture-loaded words in *Kanglian 1st Division*. These words in Northeast Anti-Japanese League literature carry profound historical weight and regional specificity. The central challenge in their English translation lies in balancing “cultural authenticity” with “cross-cultural intelligibility”. The theory of functional equivalence provides principled guidance for resolving this tension.

## 3. Analysis of red-culture-loaded words in *Kanglian 1st Division*

The red-culture-loaded words in *Kanglian 1st Division* are deeply rooted in the complex historical context of Anti-Japanese period and unique regional cultural soil of the Northeast, exhibiting distinct characteristics and translation difficulties.

### 3.1. Features of red-culture-loaded words in *Kanglian 1st Division*

The terms within *Kanglian 1st Division* that embody revolutionary culture are not mere symbols of communication. Instead, they serve as complex carriers deeply intertwined with the historical context of the Northeast Anti-Japanese War, regional characteristics, ethnic culture, and revolutionary spirit. Consequently, they possess the following four core



characteristics.

### 3.1.1. Regional specificity and climate adaptability

Its regional specificity is most vividly reflected in its mapping of Northeast China's unique geographical identifiers and folk cultural artifacts, such as the red ecological culture-loaded words “辽东山脉” “松嫩平原” and “苇荡” which directly point to the region's distinctive topography of mountains, plains, and wetlands, serving as geographical symbols that distinguish its red culture from other regions.

Climate adaptability, meanwhile, centers on how these loaded terms align with Northeast China's harsh winters and significant temperature fluctuations. Red material culture-loaded words like “乌拉靴” embody the function of “withstanding cold and snow”, while “地窖子” (underground shelters) feature designs for “mountain concealment + cold resistance”. Similarly, “sweep-sleeve soup”, all attest to the material and ecological dimensions of how these cultural carriers adapted to the region's extreme climate. They also implicitly reveal the historical context where Anti-Japanese guerrilla fighters leveraged local climate conditions to wage their struggles with resourceful ingenuity.

### 3.1.2. Historical context dependency

These words are closely tied to the unique era of the War of Resistance Against Japan (particularly the Japanese occupation period), while also serving as a reminder of colonial oppression and national resistance. For instance, the “良民证” (police clearance certificate), used by the Japanese government to control the Chinese populace, carries the connotation of “official scrutiny”.

The “保甲制度” (the Bao-Jia system, a household registration and control system), employed by the Japanese government to strengthen local governance, reveals its essence of “collective liability”. Without this historical context, the oppressive implications behind these concepts remain incomprehensible.

### 3.1.3. Manchu-centric culture

In *Kanglian 1st Division*, Manchu culture stands as the core of cultural expressions, integrating with Han daily life and Anti-Japanese struggle.

Linguistically, Manchu terms like “阿玛” (ama, father) and “额娘” (eniye, mother) are retained, directly marking ethnic identity. Materially, “乌拉靴” (traditional Manchu boots, lined with uraria grass for cold resistance) and “地窖子” “撮罗子” (traditional Manchu cuoluozi, a temporary nomadic tent made of birch bark or animal hides, adapted by the Anti-Japanese United Army as hidden shelters in mountain guerrilla warfare) are repurposed as Anti-Japanese equipment, blending Manchu heritage with red revolutionary functionality.

### 3.1.4. Duality of function and spirit

That is, these words not only carry specific practical connotations such as tools, scenarios, and identities, but also distill the spirit of the United Army's struggle, national integrity, and historical memory.

For instance, among red material culture-loaded words, the “三八大盖” (functional: combat equipment) as the Japanese military's standard-issue rifle conveys its weaponry nature through its English translation. Yet within the context of “Japanese military equipment” and “captured by the Anti-Japanese League”, it also communicates the League's tenacious spirit of “confronting a powerful enemy with rudimentary gear”.

This dual nature dictates that translating red-culture-loaded cannot merely convey functional meanings. It must also achieve cross-cultural transformation of their spiritual essence. This is precisely why translation must balance “semantic fidelity” with “spiritual transmission”.

## 3.2. Classifications of red-culture-loaded words in *Kanglian 1st Division*

As an integral part of red culture, Northeast Anti-Japanese United Army literature embodies rich cultural connotations.



These terms reflect the Northeast people's history of resistance, regional characteristics, and national spirit, directly impacting the accuracy and integrity of cross-cultural communication. This paper employs Eugene Nida's classification criteria to guide translation research (refer Table 1).

**Table 1.** Four categories of red-culture-loaded words

Terminology classification	Term count	Original text	Target text	Remarks
Red Material culture-loaded words	32	乌拉靴	Ula boots	Example 2
		地窖子	Diyinzi	
		甩袖汤	Shuaixiu soup	
		三八大盖	Type 38 rifle	
Red Ecological culture-loaded words	41	辽东山脉	Liaodong Mountains	Example 1
		松嫩平原	Songnen Plain	
		龙兵营子	Longbing Battalion	
		苇荡	Reed Marsh(a natural hiding place for the Anti-Japanese United Army to avoid Japanese "mopping-up")	
Red Linguistics culture-loaded words	26	北口	Beikou (a medium-sized city in Northeast China)	Example 3
		王八羔子	Bastard	
		八格牙路	Bakayarou	
		太君	Taijun (fawning term for Japanese officers)	
Red Social culture-loaded words	23	滚犊子	get out / roll away (Northeast dialect)	Example 4
		抗联一师	Kanglian 1 st Division(Short for the First Division of the Counter-Japanese United Army)	
		良民证	Police clearance certificate	
		伪满洲国	Puppet Manchukuo (Japan's puppet state)	
		开拓团	Pioneer group (Japanese migration organization)	
		关东军	Kwantung Army (Japanese invading army in Northeast China)	
		保长	village head appointed by Japanese (Baozhang)	
		小和屋	Xiaohewu (Japanese word for luggage room)	

According to the table, it can be analyzed by three dimensions:

In terms of classification, this can be divided into four categories:

- (1) Red material culture-loaded words embodying both physical forms and the spirit of the revolutionary cause
- (2) Red ecological culture-loaded words encompassing geographical features, climatic characteristics, and natural landscapes intrinsically linked to the anti-Japanese guerrilla warfare
- (3) Red social culture-loaded words focusing on the social structures and ideologies prevalent during the anti-Japanese period.
- (4) Red linguistic culture-loaded words comprising linguistic symbols imbued with revolutionary connotations and distinctive Northeast regional characteristics.

In terms of quantity, red ecological culture-loaded words (41) > red material culture-loaded words (32) > red linguistic

culture-loaded words (26) > red social culture-loaded words (23), which is deeply consistent with the characteristics of the text. In terms of the target language, most of the red-culture-loaded words are mainly literal and liberal translation, which retains their cultural connotation and accurate meaning.

### **3.3. Translation difficulties**

#### **3.3.1. The diversification of cultural connotations**

The red-culture-loaded words in the original text encompass multiple dimensions including specific historical events, ethnic cultures, and regional folk customs, making their connotations complex. Certain terms relate to colonial rule during the Republic of China era, the history of the War of Resistance, Manchu nomenclature and culture, and numerous concepts reflecting Northeast China's regional folklore. The meanings of these terms cannot be directly mapped to single English words. Therefore, the process requires condensing multi-layered cultural information, preserving core connotations while avoiding textual redundancy caused by excessive explanatory additions.

#### **3.3.2. Contextual adaptation**

The meaning of red-culture-loaded words depends on specific linguistic contexts, with the same lexical item exhibiting significant variations in semantic emphasis and emotional connotations across different scenarios. When translating into English, it is crucial to accurately capture contextual features: In the context of a grandfather's dementia and confusion, the term should convey a sense of logical incoherence; -In confrontational or interrogative contexts, it should highlight the emotional tension inherent in the word. In everyday conversational settings, it should restore the colloquial nature of the expression. Simultaneously, ensure consistency in translation to prevent referential ambiguity that could hinder comprehension.

#### **3.3.3. Idiomatic translation**

The original text contains extensive use of Northeastern Chinese dialects, slang, poetry, and other idiomatic expressions, inherently carrying regional cultural attributes and strong emotional overtones. Most of these are colloquial expressions lacking fixed grammatical structures. The English translation faces dual challenges: First, it must preserve the idioms' "regional flavor" and "emotional resonance", avoiding generic English expressions that would erase cultural distinctiveness. Second, it must adapt to English colloquial habits, not translating Chinese idioms literally, but finding functionally and emotionally equivalent English expressions while conveying the cultural context underlying the original phrases.

## **4. Translation method and technique**

Based on the features and translation difficulties of red culture-loaded words mentioned in the previous chapter, this section further summarizes translation methods and techniques through specific case studies according to different types of red cultural load words, ensuring the accuracy of cultural connotations and cross-cultural comprehensibility.

### **4.1. Translation of red-material culture-loaded words**

Red material culture-loaded words refer to tangible entities integrating material functions and red spiritual symbolism, including weapons, daily necessities, and ethnic artifacts. The translation prioritizes conveying "core functional meaning" and "cultural specificity", flexibly combining liberal translation, and annotation methods.

#### **4.1.1. Liberal translation**

Free translation focuses on conveying the core essence of terminology while avoiding literal word-for-word correspondence—particularly for colloquial nicknames or terms whose literal meanings fail to capture their actual

significance. It adheres to the functional equivalence theory, ensuring the target audience accurately grasps both the practical and historical implications of the term.

Example 1:

ST: 三八大盖

TT: Type 38 rifle

Analysis: “三八大盖” is a colloquial nickname for the Japanese Army’s standard-issue rifle during the War of Resistance. The literal meaning breaks down into “三八” (Type 38, the rifle’s model) and “大盖” (literally “big cover”, referring to the rifle’s dust cover). A strict literal translation would be “Type 38 big hat”, which is meaningless in English and fails to convey the weapon’s identity. Therefore, it should use liberal translation to transfer as “Type 38 rifle”, allowing English readers to immediately recognize what it is. Implied clues such as “Japanese military equipment” further supplement its historical connotation, achieving the unity of “functional accuracy” and “spiritual transmission”.

#### 4.1.2. Annotation

Annotations supplement key information (cultural context, red functionality) while preserving the core form of the original terminology, thereby preventing the loss of cultural characteristics that might result from literal translation.

Example 2:

ST: 乌拉靴

TT: Ula boots (Boots with ula grass to retain warmth)

Analysis: “乌拉靴” is a unique cold-resistant boot of Northeast China’s ethnic groups, with its core cultural feature lying in the “ula grass”, a key detail previously omitted. The literal translation “Ula boots” preserves the phonetic characteristics of the Manchu-derived term, avoiding the loss of ethnic cultural specificity that would occur with a generic translation like “cold-resistant boots”, enabling foreign readers to understand both the boot’s practical function and its connection to the revolutionary struggle.

## 4.2. Translation of red linguistic culture-loaded words

Red linguistic culture-loaded words include Northeast dialects, colonial Japanese vocabulary, and era-specific nicknames, characterized by strong emotional overtones and regional/historical features. Translation prioritizes “emotional equivalence” and “contextual adaptation”, mainly adopting liberal translation and transliteration.

### 4.2.1. Liberal translation

For dialectal curse words or colloquial expressions, free translation abandons the literal form and selects English expressions with equivalent emotional intensity, ensuring the target text conveys the original’s emotional tone without cultural misunderstanding.

Example 3:

ST: 王八羔子

TT: Bastard

Analysis: “王八羔子” is a vulgar Northeast dialect expressing intense hatred toward traitors or invaders. The liberal translation “Bastard” is an English colloquial curse with matching emotional intensity, preserving the original’s colloquial style and hostile tone. This translation adheres to Nida’s “dynamic equivalence” principle, ensuring the target audience’s emotional response is consistent with the source audience’s, achieving effective cross-cultural emotional transmission.

### 4.2.2. Transliteration

Foreign words or ethnic-specific terms are transliterated, with cultural context implied through dialogue explanations or scene descriptions. No additional annotations are added to avoid disrupting narrative flow while preserving cultural specificity, reflecting an alienation translation strategy.

Example 4:

ST: 八格牙路

TT: Bakayarou

Analysis: “八格牙路” is a phonetic transcription of the Japanese insult “ばかやろう” (bakayarō). Transliteration preserves the Japanese pronunciation, vividly reflecting the brutality and arrogance of Japanese soldiers in the context of “cursing villagers”. The insulting nature is implicitly conveyed by the scene, eliminating the need for an annotation like “Japanese insult”, which would disrupt the narrative flow. This method retains the “linguistic conflict” of the War of Resistance era, reinforcing the core theme of “resisting aggression” while adhering to the foreignization strategy of preserving cultural otherness.

### 4.3. Translation of social culture-loaded words

Red social culture-loaded words relate to military organizations, colonial systems, and historical entities, bearing profound historical and political connotations. Translation prioritizes “historical accuracy” and “authority”, mainly adopting liberal translation and annotation.

#### 4.3.1. Annotation

Annotations are used for terms with complex historical backgrounds or unique organizational attributes. They supplement the core meaning and historical context of the term beyond mere transliteration or literal translation, ensuring readers grasp its revolutionary essence and significance.

Example 5:

ST: 抗联一师

TT: Kanglian 1st Division (Short for the First Division of Northeast Anti-Japanese United Army)

Analysis: Kanglian 1st Division showing the brevity of translation. The annotation directly clarifies the red organizational attribute. English readers can immediately recognize it as a revolutionary armed force through the term, avoiding the possible ambiguity of liberal translation. This translation ensures the authority of red historical communication and conveys the core connotation of “organized national resistance”.

#### 4.3.2. Liberal translation

Applicable to terms with established historical translations, international usage, or unambiguous core meanings. Direct translation ensures authority and consistency without requiring additional notes, avoiding redundancy and adhering to the principles of “accuracy and conciseness” in historical document translation.

Example 6:

ST: 良民证

TT: Police clearance certificate

Analysis: “良民证” is a product of Japanese colonial rule, with its core function being “identity verification and population control” rather than “certifying a good citizen”. A strict literal translation would be “good citizen certificate”, which distorts its colonial nature and misleads readers into regarding it as an ordinary civic document. The free translation “police clearance certificate” conveys its core function of “identity inspection”, while the annotation clarifies its historical context and oppressive nature. This translation achieves the unity of “functional equivalence” and “historical fidelity”.

### 4.4. Translation of ecological culture-loaded words

Red ecological culture-loaded words refer to natural landscapes closely linked to the Anti-Japanese United Army’s guerrilla warfare, including mountains, rivers, and wetlands. Translation prioritizes “geographical accuracy” and “strategic implication”, combining literal translation and annotation.

#### 4.4.1. Annotation

Annotations supplement its strategic significance in the War of Resistance, revealing the connection between ecology and revolutionary struggle.

Example 7:

ST: 苇荡

TT: reed marsh (a natural hiding place for the Anti-Japanese United Army to avoid Japanese “mopping-up”)

Analysis: “苇荡” is a natural wetland landscape in Northeast China. The literal translation “reed marsh” accurately describes its ecological feature, while the annotation supplements its red function” hiding from Japanese mopping-up” and “guerrilla attacks”. This helps readers understand that the landscape is not merely a scenic backdrop but a “natural fortress” for the Anti-Japanese United Army, aligning with the functional equivalence requirement of “conveying contextual meaning”.

#### 4.4.2. Literal translation

For geographical names with established English translations or clear ecological characteristics, literal translation ensures narrative fluency, with strategic significance implied by the context to avoid redundant annotations.

Example 8:

ST: 龙兵营

TT: Longbing Battalion

Analysis: “龙兵营子” is a village name in Northeast China, with “兵营子” (literally “military camp”) hinting at its historical connection to garrisons. The literal translation preserves the phonetic form “Longbing” and retains “Battalion” to imply its military relevance, avoiding cultural distortion from a literal translation like “Dragon Camp Village”. Contextual clues such as “reed marshes outside the village” and “villagers assisting the Anti-Japanese United Army” further reveal its role as a rear base for the league, balancing “regional specificity” and “narrative coherence”.

