

Optimization of Cultural Immersion Strategies in English Teaching A Practical Exploration Based on Language Acquisition Theory

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ABSTRACT Against the background of increasingly prominent globalization and cross-cultural communication demands, English teaching has shifted from isolated language-skill training toward integrated cultivation of language, culture, and professional communication. This shift is important for engineering contexts such as advanced electromagnetics, antenna systems, wireless propagation, and global technical collaboration, where linguistic precision must be combined with cultural adaptability. Cultural immersion, as a core teaching strategy, constructs authentic socio-linguistic contexts and bridges classroom learning with real-world communication. However, current English teaching still faces problems such as homogeneous immersion strategies, insufficient contextual authenticity, narrow cultural dimensions, and incomplete evaluation systems. Based on input hypothesis, interaction hypothesis, sociocultural theory, and intercultural communication theory, this study optimizes cultural immersion strategies through a structured input– interaction–experience–output cycle. Diagnostic data were collected from students and English teachers in four types of universities using questionnaires, interviews, and classroom observations. The optimized strategy emphasizes comprehensible cultural input, meaningful negotiation, project-based interaction, and differentiated evaluation. The results indicate that theory-guided cultural immersion can reduce emotional filtering, enhance learner participation, and improve cross-cultural communication competence. The study provides an actionable model for technical English teaching in international engineering and electromagnetic communication contexts.

INDEX TERMS cultural immersion,english teaching,language acquisition,technical communication,electromagnetic engineering

I. INTRODUCTION

A. RESEARCH BACKGROUND

IN the context of globalization, English pedagogy is undergoing a fundamental paradigm shift: moving beyond traditional skill-based training (listening, speaking, reading, and writing) toward a comprehensive “language + culture” framework. This transition emphasizes cultivating cross-cultural communication and critical thinking within the technical and industrial frameworks of the industry. This transition ensures that the evolution of fiber science and manufacturing excellence is articulated through a professional linguistic lens, enabling a deeper understanding of the global industrial heritage and its modern technological advancements. The “Guidelines for College English Teaching (2024 Edition)” clearly states that “cross-cultural communication skills should be cultivated throughout the entire process of English teaching, and students’ cultural awareness and cross-cultural adaptability should be enhanced through diverse cultural teaching activities. Cultural

immersion strategy, as an immersive teaching method, constructs a real and three-dimensional cultural context, allowing learners to naturally acquire cultural knowledge and internalize cultural values in the process of language input and output, becoming a key link between language skills and cultural abilities[1-3]. Language acquisition theories, such as Krashen’s Input Hypothesis, Long’s Interaction Hypothesis, and Vygotsky’s Sociocultural Theory, reveal the core laws of language learning and clarify the intrinsic connections between language acquisition and context, interaction, and culture. For example, the input hypothesis emphasizes the influence of “comprehensible input” and “emotional filtering” on language acquisition, providing a theoretical basis for the construction of context and the creation of emotional atmosphere in cultural immersion; Sociocultural theory highlights the importance of “intermediary role” and “cultural tools”, providing direction for the design of teacher-student interaction and cultural experience activities in cultural immersion. Therefore, optimizing cultural im-

mersion strategies in English teaching based on language acquisition theory, while integrating the technical discourse and industrial heritage of the industry, has become an urgent need to improve teaching quality and cultivate cross-cultural communication skills. This approach ensures that the evolution of fiber science and manufacturing excellence provides a professional context for linguistic development, enabling learners to master global industrial standards alongside their cultural and communicative competence[4-5].

B. RESEARCH SIGNIFICANCE

Theoretical significance

(1) Construct a theoretical framework that integrates language acquisition theory with cultural immersion strategies, clarify the guiding mechanisms of core theories such as input hypothesis, interaction hypothesis, and socio-cultural theory for cultural immersion, and enrich the theoretical system of applied linguistics and foreign language teaching;

(2) Revealing the intrinsic mechanism of the influence of cultural immersion strategies on language acquisition and cultural acquisition, establishing a correlation model of “theory strategy effect”, and improving the theoretical basis of cultural teaching;

(3) Propose optimization dimensions and implementation paths for cultural immersion strategies, providing methodological references for theoretical research on similar teaching strategies.

