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The Emotional Driving Effect of Role Model Narratives in Ideological and Political Education for College Students

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Abstract: Under the demand for innovative development of ideological and political education for college students in the new era, the traditional education model urgently needs to be broken through. Role model narrative, with vivid cases and emotional resonance as the bond, conforms to the cognitive characteristics of young people, can effectively stimulate emotional identification, enhance the appeal and effectiveness of ideological and political education, and has become an important exploration direction for improving the quality of ideological and political education. This paper explores the emotional driving effect of role model narratives in ideological and political education, analyzes how it enhances the effectiveness of education through emotional infiltration, promotes the internalization of college students' thoughts and the externalization of their behaviors, and proposes optimization strategies to improve the appeal and sustainability of role model education.

Keywords: Role Model Narrative; Ideological and political education; Emotionally driven; Emotional resonance; Value recognition

Online publication: April 26, 2025

1. Introduction

Role Model Narratives play an important carrier role in ideological and political education, conveying mainstream values through real and vivid character stories. For the group of college students, emotional drive plays a crucial role in cognitive acceptance and behavioral practice. This article focuses on exploring how role model narratives can touch people's hearts and enhance the penetration of ideological and political education, and then constructs a theoretical framework to analyze the mechanism therein.

2. The ideological and political education value and emotional mechanism of Role Model Narrative

2.1. The emotional transmission characteristics of Role Model Narratives

The emotional transmission characteristics of the highly infectious educational discourse form of role model narrative are rooted in people's unique narrative cognition and emotional resonance mechanism. Analyzed from the perspective of

narratology, role model narrative realizes the transformation from abstract value concepts to concrete emotional carriers by constructing plot frameworks, shaping character images, and setting up conflicts and contradictions. Unlike traditional theoretical preaching, role model storytelling is not aimed at directly instilling values. Through the narration of the growth experiences, struggle stories and spiritual qualities of role model figures, the educational intention is integrated throughout the process of the story's beginning, development, transition and conclusion ^[1]. This narrative approach makes the transmission of emotions hierarchical: The unfolding of the situation at the beginning of the story evokes curiosity and attention, the dilemmas and choices in the development evoke sympathy and admiration, the breakthroughs and achievements at the climax stir up excitement and anticipation, and the elevation at the end leads to reflection and approval. Whether the emotional transmission is effective depends on whether the narrative strategy is artistic. Role model narratives tend to use the first-person or third-person perspective for narration. The former narrative approach enhances the authenticity and immersion of the story by imitating the inner monologues of role models. The latter presents the complete event from an objective perspective, making the story authoritative and credible. From the perspective of narrative rhythm control, the alternation of fast and slow plot progression can generate emotional tension, such as slowing down the narrative speed through detailed portrayal and creating immersive emotional experiences, etc. Accelerate the pace and enhance the emotional impact with the help of crisis conflicts. In addition, the choice of language style also has a direct impact on the effect of emotional transmission: plain and plain language is close to life and is easy to evoke resonance. The poetic expression elevates the emotions and endows the story with aesthetic value. This multi-dimensional narrative design enables role model stories to go beyond simple information transmission and become an active carrier loaded with emotional energy.

2.2. The convergence point between role model narratives and the psychological needs of college students

Role model narrative meets the psychological needs of college students. It is based on the theories of developmental psychology and educational communication. From the perspective of individual psychological development, college students are in a critical period of exploring self-identity and urgently need to refer to the group and value coordinates for self-positioning ^[2]. Role models, as a concrete carrier of an ideal personality, can provide students with behavioral demonstrations and value references to meet psychological needs such as self-awareness and social comparison. Maslow's hierarchy of needs theory holds that the needs for belonging and respect are particularly prominent among college students. Role model narratives present the struggles and achievements of individuals against the collective. On the premise of stimulating the value recognition of the college student group, to provide path guidance for college students to win respect and realize their self-worth, from the perspective of cognitive psychology, college students need concrete thinking as an intermediary to accept abstract theories. Role model narratives transform the education of socialist core values and ideals and beliefs into tangible life scenarios through stories as a carrier, which conforms to the cognitive characteristics of college students' transformation from concrete thinking to abstract thinking. This transformation reduces the difficulty in understanding values and also makes educational content more easily integrated into an individual's cognitive system. Meanwhile, the emotional needs of college students also show diversified characteristics. While students are longing for a strong emotional impact, they are also seeking deep emotional resonance. Role model narratives, through the description of characters' emotional experiences, psychological conflicts and spiritual elevation, can comprehensively meet students' needs for emotional experiences, transforming from superficial emotions such as admiration and being moved to deep emotions such as identification and internalization, thereby forming a multi-level emotional touch.

3. Manifestations of the emotion-driven effect

3.1. Role model narratives evoke emotional resonance

Role model narratives, with their highly infectious reports as the medium, can effectively evoke emotional resonance in

ideological and political education among college students. College students are in a period of rich emotions and deepening self-awareness. Compared with dull theoretical preaching, vivid and interesting role model stories are more likely to have a striking effect on their inner selves. When narrating the figure of Huang Wenxiu, a model of poverty alleviation, who gave up the superior environment of big cities and resolutely returned to her hometown to devote herself to poverty alleviation work and eventually dedicated her entire life to the cause of rural revitalization, braving the heavy rain and night to rush to the homes of disaster victims, the densely packed poverty alleviation plans and insights in the notebook were presented through the narrative, making the students feel as if they were there, deeply experiencing her love for her hometown and her commitment to her duties. Such a narrative technique awakens the students' deep-seated longing for fine qualities such as dedication and responsibility. They will involuntarily place themselves in the background of the story and imagine what choices they would make in the same situation ^[3]. For instance, the stories of the aerospace team overcoming numerous difficulties and achieving significant breakthroughs in China's aerospace industry, as well as the plots of young researchers working day and night to conduct in-depth research and repeated experiments, can inspire students to think deeply about their professional studies and the pursuit of their future ideals, enabling them to resonate emotionally with the exemplary figures and draw emotional power from the stories. Subsequently, there was a stronger emotional identification with the ideas conveyed by ideological and political education, and favorable conditions were created for the subsequent internalization of values and behavioral guidance.

3.2. Role model narratives promote value recognition

Role model narrative is an important way to promote the realization of college students' value identity. The growth of college students requires a clear value coordinate to point out the direction for them. The ideals and beliefs, moral standards, and spiritual qualities contained in role model figures are made concrete and vivid through narration, making the abstract values perceptible and understandable ^[4]. When telling the story of Yuan Longping's lifelong dedication to hybrid rice research, all for "saving everyone from hunger," students can see his persistent pursuit of science and deep concern for people's livelihood. This great sentiment and firm belief will imperceptibly influence students' understanding of the value of life. Judging from the narrative process, the unremitting efforts made by role model figures to realize their ideals, as well as the decisive choices they make in the face of temptations and difficulties, have all become the reference objects for students to make value judgments. For instance, Principal Zhang Guimei's establishment of a free girls' high school has helped countless girls in mountainous areas come out of the mountains and changed their destinies. The selflessness and educational passion she has demonstrated should be guided by us to re-examine the connection between personal value and social value, and encourage them to combine their personal ideals with the development of the country and the progress of society. Through the narrative of role models, college students can have a deeper understanding of the connotation of the core socialist values, and gradually move from cognition to identification based on emotional resonance, consciously internalizing the value concepts represented by role models into their own behavioral norms and value pursuits.

4. The optimization practice path of emotion-driven effects

4.1. Selection and cultivation of diverse and genuine role models

Selecting and establishing role models diversely and genuinely is a prerequisite for enhancing the narrative appeal of role models. The core lies in breaking away from the simplistic and idealized way of shaping role models and constructing a well-defined and realistic role model system. From the perspective of diversity, the types of role models need to be expanded to cover different groups, such as political leaders, academic elites, industry role models, and role models around us ^[5]. The exemplary value of different types of role models varies: Political leaders demonstrate ideals, beliefs, and patriotic sentiments; Academic elites reflect professionalism and the pursuit of innovation; Industry role models, demonstrating the spirit of craftsmanship and professional ethics; The exemplary figures around enhance the appeal of education by increasing its closeness and accessibility. This diversified selection of role models can meet the diverse

psychological needs and value orientations of college students, expand the coverage of role model education, and in the selection of role models, authenticity is a key criterion. It is necessary to abandon the “tall, large, and complete” shaping and perfection, and restore the true growth trajectory and human characteristics of role model figures. Recognizing the limitations and developmental nature of role models and demonstrating their true journey of growing through setbacks and making choices amid conflicts can make the image of role models more credible and vibrant ^[6]. At the same time, attach importance to the exploration of the details and emotional elements of role models’ deeds, and enhance the appeal of role models through life-like situations, personalized words and genuine psychological activities.

4.2. Innovate narratives and expand carriers

Innovative narrative and carrier expansion, as important means to enhance the charm of role model narratives, require breakthroughs in both narrative methods and communication media. In terms of the innovation of narrative methods, narrative techniques should be drawn from film and television art and literary creation to enrich the forms of story expression. The structural approach of using nonlinear narrative and multi-perspective narrative increases the suspense and layers of the story. The montage technique and the expression method of psychological monologue are adopted to enhance the delicacy of emotional expression. Meanwhile, combined with the cognitive characteristics of college students, the lightweight transformation of role model stories to micro-narratives and series stories is achieved to meet the fragmented reading habits. The concept of interactive narrative is introduced into it. And by setting an open ending and guiding the audience to participate in the creation of the story, the audience’s subjectivity and sense of immersion can be enhanced. The expansion of carriers requires the full application of new media technologies to build a full-media communication matrix. As for traditional media, it is necessary to optimize the narrative presentation methods of school newspapers, radio broadcasts and publicity boards, and enhance the expressiveness through the integration of text, images, audio and video ^[7]. In terms of new media, new carriers such as short videos, H5 and interactive games have developed: short videos rapidly spread core content with a strong sense of rhythm and visual impact; H5 adopts interactive design to enhance the immersive experience. In interactive games, the spirit of role models is ingeniously integrated into the entertainment scenarios, achieving the effect of both entertainment and education. Meanwhile, under the dissemination advantages of social media platforms, the dissemination scope and influence of role model stories are expanded mainly through topic discussions, live interviews and community sharing ^[8].

When innovating narratives and expanding carriers, it is necessary to pay attention to the organic unity of content and form, avoid the weakening of content depth in the pursuit of form innovation, and ensure that narrative techniques and communication carriers serve emotional expression and value transmission ^[9]. At the same time, a cross-media narrative mechanism should be established to enable the same role model stories to be presented differently through various carriers, thereby generating a communication synergy. Through narrative innovation and carrier expansion, the time and space limitations and formal constraints of traditional education can be broken through, enhancing the appeal and communication effectiveness of role model narratives.

4.3. Strengthen emotional interaction and feedback

Strengthening emotional interaction and feedback is a key link in enhancing the effectiveness of role model narrative education. It is necessary to establish a closed-loop mechanism of “dissemination - interaction - feedback - optimization”. At the interaction level, the social attributes of new media platforms should be utilized to build diverse interaction scenarios among teachers and students, students, educators and society ^[10]. Taking online discussions, thematic debates and role-playing as the carriers, guide college students to exchange their feelings and thoughts about role model stories, enhance emotional communication and ideological collision, encourage college students to participate in the creation and dissemination of role model narratives through writing reflections, shooting short videos, and conducting promotional activities, change passive acceptance to active expression, enhance the sense of participation and subjectivity in education, and establish a feedback mechanism. Relying on the collection and analysis of data through multiple channels, methods

such as questionnaires, online comments, and behavior monitoring are adopted to collect the emotional responses, cognitive changes and behavioral intentions of college students during the process of role model storytelling. The intensity and direction of the emotion-driven effect were quantitatively evaluated by using big data analysis and sentiment computing to determine the key factors of educational effect ^[11]. At the same time, a rapid response mechanism should be established to promptly answer and guide students' questions, confusions or different opinions, to avoid accumulating negative emotions ^[12]. In addition, emphasize personalized handling of emotional feedback and provide differentiated guidance and support based on the characteristics and needs of different students.

Interactive feedback aims at the continuous optimization of the educational process as the ultimate goal. Based on the feedback results, adjustments are made to aspects such as the selection criteria for role models, narrative strategies, and communication carriers, to make the educational content closer to the needs of students ^[13]. Meanwhile, transform students' excellent feedback into a new type of educational resource, such as integrating typical insights into narrative cases and innovative suggestions into teaching practices, thereby forming a virtuous cycle of synergy between educators and learners ^[14]. By strengthening emotional interaction and feedback, the narrative of role models can be promoted from one-way communication to two-way dialogue, effectively enhancing the pertinence and effectiveness of ideological and political education ^[15].

5. Conclusion

Role model narrative is an important approach in ideological and political education for college students, and the emotional driving effect depends on multi-dimensional practical optimization. Through measures such as diversified and authentic role model selection, innovative narrative dissemination, enhanced emotional interaction, integration of educational scenarios, and establishment of long-term mechanisms, it is possible to effectively stimulate the emotional resonance of college students and enhance the affinity and effectiveness of ideological and political education. In the future, it is necessary to continue to deepen the exploration of the emotional driving effect of role model narratives, and constantly innovate practical paths per the development of the era and the needs of students, so that the power of role models can truly be internalized as a person and externalized as a matter, helping college students grow up healthily.

Disclosure statement

The author declares no conflict of interest.

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Foreign Language Listening Anxiety among Chinese Tertiary EFL Learners

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Abstract: Foreign language listening anxiety (FLLA) significantly affects learners' listening performance but remains less explored compared to other language anxieties. This study surveyed 702 Chinese tertiary EFL learners across 22 faculties to investigate key dimensions of FLLA, gender differences, and their relationship with English proficiency. Through exploratory and confirmatory factor analyses, four distinct dimensions of FLLA were identified: Situational Listening Anxiety (SLA), Self-perceived Cognitive Load (SC), Self-perceived Affective Load (SA), and Listening Processing Anxiety (LP). Among them, LP emerged as the most influential, indicating that real-time processing challenges outweigh emotional or contextual stress. Gender was not a significant predictor of FLLA, suggesting that anxiety stems more from cognitive and situational challenges than from demographic factors. Interestingly, English proficiency was weakly but positively correlated with SLA and SA, implying that more proficient learners may experience slightly heightened anxiety due to increased expectations or task complexity. The findings highlight the need for pedagogical strategies that target cognitive processing and listening-specific training rather than focusing solely on emotional or demographic considerations.

