

Artificial Intelligence Empowering English Translation Teaching: Empirical Study on the Optimization of Traditional Chinese Culture Text Translation and Cross Cultural Communication Efficiency

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ABSTRACT Under the dual background of globalization and cultural confidence building, the English translation of traditional Chinese cultural texts has become an important carrier of cross-cultural communication. Current translation teaching faces problems such as insufficient translation accuracy, weak transmission of cultural connotations, and inadequate cross-cultural communication awareness. This study constructs an AI-enabled teaching model for traditional cultural text translation, integrating machine translation, natural language processing, cultural orientation, and teaching adaptation. The research focuses on university English translation teaching involving Chinese traditional cultural texts, including classic literature, folk culture, and traditional art. A 16-week teaching experiment is conducted with four English-major classes from two universities, divided into experimental and control groups. Results show that the experimental group achieves relative improvements of 40.8% in translation accuracy and 28.9% in cultural connotation transmission compared with the control group. Students' cross-cultural communication cognition and practical ability also improve significantly. The findings demonstrate that AI-supported translation teaching can reduce cultural loss, improve sentence adaptation, and enhance translation effectiveness for traditional cultural texts.

INDEX TERMS artificial intelligence, translation teaching, traditional chinese culture, cross-cultural communication, machine translation

I. INTRODUCTION

WITH the promotion of the “going global” strategy of Chinese culture, cross-cultural promotion of traditional Chinese culture will become an important way to enhance China’s cultural soft power. As a core component of cross-cultural communication, the quality of English translation directly affects the effectiveness of cultural dissemination. As an important carrier for cultivating translation talents, English translation teaching has both the task of cultivating language conversion ability and the responsibility of promoting traditional culture. The analysis basis of this article can be summarized as follows: firstly, linguistics and translation theory. Based on the theory of functional equivalence and functionalism, it is clarified that the key requirement for translating traditional cultural texts is to achieve dual equivalence in language form and cultural connotation; The second is the application theory of artificial

intelligence technology. Based on the core characteristics of machine translation, natural language processing, big data analysis and other technologies, the applicability of artificial intelligence technology in translation teaching is analyzed; The third is teaching practice data. Collect relevant information on students’ translation ability and learning outcomes through teaching experiments, questionnaire surveys, interviews, and other methods to provide empirical support for analysis and conclusions.

The main innovations of this article can be summarized as follows: at the theoretical level, it combines artificial intelligence technology with traditional cultural translation teaching and cross-cultural communication theory, enriches the theoretical system of English translation teaching, and proposes the teaching concept of “technology empowerment+cultural communication”; At the practical level, an operational artificial intelligence teaching model has been

constructed, and personalized teaching processes and translation optimization strategies have been designed to address specific issues with traditional cultural texts. This breaks through the limitations of traditional teaching methods. Empirical research has verified the effectiveness of the model. While theoretical exploration provides the conceptual framework, the core of this article is built upon robust empirical evidence derived from a 16-week pedagogical experiment.

The main contributions of this article can be summarized as follows: Firstly, beyond the limitations of traditional translation teaching, artificial intelligence technology is combined with traditional cultural text translation teaching to construct a comprehensive teaching model of “AI corpus empowering cultural semantic analysis personalized teaching cross-cultural practice”. Overcoming the shortcomings of scattered application of artificial intelligence technology in existing research; Secondly, artificial intelligence optimization strategies for traditional cultural text translation have been proposed. Starting from key issues such as cultural load words, sentence structure, and cultural connotation transmission, combined with the advantages of semantic analysis and artificial intelligence technology corpus, and traditional cultural text translation, an operable translation method system is established; Thirdly, the effectiveness of the artificial intelligence teaching model has been verified through empirical research. A quantitative analysis was conducted on the effectiveness of improving students’ translation skills and cross-cultural communication efficiency, providing data support for the promotion of this model.