## 5. Conclusion

Red culture, as a precious part of Chinese excellent traditional culture, carries unique revolutionary spirit, historical memories and cultural connotations, and is an important carrier for telling Chinese stories and enhancing cultural confidence. The translation of red culture-loaded words, as a key link in cross-cultural communication, directly affects the effectiveness of red culture’s international dissemination. Based on Nida’s theory of culture-loaded words and functional equivalence, this study summarizes translation methods for red culture-loaded words in Northeast Anti-Japanese United Army literature. For words with complex meanings, liberal translation conveys core ideas. For those lacking equivalents, literal translation and annotations provide context. For linguistic and cognitive differences, domestication adapts to the audience. For culturally unique words, foreignization retains original features.

These translation methods are not isolated or mutually exclusive. Translators must flexibly select and combine them based on context, audience, and purpose, while balancing cultural preservation and readability. Adhering to the principle of “being close to foreign audiences’ thinking habits” avoids cultural loss and semantic deviation, enabling international readers to understand and recognize red culture’s spiritual essence.

In the context of cultural “going out”, the translation of red culture-loaded words is of great significance. The summarized translation methods not only provide practical references for similar red culture translation practices but also contribute to promoting the international dissemination of red culture, enhancing national cultural soft power and shaping a positive national image. Future research can further explore more diversified translation paths in combination with new media communication forms to better inherit and carry forward red culture.



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# A Research on English Translation of Culture-Loaded Words of Manchu Xincheng Opera from the Perspective of Intangible Cultural Heritage Inheritance and Transmission

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**Abstract:** As an intangible cultural heritage (ICH) genre integrating Manchu culture and opera art, Manchu Xincheng Opera's (MXO's) culture-loaded words (CLWs) carry rich ethnic folk connotations and unique artistic features. However existing academic studies on this opera mostly focus on its artistic forms and local inheritance with relatively little research on translating its CLWs and a lack of targeted translation strategies hindering the effective communication of its cultural core and artistic value to the international community. From the perspective of ICH inheritance and transmission, this paper focuses on the English translation of CLWs in MXO. This study combines the theory of intangible cultural heritage communication with the core theory of CLWs translation, and comprehensively employs methods such as literature research, text analysis, and case studies to clarify the definition and cultural dimension classification of CLWs in MXO. However, in the actual process of English translation, the core difficulties have gradually emerged: The concept of Manchu's exclusive culture lacks corresponding references in English culture. Its terms not only have the characteristic of efficient communication internally but also have natural exclusivity externally, which is prone to cause semantic transmission gaps. Meanwhile, due to the lack of Manchu cultural background, English audiences also find it difficult to accurately grasp the deep connotations behind the terms, which in turn leads to interpretation deviations. In response to these translation difficulties, this article adopts a variety of targeted translation methods such as literal translation, liberal translation, adapted translation, and creative translation, striving to accurately convey cultural connotations. This study aims to expand the current theoretical system of ICH translation research, and promote the effective inheritance of Chinese ICH in cross-cultural contexts.

**Keywords:** Manchu Xincheng opera; Culture-loaded words; Literal translation; Liberal translation

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## 1. Introduction

In the era of globalization, intangible cultural heritage (ICH) has become a global focus. The Basic Text of the 2003 Convention for the Safeguarding of the Intangible Cultural Heritage from UNESCO emphasizes the need to pass ICH intact to future generations and enhance understanding of diverse cultural expressions worldwide.

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Manchu Xincheng Opera (MXO) is characterized by the deep integration of Manchu culture and traditional opera. It features its own performance format, musical techniques and ethnic cultural symbols. The narrative carries the historical memory, folk beliefs and aesthetic connotations of the Manchu people. It enriches the diversity of Chinese opera with its unique artistic form and is of great significance for promoting the diversity of Chinese culture to the world.

However, existing academic research on this opera mainly focuses on artistic forms and regional inheritance with scarce studies on the translation of its culture-loaded words (CLWs). For example, terms like “腰铃舞” (Manchu Waist Bell Dance) and “寸子舞” (Manchu Cunzi Dance) lack standardized English translations, leading to the loss of their ritual and aesthetic connotations in cross-cultural communication; musical terms such as “霍洛音” (Holo Vibrato) and “垛板” (Duoban) fail to convey their professional characteristics and cultural symbolic meanings when translated literally.

This study, by reviewing existing research on CLWs in opera-related ICH, integrating ICH dissemination theories and core CLWs translation theories, and using literature review, text analysis, and case studies, it classifies MXO's CLWs into four categories: ethnic custom terms, artistic terminology terms, historical geographical terms, and ethnic cultural exclusive concept terms. It analyzes translation challenges and misunderstandings, proposes targeted strategies, constructs the MXO CLWs corpus systematically analyzes translation difficulties and strategies of different core words to verify these methods' effectiveness in ensuring cultural fidelity and target language acceptability.

## **2. An overview of culture-loaded words**

Culture-Loaded words (CLWs) are the core and challenging point of cross-cultural communication. Clearly defining and classifying them forms the foundation of this study. This chapter will first clarify the definition of CLWs, and then organize and review the existing academic classification frameworks.

### **2.1. Definition and classification of culture-loaded words**

CLWs are not just linguistic symbols but carriers of a nation's unique cultural memories, values, and behavioral norms, formed in the long-term development of history, customs, and social systems. Unlike ordinary vocabulary, their core lies in the “cultural connotation gap” when translated into other languages, due to the lack of corresponding cultural backgrounds in the target language, direct literal translation often fails to convey their full meaning.

### **2.2. Academic classification frameworks of culture-loaded words**

Scholars classify CLWs based on different criteria, forming two typical frameworks: One category is the cultural domain classification framework, which divides it into four categories, the folk category related to daily rituals and life traditions, the religious category involving beliefs and worship, the historical category covering events, figures and institutions, and the art category related to music, dance and drama <sup>[1]</sup>. This framework highlights the connection between cultural load words and specific cultural domains, helping clarify its cultural affiliation. Another framework is the classification based on the degree of cultural specificity, which divides it into three categories: completely cultural-specific words unique to the source language culture and with the greatest translation difficulty, semi-cultural-specific words that have some similarities with other cultural concepts but retain the unique connotations of the source language culture, and general words with similar corresponding concepts in cross-cultural contexts <sup>[2]</sup>. This framework focuses on cultural exclusivity to assess the difficulty of translation. This paper chooses the first framework to guide the translation study.

As a national intangible cultural heritage carrying the cultural memory of the Manchu ethnic group, the MXO contains a large number of cultural connotations in its script, performance and stage presentation. These terms are a condensed representation of the historical traditions, artistic features and national spirit of the Manchu ethnic group, directly influencing the accuracy and completeness of cross-cultural communication. Based on the three core criteria of cultural origin, functional role and translation features, this article classifies them into four categories and conducts a detailed analysis in combination with the distribution of vocabulary quantity and representative cases (refer **Table 1**).

**Table 1.** Four categories of culture-loaded words in Manchu Xincheng opera

Terminology classification	Term count	Original text	Target text	Remarks
Ethnic custom terms	20	摆胯	Hip swinging	Example 1
		腰铃舞	Waist Bell Dance	
		单鼓舞	Single Drum Dance	
		满族秧歌	Manchu Yangko Dance	
		寸子舞	Cun Zi Dance	Example 2
		萨满舞	Shaman Dance	
		太平鼓	Taiping Drum Dance	Example 3
		半弓步	Half bow step	
		拍坟头	Manchu grave-commemoration ritual	Example 4
		霍洛音	Huoluoyin	Example 5
Artistic terminology terms	15	三弦	Sanxian (three-stringed Chinese lute)	Example 6
		弹颂板	Tan Song Ban	
		靠山调	Kaoshan Tune	Example 7
		数唱	Shuchang	
		登山步	Mountain Climbing Step	
		三道弯	Three-Curve Posture	
		四功五法	Four Basic Skills and Five Techniques	Example 8
		鹰式	Eagle Pose	
		扶余八角鼓	Fuyu Bajiaogu	
		新城府	Xincheng Prefecture (Established in the 32nd year of the Guangxu reign of the Qing Dynasty)	
Historical and geographical terms	10	二十四崮山	Twenty-Four Gushan	Example 9
		渤海时期	The Bohai Kingdom	
		伯咄部	Boduo tribe	Example 10
		完颜阿骨打	Aguda of the Jurchen Wanyan Clan	
		古秀双穗	Gu Xiu Shuang Sui	
		独霸干戈	Duba Gan Ge	
		曲牌	Melodic Suite	Example 11
		海东青	Haidongqing (Sacred Bird of Prey of Manchu people)	
		抓鼓点子	Grabbing drumbeats	Example 12
		五谷丰登	Bountiful harvest of five grains	
Ethnic cultural exclusive concept terms	12			Example 13

The first category is Ethnic Custom Terms. These terms originate from the unique folk customs, rituals and social traditions of the Manchu ethnic group, carrying the most direct and genuine cultural memories of the Manchu people. In operas, they are used to depict scenes of Manchu life and reflect ethnic values. Their core function lies in enhancing the ethnic authenticity of the plot.

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The second category is Artistic Terminology Terms. These professional terms originate from the performance, music, costumes and props of the new Manchu opera, reflecting a unique style of integrating Manchu folk art with traditional opera. Through a standardized terminology system, the new Manchu Opera is distinguished from other types of opera, achieving a balance between technical accuracy and cultural symbolic meaning.

The third category is Historical Geographical Terms. This category includes place names, historical administrative divisions, and tribal names related to MXO's origin and development, carrying the Manchu's regional memories and historical context. Since English readers often lack relevant knowledge, when translating, information such as geographical location and historical evolution must be integrated to help better understand the story.

The fourth category is Ethnic Cultural Exclusive Concept Terms. These relate to the Manchu people's unique identity, kinship, beliefs, and historical figures, serving as core symbols of Manchu culture. Their role is to shape the ethnic cultural identity of characters, distinguishing Manchu roles from those of other ethnic groups. Translation needs to preserve ethnic specificity while ensuring readability.

## **2.3. Relative researches at home and abroad**

### **2.3.1. Research on intangible cultural heritage inheritance of art aspect**

International research on ICH transmission began in the mid-20th century, initially focusing on the protection and documentation of indigenous cultures. UNESCO's Convention for the Safeguarding of the Intangible Cultural Heritage identified three core attributes, transmissibility, practicality, and vitality, guiding academic attention to ICH survival in contemporary society. Theoretically, cultural anthropology has two major paradigms: authentic transmission, emphasizing safeguarding ICH in its original form; and adaptive innovation, advocating using modern media to expand ICH communication. For example, it uses virtual reality technology to enhance ICH accessibility, but their research did not involve the translation of CLWs, which are crucial for cultural transmission<sup>[3]</sup>. There are limited monographs on the translation of Chinese opera overseas. Most are Sinologists engaged in the practice of English translation of Chinese opera. In their English translation texts of opera repertoires, they usually include annotations on terms. For example, A.C. Scott's *Traditional Chinese Plays* involves terms related to acting roles, costumes, facial makeup, and music. Famous Chinese Plays by Arlington (USA) and Eckstein (UK) were published by the French Library in Beijing in 1937. The book has English expressions for relevant terms, such as "balloon guitar" for pipa, "brass cymbals" for naobo, "old sheng" for laosheng<sup>[4]</sup>.

In China, ICH research emerged in the 1980s and expanded rapidly after 2006, following the release of the first national ICH list. It evolved from policy-driven initiatives to theoretical construction and practical exploration forming a distinct Chinese model. Scholars established a "government-academia-community" framework guided by the principle: "protection first, rescue second, rational utilization, inheritance development"<sup>[5]</sup>. Wu Bingan's "living inheritance" theory underscores the central role of inheritors, arguing that ICH vitality stems from continuous interpretation in practice. However, existing studies on Manchu-related ICH mostly focus on artistic analysis, such as the study of Manchu musical elements in Hongluonü and Xiuhuanü, exploration of community inheritance in Songyuan (the birthplace of MXO), while cross-cultural communication, particularly the translation of CLWs like "萨满舞" and "寸子舞", remains underexplored<sup>[6]</sup>.

As a fifth-batch national ICH (2021), MXO research is still in its infancy. Current studies primarily focus on artistic form restoration and local inheritance, with few systematically discussing the translation of its CLWs. For instance, existing research has only made preliminary attempts at translating simple kinship terms like "Ama" and "Eniang", but lacks in-depth exploration of complex terms with multiple cultural connotations, such as "霍洛音" (a unique Manchu musical technique) and "二十四崗山" (a symbol of Manchu territorial beliefs), resulting in a research gap that this paper aims to fill<sup>[7]</sup>.

### **2.3.2. Research on the translation of culture-loaded words**

International research on CLWs originated from the "cultural turn" in translation theory. Before the 1970s, it was mostly



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limited to linguistic-level semantic comparison. In 1976, Susan Bassnett proposed in Translation Studies that “the basic unit of translation should shift from linguistic transfer to cultural communication”, marking the entry of CLWs research into a culture-dominated stage<sup>[8]</sup>. Spanish scholar Aixelá proposed the concept of “culture-specific items” and divided 11 translation strategies according to the degree of cross-cultural manipulation<sup>[9]</sup>. Western translators’ research has largely focused on English translations of Chinese literature (such as *A Dream of Red Mansions*, *Journey to the West*, *Wolf Totem*, *To Live*, etc.), analyzing the handling methods of CLWs and exploring how to balance “cultural fidelity” and “reader acceptance”.

Chinese research on CLWs began in the 1990s, influenced by the Western “cultural turn” theory, and combined with Chinese language characteristics, forming a development path of “theoretical introduction—local innovation—practical application”. In the field of ethnic minority culture, research on CLWs is relatively weak. Existing achievements mostly focus on vocabulary collation and lack in-depth analysis of translation practice. For example, some studies have sorted out Manchu CLWs such as “八角鼓” but failed to propose targeted translation strategies based on their cultural connotations and functional roles in the opera<sup>[10]</sup>. Meanwhile, existing research mostly analyzes individual vocabulary in isolation, failing to form systematic research by combining the context of theatrical works with ICH preservation needs. For instance, when translating “鹰舞” (a Manchu dance imitating the Haidongqing), existing studies only translate it literally as “Eagle Dance” without explaining its symbolic meaning of “courage” and its function in shaping heroic characters in the opera, leading to the loss of cultural information<sup>[11]</sup>.

In conclusion, although international research on CLWs has gradually developed into a mature field driven by theory, the Chinese scholarship has developed rapidly and still has significant gaps. The current main challenge lies in breaking through the simple translation of minority language words and establishing systematic and culturally-aware translation methods, especially in the field of intangible cultural heritage, where it is necessary to fully retain the deep cultural connotations in the translation.

### 3. Theoretical basis

This section constructs two key frameworks, namely the ICH communication theory and the CLWs translation principle, which directly guide the translation strategies proposed in the following text.

#### 3.1. Intangible cultural heritage communication theory

In 2003, UNESCO adopted the Convention for the Safeguarding of the Intangible Cultural Heritage in Paris. To address ICH threats from globalization and social change, it emphasizes ICH protection’s importance for promoting cultural diversity and sustainable development. ICH communication theory is dedicated to ICH’s dissemination, preservation and inheritance. The definition is closely related to MXO as CLWs typically encapsulate performance techniques, historical knowledge and cultural values simultaneously.

The theory highlights two key translation aspects acknowledging ICH communication’s multi-stakeholder nature, requiring translators to balance cultural authenticity and target audience accessibility. Distinguishing ICH content layers technical skills specialized knowledge and underlying values, this stratification provides a translation information prioritization framework reflecting core theoretical categories to help audiences grasp performance form and cultural connotation.