Keywords: Foreign language listening anxiety; Chinese tertiary EFL learners; Gender differences; English proficiency

Online publication: April 26, 2025

1. Introduction

FLLA refers to the feelings of helplessness, apprehension, and loss of control that learners often experience when listening to a foreign language, particularly in contexts where they cannot influence the topic or pace of speech ^[1]. This anxiety arises from a range of interrelated factors, cognitive, affective, linguistic, and situational, such as incomprehensibility, low confidence, task difficulty, and fear of negative evaluation ^[2]. These conditions frequently cause learners to feel anxious and reluctant to participate in listening tasks ^[3].

While foreign language anxiety has been widely examined, especially in the domains of speaking, reading, and writing, listening anxiety has received comparatively limited attention ^[4]. Yet, previous research consistently demonstrates that reducing language learning anxiety improves learners' motivation, comprehension, and long-term acquisition ^[5]. Therefore, gaining a deeper understanding of FLLA is vital for enhancing language instruction and learner outcomes. This study aims to examine FLLA in the context of Chinese tertiary EFL learners by addressing the following objectives:

- (1) Identifying the key measurement factors of FLLA in the Chinese-language context.

- (2) Investigating how students experience different factors of FLLA.
- (3) Exploring the influence of gender on FLLA.
- (4) Assessing the correlation between FLLA and English proficiency.

By addressing these research questions, this study contributes to the theoretical refinement of FLLA and offers practical implications for anxiety-sensitive language instruction.

2. Literature review

2.1. The factors of FLLA

Research on FLLA can be traced back to Horwitz *et al.* (1986), who recognized the anxiety learners experience in listening and speaking situations through the Foreign Language Classroom Anxiety Scale ^[6]. However, its listening component was limited to only two items, insufficient to capture the full scope of listening-related anxiety. In response, Kim (2000) developed a 33-item Foreign Language Listening Anxiety Scale, which became a widely used tool in subsequent studies ^[7]. Elkhafaifi (2005) adapted the Foreign Language Reading Anxiety Scale by replacing “reading” with “listening” ^[8], and Zhang *et al.* (2011) further validated this adaptation using exploratory and confirmatory factor analyses ^[9]. Zhang (2013) expanded on these frameworks by identifying three core dimensions: listening anxiety, self-belief, and decoding skills, factors that have since been foundational in measuring FLLA ^[10].

More recent studies have continued to refine this model. Liu *et al.* (2015) found that low self-perceived competence significantly heightened FLLA among Chinese learners ^[11], while Liu (2016) highlighted the role of decoding difficulties ^[12]. Similarly, Wang *et al.* (2019) emphasized cognitive overload as a major contributor. Other researchers have proposed expanding the construct ^[13]. Kimura (2017) introduced social anxiety as a critical factor in interaction-based tasks ^[14], and Ji *et al.* (2022) emphasized test-related stress in high-stakes contexts ^[15]. These findings suggest that existing FLLA models may be incomplete and point to the need for a more holistic framework that integrates cognitive, affective, and situational components.

2.2. Gender differences in FLLA

Gender-based patterns in FLLA have yielded mixed findings. Several studies reported higher anxiety levels among female learners, attributing this to greater academic pressure and self-imposed expectations. However, Wang (2023) found no significant gender differences, attributing earlier discrepancies to cultural norms and self-reporting biases. This inconsistency highlights the importance of context in interpreting gender effects and underscores the need for further investigation within specific learner populations, such as Chinese EFL students.

2.3. The relationship between FLLA and English proficiency

Most studies have shown a negative correlation between FLLA and English proficiency. Learners with higher anxiety often score lower on listening comprehension tasks, as shown in IELTS-based studies and course assessments. Conversely, high-proficiency learners tend to report lower anxiety levels due to better lexical and syntactic processing skills. However, few studies differentiate how various FLLA dimensions relate to proficiency, limiting the ability to pinpoint which types of anxiety are most affected by skill level. Addressing this gap, the present study disaggregates FLLA into distinct factors and examines their relationships with proficiency.

3. Research questions

To bridge the gap, this study aims to refine FLLA measurement and examine its impact on Chinese tertiary EFL learners. The following research questions were formulated:

- (1) What are the key measurement factors of FLLA in the Chinese EFL context?
- (2) How do learners with different FLLA factors experience listening anxiety?
- (3) How does gender influence FLLA?
- (4) How do the identified FLLA factors correlate with English proficiency?

4. Research methodology

4.1. Research design

This study was conducted in two phases. The first focused on developing and validating a Foreign Language Listening Anxiety Scale (FLLAS) using a modified version of Meerah *et al.*'s (2012) five-phase model for questionnaire construction ^[16]. The second phase applied the finalized scale to examine FLLA among Chinese tertiary EFL learners, specifically addressing factor structure, gender influence, and its relationship with English proficiency.

4.2. Scale development

4.2.1. Phase 1: Literature review and item generation

A literature review identified key instruments for measuring FLLA. Since the FLCAS ^[6] acknowledged listening anxiety, later studies developed more targeted scales, including the 33-item FLLAS and the adapted FLRAS. These tools have been widely applied, especially in studies on Chinese EFL learners. Research by Wang *et al.* (2019) linked cognitive load to increased listening anxiety, while Ji *et al.* (2022) highlighted the impact of test-related stress, particularly in high-stakes exams.

Additionally, studies such as Vafaei *et al.* (2019) have employed various measurement tools to examine different factors of FLLA ^[17]. These findings emphasize the complexity of listening anxiety and the need for a comprehensive framework incorporating cognitive, affective, and situational factors.

4.2.2. Phase 2: Construct definition and item drafting

Based on Ji *et al.* (2022), three core factors of FLLA were identified: psychological (worry and emotionality), social (receiver apprehension), and situational (general listening and test anxiety). Additional themes include anxiety sources, learner characteristics, and physiological symptoms. To ensure comprehensive coverage of these factors, the researcher collaborated with subject matter experts. A total of 39 initial items were developed, adhering to best practices in survey design, particularly avoiding double-barreled questions ^[18]. For example, the item "I feel relaxed if there are pictures or videos provided when I listen to English" was revised to separate "pictures" and "videos" as distinct conditions. All items were to be rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

4.2.3. Phase 3: Content validity evaluation

Content validity was evaluated by a panel of five experts in educational psychology and foreign language education. Experts assessed the clarity, relevance, and appropriateness of each item. Items deemed ambiguous, such as those referring to "English culture and history," were removed. After revisions, a 31-item questionnaire was finalized for pilot testing. To ensure accessibility for Chinese learners, the questionnaire was translated into Chinese through a three-step process: forward translation, back translation, and expert review. A preliminary version was tested on five college students for cognitive validation.

4.2.4. Phase 4: Pilot study and psychometric analysis

A pilot study was conducted to evaluate the reliability and validity of the scale. A sample of 300 first-year college students from 3 majors (accounting, civil engineering, graphic design) participated. Following data cleaning, responses were analyzed using exploratory factor analysis (EFA) to confirm the scale structure. A total of 286 questionnaires were gathered in the pilot study. A cleaning process was conducted based on the following criteria:

- (1) Highly Repetitive Responses: Responses with the same option selected for $\geq 80\%$ of Likert scale items (5-point scale) were removed.
- (2) Excessive Missing Data: Questionnaires with $\geq 10\%$ missing responses were excluded.
- (3) Anomalous Responses: Extremely short completion times (e.g., less than 60 seconds) led to exclusion. 224 copies were left for analysis. Of these, 103 (45.98%) were from male students and 121 (54.02%) from female students. SPSS 29 was used to assess the instrument's validity and reliability.

After three rounds of exploratory factor analysis (EFA), the final scale comprised 25 items distributed across four factors, following the deletion of three items due to high cross-loadings or low factor loadings. The Cronbach's alpha coefficients for the overall scale and the four factors were 0.841, 0.924, 0.871, and 0.792, respectively, indicating good reliability.

4.3. Data collection procedure

After the pilot study, the final questionnaire for the large-scale investigation was constructed by incorporating the newly developed FLLA scale with additional demographic items (e.g., gender, major, English scores from the college entrance examination). This instrument was then administered in regular class sessions to freshmen from 22 faculties at a university in central China near the end of the semester. To minimize potential response bias, students were explicitly informed that their responses would remain confidential and that the results would have no impact on their College English course assessments. Data collection was conducted via Wen Juanxing, a widely used online survey platform in China.

4.4. Data analysis

A total of 803 responses were collected, of which 702 (299 from males and 403 from females) valid responses remained based on the same criteria in the pilot study. All data were analyzed using SPSS 29. The following statistical techniques were applied: EFA with varimax rotation and CFA to determine the scale structure (Research Question 1). Descriptive statistics (mean, standard deviation) were used to assess overall anxiety levels, while potential subgroup differences were explored through comparative analysis (Research Question 2). To examine gender differences in FLLA, Mann-Whitney U tests (for non-normally distributed data) or Independent Samples t-tests (for normally distributed data) were conducted, alongside regression analysis to assess gender's predictive effect (Research Question 3). Finally, correlational analyses were performed to examine relationships between English proficiency and FLLA factors, with additional regression modeling used where applicable (Research Question 4).

4.5. Ethical considerations

The research was conducted following ethical guidelines for educational research. All participants were provided with informed consent forms before completing the survey. Participation was voluntary, and anonymity was ensured to encourage honest responses.

5. Results

5.1. The FLLA scale

To establish the psychometric properties of the FLLAS and address the four research questions, a two-stage approach was adopted. The dataset was randomly divided into two equal halves: Exploratory Factor Analysis (EFA) was performed on one half to explore the latent factor structure, while Confirmatory Factor Analysis (CFA) was conducted on the other half to validate the proposed model.

5.1.1. Results of EFA

To identify the underlying factor structure of the initial 25-item FLLAS, an EFA was conducted using Principal Axis

Factoring with oblique rotation. Prior to factor extraction, sampling adequacy was evaluated using the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity. The results indicated that the KMO value was 0.937, exceeding the recommended threshold of 0.80^[19], suggesting that the sample was well-suited for factor analysis. Furthermore, Bartlett's test of sphericity was significant ($\chi^2 = 3783.549, p < 0.001$), confirming that the data met the assumption of sufficient inter-item correlations for factor analysis.

Table 1. KMO test and Bartlett's test of the initial 25-item FLLAS ($n = 351$)

KMO value		0.937
Approximate chi-square		3783.549
Bartlett's test of sphericity	df	300
	P	0.000***

Note: ***, **, and * represent the significance levels of 1%, 5%, and 10%, respectively.

An initial factor extraction revealed four distinct factors, accounting for 60.94% of the total variance. Three items (Item 5, 15, and 19) were removed due to high cross-loadings (> 0.40) on multiple factors or low factor loadings (< 0.50), resulting in a final 22-item scale. The remaining items demonstrated strong factor loadings and conceptual coherence. With 22 items left, seven items reflected the first factor, named Situational Listening Anxiety, which refers to the heightened anxiety learners experience in specific listening situations, such as classroom settings, oral interactions, and high-stakes assessments. 5 items indexed the second factor, named Self-perceived Cognitive Load, which refers to an individual's perception of the mental effort required to process and comprehend auditory input in a foreign language. 4 items comprised the third factor, named Self-perceived Affective Load, which refers to the emotional burden associated with self-doubt, low self-efficacy, and negative social comparison in listening comprehension. 6 items formed the fourth factor named Listening Processing Anxiety, which includes challenges in real-time processing of spoken input. The results are summarized in **Table 2**.

Table 2. Varimax rotated loading of 22 FLLAS items in the final EFA model ($n = 351$)

Factors	Item	Factor1	Factor2	Factor3	Factor4
SLA	1	0.728			
	6	0.687			
	4	0.683			
	7	0.632			
	2	0.61			
	3	0.584			
	8	0.566			
SP	13		0.777		
	12		0.745		
	10		0.719		
	25		0.624		
	9		0.511		
SA	16			0.773	

Table 2 (Continued)

Factors	Item	Factor1	Factor2	Factor3	Factor4
LP	17			0.733	
	11			0.694	
	14			0.595	
	23				0.88
	22				0.872
	21				0.797
	20				0.744
	24				0.721
	18				0.616

Then, the results for the final 22 FLLAS items in the KMO test show that the value of KMO is 0.933 (**Table 3**). At the same time, the results of the Bartlett's sphericity test show that the significant P value is 0.000***, showing significance at the level, rejecting the null hypothesis, and there is a correlation between the variables. Factor analysis is valid, and the degree is appropriate. Meanwhile, the contribution rate of the variable explanation rose from 60.942% to 62.961%. The refined 22-item scale was subsequently subjected to CFA to validate its structural integrity.

Table 3. KMO test and Bartlett's test of the final 22-item FLLAS ($n = 351$)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.933
Approx. Chi-Square		3323.425
Bartlett's Test of Sphericity	df	231
	P	0.000***

Cronbach's alpha coefficient was calculated for the revised 22-item model, yielding an overall value of 0.945. This indicates excellent internal consistency (**Table 4**).

Table 4. Reliability statistics of the final 22-item FLLAS ($n = 351$)

	Cronbach's alpha coefficient	Standardized Cronbach's alpha coefficient	Number of items
SLA	0.871	0.872	7
SC	0.841	0.842	5
SA	0.792	0.791	4
LP	0.924	0.925	6
Total	0.945	0.947	22

5.1.2. Results of CFA

To confirm the factor structure, a CFA was conducted using Maximum Likelihood Estimation on the second half of the dataset. The four-factor model demonstrated acceptable fit, with fit indices presented in **Table 5**. The model demonstrated an acceptable fit: $\chi^2/df = 4.95$, CFI = 0.945, TLI = 0.905, IFI = 0.923, GFI = 0.928, RMSEA = 0.075 (90% CI: 0.070 –

0.080), SRMR = 0.04. These results indicate that the model fits the data well, confirming the construct validity of the FLLAS.

Table 5. Model fit indices for the four-factor CFA model ($n = 351$)

Model	χ^2/df	CFI	TLI	IFI	GFI	RMSEA (90% CI)	SRMR
Four-factor	4.95	0.945	0.905	0.923	0.928	0.075 (0.070 – 0.080)	0.04

Factor loadings were examined to assess the strength of relationships between items and their respective factors. The standardized factor loadings, composite reliability (CR), and average variance extracted (AVE) are presented in **Table 6** and **Table 7**. Both CR (> 0.70) and AVE (> 0.50) confirm high internal consistency and convergent validity.