II. RELATED WORK

In the context of the rapid development of artificial intelligence technology, how to effectively empower it in English translation teaching, especially in optimizing the translation of traditional Chinese cultural texts and improving cross-cultural communication efficiency, has become an important issue in the field of translation education. Existing scholars have explored this topic from different perspectives. Qi [1] analyzes business English translation teaching based on case-based teaching method; Zhu [2] explores innovation in English translation teaching based on artificial intelligence; Yao [3] researched an English translation teaching model based on artificial intelligence; Yue [4] conducted practical research on artificial intelligence assisted college English translation teaching; Gao [5] explores teaching strategies for business English translation based on ecological translation; Li and Liu [6] studied diversified English translation teaching strategies from the perspective of computer-aided technology; Li [7] explores and analyzes the teaching practice of college English translation in cross-cultural contexts; Xi [8] analyzed the cultivation path of cross-cultural awareness in college English translation teaching; Jing Z [9] carried out innovative research on college English translation teaching in the context of “Internet plus education”; Dong [10] explores college English translation teaching under the background of ideological and political education. These studies

aim to address the teaching methods, strategies, and practical issues of English translation teaching in different fields and backgrounds, and propose corresponding measures. At present, there may be issues with insufficient depth in the integration of emerging technologies and teaching, as well as insufficient comprehensive and systematic research on the integration of cross-cultural and ideological elements into teaching in other studies on this topic.

III. METHOD

A. RESEARCH SUBJECT

This article selects two sophomore and two junior English major classes from a certain university as research subjects, with a total of 120 students. The experimental group consists of 60 students (one sophomore class and one junior class), while the control group consists of 60 students (one sophomore class and one junior class). To control for the confounding variable of year level, academic year was used as a blocking factor in the subsequent statistical analysis. Sub-group analysis revealed that while juniors performed slightly better than sophomores overall, the relative improvement of the experimental group over the control group remained consistent across both year levels, suggesting the model’s effectiveness is not restricted by existing proficiency levels. The selection criteria are as follows: there was no significant difference in English foundation, translation ability, or prior familiarity with AI translation tools (assessed via a pre-experiment digital literacy survey) between the two groups of students ($P > 0.05$). To establish equivalence, a validated English Proficiency Scale (EPS) and a baseline translation assessment (comprising 10 cultural load sentences and 2 short paragraphs) were administered. Results showed mean scores of 62.3 for the experimental group and 61.8 for the control group, with no significant differences in score distribution. Furthermore, a pre-experiment survey confirmed that both groups were equivalent regarding technology familiarity, attitudes toward AI tools, and learning motivation ($P > 0.05$), ensuring the randomness and fairness of grouping; Both groups of students have completed the basic translation course and have a certain foundation in translation, able to understand the basic connotations of traditional cultural texts; Two groups are taught by the same group of teachers, with consistent teaching progress and content (except for the teaching mode) to avoid the influence of irrelevant variables on the experimental results. The experimental period is 16 weeks, with 2 classes per week and 45 minutes per class, focusing on teaching translation of traditional Chinese cultural texts [11]. This study was approved by the Ethics Committee of Yulin Normal University, and was performed in accordance with the principles of the Declaration of Helsinki. All eligible participants signed an informed consent form.

B. RESEARCH TOOLS AND MATERIALS

The research tools mainly include: AI translation teaching support platform (integrating Baidu Translation API,

Youdao Translation API, building a traditional cultural English corpus, including classic literature, cultural load word library, sentence template library, etc., with functions such as corpus retrieval and a personalized push mechanism. The latter utilizes a rule-based tagging system combined with a collaborative filtering algorithm to match identified student error patterns (e.g., lexical vs. syntactical) with targeted remedial exercises from the cultural corpus; Translation Ability Test Paper (divided into pre-test, mid test, and post test, the content of the test paper is all Chinese traditional cultural texts, covering classic books, folk culture, traditional art, and other types. The question types include sentence translation, paragraph translation, and the scoring criteria revolve around four dimensions: translation accuracy, completeness, cultural connotation transmission, and language fluency, with a maximum score of 100 points); Questionnaire survey (divided into student questionnaire and teacher questionnaire), the student questionnaire mainly investigates students' acceptance of AI empowered teaching mode, learning experience, their own translation ability, and the improvement of cross-cultural communication awareness, with a total of 20 questions, using the Likert 5-point scale; The teacher questionnaire mainly surveys teachers' evaluations of the feasibility and effectiveness of this teaching model; Interview outline (conducting semi-structured interviews with some students and teachers to understand their feelings, problems encountered, and improvement suggestions during the teaching process) [12].