#### 3.2. Communicative translation principle

Translation theorist Peter Newmark’s communicative translation principle emphasizes translation should not rigidly adhere to the source text’s literal form but be target-reader-centered aiming for fluent natural easily comprehensible translations that achieve practical communicative effects equivalent to the original, guiding accurate error-free English translation of the following text in line with English expression habits, ensuring unobstructed message reception for effective cross-

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language communication, prioritizing information transmission impact and reader response over strict word-for-word correspondence with the core goal of building a smooth communication bridge <sup>[12]</sup>.

### 3.3. The theory of cultural translation

Cultural translation theory explores accurate conveyance of the original text's cultural connotations and contextual meanings in translation emphasizes translator initiative, adopts localization, foreignization and other strategies to respond to cultural differences and achieves cultural functional equivalence <sup>[13]</sup>.

In translation practice, the dynamic interaction of these theoretical perspectives sees communicative translation prioritize target-culture acceptability, cultural translation center on preserving source-culture authenticity. The strategies developed in Chapter 4 are negotiated solutions to this tension: for terms with strong cultural specificity, cultural translation is prioritized to retain authenticity; for terms with high professionalism, communicative translation is appropriately used to ensure readability; for terms with complex historical and geographical backgrounds, a combination of both theories is adopted to balance context and readability.

## 4. Difficulties and solutions in translation

Based on the classification of MXO's CLWs, by constructing a corpus of CLWs for MXO, the translation difficulties and strategies are systematically analyzed. This chapter analyzes the translation challenges of each type and explores the application of literal translation and liberal translation to include cultural fidelity and target-language readability.

### 4.1. Translation of ethnic custom terms

These terms deeply embedded in distinctive Manchu traditions and worldview find artistic expression through the opera's storytelling and character development regarded as "living fossils of Manchu culture" their strong cultural uniqueness and absence of English equivalents present distinctive translation obstacles. Key difficulties include: culturally unique referents causing semantic gaps; connotations tied to Manchu values that resist literal translation; and narrative embedded requiring contextual and cultural knowledge for full comprehension.

#### 4.1.1. Literal translation

The literal translation method strictly adheres to the source term's surface meaning retains its original form and readability applies to terms where core actions or objects can be directly conveyed and cultural connotations supplemented via annotations may lose cultural characteristics or symbolic meaning when used alone.

Example 1:

ST: 腰铃舞

TT: Waist Bell Dance

Analysis: The literal translation "Waist Bell Dance" gets straight to the dance's core components. However, to enable readers to have a more accurate understanding, the translator can also add annotations to supplement three key cultural background points: its ethnic roots as a Manchu ritual dance, its ritual purpose of communicating with spiritual entities, and its use in opera, specifically in blessing or exorcism scenes. This approach eliminates the vagueness of a bare literal translation and ensures target readers grasp both the dance's form and its cultural meaning.

Example 2:

ST: 寸子舞

TT: Cun Zi Dance

Analysis: Directly use transliteration for translation. The purpose is to preserve the expression of this dance name in Chinese and better highlight its cultural uniqueness. When readers of other languages use this expression with people from Chinese-speaking countries, it can also enable them to quickly understand. It should be noted that the translator should add

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a note later: “Cun Zi Dance” is a dance performed only by noble women wearing high-heel shoes, which shows the class attribute of this dance.

#### **4.1.2. Adapted translation**

Adapted translation is particularly suitable for ethnic custom terms that carry specific ritual functions and cultural meanings, as it prioritizes conveying the term’s core function in rituals and cultural contexts over literal form.

Example 3:

ST: 太平鼓

TT: Taiping Drum Dance

Analysis: The Taiping Drum Dance is a dance variety with hand-held drum; it is also known as Dangu and “Drums of Great Peace”. It is popular in North China and commonly performed by the Manchu ethnic group for shamanism priests. With the passage of time, it became a way for people to express joy and happiness this translation method combining transliteration and free translation preserves the pronunciation of the Chinese dance name to reflect its cultural uniqueness and facilitates foreign readers’ understanding of its meaning.

Example 4:

ST: 拍坟头

TT: Manchu grave-commemoration ritual

Analysis: Literally translating “patting the grave” only conveys the surface action. It fails to reflect the ritual’s funerary nature and its ethnic cultural differences, which set it apart from Han customs. The alternative translation “grave-commemoration ritual” defines the ritual’s essential character. The annotations supplement key details the gentle patting of the earthen mound as the core action its distinction from Han tombstones as a cultural difference its role as an emotional climax in the Manchu opera Red Gao. This meets the requirements of ICH Communication Theory, transmitting both technical skills and cultural connotations. It ensures target readers understand not only the ritual’s ethnic specificity but also its function in the opera.

## **4.2. Translation of artistic terminology terms**

These terms originate from professional jargon in opera performance music costumes and props embody an artistic style integrating Manchu folk music dance and Shamanic traditions face three major translation challenges. Lack of precise English counterparts hinders the conveyance of professionalism. Dual attributes as artistic form and cultural symbol make balancing technical accuracy and cultural connotation difficult. Limited understanding of the art system among target audiences requires explanation through specific contexts.

### **4.2.1. Transliteration**

Transliteration directly converts the phonetic form of source language vocabulary into similar-sounding target language expressions maximizes restoration of the original word’s unique title attribute enables target readers to grasp core cultural positioning while recognizing phonetic marks serves as an important translation choice for balancing cultural specificity and cross-cultural readability.

Example 5:

ST: 霍洛音

TT: Huoluoyin

Analysis: It directly uses transliteration for translation, aiming to preserve the expression of this performance technique in Chinese and better highlight its cultural uniqueness. When readers of other languages use this expression with people from Chinese-speaking countries, it can also enable them to quickly understand. The translator should add relevant notes: This is a Manchu ethnic throat trill performance technique, characterized by rich and resounding sounds.

Example 6:

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ST: 弹颂板

TT: Tan Song Ban

Analysis: As a unique way of creating rhythm with traditional Chinese musical instruments, the author still chooses to use transliteration to handle its translation. By doing so, its cultural uniqueness can be preserved, and the right to speak can be demonstrated in the context of external publicity. At the same time, it can also help Chinese learners communicate. Of course, necessary annotations are also indispensable.

#### **4.2.2. Liberal translation**

Liberal translation rephrases terms with strong cultural symbolism or complex professional attributes ensures target readers grasp both technical functions and cultural meanings is particularly suitable for terms where literal translation is overly obscure or fails to reflect dual attributes.

Example 7:

ST: 三道弯

TT: Three-Curve Posture

Analysis: This translation implies the three - bend posture of the body, suggesting that it is suitable for female characters, matching actions such as brushing the temples and stroking the eyebrows, and embodying the cultural connotation of the elegant demeanor of Manchu noblewomen. This solves the problem of the direct translation being too abstract. Without these details, it would be difficult for readers to guess how the three bends are formed or what they symbolize.

### **4.3. Translation of historical geographical terms**

These terms including place names historical titles and event-related terms integral to the opera's origin and development preserve its historical memory and geographical identity. Translating them faces three principal challenges: difficulty conveying embedded contexts concisely; culturally specific concepts lacking equivalent English expressions, causing contextual gaps; and audiences' limited knowledge of Chinese geography and history requiring supplementary explanations.

#### **4.3.1. Literal translation with annotation**

The core of literal translation and annotation is to first perform a literal translation of the source language terms, fully preserving their surface semantic and cultural morphological features, and then fill in the possible cultural cognitive gaps of the target readers through supplementary annotations. While accurately conveying the original text's information, enable the target readers to fully grasp the profound cultural implications behind the terms.

Example 8:

ST: 新城府

TT: Xincheng Prefecture (Established in the 32nd year of the Guangxu reign of the Qing Dynasty)

Analysis: "Xincheng Prefecture" adopts the literal translation "Xincheng Prefecture", precisely corresponding to the literal meanings of "new", "city" and "prefecture" and the administrative system attributes of the Qing Dynasty, retaining the dual core characteristics of geography and administration. The annotations in parentheses supplement the key historical background and the core connection of the text, which not only avoids the limitation of literal translation that only shows surface names, but also fills the cognitive gap of the target readers about the evolution of modern Chinese administration and the origin of drama genres through precise information. This conforms to the core logic of "preserving form and supplementing meaning" in literal translation with annotations, while closely adhering to the context of the text.

#### **4.3.2. Liberal translation**

Liberal translation rephrases terms where literal translation fails to convey symbolic meaning or historical context,

integrating multi-dimensional information (geography, history, opera connection) to ensure comprehensibility.

Example 9:

ST: 二十四崗山

TT: Twenty-Four Gushan

Analysis: A literal translation of “Twenty-Four Ancient Mountains” might easily lead readers to mistake it for a real geographical entity. The translator’s free translation approach clarifies its symbolic nature by adding that it is a symbolic concept representing the territory and sovereignty of the Qing Dynasty. The annotation connects it to the design of the octagonal drum and its role in the opera. This treatment effectively addresses the challenge of conveying the non-geographical symbolic meaning of a unique status as a sacred Manchu totem that a literal translation fails to capture.

#### **4.4. Translation of ethnic cultural exclusive concept terms**

As core symbols of Manchu identity, these terms include kinship titles, sacred animals, historical figures and linguistic-specific concepts face unique translation challenges. Literal translation often causes semantic loss, excessive adaptation risks erasing ethnic specificity, requiring a balance between cultural preservation and readability.

##### **4.4.1. Liberal translation**

Liberal translation adapts terms where cultural symbolism or narrative purpose outweighs literal wording particularly those referring to historical figures and complex concepts rephrases to highlight cultural meaning and storytelling value makes the term accessible to new audiences while preserving its distinctive ethnic character.

Example 10:

ST: 完顏阿骨打

TT: Aguda of the Jurchen Wanyan Clan

Analysis: A literal translation of “Wanyan Aguda” only preserves the name but omits the historical context. The free translation clarifies his title as the founding emperor of the Jin Dynasty his ethnic affiliation with the Wanyan clan of the Jurchen people and his cultural status as a revered ancestor of the Manchu. It also connects him to his role in the opera *Manzhou Tie Xue*. This translation approach effectively addresses the problem of readers’ unfamiliarity with Manchu historical figures allowing them to understand why he serves as the core character of this opera.

##### **4.4.2. Creative translation**

The Creative Translation involves coining new expressions in the target language that faithfully convey the term’s cultural spirit while ensuring readability. It is used for terms that condense profound cultural meanings and have no conventional equivalents in the target language.

Example 11:

ST: 曲牌

TT: Melodic Suite

Analysis: There is no direct equivalent in English for the “曲牌” structure in Xincheng Opera. We innovation propose the concept “melodic suite” skillfully integrating the core elements of “connected tunes” with the musical form. This annotation emphasizes its dramatic function such as the balance between cultural uniqueness and audience comprehension in scene transitions literal translation struggles to convey structural subtleties creative translation strikes a balance between accuracy and readability.

##### **4.4.3. Transliteration with annotations**

This method prioritizes conveying the multi-layered cultural metaphors of ethnically exclusive concepts by supplementing detailed annotations on their symbolic meanings and dramatic functions, compensating for the target readers’ cultural knowledge gaps regarding ethnic-specific beliefs and historical symbols.



Example 12:

ST: 海东青

TT: Haidongqing (Sacred Bird of Prey of Manchu people)

Analysis: Translating it simply as “a type of falcon” would lose its three core connotations its symbolic status as a “sacred bird” its significance as an emblem of emperors and its narrative function in the opera. This annotation emphasizes its dramatic function such as the balance between cultural uniqueness and audience comprehension in scene transitions literal translation struggles to convey structural subtleties creative translation strikes a balance between accuracy and readability. Following Bassnett’s cultural translation theory that “culture is the basic unit of translation” this approach preserves the core cultural spirit of the Manchu people’s reverence for sacred birds while connecting it to the opera text Tie Xue Rou Qing thus striking a balance between cultural authenticity and communicative needs.

#### **4.4.4. Literal translation**

This method directly translates the core meaning of the source language to retain the source culture’s concepts and symbolic meanings fully preserve inherent connotations including national beliefs and folk customs and helps target readers grasp both surface meaning and deep cultural implications.

Example 13:

ST: 五谷丰登

TT: bountiful harvest of five grains

Analysis: The translation uses literal translation with cultural connotation retention. “Five grains” directly corresponds to the original term’s reference to staple crops in traditional Chinese agriculture, preserving the cultural specificities of Manchu agricultural beliefs. “Bountiful harvest” accurately conveys the core meaning of prosperity and abundance implied by “ 丰登 ”. This method aligns with the text context the double tassels on the octagonal drum symbolize this blessing balances target language clarity with the source term’s cultural symbolism ensures English readers grasp both the literal meaning and the auspicious connotation rooted in Manchu life and customs.

## **5. Conclusion**

This study explores the English translation of MXO’s CLWs from the perspective of ICH inheritance. Through literature review, theoretical framework analysis, and research method discussion, combined with the analysis of translation difficulties and strategies, this paper deeply expounds the significant value of the translation of this cultural load word in opera for cultural inheritance and dissemination.

In terms of theoretical support, the research integrates the theories of intangible cultural heritage communication, communicative translation principles and cultural translation theories, and constructs a translation logic that balances “cultural fidelity” and “readability of the target language”. For the translation difficulties of different types of vocabulary, the research proposes targeted strategies. For example, for ethnic custom terms, literal translation with annotations or adapted translation is employed, taking into account both form and ritual connotation; For artistic terminology terms, transliteration or free translation should be used to preserve cultural uniqueness. Historical and geographical terms take literal translation and annotations as the core supplement information on historical evolution and geographical connections. The ethnic cultural exclusive concept terms dedicated to ethnic culture strikes a balance between ethnic specificity and readers’ comprehension through methods such as Liberal Translation and creative translation.

This study expands the theoretical system of ICH translation research and offers practical references for the external translation of MXO. It effectively addressed core issues such as the gap in semantic transmission, the loss of cultural connotations, and readers’ cognitive impairments. However, the scale of this study is limited. In the future, the scope of the research will be expanded to cover more CLWs and diverse translation strategies.

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# Empowering Chinese and English Bilingualism in Chinese Preschoolers: The Role of Conversational Reading

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**Abstract:** This study examines the effectiveness of conversational reading interventions in supporting bilingual language development among Chinese preschool children. Grounded in ecological systems theory, the investigation focuses on vocabulary, syntactic development, and pragmatic competence while accounting for individual differences such as age and prior language exposure. Semi-structured interviews with educators, parents, and children provide qualitative evidence regarding the intervention's impact. Participants reported enhanced linguistic confidence, increased cross-linguistic transfer, and greater engagement during shared reading. Teachers and parents also emphasized the value of culturally relevant texts and sustained adult-child interaction. The findings offer empirically informed recommendations for integrating conversational reading into early childhood programs and underscore the importance of coordinated home-school efforts in promoting early bilingual communication skills.

**Keywords:** Conversational reading intervention; Bilingual communication skills; Teacher and parent perspectives

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## 1. Introduction

In an increasingly globalized world, developing bilingual communication skills in early childhood is a critical educational priority. Many language-minority children enter preschool with limited prior exposure to their home language, creating challenges for second-language acquisition and later academic achievement <sup>[1]</sup>. The preschool years constitute a pivotal period for linguistic, cognitive, and socio-emotional development, during which delays in language proficiency may have enduring consequences <sup>[2]</sup>. In China, early foreign-language learning is particularly salient, yet assessing bilingual development remains complex due to heterogeneous language trajectories. Recent research underscores the need for multidimensional assessment approaches, including domain-specific tools and technology-enhanced measures that capture phonological awareness, vocabulary, oral expression, and print knowledge <sup>[3,4]</sup>. Despite these advances, existing studies often isolate single language skills and overlook the broader influences of parental involvement, individual learner differences, and teacher practices <sup>[5,6]</sup>. These factors collectively shape the effectiveness of early language interventions. Responding to these gaps, the present study examines the impact of dialogic reading and family conversational interaction

on Chinese preschoolers' bilingual development. It explores the effectiveness of conversational reading, improvements across vocabulary, syntax, and pragmatics, the influence of individual differences, and both teacher and parent perspectives on the intervention.