Table 6. Standardized factor loadings for the final 22-item FLLAS ($n = 351$)

Factor	Item	Standardized Factor Loading (λ)	Standard Error (S.E.)	Critical ratio (C.R./ t-value)	p-value
SLA (Situational Listening Anxiety)	SLA1	0.725	0.033	21.97	***
	SLA2	0.71	0.034	20.94	***
	SLA3	0.684	0.035	19.54	***
	SLA4	0.693	0.037	18.65	***
	SLA6	0.677	0.036	18.79	***
	SLA7	0.632	0.038	16.58	***
SC (Self-perceived Cognitive Load)	SC1	0.665	0.036	18.47	***
	SC2	0.511	0.04	15.23	***
	SC3	0.643	0.037	17.38	***
	SC4	0.501	0.042	14.91	***
	SC5	0.665	0.038	18.02	***
SA (Self-perceived Affective Load)	SA1	0.694	0.035	19.83	***
	SA2	0.595	0.04	17.31	***
	SA3	0.773	0.033	22.41	***
	SA4	0.733	0.037	20.32	***
LP (Listening Processing Anxiety)	LP1	0.667	0.026	22.91	***
	LP2	0.831	0.027	30.78	***
	LP3	0.798	0.029	27.52	***
	LP4	0.825	0.028	29.46	***
	LP5	0.842	0.025	32.68	***
	LP6	0.772	0.03	25.73	***

Table 7. Results of CR and AVE ($n = 351$)

Factor	Items	AVE	CR
SLA	SLA1 – 7	0.56	0.89
SC	SC1 – 5	0.52	0.87
SA	SA1 – 4	0.57	0.88
LP	LP1 – 6	0.62	0.91

The 22-item FLLAS model exhibited strong factor structure, good fit, and high reliability, supporting its validity as an instrument for measuring Foreign Language Listening Anxiety.

5.2. Learners' levels of listening anxiety across different factors

Descriptive statistics and frequency distributions were analyzed to assess students' FLLA levels across the four dimensions. **Table 8** summarizes the percentage distribution of students' responses for each FLLA item, while **Table 9** presents the mean scores and standard deviations for each of the four FLLA factors.

Table 8. Students' response frequencies in percentages for FLLAS items ($n = 702$)

Factors	Item	SD	D	N	A	SA
SLA1	1	50	139	224	175	114
SLA2	2	61	177	216	194	54
SLA3	3	18	62	113	252	257
SLA4	4	44	197	237	157	67
SLA5	5	28	119	190	235	130
SLA6	6	28	113	194	224	143
SLA7	7	16	96	186	267	137
SC1	8	18	76	232	264	112
SC2	9	31	121	187	248	115
SC3	11	12	37	144	311	198
SC4	12	20	111	212	243	116
SC5	22	8	84	196	300	114
SA1	10	78	183	208	161	72
SA2	13	21	113	235	233	100
SA3	14	125	274	182	83	38
SA4	15	128	267	173	107	27
LP1	16	17	81	182	305	117
LP2	17	12	34	119	341	196
LP3	18	12	65	182	316	127
LP4	19	6	40	147	346	163
LP5	20	3	30	104	383	182
LP6	21	6	44	166	332	154

The frequency distribution of responses across the FLLA scale suggests considerable variation in learners' experiences of listening anxiety. Responses to SLA items were widely distributed, with some students experiencing minimal stress while others reported substantial anxiety. Notably, SLA3 exhibited the highest levels of agreement, with 252 students selecting "Agree" and 257 selecting "Strongly Agree", indicating that a significant proportion of learners experience test-related stress and worry about their listening performance. Similarly, items like SLA7 (267 "Agree") and SLA5 (235 "Agree") suggest that many students feel anxious when they cannot understand every word or when nervousness affects their ability to retain information.

Responses to self-perceived cognitive load showed noticeable variability, with SC3 standing out due to its high level of agreement (311 "Agree", 198 "Strongly Agree"). This finding suggests that a considerable number of students are dissatisfied with their current listening comprehension skills, possibly perceiving listening as the most challenging aspect of language learning. Additionally, SC4 (243 "Agree", 116 "Strongly Agree") supports this observation, emphasizing that students recognize listening comprehension as a cognitively demanding task.

Compared to cognitive and processing difficulties, affective factors appeared to be less dominant in shaping students' listening anxiety. Responses to SA3 and SA4 were particularly polarized, with a significant proportion of students disagreeing or remaining neutral. This suggests that while some students may feel emotionally burdened by listening tasks, many do not perceive affective factors as a major obstacle. Additionally, SA1 (161 "Agree", 72 "Strongly Agree") indicates that some students attribute their listening test performance to luck rather than their actual ability, reflecting a lack of confidence rather than purely emotional distress.

Listening processing anxiety exhibited the highest levels of agreement, suggesting that real-time auditory processing poses a major challenge for learners. LP5 and LP4 recorded the highest agreement frequencies, with 383 and 346 students selecting "Agree," respectively, underscoring difficulties in keeping up with fast speech and processing information when passages are played only once. Similarly, LP6 (332 "Agree", 154 "Strongly Agree") highlights the importance of having preparation time before listening tasks, reinforcing the notion that processing constraints rather than comprehension difficulties are a primary source of listening anxiety.

To further analyze FLLA levels across different dimensions, Table 9 presents the mean scores and standard deviations of each factor.

Table 9. Descriptive statistics of the factors in the FLLA scale

	N	Mean	Std. Deviation
SLA	702	3.3897	0.72669
SC	702	3.5895	0.71211
SA	702	2.828	0.80999
LP	702	3.8298	0.64898

Among the four FLLA factors, Listening Processing Anxiety (LP) recorded the highest mean score ($M = 3.83$, $SD = 0.65$), suggesting that real-time processing challenges pose the most significant anxiety source for learners. In contrast, Self-perceived Affective Load (SA) had the lowest mean score ($M = 2.83$, $SD = 0.81$), implying that emotional stress contributes relatively less to overall FLLA.

5.3. Gender difference in the FLLA

To examine potential gender differences in Foreign Language Listening Anxiety (FLLA), statistical tests were conducted across four FLLA dimensions. Before performing inferential statistical analyses, the assumption of normality was tested for each FLLA factor across gender groups using Kolmogorov-Smirnov (K-S) and Shapiro-Wilk (S-W) tests. As shown

in **Table 10**, all variables significantly deviated from normality ($p < 0.001$), indicating a non-normal distribution for both male and female participants. Given this violation of normality, a Mann-Whitney U test, a non-parametric alternative to the independent samples t-test, was employed to compare gender differences across the four FLLA factors.

Table 10. Normality tests for FLLA factors by gender

	Gender	Kolmogorov-Smirnova			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
SLA mean	Male	0.08	299	< 0.001	0.978	299	< 0.001
	Female	0.069	403	< 0.001	0.985	403	< 0.001
SA mean	Male	0.078	299	< 0.001	0.982	299	< 0.001
	Female	0.091	403	< 0.001	0.985	403	< 0.001
SC mean	Male	0.073	299	< 0.001	0.981	299	< 0.001
	Female	0.073	403	< 0.001	0.985	403	< 0.001
LP mean	Male	0.077	299	< 0.001	0.98	299	< 0.001
	Female	0.106	403	< 0.001	0.978	403	< 0.001

The Mann-Whitney U test results (**Table 11**) revealed no statistically significant gender differences across any of the four FLLA dimensions. While Self-perceived Affective Load (SA) exhibited a marginal difference ($p = 0.075$), it did not reach the conventional significance threshold ($p < 0.05$). These findings suggest that if gender differences in FLLA exist, they are minor and not statistically meaningful within the present sample ($n = 702$).

Table 11. Mann-Whitney U test results for FLLA factors

Variable	U	Z	<i>p</i> (2-tailed)
SLA	57,342.50	-1.096	0.273
SC	59,691.00	-0.211	0.833
SA	55,544.00	-1.779	0.075
LP	56,506.00	-1.414	0.157

To further examine the influence of gender on FLLA, a multiple regression analysis was conducted with gender as the independent variable and four factors of FLLA (SLA, SC, SA, LP) as dependent variables, while controlling for English proficiency.

Table 12. Regression coefficients for gender predicting FLLA factors

Dependent variable	Predictor	B	Std. Error	Beta	<i>t</i>	<i>p</i>
SLA (Situational Listening Anxiety)	Gender	-0.014	0.055	-0.009	-0.246	0.806
SC	Gender	0.027	0.049	0.019	0.551	0.582
SA (perceived Affective Load)	Gender	-0.031	0.061	-0.015	-0.508	0.612
LP (Listening Processing Anxiety)	Gender	-0.017	0.046	-0.013	-0.37	0.712

The regression results (**Table 12**) confirmed that gender was not a significant predictor of any FLLA factor ($p > 0.05$). Even after accounting for English proficiency, gender remained non-significant across SLA ($\beta = -0.009, p = 0.806$), SC ($\beta = 0.019, p = 0.582$), SA ($\beta = -0.015, p = 0.612$), and LP ($\beta = -0.013, p = 0.712$). These results align with the Mann-Whitney U test findings, further supporting the conclusion that gender does not play a substantial role in influencing Foreign Language Listening Anxiety levels.

5.4. Correlations between students' FLLA level and FL proficiency

To explore the relationship between English proficiency and FLLA factors, a Pearson correlation analysis was performed (**Table 12**). This analysis examined the strength and direction of associations between proficiency levels and the four dimensions of FLLA: SLA, SC, SA, and LP. Additionally, multiple regression analysis was conducted to determine whether proficiency serves as a significant predictor of these factors while accounting for gender as a control variable.

Table 13 presents the Pearson correlation coefficients between English proficiency and the four FLLA dimensions. The results indicate that English proficiency was weakly but significantly correlated with SLA ($r = 0.146, p < 0.01$) and SA ($r = 0.171, p < 0.01$). This suggests that students with higher proficiency levels tend to report slightly greater situational listening anxiety and affective burden. However, proficiency was not significantly correlated with SC ($r = 0.003, p > 0.05$) or LP ($r = 0.005, p > 0.05$), indicating that proficiency alone does not strongly influence self-perceived cognitive load or listening processing anxiety.

Table 13. Pearson correlation coefficients between English proficiency and FLLA factors

Variable	SLA	SC	SA	LP	Proficiency
SLA	1	0.653**	0.575**	0.568**	0.146**
SC	0.653**	1	0.597**	0.667**	0.003
SA	0.575**	0.597**	1	0.380**	0.171**
LP	0.568**	0.667**	0.380**	1	0.005
Proficiency	0.146**	0.003	0.171**	0.005	1

Note: $p < 0.05$ (*), $p < 0.01$ (**)

To further explore the impact of proficiency on FLLA, a multiple linear regression analysis was conducted. In this analysis, English proficiency was treated as the independent variable, while SLA, SC, SA, and LP were considered dependent variables. Gender was included as a control variable to account for potential confounding effects. The regression results, presented in **Table 14**, indicate that proficiency significantly predicted SLA ($B = 0.102, p = 0.001$) and SA ($B = 0.118, p = 0.001$). This suggests that students with higher proficiency levels tend to experience slightly greater situational listening anxiety and affective burden. However, proficiency was not a significant predictor of SC ($B = -0.002, p = 0.927$) or LP ($B = 0.003, p = 0.891$). This finding implies that self-perceived cognitive load and listening processing anxiety are not directly influenced by a learner's language proficiency level.

Table 14. Regression coefficients for FL proficiency predicting FLLA factors

Dependent Variable	B (Unstandardized)	Std. Error	Beta (Standardized)	<i>t</i>	<i>p</i>
SLA	0.102	0.031	0.146	3.26	0.001
SC	-0.002	0.022	-0.003	-0.09	0.927
SA	0.118	0.029	0.171	4.12	0.001
LP	0.003	0.025	0.005	0.14	0.891

6. Discussion

This study aimed to examine FLLA among Chinese tertiary EFL learners, exploring its multifactorial structure, gender differences, and its relationship with English proficiency. The findings provide significant insights into the cognitive, affective, and situational aspects of listening anxiety and challenge some commonly held assumptions in foreign language learning research.

6.1. The multifactorial nature of FLLA

Findings from factor analysis confirmed that FLLA is not a unidimensional phenomenon but consists of four interrelated components. Each of these components contributes uniquely to the overall anxiety experienced by learners, highlighting the complexity of listening difficulties in second language acquisition.

Among these factors, LP exhibited the highest mean score, indicating that real-time comprehension and processing difficulties are the most significant contributors to listening anxiety. This supports existing research suggesting that the transient nature of spoken language and the inability to revisit auditory input exacerbate learners' anxiety^[20]. Items such as LP5 (concerns over fast speech) and LP4 (worry about single-exposure listening tests) recorded particularly high levels of agreement, reinforcing the idea that learners feel most vulnerable when they cannot control the pace of auditory input. These results suggest that interventions focusing on enhancing processing efficiency, improving predictive listening strategies, and increasing exposure to various accents and speech rates may help mitigate LP-related anxiety.

Conversely, SA exhibited the lowest mean score, suggesting that emotional distress, such as nervousness or self-doubt, plays a relatively smaller role compared to cognitive and processing challenges. This finding aligns with studies emphasizing the cognitive rather than purely affective nature of listening comprehension difficulties^[21]. The relatively lower levels of agreement on SA items, such as SA3 (reluctance toward listening practice) and SA4 (uncertainty about improvement through practice), indicate that while some learners may experience affective discomfort, it does not dominate their listening anxiety experience.

The results suggest that helping students process information more efficiently and reduce mental strain may be more effective than just addressing their emotional anxiety. While building confidence is important, teaching methods that focus on improving memory, practicing different listening techniques, and gradually exposing students to more difficult listening materials may be more effective in improving their listening skills and reducing anxiety.

6.2. Gender and FLLA: A non-significant relationship

The findings challenge conventional views on gender-based differences in language anxiety. Both non-parametric (Mann-Whitney U test) and regression analyses indicated that gender did not significantly impact any FLLA factors. These results contrast with some previous studies that have reported higher anxiety levels among female learners^[22] but are consistent with more recent research suggesting that gender differences in FLLA may be overstated when controlling for additional factors such as proficiency and learning strategies.