The research materials mainly include: Chinese traditional cultural text corpus (selecting texts suitable for English majors to translate, with difficulty gradually increasing, covering excerpts from the Analects and Tao Te Ching, introductions to traditional festivals, explanations of intangible cultural heritage skills, calligraphy and opera culture, etc., totaling 32 texts); Guidelines for AI Translation Optimization (Combining Functional Equivalence Theory and Skopos Theory to Develop AI Translation Optimization Strategies and Methods for Difficulties such as Cultural Load Words, Complex Sentences, and Cultural Connotation Transmission in Traditional Cultural Texts); Teaching courseware (the experimental group courseware integrates AI tool operation guidance, AI translation case analysis, and other content, while the control group courseware adopts traditional teaching content, focusing on translation skills explanation and text analysis).

C. RESEARCH DESIGN AND IMPLEMENTATION PROCESS

This article adopts a quasi experimental research method (as shown in Figure 1) to compare the translation ability, cross-cultural communication effectiveness, and learning outcomes of the two groups of students using an AI empowered teaching mode in the experimental group and a traditional teaching mode in the control group. The specific implementation process is as follows:

Phase 1 (Week 1): Preliminary preparation and pre-test.

Conduct a pre-test of translation ability for two groups of students, focusing on traditional cultural text translation. Collect test scores and confirm that there is no significant difference in translation ability between the two groups of students; Introduce the usage method of the AI translation teaching support platform to the experimental group students, distribute AI translation optimization guidelines, and guide students to familiarize themselves with the platform's functions and optimization strategies; Explain the purpose, process, and precautions of the experiment to two groups of students and teachers to ensure the smooth progress of the experiment [13].

Phase 2 (weeks 2-15): Teaching implementation. The control group adopts the traditional teaching mode, with the teaching process of "teacher explains translation skills - analyzes the cultural background of the text - student exercises - teacher feedback", focusing on explaining the translation skills of traditional cultural texts, guiding students to engage in manual translation exercises, and teachers providing concentrated explanations for students' translation errors. The experimental group adopts an AI enabled teaching mode, and the teaching process revolves around "AI preview classroom lectures AI exercises feedback optimization": before class, teachers push traditional cultural text corpus, cultural background information, and preview tasks to students through the AI platform. Students use the AI platform for preliminary translation exercises, and AI tools automatically identify translation errors and provide preliminary correction suggestions; In class, the teacher combines AI platform translation demonstrations to address difficulties such as cultural loaded words and complex sentence structures. Using AI's semantic analysis function to break down translation logic, the teacher guides students to compare AI translation results with manual optimization solutions, explore techniques for conveying cultural connotations, organize student group discussions, and exchange translation experiences; After class, students use AI platforms for personalized translation exercises. The AI platform pushes targeted reinforcement training tasks based on students' translation error types. After students complete the exercises, AI tools provide ratings and detailed feedback. Teachers focus on explaining students' common problems and provide individual guidance for individual problems.

Phase 3 (Week 16): Post testing and data collection. Conduct a post test of translation ability for two groups of students, with test content and question types that are equivalent in difficulty to the pre-test, and collect test scores; Distribute questionnaires to two groups of students to collect relevant data on their learning experience, ability improvement, etc; Conduct semi-structured interviews with some students and teachers to understand their evaluations and improvement suggestions on the teaching mode; Organize relevant data during the experimental process, including test scores, questionnaire data, interview records, etc., to provide support for subsequent result analysis.