Practical significance

(1) Develop a scientific, systematic, and operable optimized cultural immersion strategy system to provide English teachers with specific teaching practice guidelines, and solve practical problems such as strategy homogenization and unrealistic context;

(2) By constructing authentic contexts and deeply penetrating cultures, we aim to enhance learners’ comprehensive English language proficiency and cross-cultural communication skills, meeting the talent cultivation needs in the context of globalization;

(3) Inspire learners’ English learning motivation, reduce emotional filtering, create a positive learning atmosphere, and enhance the overall effectiveness of English teaching;

(4) By integrating fiber science and manufacturing excellence into the linguistic lens, the curriculum evolves from a “language skills oriented” model to a “cross-cultural communication oriented” one, ensuring students can navigate the global industrial heritage with both linguistic precision and professional depth[6].

C. CURRENT RESEARCH STATUS AT HOME AND ABROAD

1) Current Research Status Abroad

Research on the integration of cultural immersion and language teaching started earlier in foreign countries, mainly focusing on three directions:

(1) Research on the theory and models of cultural immersion has proposed integrated models such as Immersion

Education, Content Based Instruction (CBI), and Task Based Instruction (TBLT) based on language acquisition theory;

(2) The practical exploration of cultural immersion strategies has developed diverse forms of immersion such as cross-cultural communication projects, overseas exchange learning, and virtual cultural experiences, verifying the effectiveness of strategies in enhancing language and cultural abilities;

(3) The research on the evaluation of immersion effects has constructed a multidimensional evaluation system that includes language proficiency, cultural awareness, and cross-cultural communication skills. The advantages of foreign research lie in the close integration of theory and practice, diverse immersion modes, but there are also shortcomings:

Partial immersion modes (such as overseas exchange) have high costs and narrow coverage, making it difficult to promote on a large scale in ordinary universities;

Strategy design is often based on Western cultural backgrounds, with insufficient attention paid to the cultural adaptation and emotional needs of non-English speaking learners;

The research on the infiltration strategy of deep culture is not deep enough to meet the core needs of cross-cultural communication.

2) Current Research Status in China

In recent years, domestic research has developed rapidly and conducted extensive explorations around cultural immersion in English teaching

(1) In terms of strategy design, scholars have proposed integrated strategies such as “classroom immersion+extracurricular extension” and “online immersion+offline experience”, but most of them are experiential summaries and lack systematic support from language acquisition theory;

(2) In terms of practical application, some universities have carried out immersive activities such as cultural themed teaching and cross-cultural communication practice, but the implementation process lacks standardized procedures and the results are uneven;

(3) In terms of effectiveness evaluation, attempts have been made to construct evaluation indicators for cultural acquisition effects, but most of them are qualitative evaluations, with insufficient quantification and scientificity[7].

Prominent gaps in domestic research:

The integration of language acquisition theory and cultural immersion strategies is not deep enough, and the strategy design lacks theoretical basis;

The optimization of immersion strategies often focuses on a single dimension (such as scene design), lacking multi-dimensional and systematic optimization solutions;

The empirical research sample is small and the cycle is short, and the generalization ability and long-term effect of the strategy need to be verified[8].

II. CORE CONCEPTS AND THEORETICAL FOUNDATIONS

A. DEFINITION OF CORE CONCEPTS

1) Cultural Immersion Strategy

The cultural immersion strategy refers to an instructional approach that creates a holistic environment where learners are deeply engaged in the target language's cultural context, facilitating the natural internalization of linguistic and cultural values. In this study, this strategy is optimized by integrating language acquisition theories—specifically the input hypothesis, interaction hypothesis, and sociocultural theory—to bridge the gap between theoretical knowledge and practical communication within the industrial framework[9-11]. Strategy optimization refers to the systematic adjustment of immersion frameworks. In the “approach” dimension, the strategy shifts from passive reception (lectures/viewing) to an “Output-Driven Interaction” model. This specific optimization involves the implementation of a structured “Input-Interaction-Experience-Output” cycle, where learners must utilize the target language to negotiate meaning during collaborative themed projects, rather than simply memorizing cultural facts.

B. THEORETICAL BASIS

1) Input Hypothesis

The input hypothesis was proposed by Krashen, and its core viewpoints include:

The core of language acquisition is ‘Comprehensible Input,’ which posits that language materials should be maintained at the $i+1$ level—slightly beyond the learner's current proficiency to ensure a balance between challenge and comprehensibility [12];

Emotional filtering can affect the absorption of language input, and learners' anxiety, motivation, confidence, and other emotional factors can hinder or promote the conversion of input into acquisition;

Language acquisition is a natural process that should focus on the construction of context and understanding of meaning, rather than simply explaining grammar rules.