One reason why gender differences were not significant could be that listening anxiety is more influenced by individual learning habits, cognitive challenges, and experience with real-life listening than by gender itself. This suggests that teaching methods should focus on personalized learning approaches rather than generalizing based on gender.

6.3. English proficiency and its complex relationship with anxiety

Contrary to the expectation that higher proficiency would correlate with lower listening anxiety, the findings revealed a weak but significant positive correlation between English proficiency and both SLA ($r = 0.146, p < 0.01$) and SA ($r = 0.171, p < 0.01$). These results suggest that as learners' proficiency increases, they may experience slightly higher situational and affective anxiety in listening tasks.

A potential explanation for this trend is that higher-proficiency learners are more aware of comprehension challenges and may place greater expectations on themselves, leading to increased self-imposed pressure^[23]. Additionally, advanced

learners are often exposed to more complex and authentic listening materials, which may induce greater anxiety despite their language competence ^[24].

On the other hand, no clear link was found between proficiency and either SC or LP, suggesting that cognitive load and processing anxiety are not directly tied to language skills. This means that simply improving proficiency may not be enough to reduce listening anxiety, as challenges related to mental effort and processing speed persist.

6.4. Implications for foreign language teaching

Given the findings, several pedagogical implications emerge:

- (1) Focusing on Cognitive and Processing Strategies: Since SC and LP are major sources of anxiety, instructional approaches should emphasize training learners to handle cognitive overload and improve processing efficiency.
- (2) Shifting from Gender-Based to Individualized Learning Approaches: Since gender differences were not significant, teaching strategies should focus on individual needs rather than gender-based approaches. Teaching should focus on individual listening difficulties, such as recognizing sounds, managing memory load, and becoming familiar with different listening tasks. Providing targeted support in these areas can help students develop stronger listening skills and reduce frustration.
- (3) Balancing Proficiency Development with Anxiety Management: Since being more proficient in English does not always mean feeling less anxious, teachers should gradually make listening tasks harder instead of jumping to difficult ones too quickly. At the same time, offering support and strategies to manage stress is essential. Using listening exercises that progressively increase in difficulty, along with simple anxiety-reducing techniques, such as relaxation exercises and confidence-building activities, can help students feel more comfortable as they improve their listening skills.

7. Conclusion

This study offers a comprehensive examination of FLLA among Chinese tertiary EFL learners, providing empirical evidence for its multidimensional nature and clarifying its relationship with gender and language proficiency. Through rigorous scale development and large-sample validation, four core factors were identified: SLA, SC, SA, and LP, thereby enriching the theoretical landscape of language anxiety research.

Among these, LP emerged as the most prominent anxiety trigger, highlighting the critical role of real-time processing demands in shaping learners' listening experiences. By contrast, affective elements such as nervousness and self-doubt played a comparatively minor role. These findings underscore the importance of targeting cognitive and auditory processing constraints, rather than purely emotional or gender-based factors, when designing pedagogical interventions. Notably, the study found no significant gender-based differences across FLLA dimensions, challenging commonly held assumptions and advocating for learner-centered, rather than gender-specific, instructional approaches. Additionally, a weak but significant positive correlation between proficiency and both SLA and SA suggests that as learners become more proficient, they may also become more self-aware and performance-sensitive, resulting in heightened situational and emotional anxiety.

While this study provides robust methodological and practical insights, several limitations must be acknowledged. The reliance on self-reported data introduces the possibility of perception bias. Furthermore, the cross-sectional design restricts the ability to assess how FLLA evolves. Future research should incorporate longitudinal methodologies and performance-based assessments to better understand the dynamic nature of listening anxiety and its underlying mechanisms. Additional inquiry is also warranted into contextual and pedagogical moderators that may influence the relationship between proficiency and anxiety.

In conclusion, this research contributes to a more nuanced and empirically grounded understanding of FLLA. It calls for instructional practices that focus on enhancing learners' processing capacity and adaptive strategies, ultimately

promoting more equitable and effective language learning environments.

Funding

Project Topic: General Project of Humanities and Social Sciences Research in Universities of Henan Province, Project Approval Number: 2024-ZZJH-080.

Disclosure statement

The author declares no conflict of interest.

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Design and Application of Haptic Feedback System for Virtual Characters based on Multimodal Perception

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Abstract: Improving the realism of tactile interaction of virtual characters has become a key bottleneck in the development of virtual reality technology, and multimodal perception fusion technology provides an innovative solution to break through this limitation. The physical simulation technology, based on the coupling of the virtual character's surface material, contact interaction and environment, realizes the calculation of tactile effects with high fidelity. At the same time, the haptic feedback system with multi-channel drive control ensures the coordination and unity of audio-visual and tactile three-dimensional perception.

Keywords: Multimodal perception; Virtual characters; Haptic feedback; Cross-modal fusion; Physical simulation

Online publication: April 26, 2025

1. Introduction

As the core carrier of digital interaction, the perceptual authenticity of virtual characters will directly affect the quality of user immersion experience, and the traditional virtual character system relies on a single visual presentation mode, due to the lack of deep perception support of the tactile dimension, resulting in an obvious lack of realism in human-computer interaction. The rise of multimodal perception technology has brought breakthrough solutions to the tactile interaction of virtual characters, and a more complete virtual character perception ecology can be built by integrating multi-dimensional perception channels such as vision, hearing, and touch. At present, the haptic feedback technology of virtual characters is facing core technical challenges, and the haptic feedback system of virtual characters based on multi-modal perception realizes the intelligent modeling of virtual character behavior and high-fidelity simulation of tactile attributes by establishing a cross-sensory information collaboration mechanism.

2. Fundamentals of virtual character modeling for multimodal perception mechanism

2.1. Multi-sensory information collection architecture for virtual characters

The multi-sensory information collection architecture of virtual characters builds a hierarchical and multi-dimensional perception data acquisition system, and realizes the three-dimensional spatial reconstruction of the visual characteristics

of virtual characters by deploying high-resolution RGB-D camera arrays, in which the accuracy of the depth sensor can reach the millimeter level, which can capture the subtle differences in the changes of facial micro-expressions and body movements and posture transitions of virtual characters^[1]. The voice interaction module adopts a multi-directional microphone array. It cooperates with the noise suppression algorithm to achieve the spatial accuracy of the virtual character's voice positioning in the horizontal direction of ± 3 degrees and the vertical direction of ± 5 degrees. The integrated voice emotion recognition engine can analyze the eight basic emotional states contained in the virtual character's intonation. The haptic sensing system uses a distributed network of pressure sensors, with a sensor density of 16 sampling points per square centimeter and a response frequency ranging from 1 Hz to 1000 Hz, which can detect physical parameters such as elastic modulus and roughness of the surface material of the virtual character, as well as temperature distribution.

2.2. Cross-modal data fusion of virtual character behavior

The cross-modal data fusion mechanism of virtual character behavior adopts a synchronization strategy that combines time series alignment and spatial registration, and solves the time synchronization problem between the visual frame rate of 30 fps, the audio sampling rate of 48 kHz and the update frequency of the tactile sensor of 1 kHz by establishing a unified timestamp reference system, and the time alignment accuracy is controlled within the range of ± 1 milliseconds. The spatial registration algorithm uses the three-dimensional coordinate transformation matrix to map the local coordinate systems of different sensors to the global coordinate system of the virtual character, and controls the registration error within ± 0.5 mm, the feature extraction module adopts the deep learning network architecture, the visual feature extraction uses the improved ResNet-101 network to extract the 512-dimensional feature vectors, the audio features use the Mel frequency cepstrum coefficient to extract the 39-dimensional acoustic features, and the tactile features extract the 64-dimensional texture features through wavelet transform analysis. The multimodal feature fusion adopts the neural network architecture weighted by the attention mechanism, and dynamically adjusts the weight coefficients of different modalities, with visual weights ranging from 0.3 to 0.6, auditory weights ranging from 0.2 to 0.4, tactile weights ranging from 0.1 to 0.5, and the comprehensive feature vector dimension after fusion is 256 dimensions.

3. Physical simulation technology for haptic feedback of virtual characters

3.1. Tactile modeling of virtual character surface materials

The use of haptic feedback technology is a viable and promising solution^[2]. The tactile modeling of the surface material of the virtual character relies on a multi-level physical property description system, and the accurate simulation of different material types is achieved by establishing a database of material characteristics (**Figure 1**). Skin texture modeling uses fractal geometry theory, uses Perlin noise function to generate surface microscopic concave and convex structure, texture resolution reaches 0.01 mm accuracy to simulate the fine folds and pore distribution on the skin surface and sweat gland openings and other detailed features, clothing material modeling by measuring the elastic modulus of real fabrics, Poisson's ratio and density and other parameters, to establish a physical parameter library including cotton, silk and wool and other common materials, in which the elastic modulus of cotton material is set to 5–15MPa, silk material is set to 8–25MPa, leather material set 10–100MPa. The biological tissue modeling is based on the finite element method to construct a multi-level anatomical structure, covering the layered modeling of epidermal thickness of 0.1–0.2 mm, dermis thickness of 1–3 mm, and subcutaneous tissue thickness of 2–30 mm, and the Young's modulus of each layer is set to 0.1–0.2 MPa, 0.02–0.2 MPa, and 0.002–0.02 MPa, respectively.

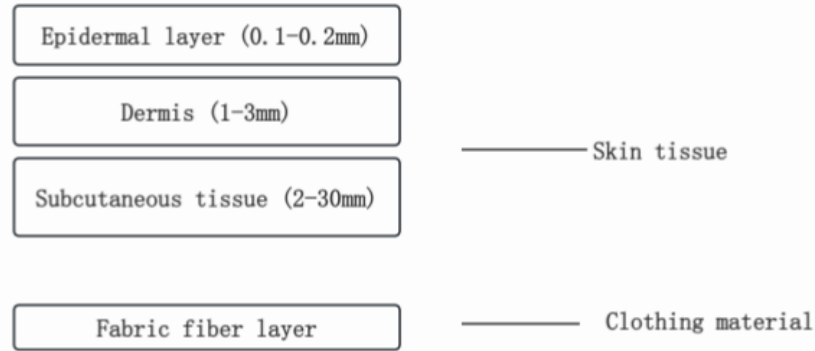


Figure 1. Material modeling hierarchy.

3.2. Mechanical calculations of virtual character contact interactions

Haptic feedback, as a form of tactile reproduction, is playing an increasingly important role in modern society^[3]. The collision detection system uses the hierarchical enveloping box method to divide the surface of the virtual character into a triangular grid element with a minimum of 0.5 mm, and the detection frequency can reach 1000 Hz, which can capture instantaneous contact events and calculate the precise position of the contact point. The contact force calculation is based on Hertz's contact theory, considering the nonlinear properties of the material and the viscoelastic effect, and the normal contact force is calculated as follows:

$$F_n = K \times \delta^{\frac{3}{2}} + C \times \dot{\delta} \quad (1)$$

Where K is the contact stiffness coefficient, δ is the contact deformation, C is the damping coefficient, and $\dot{\delta}$ is the deformation velocity. The tangential friction is based on the Coulomb friction model, and the friction coefficient μ is dynamically adjusted according to the material combination, with $\mu = 0.4-0.8$ in skin-to-skin contact, $\mu = 0.2-0.6$ in skin-fabric contact, and $\mu = 0.1-0.4$ in skin-metal contact. The calculation of joint torque is based on the inverse dynamics algorithm, considering the mass distribution of the virtual character, the inertia matrix and the influence of gravity, the maximum torque of the shoulder joint is set to 40–60 Nm, the elbow joint is set to 20–40 Nm, and the wrist joint is set to 5–15 Nm.

3.3. Physical effects of virtual character environment coupling

The simulation of the physical effect of the coupling of the virtual character environment involves a variety of complex physical phenomena, and the real physical response is achieved by constructing a dynamic interaction model between the virtual character and the surrounding environment. The interactive modeling of scene objects uses the rigid body dynamics engine, which can support collision detection between virtual characters and static objects, the collision response time is controlled within 1 millisecond, the rebound coefficient is set according to the material combination, the rebound coefficient of wood surface is 0.3–0.5, the metal surface is 0.6–0.8, and the soft material is 0.1–0.3, and the environmental resistance simulation will consider the comprehensive effect of air resistance and surface friction, and the air resistance coefficient is set at 0.1–0.5 Ns/m. The surface frictional resistance is calculated dynamically based on the contact area and pressure, and the frictional resistance ranges from 0.5 to 5.0 N. The thermal conductivity coefficient is set at 0.2–0.6 W/(mK) and the specific heat capacity is set at 3000–4000 J/(kgK), which can simulate the temperature change at the moment of contact, with a temperature transfer rate of 0.5–2.0 degrees per second.

4. Architecture of haptic feedback system based on multimodal perception

4.1. Generation and encoding of multimodal tactile signals

The generation and encoding of multi-modal tactile signals use perceptual fusion algorithms to convert visual, auditory and tactile three-dimensional information into unified tactile feedback signals. The visually-guided tactile signal mapping is based on depth image analysis, and the pixel depth value is converted into tactile intensity parameters by extracting the surface geometric features of the convolutional neural network, and mapping function is:

$$I_{\text{tactile}} = \alpha \times \log(d_{\text{visual}} + 1) \times \beta \times \nabla^2(d_{\text{visual}}) \quad (2)$$

Where I_{tactile} is tactile intensity, d_{visual} is the visual depth value, α and β are the weight coefficients, and ∇^2 is the Laplace operator.

The auditory-assisted tactile modulation mechanism analyzes the characteristics of the audio spectrum and maps the sound intensity, frequency and timbre to the tactile vibration mode, where the low-frequency sound, i.e., the sound of 20–200 Hz, will be mapped as the low-frequency vibration, the medium-frequency sound, that is, the sound of 200–2000 Hz, will be mapped as the pulsed haptics, and the high-frequency sound, that is, the sound of 2000–20000 Hz, will be mapped as the fine texture perception. The tactile pattern recognition with multi-sensory fusion uses Bayesian classifiers to learn the multi-modal feature combinations of different materials through training samples, and its recognition accuracy can reach more than 92%, and the response delay can be controlled within 5 milliseconds.