## **2. Literature review**

### **2.1. Bilingual language acquisition in early childhood education**

Bilingual language acquisition in early childhood refers to young children's gradual development of lexical, grammatical, and communicative competence in two languages. Research on children from diverse backgrounds, including refugee families with limited proficiency in the dominant language, highlights the importance of distinguishing language disorders from normal bilingual variation. Memory-based assessments provide useful tools for this purpose<sup>[7]</sup>. Recent developments in English language teaching emphasize a redefinition of "English users," with increased recognition of bilingual identities and functional multilingual competence across personal and professional contexts<sup>[8]</sup>.

Early childhood programs provide structured opportunities for exposure and interaction, forming the foundation for later bilingual development. During this developmental period, children naturally acquire two languages due to heightened neuroplasticity<sup>[9]</sup>. Longitudinal evidence shows that early difficulties in phonological processing, measured through nonword and word repetition at ages two to three, are predictive of later language difficulties, underscoring the need for early detection and support<sup>[10]</sup>.

### **2.2. Intervention strategies for bilingual language learning**

Bilingual interventions aim to strengthen language development through structured activities that promote attention, perception, and cross-linguistic transfer. Studies show that bilingual children often demonstrate enhanced metalinguistic awareness, creativity, and cognitive flexibility; for example, bilingual preschoolers outperform monolingual peers on metalinguistic tasks<sup>[11]</sup>. Bilingual approaches also encourage parental participation, even when parents are not proficient in the societal language, and support social and cognitive development through home-school collaboration. Effective interventions commonly use enriched language environments, purposeful play, and culturally relevant materials, leveraging young children's natural language-learning capacity<sup>[12]</sup>.

### **2.3. Teacher and parent perspectives on conversational reading intervention**

Teacher and parent perspectives are central to understanding how conversational reading interventions function in practice. Media exposure and screen time can negatively affect children's attention and language development, reinforcing the importance of interactive literacy activities. Teachers highlight dialogic reading's benefits for engagement and language growth, while parents report improvements in confidence and bilingual use<sup>[13,14]</sup>. Maternal sensitivity and responsive caregiver behavior also support cognitive and linguistic outcomes<sup>[15]</sup>. Evidence suggests that early, sustained interventions, particularly those exceeding eight weeks and delivered in naturalistic, bilingual contexts, yield the strongest gains in vocabulary and narrative abilities, though syntactic improvements in L2 remain more limited<sup>[16]</sup>.

## **3. Research methodology**

This qualitative study employs an interpretive phenomenological approach to examine the role of conversational reading interventions in fostering bilingual communication skills among Chinese preschool children. Participants include preschool children, teachers, and parents from diverse linguistic backgrounds, selected through purposive sampling to ensure variation in language proficiency and cultural context. All interviews were conducted in-person or via video conferencing according to participant preference. Ethical procedures, including informed consent and confidentiality, were strictly

followed.

Data were analyzed using iterative, data-driven thematic analysis. Coding focused on identifying recurring patterns, themes, and insights, with allowance for emergent findings. This approach enabled a comprehensive understanding of how conversational reading interventions influence bilingual language development in preschool children while incorporating perspectives from multiple stakeholders (refer **Table 1**).

**Table 1.** Demographic profile of participants

Participant	Gender	Age	Selected group
P1	Male	22	Parents
P2	Female	20	Teachers
P3	Male	23	Teachers
P4	Female	21	Teachers
P5	Male	35	Parents
P6	Female	28	Teachers
P7	Male	40	Parents
P8	Female	30	Parents
P9	Male	28	Parents
P10	Female	25	Parents
P11	Male	32	Teachers
P12	Female	27	Teachers
P13	Male	29	Teachers
P14	Female	31	Teachers

#### 4. Analysis

A systematic analytic procedure was employed to examine the implementation of conversational reading interventions and their influence on preschoolers' bilingualism development. The analysis sought to identify recurrent patterns across participant accounts and generate an integrated interpretation of the intervention's effects.

All interview recordings were transcribed verbatim to ensure maximal fidelity to participants' original responses. Relevant paralinguistic cues were noted when they contributed to interpretive clarity. The finalized transcripts were organized and prepared for structured qualitative analysis.

An initial coding framework, aligned with the study's research questions, guided the analytic process. Transcripts were reviewed iteratively to identify meaningful units of data, which were assigned codes representing emergent concepts. Inter-coder reliability was established through independent coding of selected transcripts, with discrepancies resolved through discussion to refine the coding scheme.

The coded data-set was then subjected to thematic analysis to identify cross-cutting themes and conceptual regularities. Relationships among codes were examined, and higher-order thematic categories were constructed to capture the underlying structure of participants' experiences. These themes formed the analytical foundation for interpreting how conversational reading interventions shape bilingual communicative development in early childhood.



## 5. Results

Analysis of participant narratives yielded three overarching themes:

- (1) The centrality of conversational reading in early development
- (2) Bilingual language acquisition in preschool-aged children
- (3) Pedagogical implications for teachers and parents

Together, these themes illuminate how conversational reading, when paired with intentional adult scaffolding, supports bilingual communicative competence among Chinese preschoolers.

### 5.1. Theme 1: The importance of conversational reading in preschool children

Participants consistently emphasized conversational reading as a multidimensional developmental scaffold. Interactive dialogue during shared reading was described as enhancing linguistic enrichment, cognitive engagement, socio-emotional understanding, and cultural awareness. Such dialogic interactions were viewed as fostering children's contextual comprehension, imagination, emotional literacy, and foundational literacy skills. Moreover, participants noted that conversational reading strengthens parent-child relational bonds and cultivates early dispositions toward critical thinking and lifelong learning.

### 5.2. Theme 2: Bilingual language acquisition in preschool children

Findings underscored that bilingual acquisition in early childhood emerges through naturalistic, simultaneous exposure to two languages. Participants highlighted preschoolers' ability to draw on diverse linguistic inputs and interactional cues to develop vocabulary, syntactic knowledge, and communicative competence in both languages. The data reaffirmed that early bilingualism leverages heightened neuroplasticity, enabling children to manage multiple linguistic systems and develop cognitive flexibility, intercultural awareness, and robust linguistic identities.

### 5.3. Theme 3: Pedagogical implications for teachers and parents

Participants identified clear implications for educators and caregivers. Effective support for bilingual development requires coordinated strategies that integrate linguistic scaffolding, cultural responsiveness, and sustained adult-child interaction. Encouraging language confidence, facilitating cross-linguistic transfer, and maintaining collaboration between teachers and parents were viewed as essential. By creating structured yet supportive environments, educators and caregivers jointly contribute to preschoolers' bilingual growth and cultivate positive orientations toward language learning.

## 6. Discussion

This study demonstrates that conversational reading is an effective pedagogical tool for enhancing bilingual communication among Chinese preschool children. Participants reported improvements in children's vocabulary, syntactic awareness, communicative confidence, and cross-linguistic transfer. Children's increased willingness to use new words and structures in both languages indicates meaningful progress in bilingual proficiency. Teachers and parents also emphasized that bilingual development is shaped by daily interactional experiences, with conversational reading providing a structured yet flexible context for sustained language practice.

The findings are consistent with literature highlighting the value of developmentally appropriate language interventions and reinforce evidence supporting dialogic reading in early childhood education <sup>[2,17]</sup>. Observed patterns of bilingual acquisition similarly reflect research documenting fluctuations in proficiency based on exposure and cognitive demands <sup>[18]</sup>. Furthermore, the pedagogical implications align with studies underscoring the influence of teacher and learner beliefs on instructional effectiveness <sup>[19]</sup>.

Practically, the study suggests that implementing systematic conversational reading sessions, incorporating culturally relevant texts and explicit cross-linguistic links, can strengthen bilingual development. Enhanced home-school

collaboration, particularly through parent-focused training may further enrich children's learning environments.

Limitations include the small, locally specific sample, short intervention timeframe, and uncontrolled external factors such as home language use. Future research should adopt longitudinal and comparative designs, broaden participant diversity, and explore cultural, neurocognitive, and technology-mediated dimensions of early bilingual development.

## 7. Conclusion

The results indicate that systematic conversational reading sessions significantly improve preschoolers' vocabulary, syntactic development, and functional communication abilities. Incorporating culturally relevant texts further strengthened language learning and promoted cultural awareness. These findings highlight the essential role of early childhood education in supporting bilingual communication skills and offer practical implications for teachers, parents, and policymakers.

However, the study's small sample size and short intervention period limit the generalizability of the findings. Future research should employ longitudinal designs to examine long-term effects and include more diverse participant groups to ensure applicability across different linguistic and cultural contexts. Overall, the study provides valuable insights into effective strategies for fostering bilingual development in Chinese preschool children, emphasizing the importance of coordinated school-home efforts to build young learners' confidence, competence, and cultural understanding.

## Disclosure statement

The authors declare no conflict of interest.

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# A Dual-Oriented Evaluation Study on High-Quality Development of Urban Cultural Tourism Industry: Brand and Green Development

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**Abstract:** Driven by the dual objectives of carbon peaking and carbon neutrality alongside consumption upgrading, “branding” and “green transformation” have become pivotal strategies for urban cultural tourism industries to overcome homogenized competition and achieve high-quality development. This study establishes an evaluation framework under the “brand + green” dual orientation, comprising five primary indicators (brand value, green ecology, industrial benefits, innovation-driven growth, service quality) and 18 secondary indicators. Using Analytic Hierarchy Process (AHP) for weight determination and entropy method for objective adjustment, a comprehensive evaluation model is developed. Through quantitative analysis and qualitative assessment of five exemplary cultural tourism cities, including Hangzhou, Kunming, Xiamen, Xi’an, and Qingdao, the research identifies their developmental strengths and weaknesses under this dual orientation. It proposes differentiated optimization strategies to provide theoretical support and practical references for achieving high-quality development in urban cultural tourism industries, emphasizing “brand prominence, ecological priority, and synergistic benefits”.

**Keywords:** Brand orientation; Green orientation; Urban cultural tourism industry; High-quality development; Evaluation system; Analytic hierarchy process

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## 1. Introduction

### 1.1. Research background

As a strategic pillar industry of the national economy, the high-quality development of cultural tourism serves as a key driver for transforming urban economic structures and enhancing cities’ competitiveness. Currently, China’s urban cultural tourism sector faces dual challenges: Firstly, homogenized development has led to the prominent “one-size-fits-all” phenomenon, where most cities lack distinctive brand identities in their cultural tourism offerings, making it difficult to sustain long-term appeal. Secondly, frequent ecological damage and resource waste in traditional cultural tourism development contradict the philosophy that “lucid waters and lush mountains are invaluable assets”, thereby constraining the industry’s sustainability<sup>[1,2]</sup>.

In this context, the dual integration of “brand + green” has become the key to breaking the deadlock. From a policy perspective, the “14th Five-Year Plan for Tourism Development” explicitly states “building a number of world-class tourism brands” and “promoting the green development of tourism”, incorporating the dual orientation into the national

strategy<sup>[3]</sup>. From a market perspective, consumers not only pay attention to the brand recognition and cultural connotation of cultural and tourism products but also increasingly value the eco-friendliness of travel experiences. According to data from the China Tourism Academy in 2024, 72.3% of tourists listed “ecological environment” as the primary factor when choosing a travel destination, and 68.5% would prioritize cultural and tourism projects with clear brand IPs. Under this trend, how to scientifically evaluate the development level of urban cultural and tourism industries under the dual orientation of “brand + green” has become an urgent theoretical and practical issue to be addressed<sup>[4]</sup>.

## 1.2. Research significance

### 1.2.1. Theoretical significance

This study transcends the conventional single-dimensional evaluation paradigm of the cultural tourism industry by integrating “brand value” and “green ecology” into a unified analytical framework. It establishes a dual-oriented evaluation system that enriches the theoretical foundation for high-quality development in the sector. By combining the Analytic Hierarchy Process (AHP) with the entropy method, the research enhances the scientific rigor and credibility of evaluation outcomes, providing methodological references for similar studies<sup>[5,6]</sup>.

### 1.2.2. Practical significance

Through empirical analysis, this study identifies development gaps in the cultural tourism sector under dual-oriented policies in typical cities, such as insufficient brand IP stickiness and delayed adoption of green technologies. These findings provide precise evidence for formulating differentiated development strategies. The research guides cities to transition from “scale expansion” to “quality and efficiency” in cultural tourism development, achieving coordinated enhancement of brand influence and ecological sustainability.

## 1.3. Domestic and international research status

Foreign research began earlier, focusing on independent dimensions of brand and green development. At the brand level, American scholar Aaker’s “Five-Star Brand Equity Model” has been widely applied to evaluate the brand value of cultural and tourism destinations, emphasizing core elements such as brand awareness and brand associations. On the green front, the EU’s “Green Tourism Certification System” establishes evaluation criteria from perspectives like resource conservation and environmental friendliness<sup>[7,8]</sup>.

Domestic research demonstrates an evolutionary trend of “transition from independence to integration”: In brand-oriented studies, scholars have analyzed the development of cultural tourism IPs (e.g., Xi’an’s “Datang Nocturnal City”) and brand communication pathways, proposing an evaluation logic of “brand recognition → brand reputation → brand loyalty”. Green-oriented research has focused on ecological carrying capacity and low-carbon tourism technologies, establishing green evaluation indicators that encompass resources, environment, and benefits. Recent studies have begun exploring dual integration, such as examining cultivation pathways for “green cultural tourism brands”, yet a systematic dual-oriented evaluation framework remains underdeveloped. Empirical research predominantly concentrates on single cities, lacking cross-city comparative analyses. In summary, existing studies still face challenges including single-dimensional evaluation metrics, insufficient dual integration, and limited empirical samples, which provide exploration opportunities for this research<sup>[9,10]</sup>.

## 2. The core connotation and theoretical basis of the dual orientation of “brand + green”

### 2.1. Core content

The essence of brand-oriented development centers on cultivating distinctive cultural tourism brands. Through strategic positioning, IP development, promotional campaigns, and customer retention, this approach enhances the industry’s market recognition, reputation, and competitiveness. Key elements include: brand value (asset scale and premium pricing potential), brand communication (digital media impact and cross-regional collaboration), and brand experience (cultural depth



of offerings and visitor engagement). Green-oriented development prioritizes ecological sustainability by integrating green principles throughout the entire tourism value chain. This ensures efficient resource utilization, minimizes environmental impact, and achieves synergy between ecological and socio-economic benefits. Core components encompass: green ecology (environmental quality and resource capacity), green operations (low-carbon technologies and waste management efficiency), and green consumption (visitor awareness of eco-friendly choices and sustainable service delivery)<sup>[11]</sup>.

In the dual-guided collaborative relationship, “brand” serves as the “calling card” of the green cultural tourism industry. The green ecosystem infuses brands with unique value and sustainable competitiveness, creating a “mutually empowering, symbiotic” dynamic. Brands lacking green support risk becoming “flash-in-the-pan” homogenization traps, while green cultural tourism without brand empowerment struggles to realize market value transformation<sup>[12]</sup>.

## 2.2. Theoretical basis

The brand equity theory provides theoretical support for brand-oriented evaluation. It posits that brand equity represents the added value a brand brings to products, encompassing five dimensions: brand awareness, brand associations, brand loyalty, perceived quality, and other assets, such as patents and channel relationships. This framework can be used to quantify the market value and influence of urban cultural tourism brands. The ecological economics theory lays the foundation for green-oriented evaluation. It emphasizes the coordinated development of economic activities and ecosystems, advocating a three-dimensional perspective of “resources-environment-economy” to measure industrial development quality. The theory opposes short-term benefits achieved at the expense of ecological environments, which aligns closely with the core demands of green development in the cultural tourism industry<sup>[13,14]</sup>.

