

A Study on the Path and Practice of Chinese Cultural Dissemination in College English Classrooms Driven by AI

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ABSTRACT Current college English teaching faces a persistent limitation in students' ability to express Chinese culture in English, which weakens their capacity to explain Chinese cultural concepts accurately in international communication. To address this issue, this study constructs an AI-driven end-to-end teaching path for Chinese cultural dissemination in college English classrooms. First, natural language processing is used to build a bilingual corpus of Chinese culture and establish a structured knowledge base of core cultural terms. Second, generative AI is applied to dynamically generate personalized learning resources and virtual scenarios. Third, an intelligent interaction platform is constructed to provide real-time feedback and critical thinking guidance. Finally, learning analytics is used to build comprehensive competency profiles. Experimental results show that the experimental class significantly outperforms the control class in cultural accuracy and fluency, reaching 84.6 ± 6.3 and 81.9 ± 5.8 , respectively. Students' cross-cultural critical thinking scores increase by 13.6-18.0 points across dimensions, and 93.3% of students express willingness to actively promote Chinese culture. The proposed path improves cultural expression accuracy, learning engagement, and classroom dissemination effectiveness.

INDEX TERMS college english teaching, chinese cultural dissemination, artificial intelligence, learning analytics, intelligent interaction

I. INTRODUCTION

THERE is a significant phenomenon of "limited cultural expressive capacity" (often referred to in local contexts as cultural aphasia) in current college English teaching. Although students possess certain English expression skills, they struggle to accurately interpret core Chinese cultural concepts such as "harmony in diversity" and "harmony between man and nature" within the context of traditional heritage and silk craftsmanship, leading to a double dilemma of "expression deficit" and "content discount" in the global dissemination of oriental fiber arts. This linguistic barrier prevents future professionals from effectively articulating the philosophical depth of ancient weaving techniques and their modern integration with sustainable innovation [1-2]. This situation not only deprives students of opportunities to tell China's story well in international exchanges but also weakens the cultural mission of English courses in moral education, becoming a deep-seated bottleneck restricting the improvement of national cultural soft power and mutual learning among civilizations [3-4]. In recent years, the academic community has conducted numerous explorations on the issue of cultural integration in college

English teaching. For example, Luckyardi et al. analyzed the role of new technologies and teaching methods in promoting the reform of language education in Indonesia and proposed policy and teaching suggestions to build a sustainable and inclusive framework oriented towards the well-being of citizens [5]. Halim et al. explored the application of self-directed learning in mobile-based foreign language English teaching in Indonesian colleges and universities, analyzed its advantages and challenges, and advocated for teacher training based on the principle of self-directed learning to create a more learner-centered classroom [6]. After clarifying the concept of integrating ideological and political education into various professional courses and daily teaching, Lingling focused on the main problems and underlying causes in the construction of English major courses [7]. However, existing research mostly remains at the level of theoretical appeals and empirical summaries, lacking operable technical paths and systematic empirical support. In particular, there is still a significant research gap in how to use artificial intelligence technology to achieve a qualitative change in Chinese culture from "knowledge supplementation" to "deep dissemination". Some researchers

have tried to introduce multimedia resources or network platforms into cultural teaching. In response to the problems of insufficient traditional cultural content, single integration methods and weak evaluation in vocational English, Duan proposed to optimize the teaching by studying textbooks to explore cultural resources, using multimedia to build online classrooms, conducting comparisons between Chinese and Western cultures and organizing extracurricular practice activities [8]. Han et al. believe that the use of multimedia in junior high school English teaching can enhance interaction and immersive experience, improve comprehension and language skills and promote the development of cross-cultural communication ability [9]. However, due to the fragmented and superficial application of technology, it is difficult to solve the core problems such as accurate supply of cultural content, generation of personalized learning resources and instant interactive feedback. To address the aforementioned shortcomings, this paper proposes and implements an innovative AI-driven approach to teaching Chinese culture in English. Through the systematic integration of natural language processing, generative AI, intelligent interactive platforms, and learning analytics, it effectively overcomes the predicaments of superficial cultural content, monotonous teaching methods, and a lack of evaluation systems in traditional teaching.

This study attempts to find feasible ways to promote the dissemination of Chinese heritage and silk craftsmanship in university English classes through the assistance of AI technology. By leveraging intelligent systems to bridge linguistic gaps, students can more effectively articulate the technical evolution from ancient weaving techniques to modern functional fiber innovations in cross-cultural dialogues. First, natural language processing is used to build a bilingual corpus of Chinese culture to solve the problem of the source of teaching content. Second, generative AI is used to generate personalized learning resources and virtual simulation scenarios dynamically. Third, an intelligent interactive platform is constructed to realize instant feedback and critical thinking guidance. Finally, learning analytics is used to generate developmental evaluation profiles.