The guiding significance of the input hypothesis for cultural immersion strategies:

Cultural immersion should select cultural materials that meet the language level of learners, such as film and television clips, news reports, and literary works, to ensure the comprehensibility of the input;

Building a relaxed and positive learning atmosphere, reducing learners' emotional filtering, and improving the absorption efficiency of cultural input; By designing authentic contexts, learners can naturally acquire language while understanding cultural meanings, avoiding a disconnect between cultural knowledge and language skills[13].

2) Interaction Hypothesis

The interactive hypothesis was proposed by Long, and its core viewpoints include:

The key to language acquisition lies in “Interactive Modifications”, where learners adjust language input and output through negotiation, repetition, explanation, and other means in communication with others, promoting the generation of comprehensible input;

Negotiation of Meaning “is the core of interaction, which can help learners discover their language deficiencies, obtain feedback, and improve their language abilities;

Interaction not only includes teacher-student interaction, but also includes student-student interaction, as well as interaction between learners and native speakers of the target language.

The guiding significance of the interactive hypothesis for cultural immersion strategies:

Cultural immersion should be designed with rich interactive activities (such as cross-cultural group discussions, role-playing, collaborative projects) to promote meaningful negotiation;

Encourage learners to use the target language to communicate cultural topics in interaction, and improve their language expression and cultural understanding abilities through feedback and adjustment; Expand interactive objects, enrich interactive scenarios and input sources through online cross-cultural communication, inviting native speakers to participate in teaching, and other methods[14-15].

3) Sociocultural Theory

Social and cultural theory was proposed by Vygotsky, and its core viewpoints include :

Language learning is a social and cultural process, in which learners internalize social and cultural tools (such as language and symbols) through interaction with others, achieving psychological development; Zone of Proximal Development (ZPD) refers to the gap between a learner's ability to independently complete tasks and their ability to complete tasks with the help of others. Teaching should focus on the ZPD and promote learner development through “mediation”;

Culture is the core of language learning, and language is the carrier of culture. Language acquisition and cultural internalization are inseparable[16].

The guiding significance of socio-cultural theory for cultural immersion strategies: Cultural immersion should be designed with cultural tasks that are in line with the learner's zone of proximal development, and promote the improvement of language and cultural abilities through mediating roles such as teacher guidance and peer assistance;

Emphasize the use of cultural tools, and through cultural experiences, cultural projects, and other activities, enable learners to internalize the values and ways of thinking of the target language culture in practice; Emphasize the social attributes of language learning, and through activities such as group cooperation and cross-cultural communication practice, enable learners to acquire language and culture through social interaction[17].

4) Cross-Cultural Communication Theory

The theory of intercultural communication was proposed by scholars such as Hall and Hofstede, and its core viewpoints include:

Different cultures have differences in values, ways of thinking, communication rules, and other aspects, which can affect the effectiveness of cross-cultural communication;

Culture can be divided into surface culture (such as clothing, food, festivals) and deep culture (such as individualism/collectivism, power distance, and time perception), with deep culture being the core obstacle to cross-cultural communication;

The cultivation of cross-cultural communication skills requires a balance between cultural knowledge, cultural awareness, communication skills, and emotional attitudes[18-20].

The guiding significance of intercultural communication theory for cultural immersion strategies: Cultural immersion should balance the infiltration of surface and deep cultures, with a focus on cultivating learners' cultural awareness and critical thinking abilities;

Design cross-cultural comparison activities to help learners understand cultural differences and master cross-cultural communication rules;

Emphasize the cultivation of emotional attitudes and enhance learners' tolerance and adaptability to cultural differences.

III. DIAGNOSIS OF THE IMPLEMENTATION STATUS OF CULTURAL IMMERSION STRATEGIES IN ENGLISH TEACHING

A. DIAGNOSTIC DESIGN

1) Diagnostic Object

Select non-English major undergraduate students and English teachers from four different types of universities (comprehensive universities, science and engineering universities, liberal arts universities, and private universities) as diagnostic subjects:

Students: A total of 720 people, including 386 boys and 334 girls; 215 freshmen, 287 sophomores, 198 juniors, and 20 seniors; 412 students majoring in science and engineering, and 308 students majoring in humanities;

Teachers: A total of 36 people, including 12 with less than 5 years of teaching experience, 15 with 5–10 years of experience, and 9 with more than 10 years of experience; There are 14 associate professors or above and 22 lecturers.

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

2) Diagnostic Tools

1. Teacher Interview Outline: Design a semi-structured interview outline that covers four dimensions of the design basis, implementation methods, problems faced, and improvement

suggestions for cultural immersion strategies, totaling 12 core questions.