4.2. Multi-channel drive control of haptic feedback devices

The multi-channel drive control system of the haptic feedback device is based on a distributed actuator array to achieve multi-point synchronous tactile stimulation output. The actuator configuration adopts an 8×8 grid layout, the size of a single actuator is 5×5 mm, the driving frequency range covers 1–300Hz, the maximum output force is 2 N, and the displacement accuracy reaches 0.01 mm, and the parallel excitation scheme adopts time-division multiplexing technology, which divides 64 actuators into 8 groups, each group of 8 actuators is driven at the same time, and the cycle period is 1 millisecond to ensure the continuity of user perception. The delay compensation algorithm adopts the predictive control mechanism, predicts the contact time by analyzing the user's hand movement trajectory, triggers the actuator response 0.5–2 milliseconds in advance, compensates for the inherent delay of the system, and the nonlinear correction adopts the look-up table method, and dynamically corrects the saturation characteristics of the actuator and non-ideal factors such as hysteresis effect and temperature drift, with a correction accuracy of more than 95%, and the controller adopts ARM Cortex-M7 processor, with a running frequency of 168 MHz and a built-in floating point operation unit. It supports real-time signal processing, and the communication interface adopts USB 3.0 protocol, and the data transmission rate reaches 5 Gbps.

4.3. User-oriented haptic experience adaptive mechanisms

The user-oriented adaptive mechanism of haptic experience relies on the establishment of individual difference models to achieve personalized optimization of haptic feedback^[4]. The test range covers 0.01–2.0 N force stimulation and 0.1–10 μm displacement stimulation and 1–1000 Hz vibration stimulation, the calibration accuracy can reach $\pm 5\%$ of the perception threshold, the physiological monitoring module integrates a variety of physiological signal acquisition devices such as heart rate sensor, skin conductivity sensor and electromyography sensor, etc., which can monitor the user's fatigue state in real time. Heart rate variability can be analyzed with an accuracy of 1 millisecond, skin conductivity measurement ranges from 0.1 to 100 μS , and EMG signal frequency response ranges from 10 to 500 Hz. The subjective evaluation system adopts a multi-dimensional scale design, including comfort score (1–10 points), realism score (1–10 points) and fatigue score (1–10 points) and other indicators, and the personalized tactile preference model is established by analyzing user evaluation data through machine learning algorithms, with a prediction accuracy of more than 85%, and the adaptive adjustment strategy dynamically adjusts the haptic feedback parameters according to physiological monitoring data and

subjective evaluation results.

5. Application verification of multimodal virtual character haptic system

5.1. System performance evaluation

The performance evaluation of the multi-modal virtual character haptic feedback system uses a multi-dimensional quantitative testing system to comprehensively verify the effectiveness of the system by combining objective performance index measurement and subjective experience evaluation. The haptic feedback accuracy test is based on the high-precision force sensor, measuring the deviation between the output and the theoretical value of the system, covering the force sensing range of 0.1–10 N and the frequency range of 1–1000 Hz and the displacement range of 0.01–5 mm, the accuracy is controlled within $\pm 2.8\%$, the multi-modal perception delay test is triggered by synchronous triggering of visual auditory tactile stimulation, and the time difference between each modality is measured with a high-speed camera and an oscilloscope, and the overall delay is controlled within 15 milliseconds. The user experience evaluation uses a standardized questionnaire survey, recruits 50 test users to carry out a two-week use test, the evaluation indicators cover the dimensions of immersion, realism, comfort, ease of use, etc., and the system stability test has achieved 99.7% through continuous 72 hours of uninterrupted operation, monitoring key parameters such as the number of system crashes, memory leaks, and processor temperature. The system core performance test results are as shown in **Table 1**.

Table 1. System core performance test results

Test metrics	Actual results	Design goals	Attainment status
Haptic feedback accuracy	$\pm 2.8\%$	$\pm 3.0\%$	✓
System response delay	15 ms	≤ 20 ms	✓
Feature fusion accuracy	92.3%	$\geq 90\%$	✓
User immersion scores	8.4	≥ 7.5	✓
System availability	99.7%	$\geq 99\%$	✓
Actuator output force	1.98 N	≥ 2.0 N	△

Note: ✓ indicates that the standard is met, and △ indicates that the target is close to the standard

As can be seen from the test results, the system meets or exceeds the design target on most performance metrics. Among them, the core indicators such as haptic feedback accuracy, system response delay and user experience evaluation are excellent, which verifies the effectiveness of the multi-modal perception fusion architecture, and the maximum output force of the actuator is slightly lower than the design target, but it is still within the acceptable range and does not affect the overall performance of the system.

5.2. Application field expansion

The multimodal virtual character haptic feedback system has the potential to be widely used in many technical fields and can provide important technical support for the digital transformation of different industries. In the field of medical rehabilitation, virtual characters can be used to guide patients through rehabilitation training, and to help patients rebuild motor function with precise tactile feedback, and in the medical field, haptic feedback devices are often used to improve the quality of life of people with disabilities due to their lightweight and good compliance^[5]. In the field of entertainment interaction, the tactile interaction ability of virtual characters can significantly improve the immersive experience of users, and create a more realistic virtual environment in applications such as virtual reality games, social platforms and digital art displays, and the field of industrial design can realize the virtual verification of product prototypes with the help of the

haptic feedback function of virtual characters, which can reduce the cost of physical prototype production and improve design efficiency, and the research field of human-computer interaction provides an experimental platform for exploring new interaction modes and promotes the sustainable development of tactile interaction technology.

6. Conclusion

The haptic feedback system of virtual characters based on multi-modal perception has successfully built an immersive interactive environment with three-dimensional collaboration of audio-visual touch, which has significantly improved the authenticity of virtual character perception. The cross-modal data fusion algorithm effectively integrates the multi-dimensional perception information of the virtual character, the adaptive perception model realizes the intelligent evolution process of the virtual character's behavior, and the physical simulation technology lays a solid foundation for high-fidelity haptic feedback by accurately modeling the material attributes and contact interaction and environmental coupling effects of the virtual character. The parallel drive control mechanism of the multi-channel haptic feedback system ensures the real-time and accurate transmission of tactile signals, and the personalized experience optimization strategy meets the differentiated needs of different users.

Funding

2024 Wenzhou Science and Technology Bureau Basic Scientific Research Project, "Research on the Application of Multimodal Haptic Technology in Virtual Character Interaction Design" (Project No. G20240079)

Disclosure statement

The author declares no conflict of interest.

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The Argument of the Legend of the Yellow Emperors Development of Chinese Music Culture

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Abstract: Distant legends recount the Yellow Emperor's contributions to Chinese music culture. These narratives, which intertwine historical facts with mythical elements, should not be uncritically accepted as definitive accounts of his achievements. Instead, they require careful analysis through a scientific lens to assess their authenticity. By adopting a historical and dialectical approach, the Yellow Emperor's role in the development of Chinese music culture can be more accurately understood.

Keywords: Yellow Emperor; Music; Reality; Contribution

Online publication: April 26, 2025

1. Introduction

The Yellow Emperor, the cultural ancestor of the Chinese nation, pioneered in various fields, illuminating the dawn of Chinese civilization. Historical records recount the legend of the Yellow Emperor's establishment of music culture, which later generations often cite to affirm his contributions to music. However, it is undeniable that historical legends are heavily influenced by imagination and superstition. These accounts should neither be blindly accepted nor outright dismissed. To accurately position the relationship between the Yellow Emperor and Chinese music culture, this article reviews relevant historical legends and then examines the historical traces of music culture to determine the authenticity of these legends.

2. The legend of the Yellow Emperor developing Chinese music culture

2.1. The legend of the Yellow Emperor making drums

In the 26th century BC, Xuanyuan was the central emperor and the supreme ruler of heaven and earth ^[1]. At this time, a demon named Chiyu emerged in the South. He was ambitious and first used force to conquer the Miao people in the south, forming a fierce army. Then, he attacked his ancestor, Emperor Yan, using force, driving him from the South to Zhuolu (present-day Zhuolu, Hebei). With no other choice, Emperor Yan sought help from the Yellow Emperor, Xuanyuan.

When the news reached the Yellow Emperor, he was furious. He decided to conquer Chiyu by force. Thus, a bloody battle broke out in the Zhuolu field. The Yellow Emperor's army was overwhelming, and Chiyu's resistance was fierce. The two sides fought fiercely and could not tell who was winning.

The prolonged war had drained both sides of their resources, and the Yellow Emperor could not quickly subdue Chiyou's forces. What could he do? The Yellow Emperor then thought that if he could create a drum that produced a loud sound, it would boost his army's morale and dampen Chiyou's troops' fighting spirit, leading to a decisive victory over Chiyou. However, what material should be used to make such a large drum? He then thought of the monster Kuai on Liupo Mountain in the East Sea. Thus, he ordered his divine soldiers to strip Kuai's skin to make a large drum and to use the leg bones of the Thunder God to make a pair of drumsticks.

After the large drum was completed, the Yellow Emperor ordered it to be placed on a war chariot and had the mighty Chang Bo beat it. Chang Bo, with immense strength, swung his arms and beat the drum nine times, producing a thunderous sound that echoed through the mountains and valleys, darkening the sky and earth. The morale of the Yellow Emperor's army soared, and they charged towards Chiyou's position with loud shouts. Chiyou's troops were suddenly terrified by the drumming, trembling, and fleeing in fear. When Chiyou retreated to Ji Zhou with his army, he was finally captured alive by the emperor's forces and beheaded. After that, the Yellow Emperor often used drums to encourage his soldiers in the war and won many victories.

2.2. The legend of the Yellow Emperor ordering laws to be made

In ancient times, our ancestors often danced and sang joyfully to celebrate their hunting successes and express their happiness. However, due to the lack of a unified musical system at that time, the songs they sang were inconsistent and unpleasant to listen to^[1]. What could be done? The Yellow Emperor summoned Ling Lun and instructed him to find a solution to the music issue.

After Ling Lun accepted his mission, he spent day and night thinking and traveling. One day, he arrived at a valley by a stream on the northern side of Kunlun Mountain. There, he saw the green bamboo swaying in the wind and birds flying and singing joyfully in the bamboo grove. Inspired, he decided to use the green bamboo from Kunlun Mountain to create musical scales. He cut down twelve green bamboos from the mountain, removed the joints, and selected one section of each bamboo to make twelve pipes. When blown, these pipes produced sounds, but they were unpleasant to the ear. Just as Ling Lun was at a loss, a pair of phoenixes with spread wings flew over. The front phoenix called six times, and the rear phoenix also called six times.

2.3. The legend of the Yellow Emperor's creation of the music "Qingjiao"

According to legend, during the Spring and Autumn period, Duke Ping of Jin was a great lover of music. One day, Duke Ling of Wei visited Jin. Duke Ping hosted a banquet at the Shiyi Terrace^[1]. During the feast, Duke Ling, to express his gratitude for the hospitality, asked Shi Juan, who accompanied him, to play a piece called Qing Shang on the Se. After completing the performance, Duke Ping asked his musician, Shi Kuang, if there was any piece more moving than this. Shi Kuang replied "There is one, Qing Zheng, which is even more poignant." Duke Ping then asked Shi Kuang to play Qing Zheng. Shi Kuang brought out his Se and played it with great skill.

This piece of music is indeed more touching than Qing Shang. Duke Ping of Jin, Duke Ling of Wei, and all the guests at the banquet were delighted. When the music ended, Duke Ping of Jin moved and toasted Shi Kuang, as well as said, "Could this Qing Zheng be the most moving piece of music in the world?" Shi Kuang replied, "No, it is far less moving than Qing Jiao!" Duke Ping of Jin responded, "That's great. Please play Qing Jiao once more." Shi Kuang quickly shook his head and said, "Absolutely not. The Qing Jiao, created by the Yellow Emperor when he met the gods on Mount Tai, is too profound for you to listen to. If you insist on playing it, it will bring disaster." Duke Ping of Jin insisted, and Shi Kuang had no choice but to comply, playing Qing Jiao.

3. The argument for the truth of ancient legends

3.1. On the argument of the Yellow Emperor's drum making

The legend of the Yellow Emperor making drums provides us with several pieces of information that can be used to argue:

- (1) The time when the Yellow Emperor made drums is about 5000 years ago.
- (2) The drum made by the Yellow Emperor was made of the skin of a wild animal called "Kui".
- (3) The drum made by the Yellow Emperor was put on the war chariot, indicating that it could be moved as a whole.
- (4) The drum made by the Yellow Emperor used the leg bones of wild animals as the drumsticks.
- (5) The drum made by the Yellow Emperor has a loud sound and has the power to deter people.
- (6) The purpose of the Yellow Emperors drum was for war.

Does this information align with the historical evidence of early human drum-making? To answer this, it is helpful to explore the history of music and the cultural significance of drums. A logical starting point is the concept of the twelve tones. "The science of music" refers to a system that defines musical pitch using numerical methods based on specific intervals ^[2]. According to ancient Chinese texts, there were dozens of different names for drums, and their varieties were diverse. Ancient documents such as the Book of Documents, The Spring and Autumn Annals of Mr. Lu, The Book of Songs: The Great Odes, Li Si's Memorial on the Expulsion of Guests, and Sima Xiangru's Zixu Fu from the Han Dynasty all mention drums made from crocodile skin ^[2]. This indicates that drums played a significant role in prehistoric music.

In 1959, two pottery drums were discovered in a large late-period tomb at the Dawenkou site in Taian, Shandong. These drums were located at the eastern corners of the pit ^[3]. The vessels were wide-shouldered, thick-necked, open-mouthed, and small flat-bottomed pottery jars, approximately 30cm tall and 13cm in diameter. In 1980, a wooden alligator drum was discovered in a large tomb at the Taosi Cemetery in Xiangfen, Shaanxi Province ^[2]. During excavation, it was found alongside a special bell, with alligator skin and bone plates scattered inside the drum. It is confirmed that this is the drum of the divine alligator mentioned in ancient texts. The drum frame was hollowed out from a natural tree trunk.

In 1981, a wooden drum was unearthed in the fourth tomb of the fifth district of the Erlitou site in Yanshi, Henan Province. In addition to the wooden drum, other artifacts such as copper bells were also unearthed. The drum is long and cylindrical with a tight waist, about 54cm long and dating back more than 4000 years ago ^[2]. In addition to the above drums, there are also pottery drums unearthed in Leshanping, Yongdeng, Gansu province; Xiaohecun, Zhuanglang, Gansu Province; and Yangshan, Minhe, Qinghai Province. Music archaeology provides us with information and basis for the study of prehistoric drum instruments. The information of drums found in archaeology is very consistent with the legend of drum making by the Yellow Emperor.