II. INTELLIGENT CONSTRUCTION OF A BILINGUAL CULTURAL CORPUS

The beginning point of our research is “what to teach”. Therefore, we built a bilingual corpus for teaching Chinese culture in English as the beginning point. Compared with simple corpus construction based on texts, we used natural language processing method to achieve deep processing of cultural content.

In fact, the multilingual scripts from Chinese Ideological and Cultural Terminology, A Reader on Chinese Culture and videos for promoting national image were chosen as basic corpus for constructing the corpus in practice. Then, word segmentation tool and part of speech tagging algorithm were used to preprocess the Chinese text and get core cultural terms like “Ren, filial piety, and Silk Road”. After that,

we used deep learning based entity relationship extraction method to get the semantic roles of these core cultural terms in certain context and logical relationship between these core cultural terms and surrounding texts (they got extracted association paths between Confucius and benevolence and between Confucianism and Confucianism). Based on these, we constructed knowledge graph for core Chinese cultural terms, and used bilingual alignment technology to automatically match authorized English translations of these core cultural terms and manually correct them with corresponding Chinese concepts, thus building a bilingual corporation with standardized terminology, complete context and clear hierarchy. The constructed corporation offers a kind of cultural-containing and English-accurate source content for building teaching resources afterwards [10]. Based on these, we constructed a knowledge graph for core Chinese cultural terms and used bilingual alignment technology to match authorized English translations. To ensure a seamless end-to-end workflow, this corpus serves as the foundational data layer; the semantic roles and relationship paths identified here are directly exported as prompt constraints for the generative AI in the subsequent stage, ensuring that dynamically generated materials remain terminologically consistent with the knowledge graph.

III. DYNAMIC GENERATION OF TEACHING RESOURCES DRIVEN BY GENERATIVE AI

To bridge the gap between static data and active learning, the system functions as an integrated pipeline. The material packages retrieved from the corpus are fed into the LLM, which acts as the ‘engine’ for the virtual simulation interactive platform described in Section 4. This ensures that the vocabulary students encounter in reading materials is the same terminology they must use when interacting with digital humans in the VR environment.

In traditional teaching, teachers are constrained by the fixed and stale supporting resources of textbooks, unable to change the difficulty and form of cultural teaching materials issued in real time according to the students’ levels. This study aims to apply generative AI technology to enable automated, custom resource generation.

The specific approach is as follows: First, taking the theme of the teaching unit as the input condition, such as “Chinese traditional festivals” or “the thoughts of the Hundred Schools of Thought”, the system automatically retrieves matching core terms and typical contexts from the bilingual corpus constructed in the previous section to form a content material package. Then, the generative AI model (such as Wenxin Yiyan or ChatGPT) is called to generate reading materials and situational dialogue scripts of different difficulty levels according to the students’ English level classification instructions. Taking the theme of “Mid-Autumn Festival” as an example, for low-level students, the AI generates short articles focusing on the introduction of festival customs; for high-level students, it generates critical reading materials that incorporate the deep cultural

connotations of “reunion” and “family and country are the same” [11].

In terms of resource type, in addition to generating text resources, the system also uses the results of AI image generation technology and speech synthesis technology to generate corresponding cultural micro-video script resources, bilingual narration examples and virtual character dialogue examples. After being reviewed by teachers, the resources generated by the system are pushed to the students via the teaching platform. The above dynamic generation mechanism ensures that the teaching content is based on the standard terms of the corpus and solves the problem of “one-size-fits-all” supply in teaching by adapting resources to each class and each student.

After being reviewed by teachers, the resources generated by the system are pushed to the students via the teaching platform. To ensure academic rigor and cultural appropriateness, a ‘human-in-the-loop’ verification protocol was implemented: all AI-generated reading materials and scripts were cross-referenced against the bilingual corpus built in Section 2. Any terminology or cultural interpretations deviating from the authorized knowledge graph were flagged and manually corrected by a panel of two senior English faculty members and one cultural expert before being released to students. This multi-layer filtering mechanism prevents the dissemination of unverified or hallucinated AI content.