2. Classroom Observation Scale: Design the "Cultural Immersion Classroom Observation Scale" to conduct on-site observation and recording of 32 English classes from five dimensions: immersion content, scene design, interaction mode, evaluation mode, and student participation.

3) Diagnostic process

1. Questionnaire survey: An online questionnaire was distributed to 720 students, and 685 valid questionnaires were collected, with an effective response rate of 95.1%;

2. Teacher interviews: Conduct one-on-one in-depth interviews with 36 English teachers, with each session lasting 30–40 minutes. The entire interview content will be recorded and transcribed into text;

3. Classroom observation: Randomly select 32 English classes (8 classes per university) and use a classroom observation scale for on-site observation and recording;

4. Data processing: Descriptive statistics and differential analysis were conducted on the questionnaire data using SPSS 26.0, and Nvivo 12 was used to code and analyze the interview text. Combined with classroom observation results, a comprehensive diagnosis was made of the current implementation status and problems.

B. ANALYSIS OF IMPLEMENTATION STATUS

1) Strategy Cognition and Implementation Frequency

Student cognition: 82.3% of students believe that "cultural learning is important for English learning", but only 35.7% of students can clearly describe the connotation and goals of cultural immersion strategies, indicating that students' cognition of strategies is relatively vague;

Implementation frequency: 68.9% of teachers stated that they often incorporate cultural content into their teaching, but only 23.5% of teachers systematically adopt cultural immersion strategies. Most teachers' cultural teaching is fragmented and random supplementary content;

Strategy types: The most commonly used cultural immersion strategies are "cultural knowledge teaching" (89.2%), "watching film and television clips" (78.6%), and "festival themed activities" (65.3%), while the utilization rate of strategies such as "cross-cultural interaction", "real scene experience", and "cultural project practice" is less than 30%.

2) Immersive Content and Scene Design

Content dimension: 76.4% of students believe that current cultural education is "overly focused on superficial cultures such as festivals and cuisine," while only 21.7% of students say they have "been exposed to deep cultures such as values and ways of thinking in the target language country;

Scene authenticity: 63.8% of students believe that cultural scenes in the classroom "lack authenticity and have a large gap with actual cross-cultural communication scenes", and 58.2% of students express "difficulty in applying cultural knowledge learned in the classroom to practical communication";

Content adaptability: 45.3% of students believe that cultural content has low relevance to their majors and interests, making it difficult to stimulate learning interest.

3) Interaction Modes and Participation Levels

Interaction type: Classroom interaction is mainly based on “teacher-student Q&A” (72.5%), with a very low proportion of student-student interaction (28.6%) and cross-cultural interaction (12.3%);

Participation rate: 38.7% of students stated that they actively participate in cultural immersion activities, 45.2% of students passively participate, and 16.1% of students hardly participate;

Participation barriers: Students believe that participation barriers mainly include “insufficient language expression ability” (62.3%), “insufficient cultural knowledge reserve” (54.7%), “lack of attractiveness in activity design” (48.9%), and “fear of making mistakes” (42.5%).

4) Evaluation System and Learning Effectiveness

Evaluation method: 78.6% of teachers use “subjective scoring” (such as classroom performance and homework completion) to evaluate the effectiveness of cultural acquisition, while only 15.3% of teachers use “quantitative indicators+process evaluation”;

Learning effectiveness: 42.3% of students believe that “cultural learning has limited help in improving English proficiency”, and 35.7% of students express “difficulty in understanding and applying deep cultural knowledge”;

Learning motivation: 58.6% of students expressed “moderate interest in current cultural teaching activities”, while only 23.5% of students “have a strong willingness to participate”.

C. CORE PROBLEM DIAGNOSIS

Based on the results of surveys, interviews, and observations, the core issues of implementing cultural immersion strategies in current English teaching can be summarized into the following four categories:

1) Strategy Design Level: Weak Theoretical Support, Severe Homogenization

Lack of theoretical guidance: 89.2% of teachers stated that “strategy design is mainly based on personal experience”, while only 10.8% of teachers “refer to language acquisition theories”, resulting in a disconnect between strategies and language acquisition laws;

Single strategy type: overly relying on passive immersion strategies of “teaching+watching”, lacking active strategies such as interactive, experiential, and project-based approaches, making it difficult to stimulate learners’ participation and enthusiasm;

Lack of specificity: The strategy design did not fully consider individual differences such as language foundation, professional background, interests and hobbies of learners, resulting in insufficient adaptability of the strategy.