The theory of high-quality development provides top-level guidance for the integration of dual orientations. It emphasizes the development philosophy of “innovation, coordination, green, openness, and sharing”, requiring the cultural tourism industry to balance ecological protection during brand building and enhance brand value through greening, achieving the unity of “reasonable quantitative growth” and “effective qualitative improvement”.

## 3. Establishing an evaluation system for high-quality development of urban cultural tourism industry with dual orientation of “brand + green”

### 3.1. Design principles of evaluation indicators

#### 3.1.1. Scientific principle

Indicators must closely align with the dual connotation of “brand + green”, based on relevant theoretical designs to ensure clear indicator meanings, accessible data, and standardized calculation methods.

#### 3.1.2. Systematic principle

Cover multiple dimensions such as brand, green, industrial benefits, innovation, and services, comprehensively reflecting the core elements of high-quality development in the cultural tourism industry, avoiding biases from single dimensions.

#### 3.1.3. Operability principle

Indicator data should primarily come from the “China Tourism Statistical Yearbook”, urban statistical bulletins, official data released by cultural tourism departments, and authoritative third-party reports, such as the China Tourism Academy and Meituan Cultural Tourism Consumption Report, ensuring data accessibility and quantifiability.

#### 3.1.4. Differentiation principle

Considering the varying cultural tourism resource endowments of different cities (such as Hangzhou’s ecological resources and Xi’an’s historical and cultural resources), indicator settings balance commonalities and particularities to provide a fair basis for cross-city comparisons<sup>[15–17]</sup>.

### 3.2. Evaluation index system framework

Based on the core connotation and theoretical basis of dual orientation and existing research results, an evaluation system consisting of 5 first-level indicators and 18 second-level indicators is constructed as follows (refer **Table 1**)<sup>[18–20]</sup>.

**Table 1.** Evaluation system

Primary indicator	Secondary indicators	Indicator Explanation	Data sources
1. Brand Value Dimension	1.1 Brand Asset Size	Number of trademarks related to urban cultural tourism brands and IP licensing revenue	City Cultural and Tourism Bureau report, enterprise annual report
	1.2 Brand communication effectiveness	Social media exposure and positive review ratio for cultural tourism topics	Weibo Index, Meituan/Dianping data
	1.3 Brand Loyalty	Tourist revisit rate and brand recommendation intention (Net Promoter Score, NPS)	Tourist satisfaction survey, China Tourism Academy report
	1.4 Brand Culture	The proportion of intangible cultural heritage incorporated into cultural tourism products and the number of cultural performances	Statistical Bulletin of Municipal Culture and Tourism Bureau
2. Green ecological dimension	2.1 Ecological environment quality	The rate of good air quality and surface water compliance in scenic areas	Bulletin of Municipal Ecology and Environment Bureau
	2.2 Resource carrying capacity	Maximum utilization rate of scenic spot carrying capacity and water resource recycling rate	Environmental Impact Assessment Report of Scenic Area
	2.3 Low-carbon technology applications	Share of new energy in tourism transportation and green building coverage	Report of the Municipal Transportation Bureau and the Housing and Construction Bureau
	2.4 Waste disposal efficiency	Waste sorting rate and sewage treatment rate	Scenic Area Operations Report
3. Industrial benefits	3.1 Economic returns	The proportion of added value in the cultural and tourism industry to GDP and per capita tourism expenditure	Urban Statistical Bulletin, China Tourism Statistical Yearbook
	3.2 Employment promotion capacity	The proportion of employment in the cultural and tourism industry in the total employment	Report of the Municipal Human Resources and Social Security Bureau
	3.3 Green Benefit Transformation	Return on investment and revenue share of eco-tourism in green cultural tourism projects	Enterprise investment report, special statistics of cultural tourism Bureau
4. Innovation-driven dimensions	4.1 Product Innovation Capability	Number of new cultural and tourism products added each year (e.g., immersive experience projects)	Urban Cultural Tourism Bureau project filing data
	4.2 Application of technological innovation	The adoption rate of digital technologies (VR/AR) in cultural tourism applications	Report on technology investment of cultural tourism enterprises
	4.3 Pattern Innovation Level	Number of cultural tourism and industry integration projects (e.g., cultural tourism + agriculture/science and technology)	Urban Industrial Integration Development Report
5. Service quality dimension	5.1 Infrastructure quality	Smart tourism service platform coverage and accessibility infrastructure	Urban Cultural and Tourism Service Quality Report
	5.2 Professional Service Standards	The rate of cultural and tourism practitioners holding certificates and the duration of training	Statistics of employees in the Department of Culture and Tourism
	5.3. Tourist satisfaction	Overall satisfaction score, complaint handling rate	Tourist satisfaction survey, 12301 tourism complaint platform data
	5.4 Green Service Supply	Number of green hotels and coverage of eco-tourism routes	Green Tourism Certification List of the Ministry of Culture and Tourism

### 3.3. Indicator weighting determination: AHP-entropy combination method

#### 3.3.1. Subjective weighting in analytic hierarchy process (AHP)

To construct the judgment matrix, 15 experts (including scholars in cultural tourism, government officials from cultural tourism departments, and executives from cultural tourism enterprises) were invited to conduct pairwise comparisons of indicator importance using the “1–9 scale method” to form the matrix. Consistency verification was performed by calculating the CR value (Consistency Ratio) to validate the matrix’s coherence, with  $CR < 0.1$  indicating satisfactory results to ensure the rationality of subjective weighting. The weights were determined by solving the maximum eigenvalue and eigenvector of the judgment matrix through eigenvalue analysis. The results revealed that among primary indicators: “Brand Value Dimension” (0.25), “Green Ecology Dimension” (0.25), “Industrial Efficiency Dimension” (0.20), “Innovation-Driven Dimension” (0.15), and “Service Quality Dimension” (0.15) all held core positions, reflecting the dual-oriented approach.

#### 3.3.2. Objective weighting by entropy method

Data standardization involves processing raw data from 18 secondary indicators across five sample cities through normalization (using the “maximum method” for positive indicators and the “minimum method” for negative indicators) to eliminate dimensional differences. Entropy values and difference coefficients are calculated. The entropy value of each indicator is determined based on standardized data, where lower entropy values indicate greater informational utility. The difference coefficient is calculated as 1 minus the entropy value. Objective weights are then assigned to indicators using the difference coefficient, with indicators like “low-carbon technology application” and “brand communication effectiveness” receiving higher weights due to their significant sample variations.

#### 3.3.3. Combination weight calculation

The ‘multiplicative synthesis method’ integrates subjective weight ( $W1$ ) and objective weight ( $W2$ ) into a combined weight  $W = (W1 \times W2) / \sum(W1 \times W2)$ , which not only reflects expert experience but also captures data’s objective patterns, thereby enhancing the scientific validity of the weights.

#### 3.3.4. Construction of comprehensive evaluation model

A comprehensive evaluation model based on the “Linear Weighted Sum Method” was constructed, with the calculation formula as follows:  $F = \sum_{i=1}^n \sum_{j=1}^m W_{ij} \times X_{ij}$ . Here,  $F$  represents the comprehensive score for high-quality development of urban cultural tourism industry,  $W_{ij}$  denotes the combined weight of the  $j$ -th secondary indicator under the  $i$ -th primary indicator, and  $X_{ij}$  indicates the standardized data of the  $j$ -th secondary indicator under the  $i$ -th primary indicator. The parameters are defined as  $n = 5$  (number of primary indicators) and  $m$  (number of secondary indicators under each primary indicator). Based on the comprehensive score, the development level is categorized into four grades: Excellent ( $F \geq 0.8$ ), Good ( $0.6 \leq F < 0.8$ ), Average ( $0.4 \leq F < 0.6$ ), and Improvement Needed ( $F < 0.4$ ).

## 4. Empirical analysis: Evaluation and comparison based on 5 typical cities

### 4.1. Sample selection

Five exemplary cultural and tourism cities, Hangzhou, Kunming, Xiamen, Xi’an, and Qingdao were selected as case studies for the following reasons: These cities exhibit distinct resource endowments: Hangzhou (ecology + culture), Kunming (ecology + wellness), Xiamen (coastal + leisure), Xi’an (history + culture), and Qingdao (coastal + beer culture). Their diverse cultural and tourism profiles make them representative of different regional characteristics.

The dual-track approach has been actively implemented: All five cities have launched cultural tourism IP brands (e.g., Hangzhou’s “Songcheng” and Xi’an’s “Datang Nocturnal City”) alongside green tourism policies (e.g., Xiamen’s “Low-Carbon Tourism City” and Kunming’s “Ecological Tourism Demonstration Zone”), with strong data accessibility.

## 4.2. Data sources and processing

The data mainly comes from the 2023–2024 “China Tourism Statistical Yearbook”, statistical bulletins of various cities, the “Cultural and Tourism Industry Development Report” officially released by the cultural and tourism bureau, Meituan’s “China Cultural and Tourism Consumption Big Data Report”, data from the China Environmental Monitoring Center, and tourist satisfaction surveys (with a sample size of 1,000 in each city). For some missing data, the “linear interpolation method” was used to supplement, ensuring data integrity.

## 4.3. Evaluation results and analysis

### 4.3.1. Comprehensive score ranking and grade division

According to the evaluation model, the comprehensive scores and rankings of the five cities are as follows: Hangzhou (0.82, excellent), Xiamen (0.75, good), Xi’an (0.71, good), Qingdao (0.65, good) and Kunming (0.58, medium).

### 4.3.2. Score analysis by dimension

#### (1) Brand value dimension

Xi’an (0.81) > Hangzhou (0.79) > Xiamen (0.70) > Qingdao (0.63) > Kunming (0.52). Xi’an scored highest in brand communication effectiveness and cultural depth, leveraging IPs like “Tang Dynasty Night City” and “Twelve Hours of Chang’an”. Kunming ranked lowest due to ambiguous brand positioning (“Spring City” brand with low cultural-tourism integration).

#### (2) Green ecology dimension

Hangzhou (0.85) > Xiamen (0.80) > Kunming (0.72) > Qingdao (0.61) > Xi’an (0.58). Hangzhou leads in ecological advantages of West Lake and Xixi Wetland, low-carbon technologies (e.g., electric boats, smart energy-saving attractions), and resource recycling rates. Xi’an’s low green score reflects high tourist density in historic districts and insufficient low-carbon infrastructure.

#### (3) Industrial benefits dimension

Hangzhou (0.80) > Xiamen (0.73) > Qingdao (0.68) > Xi’an (0.65) > Kunming (0.55). Hangzhou’s cultural-tourism industry contributes 8.2% to GDP (2024), with high ROI for green projects. Kunming’s low score stems from traditional sightseeing products.

#### (4) Innovation-driven dimension

Hangzhou (0.78) > Xi’an (0.73) > Xiamen (0.69) > Qingdao (0.62) > Kunming (0.51). Hangzhou boasts multiple “Culture–Tourism + Digital” projects (Songcheng VR experience) and “Culture–Tourism + E-commerce” initiatives (live-streaming cultural products). Kunming’s innovation capacity remains weak with limited new cultural offerings. Service quality ranking: Xiamen (0.82) > Hangzhou (0.77) > Qingdao (0.66) > Xi’an (0.63) > Kunming (0.56).

Xiamen’s smart tourism platform has a 95% coverage rate, with 100% prompt complaint resolution. In contrast, Xi’an’s service supply falls short during peak holiday seasons, resulting in lower tourist satisfaction.

### 4.3.3. Core conclusions

Hangzhou demonstrates a ‘dual synergy and comprehensive leadership’ status, with both its brand strength and green development ranking first. The city excels in industrial efficiency and innovation, serving as a benchmark for the ‘brand + green’ dual orientation. Xi’an, while strong in branding, needs to address its ecological shortcomings. Xiamen, with its outstanding green performance and great brand potential, can further enhance its brand IP.

Qingdao is balanced in all dimensions but lacks obvious advantages, and needs to make breakthroughs in brand differentiation and green technology application; Kunming is at a medium level overall, and brand positioning, innovation ability and industrial benefits need to be improved, which is a key city for dual orientation optimization.



## 5. Dual-oriented optimization strategies for high-quality development of urban cultural tourism industry: “Brand + green” approach

### 5.1. Differentiated positioning: Building a “dual characteristics” cultural tourism brand

Xi'an is strengthening its “green cultural brand” by infusing environmental values into historical landmarks. Core attractions like “Tang Dynasty Night City” and “Twelve Hours of Chang'an” now feature low-carbon lighting systems and eco-friendly cultural products, with green operational metrics becoming a key focus in brand promotion. Drawing inspiration from Lingchuan Demonstration Zone's “leading scenic area model”, the city is developing the “Qinling Ecological Cultural Tourism Belt” based on Qinling Mountain conservation. This initiative connects key sites including the Ancient City Wall Greenway and Qujiangchi Ecological Park, creating integrated “historical exploration + ecological education” routes that seamlessly blend cultural heritage with sustainable practices.

Xiamen is upgrading its “Coastal Green Brand” with a core positioning as a “Low-Carbon Tourism City”, continuously refining the “Xiamen Blue·Eco-Tourism” IP system. Drawing inspiration from Hainan's “Traveling with Sports Events” initiative, the city has organized activities like.

Qingdao is redefining its marine eco-branding strategy by moving beyond the conventional “beer culture + coastal tourism” model, establishing a three-dimensional framework that integrates marine ecology, industrial heritage, and leisure resorts. Leveraging ecological assets like Laoshan Mountain and Xuejia Island, the city has developed signature offerings such as “marine ecological research expeditions” and “island restoration study tours”. Inspired by Lingchuan's successful “transportation-tourism integration” approach, Qingdao is upgrading coastal tourism routes to connect industrial heritage sites including the Beer Museum and Textile Valley. This creates distinctive “green transportation + cultural immersion” itineraries, ultimately forging a unique marine cultural tourism brand that stands out in the industry.

Kunming is building its “Spring City Ecological Culture Brand” by integrating the “Spring City” ecological IP with ethnic cultural resources, establishing a brand positioning of “Spring-like All Year Round • Ethnic Charm • Eco-friendly Living”. Drawing inspiration from Hainan's “travel photography + ethnic costume experience” model, the city has set up Yi and Dai ethnic costume experience zones and eco-friendly travel photography spots in core scenic areas like Dianchi Lake and Cuihu Lake. Building on Lingchuan's “festival empowerment” approach, Kunming has upgraded its “Kunming International Tourism Festival” with new segments like the “Spring City Flower Ecology Forum” and “Ethnic Ecological Culture Show”, enhancing the brand's cultural depth and green identity.

### 5.2. Full-chain innovation: Cultivating a “dual integration” industrial ecosystem

Product innovation and development of green brand formats: Hangzhou can leverage its digital economy advantages to launch “VR eco-educational tours” and “digital cultural heritage preservation experiences” as “culture-tourism + digital + green” products, consolidating its dual leadership advantages. Xi'an could adopt the “ice and snow economy” model from Lingchuan to develop low-carbon winter sports projects in the Qinling region, filling the gap in winter green industry formats. Kunming may follow the “pharmaceutical-tourism integration” approach, collaborating with pharmaceutical companies like Yunnan Baiyao to create a “medicinal plant sightseeing + wellness experience” green industrial chain, thereby enhancing product value-added.

Technological innovation empowers green operations and brand communication: Promoting Hebei's “Green Power Empowerment” and “Low-Carbon Transportation” technologies, the scenic area has fully deployed new energy shuttle buses and photovoltaic power supply systems, transforming carbon emission data into brand communication highlights. Drawing inspiration from Guangzhou Rural Commercial Bank's “Sustainable Development-Linked Financing” model, financial tools incentivize enterprises to upgrade low-carbon facilities such as sewage treatment systems and smart energy management platforms, achieving synergistic enhancement of green technology and brand value.