IV. DESIGN OF A VIRTUAL SIMULATION INTERACTIVE PLATFORM BASED ON A LARGE LANGUAGE MODEL

After solving the problem of “supply” of teaching resources, how to make students can “use” these resources in real communicative scenarios becomes the key issue of communication skills teaching implementation. Role-plays designed in traditional classrooms often become only a formal performance, without real pressure of context and immediate feedback for students, so their expression still be stuck in the level of mechanical drills. To overcome this shortcoming, this study has constructed a virtual simulation interactive platform based on a large language model.

The technical architecture of platform includes VR/AR environment, large language model and speech recognition/synthesis. By using 3D modeling and panoramic image technology, we constructed several virtual scenes with Chinese cultural connotation, for example Digital Dunhuang, Virtual Tour of Forbidden City, Confucius Asking About Etiquette etc. After students wearing terminal device entered into the scene, they will trigger related cultural dissemination tasks, for example, as the museum guide, explain the mural of Mogao Grottoes to foreign guests; or participate in the international youth forum on harmony in diversity as cultural exchange ambassadors [12].

At the level of interaction, the platform constructed virtual digital human with Chinese cultural knowledge base. These digital humans are not simple question-and-answer robots, but dialogue intelligence agent based on large language model and fine-tuning, and their knowledge base is con-

nected to the bilingual corpus built in the early stage. When students play role and dialogue with digital human, the system will do two kinds of realtime behaviors, first, by using speech recognition technology, the system can instantly score and correct their fluency and pronunciation accuracy instantly; second, the system analyzes the accuracy of student’s use of cultural terminology by semantic understanding. For example, when a student just simply treat Confucianism as philosophy, the digital human will give them guided question to add the ethical system part, so that the student can constantly improve their level of cultural expression.

Whole interaction process is not one-time output, but formed spiral upward closed loop of expression-feed back-correction-re-expression. The whole interaction process of platform records a complete log of dialogue, and it will be the raw data for later learning analysis. This design attempts to break the limitation of time and space of traditional classroom, and let students repeatedly practice in low anxiety and highly immersed simulated environment, so as to achieve the transformation from knowing to using.

V. LEARNING ANALYTICS-SUPPORTED FULL-PROCESS COMPETENCY TRACKING

The digital reconstruction of the teaching process has generated massive amounts of behavioral data. How to transform this data into interpretable teaching feedback, thereby achieving a precise grasp of student growth, is another core issue addressed in this research. Traditional assessment often relies on a single final exam, which is insufficient to reflect the trajectory of students’ changes throughout the actual learning process. To address this deficiency, we introduced learning analytics to construct a full-process competency tracking mechanism.

Regarding implementation, the backend system logs all behaviors. While ‘daily online time’ is recorded, it is treated only as a secondary administrative metric. Primary cognitive engagement is measured through ‘active interaction density’—calculated as the ratio of student input length to session duration—and ‘semantic depth,’ which tracks the frequency of high-level cultural descriptors used during VR role-play. From the raw log, we use data cleaning to convert these behaviors into indicators such as ‘active participation rate’ (rather than simple login time) and ‘number of corrections,’ indicating the student’s ability for reflection. On this basis, the research group further developed the “Developmental Evaluation Framework for English Expression Ability in Chinese Culture” based on Bloom’s Taxonomy of Cognitive Objectives and the Intercultural Communicative Competence Model. The three dimensions include knowledge reserves, contextual application and critical thinking. The system regularly conducts clustering and association rule mining on each student’s data and dynamically generates the visualized personal competency profile. Not only does the system shows students’ current score in each dimension, but also reflects students’

development and poor performance by comparing with the historical data. For example, the system will tell students that the student has made a significant improvement in the dimension of “cultural analysis” but still needs to improve in the dimension of “viewpoint selection”. Through this whole process tracking, the system provides data support for teachers to implement precise remedial teaching, and also allows students to clearly see the track of their development and improve their metacognitive awareness of learning.

VI. MULTIDIMENSIONAL EVALUATION OF THE EFFECTIVENESS OF THE DISSEMINATION PRACTICE

A. EXPERIMENTAL DESIGN

This study used a quasi-experimental research design. The first-year non-English major students in two parallel classes in a university were chosen as the research subjects and randomly divided into experimental class (45 students) and control class (45 students). The experimental class lasted for 18 weeks (one semester). The experimental class carried out the experimental teaching path of Chinese culture dissemination based on AI-driven teaching mentioned above. However, the control class was traditionally taught English (only added cultural knowledge based on the units of the English textbook). In addition, the English expression ability related to Chinese culture was collected from all the students through pre-tests (the first week of school) and post-tests (the last week of school). To account for the ‘media effect’ and the novelty of high-cost technologies, the control class was also provided with digital multimedia supplements, such as high-definition videos and online interactive quizzes, to ensure a comparable level of digital exposure. This design ensures that the significant improvements observed in the experimental group are attributable to the specific end-to-end pedagogical path and the systematic integration of AI-driven logic, rather than merely the introduction of new hardware or simulation environments.