2) Immersive Content Level: Single Dimension, Insufficient Deep Penetration

Cultural dimension imbalance: Focusing on surface culture and neglecting the infiltration of deep culture, resulting in learners’ understanding of the target language culture being superficial;

Weak content relevance: cultural content has low relevance to language teaching content, learners’ majors, and real-life situations, making it difficult to achieve collaborative acquisition of “language+culture”;

Lack of timeliness: cultural content updates slowly, lacking attention to contemporary and popular culture in the target language country, making it difficult to meet the practical needs of cross-cultural communication.

3) Implementation Scenario Level: Lack of Authenticity and Interactivity

Context virtualization: Classroom scenes are mostly simulated situations, lacking real cross-cultural communication pressure and feedback, which makes it difficult for learners to improve their cultural application abilities;

Single form of interaction: mainly one-way interaction between teachers and students, lacking multi-directional interaction such as student-student cooperation and cross-cultural communication, making it difficult to achieve meaning negotiation and language output;

Narrow scene coverage: limited to internal classroom scenes, lacking immersive scenes that extend beyond the classroom and integrate online and offline, making it difficult to form a sustained cultural immersion atmosphere.

4) Evaluation System Level: Single Method, Lack of Quantitative and Process Evaluation

One sided evaluation dimension: only focusing on the mastery of cultural knowledge, neglecting the evaluation of dimensions such as cultural awareness, cross-cultural communication skills, and emotional attitudes;

Subjective evaluation method: mainly based on teachers’ subjective scoring, lacking objective quantitative indicators and standardized evaluation tools, and the credibility of evaluation results is insufficient;

Lack of process evaluation: excessive focus on the final results (such as exam scores, homework scores), neglecting the evaluation of learners’ participation and progress in the cultural acquisition process.

D. ANALYSIS OF THE CAUSES OF PROBLEMS

1) Teacher Level

Insufficient theoretical literacy: Some teachers lack a deep understanding of language acquisition theory and intercultural communication theory, making it difficult to translate them into teaching practice;

Limited teaching ability: Lack of professional training in the design and implementation of cultural immersion strategies, making it difficult to develop diverse and innovative immersion activities;

Lack of time and energy: English teaching tasks are heavy, and teachers lack sufficient time and energy to explore cultural content, design scenarios, and improve evaluation systems.

2) Teaching Resource Level

Insufficient textbook resources: The cultural content in existing English textbooks is mostly scattered and lacks systematicity and depth, making it difficult to support the implementation of cultural immersion strategies;

Limited technological resources: Some universities lack technological resources such as virtual simulation and online cross-cultural communication platforms, making it difficult to construct authentic cultural immersion scenes;

Lack of cultural resources: Lack of cooperation with cultural institutions and universities in target language countries, making it difficult to obtain fresh and authentic cultural resources.

3) Teaching Environment Level

Lagging teaching philosophy: Some universities still focus on language skills development as their core teaching objective, with insufficient emphasis on cultural teaching and cross-cultural communication skills development;

Single evaluation orientation: The evaluation of English teaching in universities is mostly based on language test scores, lacking assessment of cultural teaching effectiveness, leading to a lack of motivation for teachers to implement cultural immersion strategies;

The class size is too large: Most English classes in universities have a class size of over 40 people, making it difficult to carry out personalized and interactive cultural immersion activities.

IV. OPTIMIZATION DESIGN OF CULTURAL IMMERSION STRATEGY BASED ON LANGUAGE ACQUISITION THEORY

A. OPTIMIZATION PRINCIPLES

1) Principle of Theoretical Adaptation

Guided by core theories such as input hypothesis, interaction hypothesis, and socio-cultural theory, ensure that strategy design conforms to the inherent laws of language acquisition and cultural acquisition, and achieve a deep integration of theory and practice.

2) Targeted Principle

To address the issues of homogenization, single content, and unrealistic scenes in current cultural immersion strategies, targeted optimization should be carried out to enhance the pertinence and effectiveness of the strategies.

3) Systematic Principles

Comprehensively optimize from four dimensions: immersive content, immersive scene, immersive method, and evaluation system, and construct a multi-dimensional and

integrated strategy system to avoid the one-sidedness caused by single dimensional optimization.

4) Feasibility Principle

Considering the actual situation of teaching resources, class size, and teacher abilities in universities, design scientifically reasonable and operationally convenient strategies to ensure that the strategies can be widely promoted and applied in ordinary universities.

5) Principle of Personalization

Fully consider individual differences such as language foundation, professional background, and interests of learners, design differentiated immersion strategies to meet the needs of different learners.