To sum up, the legend of the Yellow Emperor making drums is completely consistent with the information of prehistoric drums in music archaeology. We can fully believe that the basic facts in the legend of the Yellow Emperor making drums are true and credible.

3.2. The Yellow Emperor sent people to make laws and legends

The legend that the Yellow Emperor sent Ling Lun to make music provides us with the following information that can be studied and verified:

- (1) Ling Lun made bamboo laws about 4,500 years ago.
- (2) Ling Lun made twelve bamboo tubes and made twelve laws. Among them, six were called "Laws" and six were called "Lu".
- (3) Ling Lun made the law in Kunlun Mountain;
- (4) The purpose of the Yellow Emperor sending Ling Lun to make music was to unify the music and make the music and singing harmonious.

The story of the Yellow Emperor sending people to make laws says that Ling Lun made laws by collecting bamboo

in Kunlun Mountain. This is also not credible. Kunlun Mountain is located in the Qinghai-Tibet Plateau, with an average altitude of 5500—6000 meters. Its northern slope belongs to a cold and extremely dry area, with barren land and few plants. Only some cold and drought-resistant shrubs and camel hair li can grow, and it is impossible for bamboo to grow here, let alone for bamboo to be harvested and made into music.

To sum up, there is no solid evidence to support the legend in historical records that the Yellow Emperor sent people to create musical scales. The information reflected does not align with what archaeology has revealed^[4]. Therefore, the authenticity of this legend cannot be confirmed. However, the comprehensive analysis of various pieces of information provides us with room for imagination. The legend in “The Spring and Autumn Annals of Mr. Lu” about the Yellow Emperor sending people to create musical scales is very similar to the story of Xun Xun creating musical scales three thousand years later. This resemblance raises the question: Is it merely a coincidence, or did Xun Xun draw inspiration from earlier historical or mythological methods of scale construction? After all, our ancestors had already made bone flutes with semitone relationships around eight or nine thousand years ago. Over the approximately three thousand years between the emergence of bone flutes and the period attributed to the Yellow Emperor, is it possible that bone flutes were gradually replaced by bamboo flutes and that a system of twelve musical scales was developed?

Otherwise, it is unclear where the author of The Spring and Autumn Annals of Mr. Lu got the idea of the Yellow Emperor sending people to create musical scales. This suggests the story may be based on earlier traditions or facts. So, the possibility that the Yellow Emperor was involved in creating musical scales should not be easily dismissed.

3.3. The argument for the creation of the Yellow Emperors music “Qingjiao”

In the legend of the Yellow Emperor’s creation of the music “Qingjiao”, the following information can be used for further study and analysis:

- (1) “Qing Shang”, “Qing Zheng”, and “Qing Jiao” are three different pieces of music.
- (2) “Qingjiao” was written by the Yellow Emperor when he met all kinds of gods and ghosts on the top of Mount Tai.
- (3) The creation of Qingjiao is about 4,500 years ago.
- (4) Shi Kuang believed that “Qingzheng” was a more beautiful music than “Qingshang”, and “Qingjiao” was a music that could control heaven, Earth, man, and god.

To critically interpret the information presented in these historical legends, it is essential to begin with an examination of the concept of “Qing Shang”, which serves as a foundational element in understanding the musical framework of the period. In the history of Chinese music, “Qing Shang” has several interpretations. The first interpretation refers to a specific musical tone. Shang in Shang Sheng refers to the Shang tone in the traditional Chinese pentatonic scale, which includes Gong, Shang, Jiao, Zhi, and Yu. A mode with Shang as its main tone is also known as Shang mode. The term Qing indicates that the pitch is half a step higher than the original note.

Another interpretation of “Qing Shang” refers to Qing Shang music, a form of traditional Chinese music. Traditional Chinese classical music has roughly three stages of development. The first stage is the ancient music before the Three Kingdoms period, primarily characterized by Confucius’ elegant music. The second stage is the Qing Shang Music of the Wei, Jin, Southern and Northern dynasties. The third stage is the Yan Music, also known as Feast Music, which emerged in the early Tang Dynasty from the integration of Qing Shang music with Western regions’ music^[5]. From the above argument, it can be seen that it is not accurate to say that “Qing Shang” is a musical piece in historical legends. A mode system or a folk music system of an era cannot be replaced by the concept of a single musical piece.

The following analysis will focus on the two key concepts of “Qingzheng” and “Qingjiao”, which are essential for understanding the theoretical and cultural dimensions of early Chinese music. According to the previous explanation of “Qing Shang”, it is not difficult to understand “Qing Zheng” and “Qing Jiao”. In the traditional Chinese pentatonic scale, Zheng and Jiao correspond to So and Mi, respectively. “Qing Zheng” and “Qing Jiao” are modes where So and Mi are raised by a half step.

The above analysis also tells us that the concept of “Qing Shang”, “Qing Zheng” and “Qing Jiao” appeared after the 6th century AD, that is, during the Three Kingdoms, Jin, Northern and Southern dynasties period, which is far from the time when the Yellow Emperor was in power. Historically, there is no definitive evidence to confirm whether the Yellow Emperor possessed the talent to compose music. However, based on the preceding analysis, the legend attributing the creation of the music “Qing Jiao” to the Yellow Emperor lacks sufficient credibility.

4. How to understand the contribution of the Yellow Emperor to Chinese music culture in historical legends

This article concludes through argumentation that the legend of the Yellow Emperor making drums is credible; the legend of the Yellow Emperor sending people to create musical scales is theoretically plausible, but there is no evidence to support its authenticity, and the legend of the Yellow Emperor composing the musical piece “Qing Jiao” is not credible. Does this conclusion imply a diminution of the Yellow Emperor’s achievements or a decline in reverence for him? It is important to approach historical legends and the Yellow Emperor’s accomplishments from a historical materialist perspective, employing dialectical and analytical methods to critically examine the relevant historical issues.

The Yellow Emperor held a high position and was highly respected, and his wisdom and abilities undoubtedly played a crucial role in the development of Chinese society. Emperors such as Han Wudi (Liu Che), Tang Taizong (Li Shimin), Song Taizu (Zhao Kuangyin), and Qing Shengzu (Kangxi) each presided over periods of prosperity, making significant contributions to social and economic development as well as cultural advancement. The Yellow Emperor, the progenitor of Chinese civilization, made great contributions. Although later legends have embellished the Yellow Emperor’s image, and it is unlikely that he personally handled every aspect of civilization’s development, he was the leader of that great era, and all the achievements of civilization development are attributed to him. As the renowned Taiwanese scholar Qian Mu said: “The emperor is the founder and pioneer of Chinese civilization. After him, culture gradually developed and was largely established during the Zhou Dynasty. The subsequent figures, including Yao, Shun, Yu, Tang, Wen, Wu, and Duke of Zhou, continued this legacy ^[6].”

5. Conclusion

In summary, when evaluating the achievements of the emperor, excessive focus on the authenticity of specific events within certain legends should be avoided. Instead, his significant contributions to Chinese civilization ought to be recognized and affirmed from a broader historical and cultural perspective. The image of the emperor has transcended historical fact to become a symbol of the collective wisdom of the people and a spiritual icon for the Chinese nation. Thus, the Yellow Emperor endures as an enduring monument in the collective memory of the descendants of Huaxia.

Disclosure statement

The authors declare no conflict of interest.

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Exploring the Design Aesthetic Connotation of “Observing Objects and Taking Images” in Zhouyi

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Abstract: The Book of Changes (Zhouyi) embodies profound cultural wisdom. Its core creative principle, “Observing Objects and Deriving Symbols” (Guan Wu Qu Xiang), provides subsequent generations with invaluable artistic creation concepts and a unique aesthetic framework. Interpreting the Zhouyi from a design aesthetics perspective reveals its extensive content and well-developed system; its concepts concerning material creation encompass nearly all dimensions of traditional design aesthetics thought. This paper elucidates the concept of “Observing Objects and Deriving Symbols” and employs the “Li Hexagram” (Li Gua) from the Zhouyi as a specific case for definition and discussion. Through this exploration of its expressed aesthetic thought, the paper aims to uncover the design aesthetics philosophy within the Zhouyi and its profound influence on the cultural essence and stylistic characteristics of traditional Chinese material creation. It constitutes a significant theme within ancient Chinese design aesthetics.

Keywords: Zhouyi (Book of Changes); Guan Wu Qu Xiang (Observing Objects and Deriving Symbols); Design aesthetics; Aesthetic thought

Online publication: April 26, 2025

1. Introduction

Historically, much of our aesthetic theory has been dominated by Western perspectives, largely excluding Eastern cultural traditions. Such a limited scope renders this understanding of aesthetics incomplete. There is now a growing recognition that culture cannot be monolithic or exclusively Western. It is important to cultivate a multi-cultural perspective. Designers, in particular, need to prioritize the study of aesthetics rooted in Eastern traditions, fostering their mutual enrichment with Western aesthetics.

A key emphasis emerging from the 20th National Congress of the Communist Party of China is the call to “advance the rejuvenation of the Chinese nation on all fronts through a Chinese path to modernization.” Historical trends consistently demonstrate that development tailored to a nation’s unique context ensures its enduring progress. This principle is equally applicable to design.

This paper examines and systematizes the aesthetic thought found within the Zhouyi (The Book of Changes). By harnessing the complementary strengths of both cultural traditions, it seeks to contribute to the advancement and broader recognition of the profound essence of Chinese design aesthetics globally.

2. The relationship between the Zhouyi and design

“The Zhouyi is revered as the ‘primordial classic of all scriptures’ and an extraordinary text encompassing the Dao of Heaven and Earth”^[1]. Although its most immediate purpose served divination practices, the profound philosophies it contains have exerted significant influence on later societal development, human existence, and the evolution of knowledge. Within its content lie rich philosophical, military, economic, political, and artistic thought systems, naturally including pivotal design principles.

The design philosophy embedded in the Zhouyi directly shaped subsequent Chinese artifact creation and craft ideologies, establishing itself as the genesis of traditional Chinese design. The term “design” originates from the Western concept of “Design.” Its formal emergence in China traces to the late 19th and early 20th centuries, when it was termed “Tuan’an” (“seeking solutions”; tu = strategize, an = proposal) or “Gongyi Meishu” (“craft art”). This conceptual continuity aligns with ancient China’s core definition of design as “Zaowu” (artifact creation)—fundamentally addressing human needs through purposeful object-making.

Tracing its developmental roots, ancient Chinese design thought originates from pre-Qin philosophical texts, with the Zhouyi exemplifying the methodology of “Guanwu Quxiang” (observing objects to derive symbolic imagery). This study thus returns to China’s oldest canon, interpreting the Zhouyi’s “Guanwu Quxiang” philosophy to excavate its aesthetic depth. By harnessing the power of traditional culture, the study aims to inspire contemporary designers to reconstruct China’s indigenous aesthetic framework and advance localized design discourse in modern practice.

3. Exposition of fundamental concepts in The Book of Changes

“The Book of Changes (Zhouyi) is regarded as one of China’s oldest texts and also one of the most challenging to comprehend”^[2]. Its difficulty arises from two aspects: first, its ancient origins and linguistic system differ significantly from modern conventions, resulting in obscure and arcane language; second, its primary function as a divinatory text encompasses extensive philosophical content, making its deeper meanings inherently complex.

The Book of Changes evolved from King Wen’s refinement of Fu Xi’s primal Eight Trigrams system. Within it, each “hexagram” (Gua) constitutes a complete unit, totaling 64 hexagrams. Every hexagram is composed of six “lines” (Yao), categorized as either “solid lines” (—, yang yao) or “broken lines” (---, Yin Yao). This structure reveals the text’s emphasis on the balance of complementary opposites (yin and yang), epitomizing the “Doctrine of the Mean” (zhongyong zhi dao) and the “aesthetics of harmony” (Zhonghe Zhi Mei).

In divination, lines are interpreted sequentially from the bottom upward. These six lines are divided into two sets: the lower three lines form one group, and the upper three lines constitute another. This grouping is termed the “image” (Xiang), central to the concept of “observing forms to derive images” (Guan Wu Qu Xiang) discussed in this study. Additionally, adjacent pairs of lines are grouped into three tiers, known as the “Three Talents” (Sancai):

- (1) The lowest two lines symbolize Earth (Di),
- (2) The middle two lines represent Humanity (Ren),
- (3) The uppermost two lines signify Heaven (Tian).

Thus, the hexagram structure embodies the cosmic triad of “Heaven, Earth, and Humanity.” The hexagram Ji Ji (“After Completion”) exemplifies this division of “image” and “Three Talents” (**Figure 1**).

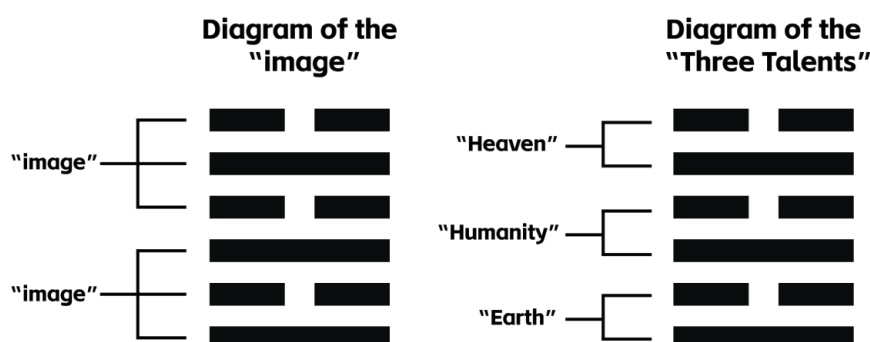


Figure 1. Division of “Xiang” and “Three Talents” in the Book of Changes.

“Graphically, the 64 hexagrams comprise distinct six-line configurations. Much like the symbolic nature of the primal trigrams, these hexagrams metaphorically represent 64 categories of phenomena. Structurally, their symbolic forms adhere to specific combinatorial rules and sequences, while their inherent meanings follow a coherent logical framework. The establishment of hexagram forms gives rise to hexagram statements (Guaci), commentaries (Wenyan), and appended judgments (Xiici), collectively forming the integrated system of the Book of Changes. Here, graphic design serves as the foundational origin. From a design perspective, this represents one of ancient China’s most monumental design achievements”^[3].