B. COMPARATIVE EXPERIMENT ON ACCURACY OF CULTURAL CONTENT AND FLUENCY OF LANGUAGE EXPRESSION

This study used two parallel classes of first-year non-English major students from a university as subjects, with 45 students in each class (experimental and control). A comparative teaching experiment was conducted for 18 weeks. Before and after the experiment, students were tested on their oral performance in explaining Chinese cultural themes in English. Three evaluators conducted blind assessments of the accuracy of cultural content, while speech analysis software was used to automatically calculate the fluency index.

Figures 1 (a-b) show the pre- and post-test comparison results of the accuracy of cultural content and the fluency of language expression in the experimental and control classes, respectively. The experimental results showed that the experimental class’s post-test score on cultural content accuracy (84.6 ± 6.3) was significantly higher than that of

the control class (70.1 ± 7.5), $t = 9.93$, $p < 0.001$, and an improvement of 19.4 points compared to the pre-test (65.2 ± 8.1). Regarding fluency in language expression, the experimental class’s post-test score (81.9 ± 5.8) was also significantly better than that of the control class (71.4 ± 7.2), $t = 7.62$, $p < 0.001$, and an improvement of 14.4 points compared to the pre-test (67.5 ± 7.3). This indicates that AI-driven teaching can effectively improve students’ accuracy and fluency in expressing Chinese culture in English.

C. TRACKING EXPERIMENT ON CROSS-CULTURAL CRITICAL THINKING ABILITY AND LEARNING ENGAGEMENT

In this study, we carried out an 18-week tracking experiment with 45 students in the experimental class to evaluate the effects of AI-based teaching on the students’ cross-cultural critical thinking ability and learning engagement. The experiment automatically collected the students’ average daily online time and task completion rate from the platform. We used a 100-point critical thinking skills scale adapted from the California Critical Thinking Skills Test (CCTST) to evaluate students. The ‘viewpoint adoption’ dimension was quantified using a 5-level rubric (1–20 points per level), where students were scored on their ability to acknowledge and synthesize counter-arguments in forum discussions. Similarly, ‘critical reflection’ was measured by the frequency and accuracy of self-corrections made following digital human feedback during the VR sessions.

Figures 2 (a-b) show the pre- and post-test comparisons of the three dimensions of cross-cultural critical thinking skills and the distribution of the two indicators of learning engagement for students in the experimental class. The results showed that students in the experimental class achieved significant improvements in all three dimensions of cross-cultural critical thinking skills: cultural analysis improved from 64.1 ± 11.3 to 78.1 ± 8.6 , critical reflection improved from 61.2 ± 9.5 to 74.8 ± 9.8 , and viewpoint adoption improved from 62.6 ± 10.6 to 80.6 ± 6.0 . Regarding learning engagement, students’ average daily online time was 38.7 ± 14.9 minutes, and the task completion rate was $84.0\% \pm 10.4\%$. Data shows that AI-driven teaching pathways effectively promoted students’ in-depth critical thinking and sustained learning engagement.

D. QUALITATIVE INTERVIEWS ON THE DEPTH OF CULTURAL UNDERSTANDING AND THE WILLINGNESS TO DISSEMINATE IT

After the experiment, in this study, 15 students were randomly stratified from 45 students in the experimental class according to their high, medium and low levels of language proficiency for semi-structured interviews.

The interviews were conducted in three dimensions: the depth of understanding of Chinese cultural connotations of the students after the experiment, their confidence in explaining Chinese culture in English, and their subsequent

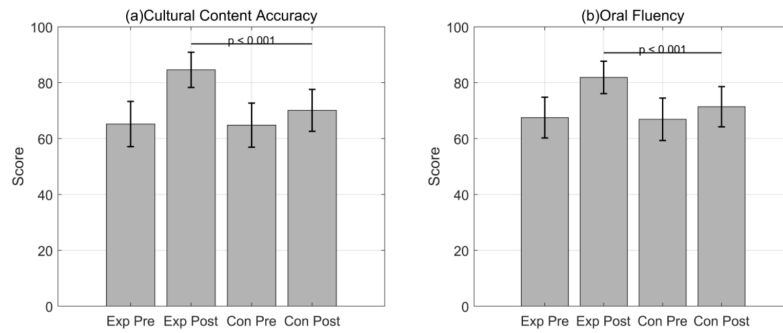


FIGURE 1. Comparison of Accuracy of Cultural Content and Fluency of Language Expression