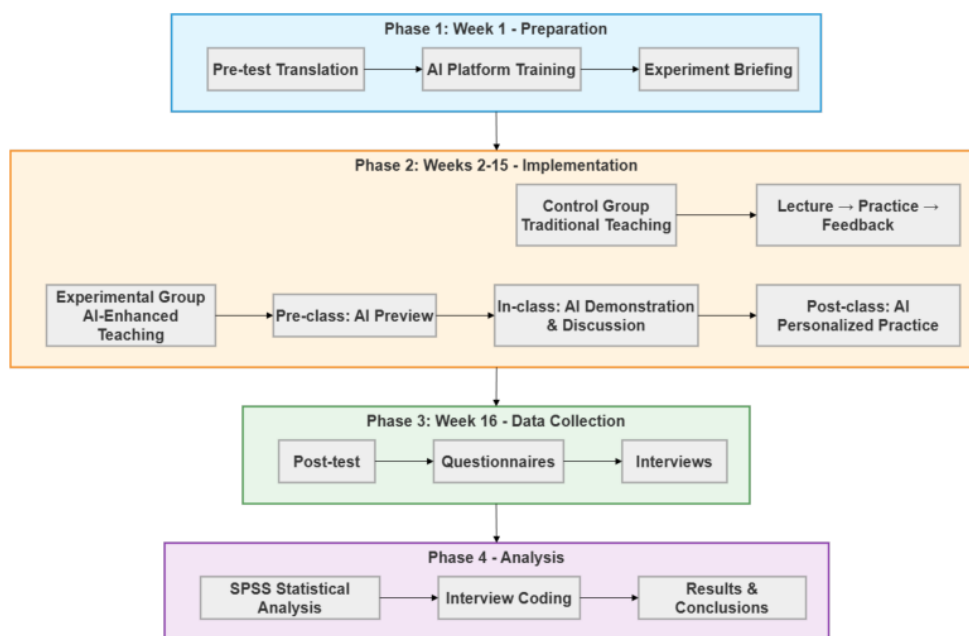


FIGURE 1. Research Design and Implementation Process

Stage Four: Data Processing and Analysis. SPSS 26.0 software was used to conduct statistical analysis on the collected test scores and questionnaire data, including descriptive statistics, independent sample t-test, correlation analysis, etc., to test the effect of AI empowered teaching mode on improving students' translation ability and cross-cultural communication effectiveness; Encode and analyze interview records, extract core viewpoints, and summarize the advantages and disadvantages of teaching models [14].

IV. RESULTS AND DISCUSSION

A. ANALYSIS OF TRANSLATION ABILITY TEST RESULTS

Through statistical analysis of the translation scores of two groups of students in the pre-test and post test (as shown in Figure 2), the results showed that in the pre-test, the average score of the experimental group was 62.3 points, and the average score of the control group was 61.8 points. Independent sample t-test showed $P = 0.723 > 0.05$, indicating that there was no significant difference in translation ability between the two groups of students before the experiment, and the grouping was reasonable. In the post test, the average score of the experimental group was 85.7 points, while the average score of the control group was 64.9 points. Independent sample t-test showed $P = 0.000 < 0.01$, indicating a significant difference in translation scores between the two groups of students. The translation ability of the experimental group students was significantly better than that of the control group.

From the specific dimensions of translation ability, the experimental group students scored significantly higher than the control group in the three dimensions of translation

accuracy, cultural connotation transmission, and language fluency. In terms of translation accuracy, the average score of the experimental group was 28.3 points (out of 30 points), while the average score of the control group was 20.1 points, with an improvement of 40.8%; In terms of cultural connotation transmission, the experimental group scored an average of 27.6 points (out of 30), while the control group scored an average of 21.4 points, with an improvement of 28.9%; In terms of language fluency, the experimental group scored an average of 22.8 points out of 25, while the control group scored an average of 16.4 points, with an improvement of 39.0%. This result indicates that the AI-integrated teaching model significantly enhances students' cultural translation performance. However, since AI tools alone may exhibit limitations in complex cultural semantics, the improvement in cultural connotation transmission is attributed to the synergistic effect of technology and human guidance. The AI platform acts as a 'discovery tool' for potential errors and corpus variations, while the teacher provides the critical cultural context necessary to refine AI outputs. This dual-track approach ensures that technology facilitates the process while the teacher ensures semantic accuracy, resolving the inherent limitations of standalone AI translation.