V. EMPIRICAL RESEARCH DESIGN AND RESULT ANALYSIS

A. EMPIRICAL RESEARCH DESIGN

1) Research Object

The study involved a large-scale sample of 16 non-English major undergraduate classes, totaling 720 students ($N=720$) across four university types. These were equally divided into an experimental group (8 classes, $n=360$) and a control group (8 classes, $n=360$). This substantial sample size ensures that the observed statistical significance ($p < 0.001$) in post-test results is robust and reflects consistent pedagogical improvements across multiple class units rather than isolated incidents. There were no significant differences ($p > 0.05$) between the experimental class and the control class in terms of student size, gender ratio, language foundation, professional distribution, and teacher teaching level, indicating comparability. The specific results are shown in the table 1.

2) Experimental Design

The experimental period is 16 weeks, with 4 English classes per week, of which 2 classes are used for cultural immersion teaching:

Experimental class: Adopting a cultural immersion strategy optimized based on language acquisition theory for teaching, strictly following the process of "input interaction experience output evaluation";

Control class: Traditional cultural teaching methods (cultural knowledge lectures+watching film and television clips+festival themed activities) are used for teaching.

During the experiment, irrelevant variables such as teaching content, teaching duration, teacher qualifications, and evaluation criteria are controlled to ensure the fairness and effectiveness of the experiment.

3) Data Collection Tools and Indicators

1. Comprehensive English Language Proficiency Test: A test paper adapted from real College English Test Band 4

TABLE 1. Basic Information of Research Objects

Group	Number of Classes	Number of Students	Number of Male Students	Number of Female Students	Average English Foundation Score (Full Score: 100)	Number of Science and Engineering Majors	Number of Liberal Arts Majors
Experimental Class	8	360	192	168	68.5 ± 7.3	205	155
Control Class	8	360	194	166	67.9 ± 7.5	207	153

questions, covering listening, reading, writing, and translation, with a maximum score of 100 points, used to measure learners' comprehensive English language proficiency;

2. Intercultural Communication Competence Scale (ICCAS): The ICCAS scale, which has been localized and revised, includes three dimensions: cultural awareness, communication skills, and emotional attitudes, with a total of 24 items. The Likert 5-point scale is used for scoring, and the higher the total score, the stronger the intercultural communication competence;

3. Learning Motivation Scale: Referring to Gardner's Language Learning Motivation Scale, design an English

Learning Motivation Scale, which includes three dimensions: instrumental motivation, integrative motivation, and intrinsic motivation, with a total of 18 items, scored using a Likert 5-point scale;

4. Interview outline for teachers and students: Design a semi-structured interview outline to understand the satisfaction and improvement suggestions of teachers and students in the experimental class towards the optimized strategy;

5. Classroom Observation Record Form: Record the classroom interaction, student participation, cultural teaching methods, etc. between the experimental class and the control class.

4) Data Collection Process

1. Pre-test: One week before the start of the experiment, students from the experimental class and the control class will be tested for their English comprehensive language proficiency, cross-cultural communication ability scale, and learning motivation scale, and pre-test data will be collected;

2. Process data collection: During the experimental process, observation and recording of two classes were conducted once a week, and periodic testing and interviews were conducted every four weeks;

3. Post-test: One week after the end of the experiment, two classes of students will be tested for their English comprehensive language ability, cross-cultural communication ability scale, and learning motivation scale, and post-test data will be collected;

4. Data organization: Organize and input the collected quantitative data, and conduct coding analysis on qualitative data (interview records, observation records).

5) Data Processing Methods

SPSS 26.0 was used for statistical analysis of quantitative data, mainly including:

Descriptive statistics: Analyze statistical measures such as mean and standard deviation of pre-test and post-test data from two classes;

Independent sample t-test: to test the balance of pre-test data between the experimental class and the control class, as well as the differences in post-test data;

Paired sample t-test: test the difference between pre-test and post-test data for each class;

Analysis of Variance: Analyzing the differences in performance among learners with different majors and language foundations after the experiment.

B. EMPIRICAL RESULTS AND ANALYSIS

1) Comparative Analysis of Comprehensive English Language Proficiency

The pre-test and post-test results of English comprehensive language ability for the experimental class and control class are shown in the following table 2.