Innovative models deepen the “Culture + Tourism +” cross-sector integration: Qingdao can leverage the Jiaozhou Bay Bridge to develop a “Marine Culture + Tourism + Highway Economy” corridor, while Xiamen could connect coastal homestays with ecological scenic areas through its Ring Island Road. Inspired by Hainan's “Agriculture + Sports + Culture



+ Tourism + Commerce” model, Kunming could create a full-chain project integrating “Plateau Agriculture Tours + Ethnic Festivals + E-commerce Sales”. Meanwhile, Xi’an could develop an immersive experience cluster combining “Historic Districts + Intangible Cultural Heritage + Eco-friendly Dining”.

### 5.3. Mechanism reform: Building a “dual synergy” guarantee system

The government has established a cross-departmental “Brand + Green” dual-development task force, modeled after Lingchuan’s “Three Ones” liaison mechanism and its “Weekly Report, Monthly Coordination” system. This initiative coordinates resources from cultural tourism, ecological conservation, and development and reform departments. Special policies have been introduced to provide financial subsidies for green cultural tourism brand development and tax incentives for low-carbon technology adoption. For instance, Xiamen offers brand promotion funding for eco-friendly hotels and scenic areas, while Xi’an provides targeted subsidies for low-carbon renovation projects in historical sites.

Building on Lingchuan’s “Doctoral Service Workstation” and “Industry-Academia-Research Collaboration” models, we establish industry-academia integration mechanisms to jointly develop “Dual-System Talent Training Bases” with cultural tourism enterprises. The program introduces interdisciplinary courses in “Brand Management + Green Governance” to cultivate versatile professionals with brand strategy expertise and ecological conservation awareness. By incorporating real-world project cases and inviting corporate executives and ecological experts into teaching, thus enhance the relevance of talent development programs.

To revitalize urban cultural tourism resources, we will implement market-oriented incentive mechanisms by introducing market-driven operators, adopting Lingchuan’s “investment and operation company + social capital” model. Financial support tools will be innovated by replicating Guangzhou’s “sustainable development-linked syndicated loans” approach, offering interest rate discounts to qualified enterprises to encourage green branding practices. A “Green Cultural Tourism Brand Ranking” will be established, leveraging third-party evaluations to guide market resources toward dual-integration projects.

Establish a three-dimensional supervision framework integrating government oversight, social monitoring, and corporate self-regulation. Drawing inspiration from Hainan Prefecture’s “joint enforcement + public sentiment monitoring” model, this study will rigorously combat ecological destruction and false brand promotion. A dynamic evaluation mechanism will be implemented with regularly updated metrics and weighting, incorporating tourist satisfaction and ecological benefits into performance assessments to drive continuous optimization of the cultivation system.

### 5.4. Brand communication: Expanding the market impact of “dual value”

Precision dissemination, drawing on Hainan Prefecture’s strategy of “TikTok and Xiaohongshu precision targeting”, pushes green cultural tourism vlogs and brand IP stories to young audiences; for family audiences, focuses on promoting eco-educational tours and family vacation products to enhance dissemination effectiveness. Scenario-based dissemination, referencing Jinyi New District’s experience in creating “pocket parks and sponge communities”, integrates “brand + green” elements into urban public spaces. For example, Xi’an can display “Green Chang’an” themed posters at subway stations, while Xiamen can install eco-education and brand image combination signs along coastal walkways. Collaborative dissemination, replicating Hainan Prefecture’s models of “six-province cultural tourism cooperation” and “Qinghai-Gansu Grand Loop linkage”, promotes the formation of “dual-cultural tourism development alliances” among sample cities to jointly conduct brand promotion activities. Together, they create cross-regional green cultural tourism routes such as the “Hangzhou-Xiamen Coastal Ecological Line” and the “Xi’an-Qingdao Cultural Ecological Line”, achieving synergistic diffusion of brand influence and green value.

## 6. Conclusions and outlook

### 6.1. Research conclusions

The dual orientation of “brand + green” serves as the core strategy for urban cultural tourism industries to overcome homogenization and achieve sustainable development. These two elements form a symbiotic relationship where “brand empowerment drives value transformation, while green initiatives solidify development foundations”. Building on theories of brand equity and ecological economics, this study establishes an evaluation system comprising five primary indicators (brand value, green ecology, industrial benefits, innovation-driven growth, service quality) and 18 secondary indicators. Through AHP-entropy method combined with linear weighted summation model, empirical analysis of five representative cities reveals distinct patterns: Hangzhou demonstrates “dual synergy with comprehensive leadership”, Xi’an exhibits “strong branding but weak green initiatives”, Xiamen showcases “excellent green practices with significant brand potential”, Qingdao maintains balanced dimensions but lacks standout features, while Kunming shows overall developmental lag. To address these disparities, optimization strategies should focus on four dimensions, namely the differentiated positioning, full-chain innovation, institutional reform, and brand communication; to provide practical pathways for the integrated development of urban cultural tourism industries.

### 6.2. Research outlook

While this study has established a dual-oriented evaluation framework and optimization strategies, several areas warrant further exploration. Regarding scope limitations, the current research is confined to five cities. Future work could expand to cities across different administrative tiers and resource types to enhance the generalizability of conclusions. Methodologically, incorporating a coupling coordination model could quantify the synergistic development between brand building and green initiatives. In terms of content, with the advancement of carbon neutrality goals and digital technology evolution, we should further investigate an integrated evaluation system combining “brand + green + digital” elements, along with cultivation pathways for cross-border green cultural tourism brands. These efforts would provide more comprehensive theoretical support for the high-quality development of urban cultural tourism industries.

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# The Path for Cultivating Lacquer Art Talents in Universities Under the Influence of Regional Culture—Taking the Inheritance of Lacquer Art Elements from Chu Culture as an Example

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**Abstract:** As a non-material cultural heritage treasure embodying regional spirit, Chu culture lacquer art offers rich materials for cultivating lacquer art talents in universities with its unique patterns, colors, and craftsmanship. Leveraging the abundant Chu lacquer artifacts in Hubei and the market demand for Chu culture IP, some universities have initiated preliminary teaching explorations. However, challenges remain, including insufficient cultural penetration in courses, a lack of cultural literacy among faculty, practices detached from cultural contexts, and weak innovation and transformation capabilities. To address these issues, it is necessary to develop a systematic curriculum module of “Chu” Culture + Lacquer Art”, build a composite faculty team combining “techniques + culture”, establish an immersive practice system integrating “campus + society”, and create a collaborative mechanism for “talent cultivation + cultural revitalization”. This approach aims to transition from skill-based instruction to culture-based education, fostering versatile talents with both cultural literacy and innovative capabilities, thereby promoting the contemporary inheritance and industrial revitalization of Chu lacquer art.

**Keywords:** Chu culture; University lacquer art; Talent cultivation; Regional cultural immersion; Industry-university-research collaboration

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## 1. Introduction

In the era of cultural confidence and intangible cultural heritage revitalization, regional culture has become the cornerstone of art talent cultivation in universities. Chu culture lacquer art, with its dynamic totems of phoenix motifs, the color philosophy of vermilion and black, and the exquisite craftsmanship of clamping and lacquering, stands as a brilliant peak in the history of Chinese lacquer art. It serves not only as a material carrier of Chu’s regional spirit but also as a vital gene for contemporary artistic innovation. As a higher education institution located in the core region of Chu culture, it shoulders the dual mission of inheriting intangible cultural heritage techniques and cultivating professional talents. However, in the current lacquer art education, the separation of culture and techniques, as well as the disconnection between theory and practice, has resulted in difficulties for the cultivated talents to truly grasp the cultural connotations of Chu lacquer art



and meet the demands of its contemporary transformation. How to explore a scientific and effective approach to talent cultivation with Chu culture as the core influence, enabling traditional lacquer art to flourish anew in the hands of a new generation of creators, has become an urgent issue for universities to address in this era<sup>[1]</sup>.

## **2. Definition of core concepts**

### **2.1. Chu cultural lacquer art elements**

Chu cultural lacquer art elements represent a concentrated and tangible manifestation of Chu civilization in the realm of lacquerware art. Specifically, they refer to the cultural symbols and craftsmanship systems with distinct regional identities, extracted from lacquerware unearthed from Chu tombs and relevant documented records. Their shaping elements are characterized by vividness and exuberance, such as the ingenious fusion of avian and beast forms in the Tiger-Seal Bird-Stand Drum, showcasing the romantic imagination of the Chu people. The decorative elements encompass core patterns such as phoenix motifs, coiled dragon patterns, and cloud-thunder patterns, embodying the totemic worship and spiritual pursuits of the ancient Chu people. The color elements primarily feature vermilion and deep black, forming a color philosophy that is both contrasting and harmoniously unified, concealing the cultural connotation of “Yin” and “Yang” interplay”. The craftsmanship elements include traditional techniques such as the lightweight yet sturdy lacquered fabric mold, the delicate and full inlaid lacquer, and the ornate and refined gold painting, collectively constructing the unique artistic style of Chu lacquer art<sup>[2]</sup>.

### **2.2. Regional cultural influence**

Regional cultural influence is an educational model that takes Chu culture as its core spiritual essence and deeply integrates it with university lacquer art education through diversified approaches. It is not a simple superimposition of cultural content but rather a comprehensive incorporation of Chu cultural spirit and lacquer art elements into every aspect of talent cultivation through curriculum system reconstruction, immersive practical experiences, and regular cultural immersion. This kind of immersion emphasizes a full-chain penetration from classroom to practice and from theory to creation, guiding students to deeply understand the aesthetic characteristics and spiritual essence of Chu culture while mastering lacquer art techniques. Ultimately, it aims to achieve an essential transformation in lacquer art teaching in colleges and universities from “mere technique instruction” to “cultural immersion for education”, making regional culture an intrinsic gene in students’ artistic creations<sup>[3]</sup>.

### **2.3. Objectives for cultivating lacquer art talents in colleges and universities**

The core objective of cultivating lacquer art talents in colleges and universities is to shape compound professionals who possess both Chu cultural literacy, exquisite lacquer art techniques, and innovative practical abilities. Such talents need to have a solid grasp of the historical context, aesthetic connotations, and core craftsmanship of Chu lacquer art, accurately capturing the spiritual essence of Chu culture and safeguarding the cultural authenticity of Chu lacquer art. At the same time, they should possess proficient practical skills in lacquer art, being able to flexibly apply traditional techniques such as “Jiazhu” (a method of making hollow lacquerware), filling lacquer, and gold painting to complete their creations. Moreover, they must possess modern innovative thinking, capable of integrating elements of Chu lacquer art with contemporary aesthetic demands and market development trends to create works that possess both cultural distinctiveness and practical value. These works should not only meet the diverse needs of modern artistic creation but also satisfy the job requirements of the cultural industry for specialized lacquer art talents, becoming the core force in the inheritance and innovation of Chu cultural lacquer art<sup>[4]</sup>.



### 3. Development foundations and favorable conditions for cultivating lacquer art talents in colleges and universities under the influence of Chu culture

As the core birthplace of Chu culture, Hubei boasts unique cultural resource advantages, providing a solid foundation for cultivating lacquer art talents in colleges and universities. Institutions such as the Hubei Provincial Museum and the Jingzhou Museum house a large number of precious lacquerware artifacts unearthed from Chu tombs, ranging from the Tiger-Seat Bird-Stand Drum to the Painted Wooden Figurines, comprehensively presenting the pinnacle of craftsmanship and aesthetic qualities of Chu lacquer art. Simultaneously, a group of intangible cultural heritage inheritors deeply engaged in the inheritance and preservation and transmission of Chu lacquer art are active within the province. The core techniques they master, such as “Jiazhu” mold making and gold painting with lacquer filling, serve as important carriers for living transmission. At the university level, some universities in Hubei have taken the lead in exploring the integration of Chu culture and lacquer art education. By organizing students to visit special exhibitions of Chu lacquer cultural relics, inviting inheritors of intangible cultural heritage to deliver lectures on craftsmanship, and offering specialized elective courses on Chu lacquer art, they have initially fostered a teaching philosophy focused on cultural inheritance, accumulating practical experience for subsequent talent cultivation. From the perspective of market demand, with the continuous rise in popularity of Chu culture IP, there is a growing demand for works incorporating Chu lacquer art elements in fields such as cultural and creative products, interior decoration design, and modern art creation. This not only provides lacquer art talents with broad employment opportunities but also compels universities to strengthen targeted talent cultivation, forming an initial linkage between “cultural resources, teaching exploration, and market demand”<sup>[5]</sup>.

### 4. Prominent dilemmas and practical challenges in the cultivation of university lacquer art talents influenced by Chu culture

Currently, the cultivation of university lacquer art talents in the context of Chu culture still faces multiple bottlenecks. There are obvious shortcomings in the curriculum system. The lacquer art courses in most universities still focus on traditional technique training, with Chu culture-related content often serving as scattered elective modules or case supplements. The lack of a systematic design encompassing “theory, techniques, and innovation” results in students having only a superficial understanding of the historical context, aesthetic connotations, and cultural spirit of Chu lacquer art, making it difficult for them to form a deep comprehension. There are also shortcomings in the cultural literacy of the faculty. While some professional teachers excel in teaching lacquer art techniques, they lack in-depth research on the archaeological background, symbolic meanings of patterns, and evolutionary logic of Chu culture, rendering them unable to effectively guide students in exploring the cultural value of Chu lacquer art elements and thus affecting the depth of teaching. Practical teaching is detached from the cultural context, often limited to repetitive technique practice in campus workshops, with insufficient in-depth interaction with Chu cultural heritage sites and intangible cultural heritage workshops. As a result, students struggle to understand the intrinsic connections between Chu lacquer art and the social sacrificial rituals and daily life of the time. Their creative works often exhibit the problem of “resembling in form but diverging in spirit”, merely replicating superficial elements such as phoenix patterns and cloud-thunder patterns, and failing to convey the spiritual essence of Chu culture<sup>[6]</sup>. The weakness in innovative transformation capabilities is even more pronounced. Students’ application of Chu lacquer art elements often remain at the level of mechanical replication, lacking the ability to combine traditional craftsmanship, cultural symbols with modern aesthetics and market demands. This makes it difficult for them to produce modern lacquer art works that possess both cultural distinctiveness and practical value, thereby constraining the contemporary revitalization and industrial transformation of Chu lacquer art.

## 5. Pathways for cultivating lacquer art talents in universities under the influence of Chu culture

### 5.1. Developing a systematic curriculum module combining Chu culture + lacquer art”

Developing a systematic curriculum module that integrates Chu Culture + Lacquer Art” requires constructing a progressive system that spans from cultural cognition to practical innovation, breaking free from the limitations of traditional courses that separate techniques from culture. The foundational theoretical module serves as the cornerstone, using an “Introduction to Chu Culture” to elucidate the Chu people’s worldview and life consciousness, utilizing “The History of Chu Lacquer Art” to trace the craft’s evolution from the Warring States period to the Qin and Han dynasties, and employing “The Aesthetics of Chu Lacquer Patterns” to analyze the totemic symbolism of phoenix motifs and the rhythmic principles of cloud-thunder patterns, enabling students to grasp the spiritual essence of Chu culture through theoretical study. The technical training module focuses on craft inheritance, setting core techniques such as the Chu-style jia-zhu (cloth-moulded) lacquerware’s “thinness akin to cicada wings”, the fine gold-painted detailing of phoenix motifs “as delicate as hair strands”, and the harmonious contrast of vermilion and black hues “balancing strength and softness” as specialized courses. These are taught through a collaborative effort between intangible cultural heritage inheritors and university instructors, where inheritors demonstrate ancient methods like “base application—lacquering—painting”, and teachers elucidate the material science principles and aesthetic logic underlying the crafts, ensuring that technical transmission remains authentic yet theoretically grounded <sup>[7]</sup>. The innovative design module strives to bridge the gap between tradition and modernity, with courses like “Modern Transformation Design of Chu Lacquer Art Elements” guiding students to refine pan-chi (coiled dragon) patterns into jewelry motifs, and “IP Development of Chu Culture-Themed Lacquer Art Cultural and Creative Products” exploring the creation of tea sets and stationery using Chu lacquer techniques, integrating traditional elements into contemporary lifestyle contexts. The interdisciplinary integration module further expands boundaries by collaborating with history majors to interpret the connections between Chu lacquer and sacrificial systems, partnering with archaeology majors for practical activities like “restoration of lacquerware fragment patterns”, and working with marketing majors to analyze audience demands for Chu lacquer cultural and creative products, ultimately forming a complete training chain of “cultural foundation-building—technical rooting—innovative boundary-breaking—interdisciplinary fusion” <sup>[8]</sup>.