4. “Observing Objects to Derive Images” in design aesthetics

The core concept of “observing objects to derive images” is documented in Xici Zhuan: “In ancient times, when Bao Xi ruled the world, he looked upward to observe the images in heaven, looked downward to examine the patterns on earth, observed the markings of birds and beasts and the adaptations of the land. Drawing from near, he took symbols from his own body; drawing from afar, he took symbols from objects. Thus, he created the Eight Trigrams to comprehend the virtues of divine intelligence and classify the nature of all things.”

5. Key philosophical dimensions

5.1. Observation as dynamic foundation

Observation transcends mere visual perception; it involves dynamically scrutinizing the sensible manifestations of phenomena and their inherent laws. This process is constrained by three interconnected factors: timing, geographical advantage, and human harmony—collectively termed the “Three Talents” in the Book of Changes. These dimensions integrate moral, rational, and philosophical considerations.

In design practice, this holistic observation crystallizes into a systematic design methodology. The Kaogong Ji explicitly states: “Examining curvature and assessing configuration to harness the five materials for crafting tools—this defines the work of artisans”^[4]. Here, “examining” embodies observation, emphasizing that artisans must meticulously analyze an object’s characteristics to formulate rational solutions.

5.2. Image” beyond literal representation

While “objects” refer to tangible entities, “image” requires deeper contextualization. Xici Zhuan clarifies: “An ‘image’ is a semblance.” It encompasses both mimetic depictions of observed reality and abstract distillations of essential qualities^[5].

Crucially, Xiang diverges from Western “artistic imagery,” which relies on aesthetic subjectivity. Instead, it functions as a dual-natured construct: objective reflection and conceptual refinement, transcending purely aesthetic boundaries.

5.3. Derivation as creative synthesis

Deriving images synthesizes observation with creative interpretation. Fu Xi's derivation of the Eight Trigrams exemplifies how empirical analysis of natural phenomena—sky, thunder, water, fire, marsh, wind, mountain, earth—evolves into symbolic systems. King Wen later expanded these into the 64 hexagrams of the Zhouyi.

This process unifies rational cognition (classifying laws) and intuitive creation (symbolic expression), paralleling Western discourses on “beauty and truth.” Such dialectics profoundly influenced the Chinese literati's aesthetic philosophy and became foundational to traditional ornamentation ^[6]. Every classical decorative pattern traces its lineage to this synthesis.

As the genesis of ancient Chinese aesthetics, “observing objects to derive images” centers on Xiang as both objective and outcome. The transition from observation to derivation completes the pre-material design conception, encompassing:

- (1) Cognitive mapping: Systematizing natural/social patterns;
- (2) Creative abstraction: Transforming observation into symbolic language;
- (3) Ethical integration: Harmonizing human, temporal, and spatial factors.

This framework established enduring paradigms for design thinking, where artifacts embody cosmic principles (e.g., ritual bronzes mirroring heaven-earth hierarchies) and social ethics (e.g., furniture reflecting Confucian order). Its legacy continues to radiate enduring brilliance in East Asian design philosophy.

6. The Li hexagram: The aesthetics of interplay between solid and void

The Li hexagram is the thirtieth hexagram in the Book of Changes (Zhouyi). Both its inner (lower) and outer (upper) trigrams are “Li”, hence its name. The “Li” trigram symbolizes fire (see Fig. 2). This hexagram is selected for its profound connection to ancient craftsmanship and aesthetic philosophy. As noted by Zong Baihua, “The Li hexagram is intrinsically linked to ancient Chinese architectural art, reflecting the relationship between art and productive labor. The hexagram's aesthetics are tied to crafted objects (Qi). These objects embody human creativity” ^[7]. Thus, discussions of design and design aesthetics cannot overlook the Li hexagram (Figure 2).

**Diagram of the
“Li trigram”**



Figure 2. Diagram of the “Li trigram.”

6.1. Symmetry: Foundational harmony

The hexagram's structure reveals symmetrical beauty, as both upper and lower trigrams mirror each other. In ancient China, symmetry was revered as a unique aesthetic principle, prominently featured in the ornamentation of Shang and Zhou dynasty bronze ware ^[8]. Furniture, decorative objects, and sculptures were often arranged in symmetrical pairs. This principle extended to classical garden architecture, where balance governed spatial composition and visual rhythm.

6.2. Adornment (Li): Unity of form and substance

Zhu Xi's Zhouyi Benyi states: "Li means li (adornment)," highlighting objects as vessels of artistic expression. The Erya dictionary further defines "li as attachment." Ancient thinkers regarded adornments on objects as inherently beautiful, emphasizing harmony between attachment and beauty^[9]. The Li hexagram's structure—broken (Yin) lines at the second and fifth positions flanked by solid (Yang) lines—symbolizes this balance. The yin lines must "adhere" to Yang lines to achieve equilibrium, echoing the concept of "central harmony" and perfect unity.

In aesthetics, this translates to the relationship between ornamentation (wén) and substance (zhì). Ornamentation must complement substance without overshadowing it—akin to Yin's yielding nature. Substance, as the foundation, must be robust yet restrained. Only when ornamentation aligns with appropriate materiality does beauty emerge, allowing both to coexist synergistically.

6.3. Interplay of solid and void: Transparency as metaphor

The broken (Yin) lines at positions two and five represent "void," while the solid (Yang) lines signify "solidity." This structure epitomizes solidity containing void, evoking the imagery of latticed windows that filter light, a metaphor for permeability. As Zong Baihua observed, this aesthetic mirrors ancient Chinese architectural philosophy: "separation yet connection with the external world". The dialectic of solid-void permeates all artistic creation. Concepts like "reserved blank space" and "breathing room" in design emphasize the necessity of void^[10]. It grants work transparency, enabling integration with their surroundings and achieving universal harmony.

7. Conclusion

Throughout history, the concept of "observing objects to derive forms" has been extensively applied in product design and production. From ancient Chinese pictograms to bronze vessels and porcelain, and further to creations featuring mountains, rivers, birds, beasts, flowers, and trees, this philosophy remains deeply embedded in artistic practice. Its application manifests in two primary aspects: firstly, transitioning from one form to another—a direct visual abstraction that extracts the essence of "objects" while preserving their fundamental structure and elevating their external attributes, representing the most widely used and effective method; secondly, evolving from form to meaning, where the shift transcends mere graphical transformation to embody conceptual and symbolic interpretation, requiring deep excavation of spiritual connotations from diverse entities to yield symbolic cultural products. Through creative endeavors, we advance from object to form and ultimately to meaning.

In summary, "observing objects to derive forms" has endured across eras with timeless vitality. As designers, we should fully leverage this scientifically grounded creative philosophy. China's extensive history has yielded exceptional works and theories, offering rich references and robust support for subsequent artistic creation. The concept, rooted in the Zhouyi, embodies a distinctive Chinese artistic ethos. Guided by this aesthetic principle, traditional Chinese decorative patterns emerged, integrating vivid and harmonious concrete symbols alongside classical creative methodologies. These elements hold profound significance for modern design; only through rigorous study, analysis, and revitalization of their underlying classical aesthetics can China's traditional heritage radiate renewed brilliance.

Disclosure statement

The author declares no conflict of interest.

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Analysis of the Folk Culture and Spiritual Beliefs of Shanxi Paper-cutting

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Abstract: As one of the traditional Chinese handicrafts, Shanxi paper-cutting carries a wealth of folk culture and spiritual beliefs. By studying Shanxi paper-cutting, this paper aims to reveal its importance in folk culture and spiritual beliefs. Firstly, this paper will discuss the application of Shanxi paper-cutting in rural funeral ceremonies and traditional festivals, and analyze its mysterious meaning in expressing mourning for the deceased and sacrificial ceremonies. Secondly, this paper will analyze the decorative application of paper-cutting as a traditional handicraft in religious temple fairs and sacrificial activities, and dig deep into its close connection with local beliefs and god worship. Finally, this paper will focus on the inheritance of paper-cutting in modern life, and analyze how it integrates new cultural elements into contemporary society to provide spiritual comfort for the public. Through the analysis of the folk culture connotation of Shanxi paper-cutting, this paper aims to present the profound heritage of this traditional craft and reveal its irreplaceable role in the inheritance of folk culture and spiritual beliefs.

Keywords: Shanxi paper-cutting; Folk culture; Spiritual beliefs; Inheritance

Online publication: April 26, 2025

1. The history and tradition of paper-cutting

Shanxi paper-cutting, as one of the traditional Chinese handicrafts, has a long history and rich cultural connotation. Its origins can be traced back to ancient times, and it has undergone a long process of development and has become a unique art form in Shanxi. In the development of Chinese paper-cutting art, Shanxi paper-cutting occupies a place. Shanxi paper-cutting is represented by Guangling paper-cutting, and its history can be traced back to the legend of King Zhou Cheng of the Zhou Dynasty ^[1]. Early Shanxi paper-cutting was often closely linked to religion and sacrificial activities. In ancient societies, people expressed their reverence for the gods and their yearning for life through paper-cutting. This tradition continues to this day and has become a treasure of Shanxi culture. During the Cultural Revolution, paper-cut works were often neglected to some extent because they often involved religious elements. However, after the reform and opening up, Shanxi paper-cutting has been re-emphasized, not only in the local respect, but also gradually moving towards the international stage, showing the unique charm of traditional Chinese culture.

Shanxi paper-cutting is widely used in local culture and is properly integrated with the local folk life of Shanxi, and its picture has a strong local flavor. In traditional festivals and religious ceremonies, people often use paper cutouts to decorate. These paper-cut works not only have a strong religious color, but also incorporate the local people's yearning

for a better life. In addition, in family life, Shanxi paper-cutting has become a culturally rich decoration, creating a unique atmosphere for the family.

2. The characteristics of folk paper-cutting

Due to its unique regional reasons, Shanxi Province has successfully preserved many traditional cultures, among which the style and characteristics of Shanxi paper-cutting are particularly prominent. Shanxi's paper-cut works feature people, animals, and plants, and the scenes often depict colorful scenes of festival celebrations or family life. Interestingly, these paper-cutting artists did not receive a Western art education, but they were able to skillfully present three-dimensional graphics on a flat surface through their thinking.

The structure of Shanxi's paper-cut works is unique and weird, but it exudes a primitive and pure sense of pattern art. This unique artistic expression shows the unique aesthetic concept and creativity of paper-cutting artists. Through their unique knife techniques and compositions, they successfully transform ordinary life scenes and traditional culture into paper-cut works of art full of vitality and profound connotation^[2]. These paper-cut works are known for their unique visual effects and distinctive Shanxi cultural characteristics. Despite the lack of influence from Western art education, paper-cutting artists incorporate their unique understanding of life, festivals, and family into their works through traditional techniques. This makes Shanxi paper-cutting unique in the entire field of paper-cutting art and has become a vivid embodiment of traditional cultural inheritance.

3. The folk cultural connotation of paper-cutting

3.1. The status of paper-cutting in traditional festivals

Shanxi paper-cutting is widely used in the decoration of places in traditional festivals. In traditional festivals such as the Spring Festival, Lantern Festival, and Chung Yeung Festival, people often hang or place paper-cut works in their homes, temple fairs, markets and other places. These paper-cut works are often festive in theme, with colorful patterns to create a cheerful and peaceful atmosphere and add to the festive atmosphere. As an art form rich in cultural connotation, paper-cutting conveys people's pursuit of a better life and a better expectation for the future. In traditional festivals, people express various blessings and prayers for family happiness, career success, and good health through paper cutting. This traditional custom of expressing emotions through paper-cutting makes paper-cutting play an important role in festivals^[3,4].

3.2 The application of paper-cutting in religious sacrifice ceremonies

In religious ceremonies, Shanxi paper-cutting is often used to worship gods. As a beautiful handicraft, paper-cutting is used to decorate places of worship and dedicate beautiful patterns to the gods^[5]. These cut-outs may include symbols, motifs associated with the gods, and serve as decorations and expressions of reverence. Paper-cut works in religious ceremonies are also often used to express blessings and wishes to the gods. Paper-cut patterns often contain auspicious and peaceful meanings, and people pray to the gods for peace, happiness, health, etc. As a visual form, paper-cutting helps to deepen the devotee's understanding of the content of the prayer. The application of Shanxi paper-cutting in religious ceremonies is not only a sacrificial behavior, but also a promotion of religious culture. The patterns of paper-cut works may incorporate elements such as religious classics, myths and legends, and show the connotation of religious culture through the form of art, and provide a way for believers to participate in religious ceremonies (**Figure 1**).



Figure 1. Works by Shanxi Zhongyang paper-cutting artist Wang Jiru.

In rural Shanxi funeral ceremonies, white daylily paper is used to make “flags,” which are shaped and hung on the site through a paper-cutting process, a traditional ritual element that helps indicate the gender of the deceased. At the same time, yellow daylily paper is used to make paper money, which plays the role of mourning the deceased and paying tribute to ghosts and spirits during funerals.

These paper-cut “flags” and paper money not only show the profound cultural traditions of Shanxi’s rural areas, but also carry respect for the deceased and reverence for supernatural powers. The art of decoupage skillfully transforms paper into an image with a specific meaning, and through this unique expression, people convey feelings of remembrance of the deceased and prayers for the afterlife in funeral ceremonies.

The application of this traditional paper-cutting is not only unique in form, but also contains a deep understanding of life and death, and the relationship between man and God. Through “flags” and paper money made from paper cuts, the inhabitants of rural Shanxi continue this ancient and mysterious ritual and pass on cultural traditions that have been passed down from generation to generation. It also reflects the reverence for life and death, as well as the belief in supernatural beings. These paper-cut works of art are not only a material expression, but also the inheritance of cultural spirit, adding a profound cultural connotation to the funeral ceremonies in rural Shanxi.

3.3. Paper-cut symbolic patterns and their beautiful meanings

As a treasure of traditional Chinese culture, Shanxi paper-cutting often contains profound meanings and symbols. Among them, the bat is given an auspicious symbol in Shanxi paper-cutting. This is because the pronunciation of “bat” (fú) is similar to “good fortune” (fù), so the bat motif often symbolizes happiness and auspiciousness^[6]. This element is often found in traditional festivals to bring blessings and good wishes. In Shanxi paper-cutting, the Fu character pattern is also the most classic and common, representing happiness, auspiciousness and good luck. As a strong symbol of wishes,

the word blessing often appears in the decoration of festivals and the Chinese New Year, creating a happy and peaceful atmosphere for people.