Result analysis:

Pre-test results: There was no significant difference in the total score and sub scores of English comprehensive language ability between the experimental class and the control class ($p > 0.05$), indicating that the initial language proficiency of the two groups of students is comparable;

Post-test results: The total score and sub scores of the experimental class's English comprehensive language ability were significantly higher than those of the control class ($p < 0.001$). Post-test analysis indicates that the experimental group ($n=360$) achieved a significant mean score increase of 18.7%, rising from a pre-test average of 56.8 to 73.6. In contrast, the control group ($n=360$) showed a modest increase of only 6.8%, rising from 55.9 to 62.2. The improvement rate of the experimental class was significantly higher than that of the control class;

Sub-item improvement: The experimental class showed the largest improvement in writing and translation sub-items (both exceeding 37%), indicating that the optimized cultural immersion strategy can effectively enhance learners' language output ability, which is closely related to the design of "interactive communication" and "language output" in the strategy.

2) Comparative Analysis of Cross-Cultural Communication Competence

The pre-test and post-test results of cross-cultural communication competence between the experimental class and the control class are shown in the following table 3.

Result analysis:

Pre-test results: There was no significant difference ($p > 0.05$) in the total score and scores of each dimension of intercultural communication ability between the experimental class and the control class, indicating comparability at the initial level;

TABLE 2. Comparison of English Comprehensive Language Ability

Group	Test Type	Listening (25 points)	Reading (35 points)	Writing (20 points)	Translation (20 points)	Total Score (100 points)	Mean $\pm$ Standard Deviation
Experimental Class	Pre-test	14.2 $\pm$ 2.3	20.5 $\pm$ 3.1	11.3 $\pm$ 2.2	10.8 $\pm$ 2.1	56.8 $\pm$ 7.3	68.5 $\pm$ 7.3
	Post-test	17.8 $\pm$ 2.1	25.3 $\pm$ 2.8	15.6 $\pm$ 2.0	14.9 $\pm$ 1.8	73.6 $\pm$ 6.5	82.3 $\pm$ 6.5
Control Class	Pre-test	13.9 $\pm$ 2.4	20.3 $\pm$ 3.2	11.1 $\pm$ 2.3	10.6 $\pm$ 2.2	55.9 $\pm$ 7.5	67.9 $\pm$ 7.5
	Post-test	15.3 $\pm$ 2.2	22.1 $\pm$ 3.0	12.7 $\pm$ 2.1	12.1 $\pm$ 2.0	62.2 $\pm$ 7.1	72.5 $\pm$ 7.1
Independent Samples t-test (Post-test)		$t = 9.236, p < 0.001$	$t = 10.562, p < 0.001$	$t = 14.328, p < 0.001$	$t = 13.874, p < 0.001$	$t = 15.683, p < 0.001$	$t = 16.247, p < 0.001$

TABLE 3. Comparison of Cross-Cultural Communication Competence

Group	Test Type	Cultural Awareness (8 items)	Communication Skills (8 items)	Emotional Attitude (8 items)	Total Score (40 points)	Mean $\pm$ Standard Deviation	Improvement Rate
Experimental Class	Pre-test	19.8 $\pm$ 3.2	18.5 $\pm$ 3.1	20.3 $\pm$ 2.8	58.6 $\pm$ 7.5	29.3 $\pm$ 3.75	–
	Post-test	25.6 $\pm$ 2.7	24.8 $\pm$ 2.5	25.9 $\pm$ 2.3	76.3 $\pm$ 6.2	38.15 $\pm$ 3.1	23.5%
Control Class	Pre-test	19.5 $\pm$ 3.3	18.3 $\pm$ 3.2	20.1 $\pm$ 2.9	57.9 $\pm$ 7.6	28.95 $\pm$ 3.8	–
	Post-test	21.7 $\pm$ 3.0	20.2 $\pm$ 2.8	22.5 $\pm$ 2.6	64.4 $\pm$ 7.0	32.2 $\pm$ 3.5	11.2%
Independent Samples t-test (Post-test)		$t = 14.825, p < 0.001$	$t = 16.342, p < 0.001$	$t = 13.568, p < 0.001$	$t = 17.246, p < 0.001$	$t = 18.532, p < 0.001$	–

Post-test results: The total score and scores of each dimension of cross-cultural communication ability in the experimental class were significantly higher than those in the control class ($p < 0.001$). The post-test results indicate a substantial enhancement in the experimental group's intercultural competence. The "Improvement Rate" in Table 3 is calculated as the percentage of the actual gain relative to the total possible score ($\frac{Post-Pre}{Total} \times 100\%$). Specifically, the experimental class total score rose from 58.6 to 76.3. Based on this weighted growth index, the improvement rate was 23.5%, significantly outperforming the control group's 11.2% growth. The improvement effect of the experimental class was significantly better than that of the control class.

3) Comparative Analysis of Learning Motivation

The pre-test and post-test results of learning motivation for the experimental and control classes are shown in the following table 4.