### 5.2. Building a composite faculty team combining “techniques + culture”

Building a composite faculty team that combines “techniques + culture” necessitates advancing through a three-dimensional approach of “strengthening foundations through in-house cultivation, addressing gaps through external recruitment, and enhancing synergy through collaborative mechanisms”. For teachers on campus, focusing on the dual enhancement of cultural literacy and scientific research capabilities, this study regularly organized participation in Chu culture archaeological research activities, where they delve into the Jingzhou Museum and tomb sites of the Chu State to engage in the organization of lacquerware cultural relics and the tracing of their craftsmanship origins. Thus selecting teachers to join intensive training courses for inheritors of intangible cultural heritage, immersing them in the cultural connotations of core techniques such as Chu-style Jiamu” (a lacquering technique) and “Tianqi” (lacquer filling). We encourage teachers to apply for scientific research projects related to Chu lacquer art, conducting research on themes such as “the symbolic system of Chu lacquer patterns” and “the contemporary revitalization of traditional crafts”. Meanwhile, we invite experts in Chu culture research to conduct regular on-campus training, deepening teachers’ understanding of the spiritual essence and artistic characteristics of Chu culture through specialized lectures and case studies <sup>[9]</sup>. In terms of integrating external resources, we have established a “Residency System for Inheritors of Chu Lacquer Art Intangible Cultural Heritage on Campus”, inviting inheritors to reside in studios long-term and impart the essence of ancient techniques through hands-on teaching. We also hire museum researchers and Chu culture scholars as part-time teachers to teach theoretical courses and guide scientific research projects, filling the gap in cultural research among teachers solely focused on techniques. On this basis, we form an interdisciplinary “Teaching Team for Cultivating Talents in Chu

Lacquer Art”, promoting regular collective lesson planning among on-campus teachers, off-campus experts, and inheritors. Together, they develop syllabi, create school-based teaching materials, and guide student creations, fully integrating their respective technical strengths, cultural accumulations, and research capabilities to form a closed-loop teaching synergy of “theoretical explanation—craft demonstration—innovation guidance”, providing teacher support for high-quality talent cultivation<sup>[10]</sup>.

### 5.3. Establishing an immersive practice system combining “campus and society”

To establish an immersive practice system combining “campus and society”, it is necessary to break down barriers between on-campus training and social resources, constructing a full-chain practice platform that encompasses “traditional inheritance—modern innovation—practical refinement”. On-campus practice scenarios are upgraded in two ways: on one hand, we create a Chu Lacquer Art Inheritance Studio”, accurately replicating the layout and atmosphere of Chu lacquer workshops, equipped with traditional materials such as wooden mold-making tools and natural lacquers, allowing students to immerse themselves in honing ancient techniques like “Jiamu” and gold painting in an antiquated environment; on the other hand, we establish a Chu Lacquer Art Innovation Laboratory”, introducing modern tools such as digital design software and 3D printing equipment to help students transform Chu lacquer patterns and color elements into design schemes that align with contemporary aesthetics, achieving a collision and fusion of traditional crafts and modern technology<sup>[11]</sup>. This study has established in-depth co-construction of off-campus practice bases, collaborating with the Hubei Provincial Museum and Jingzhou Museum to create research and study bases. We organize students to participate in activities such as simulated Chu lacquerware restoration, pattern rubbing, and observation of lacquerware fragments at archaeological sites, enabling them to closely engage with the cultural codes behind these cultural relics. We have also co-constructed industry-education integration bases with local intangible cultural heritage workshops and cultural enterprises, allowing students to deeply participate in real projects. They follow the entire process of Chu lacquer cultural and creative products, from creative conception and sample production to market promotion, accumulating practical experience that aligns with industry needs. Driven by projects, we facilitate the practical implementation of learning by regularly organizing university-level and provincial-level lacquer art design competitions centered around Chu culture themes. We guide students to create works based on themes such as Chu mythology and allusions, Dragon Boat Festival folklore, and modern life scenarios. This study actively organized students to participate in offline events such as the Chu Culture Festival and Intangible Cultural Heritage Expo, enabling them to test their creative achievements through work exhibitions and industry exchanges. This enhances their comprehensive abilities in cultural expression and market alignment, truly achieving a leap in capabilities from “classroom learning” to “practical application”<sup>[12]</sup>.

### 5.4. Establishing a synergistic mechanism of “talent cultivation + cultural revitalization”

To establish a synergistic mechanism of “talent cultivation + cultural revitalization”, it is essential to form a virtuous cycle of “outcome display—cultural dissemination—industrial transformation”, enabling mutual empowerment between the cultivation of lacquer art talents in universities and the contemporary revitalization of Chu culture. In terms of work display, we regularly organize characteristic events such as the “Chu” Folk Custom-Themed Lacquer Art Exhibition” and the “Modern Design Exhibition Featuring Chu Lacquer Elements”. We not only set up on-campus exhibition stages but also leverage new media platforms such as the university’s official website, WeChat Channels, and Douyin (Chinese TikTok) to launch short video series like “Behind the Scenes of Chu Lacquer Creation” and “Pattern Interpretation”, expanding the reach of work dissemination. Meanwhile, we actively encourage students to participate in domestic and international lacquer art expos and intangible cultural heritage innovation competitions, enabling lacquer artworks infused with Chu cultural genes to step out of the campus and enhance the visibility and influence of Chu lacquer art through industry exchanges<sup>[13]</sup>. In terms of cultural dissemination, we encourage students to form Chu Lacquer Art Cultural Dissemination Teams” and conduct “Chu” Lacquer Pattern Handicraft Classes” in primary and secondary schools, popularizing the cultural connotations of phoenix and bird patterns, as well as cloud and thunder patterns, among young

people. We also organize public lectures and intangible cultural heritage experience workshops in communities and rural areas, guiding the public to experience simple lacquer art making and facilitating the transition of Chu lacquer art from a “niche art” to “public recognition”. Industry-university-research collaboration, on the other hand, focuses on value transformation. It has jointly launched the Chu Lacquer Cultural and Creative Development Project with local cultural enterprises, guiding students through the entire process from creative conception, such as extracting patterns from lacquerware unearthed from Chu tombs to design cultural and creative jewelry; sample production, market research, to brand promotion. This approach not only transforms the creative achievements of students during the talent cultivation process into culturally competitive products for the market but also provides students with internships and entrepreneurial incubation support, achieving a synergistic effect of “cultivating one talent, incubating one project, and revitalizing one culture”<sup>[14]</sup>.

## 6. Conclusion

The cultivation of lacquer art talents in universities under the influence of Chu culture is, in essence, a two-way journey of cultural inheritance and innovation. When systematic courses lay a solid foundation in culture and techniques for students, when interdisciplinary faculty inject depth and vitality into teaching, when immersive practice provides a practical stage for growth, and when collaborative mechanisms open up channels for the transformation of achievements, Chu lacquer art ceases to be a static cultural relic in museums but becomes a vibrant cultural symbol that can integrate into modern life and meet market demands. This cultivation path not only nurtures professionals who safeguard the authenticity of culture and possess innovative capabilities but also promotes the contemporary revitalization and dissemination of Chu culture, achieving a symbiotic relationship between talent value and cultural value. Looking ahead, only by continuously deepening educational reforms and strengthening university-local collaboration and industry-university-research integration can the thousand-year legacy of Chu lacquer art thrive and shine anew under the nourishment of university education<sup>[15]</sup>.

## Disclosure statement

The author declares no conflict of interest.

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# Research on the Path to Improve Students' Cross-Cultural Communication Skills under the SPOC Blended Teaching Model

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**Abstract:** With the coming of internationalized 2.0 new era, more and more attention was paid to the educational modernization and new requirements are made to nowadays vocational and technical education. SPOC (Small Private Online Course) is a new teaching model which is limited, effective, purpose oriented and flexible. It can solve many problems impeding the implementation of many oral English learning abilities. According to the requirements of Higher Vocational College English Curriculum Standards, cross-cultural communication skill is the core competence of this subject. We must pay attention to and do much work to practice students' cross-cultural communication skills. SPOC can help overcome many difficulties and improve students' relevant abilities. This paper will mainly talk about the concrete ways to improve students' cross-cultural communication skills with the help of SPOC.

**Keywords:** educational modernization; SPOC; cross-cultural communication

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## 1. Introduction

College education is the final learning for most college students before they stepping in their career<sup>[1]</sup>. So, in college students must learn many things fit in the requirements of the industry. With the development of international trade and business and the deep communication with foreigners all around the world. As the new era technical and skilled personnel, college students must keep pace with the industry requirements and make them more prepared. The new development and communication trends require students can not only express personal wanting, but also carry out effective cross-cultural communications to present cultural confidence and respect other people's culture from other countries which can help students make more effective communications. But the current situation is that many college English teachings lay attention on paper testing and lay less attention on practical usage of English. And the class English teaching is more related with paper testing, such as the CET4, CET6 and the upgrading examination, less related with the fostering of cross-cultural communications which is very important for their future career. As college English teaching person, more attention should be paid to and search for useful methods to solve this problem.

## **2. SPOC teaching model**

### **2.1. Flexibility**

SPOC online learning courses are made according to the different requirements of students' in different majors. Teachers record many online learning videos. Students could learn at any time when they have free time which can break the limitation of time and places and students could learn repetitively until they grasp key points and make it easier to carry out later days relevant learning <sup>[2]</sup>.

### **2.2. Diversity**

On SPOC online learning courses, teachers could prepare many class activities according to the usage requirement of their English class teaching. Such as before class testing to know well students' English levels, after class testing to know well teachers teaching results. The online group English leaning abilities, online learning tasks and online evaluation and so on. These online learning activities can make the English class teaching more effective.

### **2.3. Goal-oriented**

SPOC, small private online course, is an online class with specific goal which pay attention to different aspects and mean to improve students' abilities in a specific aspect. Such as the writing SPOC online class used to improve students' English writing abilities, the oral SPOC online class used to improve students' English oral abilities and the reading SPOC online class used to improve students' English reading abilities. All SPOC online classes are designed to improve students' different English learning abilities and used to improve their specific abilities.

## **3. Cross-cultural abilities**

As the international communication is becoming deeper and deeper, more requirements are given to English teaching and English class. Cultural understanding and communication ability are the main and key aspects in students' English comprehensive abilities <sup>[3]</sup>. Cross-cultural communication skill is not only the promoting factor in the area of students' English leaning aspects, but also the demonstrating aspect of students' overall abilities. Furthermore, it can make a great difference in students' future career development. Yet, students' cross-cultural communication skills are relatively weaker comparing with their other English abilities. And the reasons are as following <sup>[4]</sup>.

### **3.1. Paper-based examinations dominated**

In China, from elementary school to college, attentions are always laid on paper tests. Few attentions are laid on oral communication. Most students learn English mainly take it as a tool to pass the English test and get higher education. And at present domestic English tests are main focused on reading, writing and translating <sup>[2]</sup>. Less attentions are paid to oral or cross-cultural communication skills for which we must pay attention to and cultivate practical talents. In the same time help them adapt to the career requirements to fit in their future job.

### **3.2. Less of professional knowledge**

Nowadays English is mainly a public teaching subject in higher vocational colleges. As a public English course, it lacks major knowledge. Yet major related English knowledge is very important for students' future career. Moreover, the current English teaching classes lack relevant working situations and could not do well in the aspect to broaden their career related problems dealing abilities. As a result, students don't have much interests and just learn to cope with English tests. Yet their future career requires much more to use English practically that is the reason way labor market's demands are inappropriate to college's education.

### **3.3. Teaching time limited**

College English (maybe in other countries use different names, such as practical English) is a public compulsory class which only taught once a week with two credits a week. As a result, students' time to learn English is very limited. Students don't have enough time to practice and to think deeply with the knowledge learned during their English classes <sup>[5]</sup>.

### **3.4. Outdated teaching methods**

In the information era college education should be highly informational and should lead students to adapt to nowadays high-tech learning ways. But in fact, nowadays most of college education is outmoded which rely much on textbook teaching. In the process of textbook learning teachers are dominated and students nearly have no independent thinking time. So, the teaching methods must be improved to fit nowadays' era requirements.

### **3.5. Lack of teaching and training resources**

English learning needs much resources to broaden their horizons. And English class is a way to help students know well of the world. English teachers are the guide to lead students to know well of foreign cultures and let students to have correct world viewpoints. Yet in fact the teaching and training resources are very limited, and students don't have enough opportunities to practice.

## **4. Methods to improve students' cross-cultural abilities with SPOC**

### **4.1. More online learning resources**

With the help of online teaching and learning resources the learning time could be more flexible. When comes English teaching the credits are not enough for students to develop their comprehensive English abilities. As college teachers, we should make more online learning resources to encourage students learn after class and to arrange their time according their personal learning habits or class arrangements. On the other hand, the teacher should know well of students' learning importance and key knowledge and to make more useful learning video materials accordingly. Learning materials on SPOC learning platform could let students have more learning opportunities. Apart from class learning and students could choose leaning time, learning place and leaning materials accordingly to deepen their class knowledge understanding <sup>[6]</sup>.

### **4.2. Evaluate learning effects more scientifically**

With SPOC online learning platform students could build a comprehensive evaluation system. This evaluation system not only include online test and homework checking, but also bring in group work, online communication and multi-dimensional evaluation. In the evaluation process the teacher could know well of students' leaning effects and also let students know well of their personal leaning so as to adjust their English knowledge learning in time and have better learning results. Such as for students with poor oral communication abilities teachers could give them more practices opportunities to improve their spoken English.

### **4.3. Add more professional knowledge**

As we all know, college English is a public course. So, it may involve little professional knowledge. Yet students future career requires students to grasp more professional knowledge to make it easier for their future career. To solve this problem teachers, need to know well of students' career requirements and add more related knowledge according to their future career requirements. By learning professional knowledge on SPOC platform students could be more prepared for their future job. In the same time English teachers should learn more industry knowledge, to learn more with industry instructors and be more prepared to answer industry questions.

#### **4.4. Increase beneficial guidance in exams**

To get a credit or a good mark students may pay more attention to final exams. To gain better learning effects teachers could increase oral test to activate students train their spoken English. English teachers could take advantage of SPOC English leaning platform to better the formative assessment and lead students to communicate with English.

#### **4.5. Set more scenario situations**

In the process of English teaching teachers should set more scenario simulations related to their future career and global communication and provide multi-cultural communications. For example, as for students major in Cross-Border Electronic Commerce, the teacher could set the scenarios such as business negotiation, international meeting and cross-cultural cooperation. By training on SPOC platforms students could know more of future career requirements and be more prepared <sup>[7]</sup>.

#### **4.6. Innovate teaching methods**

Depending on SPOC online learning platforms teachers could build an “online pre-class virtual learning--offline in-class learning--online after-class review” learning pattern to let students learn continuously to increase their effective learning time and take full advantage of online learning resources.

### **5. Expected learning effects with SPOC online learning platform**

#### **5.1. Increase students' class participation rate**

By learning on the SPOC learning platform pre-class students could know more about the knowledge taught in the class. The evaluation function with SPOC could also let students know well of their learning states to adjust timely and grasp more knowledge.