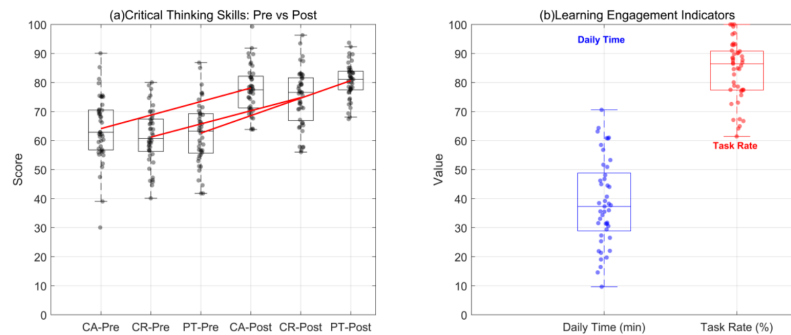


FIGURE 2. Tracking and Evaluation of Cross-cultural Critical Thinking Skills and Learning Engagement

willingness to explain it. Each student’s interview took about half an hour. All interviews were recorded and transcribed. Finally, in this study, thematic analysis was used to code and summarize.

TABLE 1. Qualitative Interview Assessment of Cultural Understanding Depth and Willingness to Disseminate

Theme	Sub-theme	Number of Mentions (n=15)	Representative Quote
Cultural Understanding Depth	Explaining core concepts	13	"Can explain the meaning of 'reunion'"
Cultural Understanding Depth	Understanding underlying values	11	"Understands the multiple meanings of 'harmony in diversity'"
Communication Confidence	Willingness to express	12	"Virtual practice increased confidence to speak"
Communication Confidence	Intelligibility of expression	10	"AI feedback improved communication effectiveness"
Communication Willingness	Active storytelling	14	"Willing to actively introduce Chinese festivals"
Communication Willingness	Participation in exchange	9	"Willing to participate in international cultural exchanges"

In Table 1, AI-driven teaching significantly deepened students’ cultural understanding: 13 students could accurately explain core concepts of Chinese culture, and 11 could further connect them to the underlying values. Confidence in dissemination was significantly enhanced, with 12 students expressing confidence in expressing themselves in English, and 10 students believing their expressions were comprehensible. Regarding willingness to disseminate, 14 students were willing to proactively tell stories about Chinese culture, and 9 expressed their intention to participate in international

exchange activities. Research indicates that AI-powered immersive learning not only enhances students’ in-depth understanding of culture but also effectively stimulates their intrinsic motivation for cultural dissemination.

VII. CONCLUSION

This study verifies the effectiveness of an end-to-end AI approach to Chinese cultural dissemination in university English classrooms, specifically focusing on the linguistic representation of traditional silk craftsmanship and ancient weaving techniques. By automating the translation of complex terminology and functional innovations, the system empowers students to articulate the technical and philosophical depth of Chinese fiber arts with greater precision. This study built a bilingual corpus, generated personalized learning resources, developed an intelligent interactive platform, and implemented a comprehensive learning process analysis to systematically solve problems existing in current university English teaching such as superficiality of cultural content, dullness of teaching methods, and lack of evaluation mechanisms. The results showed that this deep integration achieved a coordinated improvement in students’ depth of cultural understanding, accuracy of expression, and willingness to disseminate culture. This study proves that the deep application of AI technology can optimize the learners’ cognitive experience and motivation to express, which provides an

achievable model for university English courses to complete the mission of disseminating culture. However, this

study had limitations. Its sample included only one university, the research period was short, and the cultural appropriateness of the content generated by the intelligent system could still be improved. Future studies could increase the sample size and implement long-term follow-up studies to explore the deep application of human-machine collaboration in cultivating cross-cultural critical thinking regarding Chinese heritage and functional fiber innovations. This longitudinal approach will better evaluate how AI-assisted learning helps students articulate the technical evolution from ancient silk weaving to modern high-performance in global professional contexts.

AUTHOR CONTRIBUTIONS

Yu Wang designed, collected and analyzed the data, and drafted the manuscript. Yu Wang conducted the study, critically revised the manuscript for important intellectual content, and gave final approval of the version to be published. Yu Wang participated fully in the work, take public responsibility for appropriate portions of the content, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICTS OF INTEREST

The author declares no conflict of interest.

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