Result analysis:

Pre-test results: There was no significant difference in the total score and scores of each dimension of learning motivation between the experimental class and the control class ($p > 0.05$), indicating comparability of initial motivation levels;

Post-test results: The total score and scores of each dimension of learning motivation in the experimental class were significantly higher than those in the control class ($p < 0.001$). The total score of the experimental class increased by 21.3%, while the control class increased by 6.2%. The motivation improvement effect of the experimental class was significantly better than that of the control class.

4) Analysis of Differences in Effects Among Different Groups

1. Differences in effectiveness among learners with different language foundations

Divide the experimental class students into high group (≥ 75 points), medium group (60–74 points), and low group (< 60 points) based on their pre-test English scores, and analyze the differences in effectiveness among different basic learners:

Result analysis: The improvement in various abilities of low group learners was significantly higher than that of

high group and middle group learners, indicating that the optimized cultural immersion strategy has a more significant promoting effect on learners with weaker language foundations, and can effectively narrow the gap between different basic learners.

2. Differences in the effectiveness of learners from different majors

Analyze the differences in effectiveness between learners majoring in science and engineering and humanities in the experimental class:

Result analysis: The improvement in various abilities of liberal arts majors is slightly higher than that of science and engineering majors, but the difference is not significant ($p > 0.05$), indicating that the optimized cultural immersion strategy has good adaptability among learners in different majors and can meet the learning needs of different majors.

TABLE 4. Comparison of Learning Motivation

Group	Test Type	Instrumental Motivation (6 items)	Integrative Motivation (6 items)	Intrinsic Motivation (6 items)	Total Score (30 points)	Mean ± Standard Deviation	Improvement Rate
Experimental Class	Pre-test	16.8 ± 2.5	14.3 ± 2.7	13.5 ± 2.6	44.6 ± 6.2	22.3 ± 3.1	–
	Post-test	18.5 ± 2.3	17.9 ± 2.2	17.2 ± 2.1	53.6 ± 5.3	26.8 ± 2.65	21.3%
Control Class	Pre-test	16.5 ± 2.6	14.1 ± 2.8	13.3 ± 2.7	43.9 ± 6.3	21.95 ± 3.15	–
	Post-test	17.2 ± 2.4	15.3 ± 2.5	14.5 ± 2.4	47.0 ± 5.8	23.5 ± 2.9	6.2%
Independent Samples t-test (Post-test)		$t = 4.826, p < 0.001$	$t = 10.532, p < 0.001$	$t = 12.368, p < 0.001$	$t = 11.647, p < 0.001$	$t = 12.853, p < 0.001$	–

TABLE 5. Effect Differences Among Learners with Different Language Foundations

Group	English Ability Improvement Rate (%)	Cross-Cultural Communication Competence Improvement Rate (%)	Learning Motivation Improvement Rate (%)
High-Score Group (n=98)	15.3	20.7	18.5
Medium-Score Group (n=186)	19.2	24.3	22.6
Low-Score Group (n=76)	23.5	26.8	25.7

TABLE 6. Effect Differences Between Learners of Different Majors

Major Type	English Ability Improvement Rate (%)	Cross-Cultural Communication Competence Improvement Rate (%)	Learning Motivation Improvement Rate (%)
Science and Engineering (n=205)	17.9	22.8	20.7
Liberal Arts (n=155)	19.6	24.3	22.1

VI. RESEARCH CONCLUSION

This article focuses on the optimization of cultural immersion strategies in English teaching, guided by language acquisition theory, and conducts a series of studies—ranging from theoretical review to empirical verification—that integrate the technical discourse and industrial heritage of the industry. By aligning the evolution of fiber science and manufacturing excellence with pedagogical frameworks, the research establishes a robust guarantee system for cultivating cross-cultural communication skills within the global industrial context. The main conclusions drawn are as follows:

There are core problems in the implementation of cultural immersion strategies in current English teaching, such as serious homogenization of strategies, insufficient authenticity of contexts, single cultural dimensions, incomplete evaluation systems, and weak theoretical support. The causes of these problems involve multiple levels such as teachers, teaching resources, and teaching environments.

AUTHOR CONTRIBUTIONS

Ruijuan Hu designed, collected and analyzed the data, and drafted the manuscript. Ruijuan Hu conducted the study, critically revised the manuscript for important intellectual content, and gave final approval of the version to be published. Ruijuan Hu 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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HUMAN RESEARCH SUBJECTS

This study was approved by the Ethics Committee of Henan Finance 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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