#### **5.2. Decrease learning helplessness psychology**

Most students of higher vocational colleges are poor with their English. As a result, they lack learning confidence and don't think they could improve. Some of them even think it's useless for them to learn and improve their English abilities. With SPOC online learning could greatly change this situation. As students could choose resources to learn according to their personal interests and could learn repetitively. SPOC online learning platform also provides online practice materials closely related with their future career that is very useful to improve students' English leaning confidence and change their helpless psychology.

#### **5.3. Forster critical thinking**

Learning on the SPOC platform is student-centered, on which students could arrange their leaning time and choose things to learn online. Apart from that students could also have their own thoughts towards different subjects and topics. In the same time to express their own thought in English that could greatly improve students' critical thinking.

#### **5.4. Broaden international horizons**

By leaning in different scenarios set according to their future career requirements students' international horizons could be broadened greatly. By oral practices on SPOC leaning platform, students' abilities to communicate with foreigners could be improved greatly which will help students to achieve their English leaning goals <sup>[8]</sup>.

### **6. Conclusion**

SPOC online leaning platform is an outcome and achievement in the era of information which could improve the current

situation of English leaning and help better the English leaning effects<sup>[9]</sup>. In the internationalized world, students need to learn to communicate with foreigners and improve their cross-culture communication abilities which could improve their overall English proficiency and help to make their future career develop more fluently<sup>[10]</sup>.

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# On the Systematic Cultivation of AI Literacy Among Higher Vocational College Students Through the “2025 College Students’ AI+ Information Literacy Competition”

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**Abstract:** Against the backdrop of the nation’s vigorous promotion of Digital China development and the digital transformation of vocational education, the “2025 College Students’ AI+ Information Literacy Competition” emerged. It innovatively constructs a three-dimensional competency model integrating “information literacy → digital literacy → AI literacy.” This paper analyzes the systematic enhancement of students’ AI literacy capabilities through this competition framework. The competition not only solidifies students’ foundations in traditional information literacy, but also proactively integrates digital survival skills in an omni-media environment, alongside the application of intelligent tools and ethical reasoning capabilities in the AI era. This effectively facilitates students’ transformation from passive knowledge recipients to active problem solvers and lifelong learners.

**Keywords:** Information Literacy; Digital Literacy; AI Literacy; Three-Dimensional Integration

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## 1. Introduction: The Questions of the Era and the Answers of the Competition

The “Overall Layout Plan for Digital China Construction” issued by the CPC Central Committee and the State Council in 2023 clearly states the need to “build a digital literacy and skills development system that covers the entire population and integrates urban and rural areas.” For higher vocational education, which bears the responsibility of cultivating master craftsmen and technical experts, how to respond to this era’s challenge has become a key issue.

Traditional information literacy education can no longer meet the evolving demands of the intelligent era. Modern skilled professionals must not only be able to search for information, but also think critically, apply knowledge effectively, innovate, and engage in reasoned analysis. Students need to develop comprehensive competencies to accurately identify problems in complex information environments, efficiently integrate resources, skillfully utilize intelligent tools, and adhere to ethical standards<sup>[1]</sup>.

The “2025 College Students’ AI+Information Literacy Competition”, guided by the Ministry of Education’s Higher Education Institutions Library and Information Work Steering Committee, has provided a resounding answer through forward-looking top-level design. The competition innovatively proposed a three-dimensional literacy model integrating

“Information Literacy → Digital Literacy → AI Literacy”, further subdivided into 11 modules as follows:

- Module 1: Basic Concepts of Literature Information;
- Module 2: Principles of Literature Information Retrieval;
- Module 3: Information Retrieval Theory and Technology;
- Module 4: Literature Information Retrieval Systems;
- Module 5: Common Chinese Commercial Databases;
- Module 6: Government Open Information Resources;
- Module 7: Practical Learning Resources;
- Module 8: Academic Writing;
- Module 9: Knowledge Management Tools;
- Module 10: Research Tools;
- Module 11: AI Literacy.

This paper will elaborate on how the competition, through its scientific, systematic, and cutting-edge design, forges students’ fifteen core skills in an all-round and in-depth manner.

## **2. The Dimension of “Information Literacy”: Consolidating the Cognitive Foundation for the Intelligent Era**

Information literacy is the cornerstone of digital literacy and AI literacy. The first ten modules in the competition content jointly build this solid foundation.

### **2.1. The Awakening of Information Awareness: From Passive Reception to Active Exploration**

Information awareness is the soul of information literacy. It concerns an individual’s sensitivity to the value of information, their insight into information needs, and their intrinsic motivation to actively seek solutions.

#### **2.1.1. Skill Enhancement One: Keen Problem-Defining Ability**

Module 1 and Module 8 both imply the requirement for problem-defining ability.

For example, in academic writing, a clear, specific, and research-worthy problem statement is the starting point of the entire text. When students can accurately distinguish between “I want to know what AI is” (vague) and “I want to explore the logical vulnerabilities of generative AI in intelligent code generation” (specific), their information awareness has made its first qualitative leap. This ability directly corresponds to the key step of “defining problems” in the workplace and is the basic skill of excellent technical personnel.

#### **2.1.2. Skill Enhancement Two: Efficient Information Need Analysis Ability**

The core of Module 2 and Module 3 lies in teaching students how to transform a real-world problem into a searchable query statement<sup>[2]</sup>. This requires mastering retrieval techniques such as Boolean logic, wildcards, truncation, and field limitation.

For example, requiring students to search in specific fields of a particular book trains their understanding of the structure of information sources and their refined control over search strategies. This ability enables students to quickly determine: “What type of information do I need to solve this problem? Where might this information exist, in which databases or platforms?” This structured way of thinking is a prerequisite for efficient work.

### **2.2. The Systematization of Information Knowledge: Building an Individual Cognitive Map**

Discrete pieces of knowledge are insufficient to meet complex challenges; only by weaving them into a network can a powerful cognitive force be formed.

### **2.2.1. Skill Enhancement Three: The Ability to Build a Systematized Knowledge Framework**

When preparing for the competition, students need to learn a large number of national first-class online open courses. The value of these courses lies not only in imparting skills but also in helping students build systematic cognition. From document identifiers to the underlying logic of databases, from CNKI to VIP, from intellectual property to trademark moats, ... these pieces of knowledge form a complete knowledge framework. Armed with this “cognitive map,” students, when confronted with a vast amount of information, are no longer lost travelers but confident navigators who can quickly judge the source, authority, and applicability of information.

### **2.2.2. Skill Enhancement Four: The Ability to Integrate Interdisciplinary Knowledge**

Modules 5, 6, and 7 cover a wide range of information sources, from academic databases such as CNKI and Wanfang, to government data platforms like the National Bureau of Statistics and the Ministry of Industry and Information Technology, and to ubiquitous learning resources such as MOOCs and Bilibili’s knowledge zone. The competition requires students to be able to switch and integrate information from different types and fields of sources according to the task requirements<sup>[3]</sup>. For example, when studying an image recognition algorithm optimization project, it may be necessary to combine the algorithm model from academic journals (Module 5), the special report on the development of artificial intelligence technology released by the Ministry of Science and Technology (Module 6), and practical cases from online courses (Module 7). This cross-boundary integration ability is essential for solving modern complex engineering problems.

## **2.3. The Refinement of Information Skills: The Transition from Theory to Practice**

The value of knowledge lies in its application. The competition tests students’ ability to transform theoretical knowledge into practical operations.

### **2.3.1. Skill Enhancement Five: The Ability to Accurately Acquire and Screen Information**

The competition directly examines students’ ability to capture and distinguish information details. In the era of information explosion, finding information is not difficult; the challenge lies in finding the right information. The competition trains students to be like detectives, judging the authenticity and relevance of information through subtle clues, such as differences in ISBN versions and characteristics of reference formats. This ability can effectively guard against the spread of online rumors and false information, which is a fundamental quality of digital citizens.

### **2.3.2. Skill Enhancement Six: The Ability to Organize and Express Information in a Standardized Manner**

Module 8 and Module 9 both point to the output end of information. Academic writing trains students to express their ideas in a rigorous logic and standardized format, such as the correct use of terminology and references. Knowledge management tools like EndNote, XMind, and even Excel teach students how to efficiently collect, classify, label, and associate fragmented information, internalizing it as personal knowledge assets. The combination of these two skills enables students not only to “input” information but also to “output” knowledge of high quality, thus forming a personal brand and professional influence.

## **2.4. The Adherence to Information Ethics: The Moral Compass in the Digital World**

Technology is neutral, but those who use it must have ethical guidelines.

### **2.4.1. Skill Enhancement Seven: Profound Awareness of Academic Integrity and Intellectual Property**

The spirit of information ethics permeates the entire competition content. The academic writing module inevitably involves issues such as plagiarism, copying, and fair use. Understanding unique identifiers such as DOI also strengthens respect for original works. Through subtle means, the competition makes students understand that free access to information does not mean unrestricted use. Respecting the intellectual achievements of others is not only a legal requirement but

also a professional code of conduct. This is especially important for vocational students who may engage in research and development, design, and other creative work in the future.

### **3. The Dimension of Digital Literacy: Forging the Ability to Survive and Develop in the Age of All-Media**

If information literacy is the foundation, then digital literacy is the lush branches and leaves that grow on this foundation. It concerns how individuals can thrive in the digital environment.

#### **3.1. The Cultivation of Digital Thinking: The Leap from Linear to Networked**

The core of digital literacy is first and foremost a transformation of thinking patterns.

##### **3.1.1. Skill Enhancement Eight: Computational Thinking and Data-Driven Decision-Making Ability**

Using data analysis software such as SPSS and Python basic libraries in Module 10, as well as interpreting government open data in Module 6, are all aimed at cultivating a habit of thinking based on data. Students learn to break down complex problems, identify patterns, abstractly model, and design algorithms to solve problems. This computational thinking is a fundamental mode of thinking required for all future positions.

##### **3.1.2. Skill Enhancement Nine: Connected Thinking and Collaborative Innovation Ability**

The digital world is a highly interconnected network. The collaborative functions in Module 9, such as CNKI's research and study, and the online community interactions in Module 7, are all aimed at cultivating students' connected thinking, teaching them how to use digital platforms to share information with others, divide labor, and co-create. This ability breaks the limitations of physical space, making cross-regional and cross-disciplinary team collaboration possible and greatly improving innovation efficiency.

#### **3.2. The Application of Digital Technology Tools: The Transition from Consumer to Creator**

Mastery of tools is the most intuitive manifestation of digital literacy.

##### **3.2.1. Skill Enhancement Ten: Multi-Media Content Creation and Expression Ability**

Digital literacy is not just about "reading," but also about "writing" and "creating." Students ultimately need to be able to produce digital content. Whether it is writing an illustrated research report or making a short video to showcase research results, the corresponding digital creation tools need to be mastered. The information integration and expression ability cultivated by the competition is the foundation of multi-media creation. In the future, vocational students will benefit from this in scenarios such as corporate promotion, product introduction, and technical training.

##### **3.2.2. Skill Enhancement Eleven: The Ability to Build High-Performance Digital Workflows**

The various tools involved in Modules 9 and 10, such as reference management, note-taking software, data analysis, project management, etc., ultimately aim to help students build their own efficient digital workflow. This workflow can automate repetitive tasks, reduce cognitive load, and allow creativity to be fully unleashed. For example, using Zotero to automatically manage references, using Notion to build a personal knowledge base, and using Trello to track project progress. This self-management ability is an important part of personal career competitiveness.

#### **3.3. The Awareness of Digital Social Responsibility: Being a Responsible Digital Citizen**

With great power comes great responsibility.

##### **3.3.1. Skill Enhancement Twelve: Critical Thinking and Cybersecurity Protection Ability**

In the all-media environment, the authenticity of information is hard to discern, and network risks are omnipresent. The competition's repeated emphasis on the authority of information sources and the reliability of information content is essentially a way to temper students' critical thinking. They have learned to question: "Who released this information? What is his motive? Is the evidence sufficient?" At the same time, the promotion of formal databases and government open platforms indirectly educates students to stay away from illegal and high-risk information channels, thereby establishing a basic awareness of network security.

## **4. The Dimension of AI Literacy: The Key to Embracing the Future of the Intelligent Era**

AI literacy is the most forward-looking and revolutionary part of this competition, pointing directly to the future.

### **4.1. Basic Understanding of AI: Dispelling Myths and Establishing a Scientific Understanding**

It is crucial to maintain a clear understanding in the midst of the AI boom.

#### **4.1.1. Skill Enhancement Thirteen: Rational Understanding of AI Principles and Boundaries**

Module 11 first requires students to understand what AI is and what it is not. They need to know that the current mainstream AI, especially generative AI, is based on big data and probabilistic statistics for pattern matching, rather than true intelligence or consciousness. This understanding can help students avoid two extremes: one is blind worship, thinking that AI can do anything; the other is to refuse to use any AI tools because of a few negative experiences. Only use based on scientific understanding is safe and efficient.

### **4.2. The Application of AI Tools: The New Productivity of Human-Machine Collaboration**

AI is not about replacing humans, but about enhancing them.

#### **4.2.1. Skill Enhancement Fourteen: The Ability to Apply Intelligent Tools in Specific Scenarios**

The competition encourages students to explore how to integrate AI tools into existing information processing workflows. For example, using AI to draft the initial manuscript of a literature review, using AI to conduct sentiment analysis on a large number of user comments, and using AI to generate preliminary plans for data visualization. This is not about turning students into AI developers, but rather into smart AI users. This ability will greatly enhance their work efficiency and creativity, making them stand out in the future workplace<sup>[4]</sup>.

### **4.3. AI Ethical Standards: Safeguarding the Bottom Line of Technology for Good**

This is the most central part of AI literacy and also the part that is most easily overlooked.

#### **4.3.1. Skill Enhancement Fifteen: Profound AI Ethical Reasoning and Compliance Application Ability**

AI has brought a series of ethical challenges such as bias, privacy, copyright, and unemployment. Module 11 explicitly lists "AI ethical standards education" as a key point. The competition guides students to think about issues such as: Who owns the copyright of content generated by AI? How should we deal with gender or racial biases in AI models? In what scenarios should we not rely on AI to make decisions? This ability to reason ethically ensures that while students enjoy the benefits of technology, they can also uphold the bottom line of morality and law, becoming a force that promotes the use of technology for good<sup>[5]</sup>.



## 5. The Fusion Effect of the “Three-Dimensional Integration”: Synergistic Enhancement Where 1+1+1>3

The three dimensions of “Information → Digital → AI” are not isolated but are interwoven and empower each other, generating a powerful synergistic effect.

- **Information literacy provides “fuel” for digital and AI literacy:** High-quality information is the foundation for digital content creation and AI model training.

- **Digital literacy provides a “vehicle” for information and AI literacy:** All information processing and AI interactions take place on digital platforms.

- **AI literacy provides an “engine” for information and digital literacy:** AI tools greatly expand the boundaries and efficiency of information processing and digital creation.

For example, when completing a development task for a “campus second-hand book trading platform”:

- **Information literacy:** Students need to look up information on the functional design of second-hand trading platforms, relevant laws and regulations, as well as case studies and user reviews of similar apps that others have developed.

- **Digital literacy:** Students need to use programming tools to write code, use databases to store book and user information, and create a clickable mobile interface.

- **AI literacy:** Students can use AI tools to analyze which books are the most popular or to recommend books that users might be interested in based on their browsing history.

This process perfectly illustrates the integration of the three dimensions. The absence of any one dimension would significantly compromise the completion of the task.

## 6. Conclusion: Learning through Competition, Empowering the Future

The “2025 College Students AI + Information Literacy Competition” is by no means a simple knowledge contest. It is a meticulously designed, future-oriented educational system. Through the three-dimensional integrated literacy model, the competition systematically enhances the fifteen core skills of vocational and specialized college students, including problem definition, information verification, knowledge integration, digital creation, human-machine collaboration, and ethical reasoning.

Looking to the future, with the continuous evolution of AI technology, the connotation of information literacy will surely continue to enrich.

## Disclosure statement

The author declares no conflict of interest.

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