B. ANALYSIS OF QUESTIONNAIRE SURVEY AND INTERVIEW RESULTS

The survey results (as shown in Figure 3) indicate that 86.7% of the students in the experimental group are very satisfied with the teaching mode of artificial intelligence. That is to say, the students in the experimental group believe that the artificial intelligence teaching mode can effectively

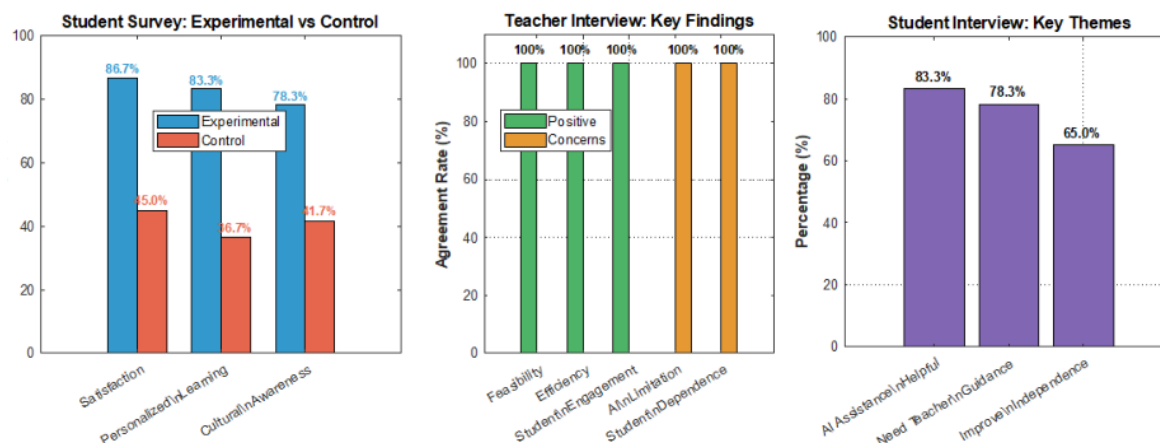


FIGURE 3. AI-Enhanced Teaching Model: Survey and Interview Results

improve their translation ability, especially their ability to translate traditional cultural texts; 83.3% of students in the experimental group believe that the personalized push function of artificial intelligence platforms can solve students' weak links and improve teaching effectiveness; 78.3% of students believe that through this teaching model, their understanding of traditional Chinese culture has been enhanced and their awareness of cross-cultural communication has been improved. In the control group, only 45.0% of students were satisfied with the traditional teaching mode. The results of interview with teacher showed that all the teachers thought that the teaching mode of AI enabled teaching was feasible and effective. The teaching mode of AI enabled teaching could effectively reduce the workload of grading for teachers and improved the teaching effect; At the same time, the teaching mode of AI enabled teaching could guide students to participate in translation exercises actively, stimulated students' interest in learning, and helped students to better master the translation skills of traditional cultural text. However, teachers also thought that AI tools still had certain limitations, such as inaccurate understanding of some complex traditional cultural text semantics, and certain stiffness in the translation results, which needed further optimization and guidance from teachers; In addition, some students had high dependence on AI tools and lacked of independent thinking ability, which needed more guidance in teaching. The results of interview with students and questionnaire survey are basically consistent. Most of the students thought that AI tools could provide effective help for translation practice, but they also hoped that teachers could strengthen the guidance on the optimization of AI translation results and help students to improve their own independent translation ability.

C. ANALYSIS AND DISCUSSION ON THE EFFECTIVENESS OF CROSS CULTURAL COMMUNICATION

According to the translation ability test, questionnaire and interview results, the cross-cultural communication effectiveness of AI empowered teaching model was analyzed. The analysis results showed that AI empowered teaching model could improve students' cross-cultural communication cognition and practice ability. In terms of cognition, a large amount of traditional cultural English language materials were absorbed by experimental group students through AI platform, and the international expression of Chinese traditional culture was deeply understood through the cultural background analysis function of AI tool, and the students' cross-cultural communication awareness was improved significantly; In terms of practice, compared with control group, the traditional cultural text translation works of experimental group students were accurate and fluent in language, could express the connotation of traditional culture better and more suitable for cross-cultural communication, and the cross-cultural communication acceptance of translation works was higher.

From the discussion, the main reason why AI empowered teaching model could improve students' translation ability and improve the efficiency of cross-cultural communication is that: firstly, the corpus advantage of AI tool could provide rich traditional cultural English corpus for students, help students master the correct expression of cultural loaded words and sentence patterns, and solve the problem of insufficient corpus in traditional teaching; The second is the semantic analysis and error correction function of AI could give students timely feedback, help students quickly find and correct the problems in translation and improve the learning effect; The third is the dual track model of "AI+teaching", technical assistance combined with teacher guidance. It not only plays the role of efficiency and personalized advantages of AI technology, but also makes up for the shortcomings of AI technology in understanding culture and conveying

emotion, and achieves the precise matching between the empowerment of technology and teaching. At the same time, the research also found that there were still some shortcomings in AI enabled teaching model: firstly, the semantic understanding of AI tools on traditional cultural text was not very accurate, especially for the ancient classics and small folk culture text, the translation results would be wrong; Secondly, some students were highly dependent on AI tool, lacked of independent thinking and innovation ability. They were too dependent on the translation results provided by AI during translation, neglecting their own subjective initiative; Thirdly, the functions of AI translation teaching platform needed to be further improved. For example, the cultural background analysis was not deep enough, and the accuracy of personalized push notification needed to be improved. These problems need to be further improved in the later teaching practice. For example, the AI translation model should be optimized, and more attention should be paid to cultivating students' independent thinking ability; The function of teaching platform should also be further improved.

V. CONCLUSION

This article makes empirical research on the optimization of traditional Chinese cultural text translation and cross-cultural communication effectiveness in English translation teaching empowered in artificial intelligence. It builds an integrated teaching model of "AI corpus empowerment cultural semantic analysis personalized teaching cross-cultural practice", puts forward feasible AI optimization strategies in traditional cultural text translation in accordance with the situation. It verifies the effectiveness of the model in the 16 weeks teaching experiment. The research results show that the AI enabled teaching model can solve effectively the problems in current English translation teaching, such as low accuracy of traditional cultural text translation, lack of cultural connotation transmission, low teaching efficiency. It can improve students' ability in translating traditional cultural texts and cross-cultural communication effectively. It provides an available way in English translation teaching reform and cross-cultural dissemination of Chinese traditional culture. The core conclusion of this article is that empowered by artificial intelligence technology, traditional cultural text translation teaching can play the advantages of AI technology in corpus processing, cultural semantic analysis and personalization, and make up for the shortcomings of traditional teaching model; Empowering teaching models with AI can help students better master the translation skills of traditional cultural texts, achieve the dual equivalence in language form and cultural connotation, and enhance the awareness of cross-cultural communication and practice ability; The AI enabled teaching model has available feasibility and promotional value.

However, there are still shortages such as inaccurate AI semantic understanding and high dependence of students, which need to be further improved and optimized. The

theoretical value of this article is that the combination of artificial intelligence technology and translation teaching as well as cross-cultural communication theory enrich the theoretical system of English translation teaching and provide a new view in the research of traditional cultural text translation teaching; The practical value is that the AI enabled teaching model constructed can be directly applied in English translation teaching practice in universities, provide available teaching plan for teachers, provide personal learning path for students, and also provide support for talent cultivation in cross-cultural dissemination of traditional Chinese culture. The limitation of this article is that only students from two universities are selected as research subjects, and the range of research subjects is narrow. In the future, the range of research subjects can be expanded to students from universities at different levels and in different regions; At the same time, there has been no follow-up research on the long-term effects of AI enabled teaching models. In the future, the period of experiment can be extended to explore further the long-term effect of this model, and then optimize the teaching models and strategies.

AUTHOR CONTRIBUTIONS

Yaodan Liang designed, collected and analyzed the data, and drafted the manuscript. Yaodan Liang conducted the study, critically revised the manuscript for important intellectual content, and gave final approval of the version to be published. Yaodan Liang 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.

HUMAN RESEARCH SUBJECTS

This study was approved by the Ethics Committee of Yulin Normal University, and was performed in accordance with the principles of the Declaration of Helsinki. All eligible participants signed an informed consent form.

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