In wedding ceremonies, people often use dragon and phoenix motifs, because dragons and phoenixes are mythical beasts in traditional Chinese culture, representing power and auspiciousness, respectively. These patterns not only highlight the solemnity and festivity of the wedding, but also carry the best wishes for a happy marriage for the couple. Double happiness motifs, as well as pomegranate motifs that symbolize many children and grandchildren, are also commonly found in Shanxi paper-cutting, expressing good wishes for the happiness of the couple and the prosperity of the family. These patterns, rich in cultural connotation, vividly convey people's yearning and expectation for a better life through the paper-cutting process^[7].

Through its unique artistic language, Shanxi paper-cutting skillfully integrates meaning and symbolism into the pattern, which not only beautifies the environment but also inherits the profound cultural heritage and injects poetry and ritual into people's lives. It is not only an art form, but also a way of inheritance and expression of traditional culture, through which people convey deep emotions for a better life and blessings.

4. The interaction between paper-cutting and spiritual beliefs

As a traditional handicraft, paper-cutting presents a variety of mysterious and beautiful patterns with its exquisite skills, fully demonstrating the Shanxi people's respect and piety to the gods. These paper-cut patterns often contain auspicious and happy meanings, and by decorating the sacrificial places, they convey blessings to the gods and hope for auspiciousness and well-being. Paper-cutting is seen as a bridge between humans and gods, and through its expression, people convey their thoughts and reverence for the gods, deepening the ritual and sacredness of the rituals.

On religious occasions, people would use paper cuts to decorate places of worship, such as shrines, altars, etc. The choice of decoupage patterns is usually related to the attributes of the deity, the purpose of the sacrifice, to present a suitable theme. Offerings in rituals, such as flowers and fruits, are often paired with exquisite paper cuts to make the offerings more solemn and beautiful. In some religious celebrations, paper-cutting may be part of the performance. Skilled paper-cutting artists demonstrate the process of paper-cutting during the sacrificial ceremony, guiding devotees to better understand and participate in the sacrificial activities. This move not only added an artistic element to the sacrifice but also allowed believers to experience the essence of traditional culture and promote the charm of traditional Chinese culture^[8].

By expressing spiritual beliefs through paper-cutting, the people of Shanxi have inherited and demonstrated the profound connotations of traditional Chinese culture in their sacrificial activities. The artistry and sense of ritual of paper-cutting make religious ceremonies more solemn and beautiful, and also inject richer cultural connotations into beliefs.

5. The inheritance of Shanxi paper-cutting in modern life

As a treasure of traditional Chinese culture, Shanxi paper-cutting has been inherited and developed in modern life. In Datong City, Shanxi Province, during the Dragon Boat Festival, the folk still retain many traditional customs, including the habit of sticking horse talismans, scorpion talismans and ingots. These symbols, usually woven from five-colored paper, are widely used in every household to ward off evil spirits and pray for good fortune and peace. This tradition has a long history and has been passed down from generation to generation, reflecting the local people's desire to ward off evil spirits^[9].

In particular, the "double chicken picture" has become a unique symbol of the Dragon Boat Festival. In this pattern, two energetic chickens step on five poisons or mouthworms. As a masculine animal, the chicken is a symbol of auspiciousness and vitality, and is also regarded as a sacred object to ward off evil spirits and drive away ghosts in the traditional culture of the Datong area. The scene of the "two chickens" devouring the five poisons in the picture further deepens the meaning of fighting against the evil forces and places people's good wishes for a peaceful and peaceful life.

These customs reflect the local people's respect and love for traditional culture, and integrate the art of paper-cutting into daily life, making it a ritualistic and mysterious way of expression. The various symbols made through paper-cutting not only reflect the belief of Shanxi people in praying for blessings and peace, but also inherit the long-standing cultural tradition. These traditional customs have been preserved and carried forward in contemporary society, contributing to the unique charm of Shanxi's cultural inheritance and diversified development.

At the same time, Shanxi paper-cutting has been widely publicized in contemporary society through a variety of media. Traditional paper-cut works are displayed to the audience through museums, exhibitions, and cultural festivals, so that more people can understand and appreciate this art form. At the same time, with the help of the Internet platform, Shanxi paper-cutting artists share their works with global audiences, enhancing the international dissemination of traditional culture^[10].

In the field of design, Shanxi paper-cutting has found new applications. The patterns and shapes of paper-cutting are often used in modern product design, packaging design and other fields, injecting new fashion elements into traditional culture and giving products a deeper cultural connotation. This kind of fusion and innovation not only inherits the tradition, but also makes the art of paper-cutting closer to modern life.

In addition, Shanxi paper-cutting has emerged in the cultural and creative industries. More and more paper-cutting artists combine traditional skills with modern cultural elements to create works that have both a strong Shanxi style and the characteristics of the times. These novel paper-cut works have injected fresh vitality into the cultural and creative market, promoted the development of Shanxi's paper-cutting industry, and also promoted the development of Shanxi's tourism industry, so that more and more people know Shanxi's traditional culture and ancient architecture.

In general, Shanxi paper-cutting has been inherited in modern life, injecting traditional culture into modern society through a variety of ways and means, showing its vitality and charm in contemporary times.

Disclosure statement

The author declares no conflict of interest.

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Research and Practice on Establishing a Value-added Evaluation System for the Academic Achievements of Engineering Undergraduates under the OBE Concept

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Abstract: Based on the Outcome-Based Education (OBE) concept and value-added evaluation theory, this study systematically examines the critical components of engineering students' academic achievement by leveraging the 12 graduate outcomes of China engineering education accreditation as a framework. Through an in-depth review of relevant literature and expert consultations, a comprehensive value-added evaluation questionnaire system with three-level indicators was constructed. This system is intended to function as a practical and reliable instrument for universities to assess the progress and attainment of students' academic achievements, thereby supporting and guiding the reform of talent cultivation practices.

Keywords: OBE; Value-added evaluation; Academic achievement

Online publication: April 26, 2025

1. New trends in higher education quality evaluation under the influence of the OBE concept

The concept of OBE, which originated in the United States in the 1970s, has gradually evolved into the dominant educational philosophy of the 21st century. The OBE philosophy emphasizes the importance of student learning outcomes, a student-centered approach, and continuous improvement. Educational activities are based on the expected learning outcomes of students, and teaching design and evaluation are carried out around the abilities and qualities that students should achieve. Influenced by the OBE philosophy, the evaluation of higher education quality has gradually shifted from a process-oriented approach to an outcome-oriented approach, focusing on the “output” of higher education, namely, students' learning effectiveness. Scholars believe that the outcome-oriented education philosophy can more directly and deeply reveal the essence of higher education quality, and the evaluation effect is more effective^[1]. The Accreditation Board for Engineering and Technology (ABET) has fully adopted the OBE philosophy and integrated it into the engineering education accreditation standards^[2]. Countries such as the United States, Japan, the United Kingdom, Australia, and Canada have applied the outcome-oriented philosophy and issued corresponding assessment guidelines, accreditation standards, and degree requirements, all highlighting the requirements for measuring and evaluating students' learning outcomes^[3].

Academic achievement, broadly, refers to learning outcomes and performance, encompassing knowledge, skills, behaviors, attitudes, and thinking habits learners acquire after completing the learning process. It can be evaluated through cognition, affect, and practical application ^[4]. Under the OBE framework, the academic achievements of college students in higher education institutions can be categorized into three levels:

- (1) At the institutional level, this refers to the accomplishments graduates should achieve in societal and professional contexts within five years of graduation. These align with the institution's overarching talent development goals, focusing on a macro perspective;
- (2) The major level, which focuses on the knowledge, skills, and competencies that students are expected to acquire upon graduation. These are usually defined as the program-specific graduation requirements, which are measurable and operational;
- (3) The course level, referring to the learning outcomes students attain after completing a specific course, is often represented by the achievement of course objectives. Since institution-level goals are long-term and broad, while course-level objectives are fragmented and detailed, evaluating undergraduate academic achievement focuses on the major level, specifically assessing graduation requirements. These requirements define the key benchmarks for knowledge, skills, and competencies students should meet upon graduation, reflecting both student development quality and institutional education effectiveness ^[5].

The *Washington Accord* has established a framework comprising 12 graduate outcomes that undergraduate engineering students are expected to achieve by the time they graduate. Each accredited program can develop more specific graduation requirements based on this framework, provided that these requirements fully encompass the content of the 12 core outcomes.

Under the OBE, the focus of evaluation transitions from the teaching process to students' learning outcomes. This shift drives higher education institutions to prioritize talent cultivation quality and ensure that students achieve expected academic outcomes. The "outcome-oriented" evaluation approach also generates a series of profound impacts: First, it promotes personalized evaluation. As the OBE concept focuses on individual development, evaluations assess each graduate's academic achievements at graduation, providing insight into students' learning states and enabling tailored teaching support. This encourages students to prioritize self-development and achievement during learning. Second, it places greater emphasis on competency evaluation. Under the OBE framework, the evaluation system focuses more on students' high-order competencies, such as solving complex problems, critical thinking, and teamwork skills. Third, it promotes self-assessment. Among the ten major challenges identified by the U.S. National Learning Outcomes Assessment Center in output evaluation is "enhancing students' self-assessment to optimize the learning process" ^[6]. Students must be able to actively monitor and assess their learning progress and outcomes, as self-evaluation is crucial for lifelong learning and career development.

2. The migration and application of value-added evaluation in the field of college students' academic evaluation

OBE has facilitated the transformation of educational evaluation concepts and established an evaluation model centered on learning outcomes. The assessment of students' learning outcomes now serves as the core component of higher education quality evaluation. However, it is important to note that the "outcome orientation" in OBE does not equate to "result orientation," which focuses solely on the final result while neglecting the process. Instead, OBE emphasizes the logical coherence of the entire process leading to the achievement of outcomes. It is essential not only to define the outcomes students are expected to achieve but also to understand how to guide them toward achieving these outcomes ^[7]. The process of achieving outcomes and its assurance are integral to the OBE framework and should be incorporated into the evaluation criteria.

There is currently no unified standard for evaluating graduation requirement achievement. Disciplines typically

use both quantitative and qualitative methods. Quantitative methods analyze course grades to calculate indicator point attainment through a graduation requirement matrix. Qualitative methods involve surveys and interviews, where recent graduates subjectively assess their achievement of each indicator.

Current methods, whether quantitative or qualitative, are summative assessments that evaluate academic achievement at graduation. While they provide feedback on learning outcomes, they lack ongoing process monitoring and hinder real-time improvement. These methods often focus on institutional performance rather than individual student development. Monitoring learning outcome changes during student development helps track progress and improve teaching, aligning with the purpose of value-added evaluation.

Value-Added evaluation assesses educational effectiveness by measuring the added value educational activities provide to students' expected learning outcomes. It primarily tracks changes in college students from enrollment to graduation or assesses academic gains after completing a study segment compared to its onset. This method integrates evaluations of learning initiation, process, and outcomes ^[8]. Applying value-added evaluation to academic achievement evaluation enhances the effectiveness of such evaluations.

2.1. Value-added evaluation helps students clarify their academic achievement goals

OBE emphasizes outcome orientation, and students' academic achievements are gradually accumulated throughout their four years of study. Implementing value-added evaluation facilitates the prediction of learning outcome achievement. By measuring changes in students' academic performance between two distinct time points and providing feedback on the evaluation results, this approach can not only help students gain a comprehensive understanding of the academic achievements they are expected to attain, enabling them to become "purposeful learners," but also offer insights into the extent to which preset goals have been achieved for both institutions and individual students ^[9].

2.2. Value-added evaluation is conducive to students' self-improvement and self-actualization

"Student-centeredness" and a focus on students' progress are the shared principles of both OBE and value-added evaluation. Value-added evaluation involves self-comparison for individual students rather than inter-student comparison, emphasizing personal growth and self-improvement over ranking and elimination. If academic early warning is a negative list for academic achievements, value-added evaluation is a positive one, like creating a Gantt chart for learning. It highlights changes in student outcomes through quantitative analysis and progress visualization, serving as a strong motivational tool ^[10].

2.3. Value-added evaluation is conducive to the effectiveness and timeliness of continuous improvement

OBE emphasizes continuous improvement. Consequently, identifying what to improve and how to improve it becomes a critical concern. Value-added evaluation examines changes at both institutional and individual levels while focusing on the impact of various factors on academic achievement development ^[11]. Its findings can serve as a foundation for schools to implement continuous improvement initiatives. For example, if value-added evaluation reveals that students' innovation and practical skills are insufficiently developed, schools can adopt targeted strategies, such as reforming the experimental teaching framework, introducing integrated and innovative experimental courses, and expanding extracurricular innovation and practice opportunities.

Against the backdrop of OBE, constructing a scientific value-added evaluation system is of great significance for guiding teaching improvement, enhancing educational quality, and promoting students' comprehensive development.

3. Framework design for the value-added evaluation system of engineering students' academic achievement

3.1. Defining evaluation objectives

The core objective of the evaluation is to guide universities in optimizing their educational training systems, not to facilitate horizontal comparisons across colleges or majors. Therefore, the research focuses on a detailed examination of the attainment of various indicators during the training process, specifically, students' progress in meeting graduation requirements, to provide a comprehensive understanding of the effectiveness of talent cultivation.

3.2. Clarifying assessment content

Based on the outcome-oriented principle of OBE, the academic achievements of engineering students are primarily embodied in the graduation requirements. Consequently, this study designs the index system using the 12 graduate outcomes outlined in the Engineering Education Accreditation Criteria (2022 Edition) as a framework. This approach not only adequately reflects the professional expectations for students but also informs the reform of university talent development through measurable outcomes.

3.3. Determining assessment methods

Student academic achievement evaluation can be categorized into four types based on the content and form of the evaluation^[12]. The first type involves direct assessment of professional knowledge and skills through course examination results. The second type involves indirect assessment of professional knowledge and skills attainment using indicators such as credit accumulation and graduation rates. For example, Shanghai Ranking Consultancy employs the quality score of new student intake as the independent variable and the postgraduate admission rate of the same cohort as the dependent variable to construct a linear regression model. This model calculates the expected value of the postgraduate admission rate and compares it with the actual value to derive the residual. The standardized residual is then used to compute the value-added standard score for undergraduate students^[13]. The third type employs standardized tests to evaluate general competencies, such as the U.S. Collegiate Assessment of Academic Proficiency (CAAP). The fourth type utilizes self-report scales or questionnaires on non-cognitive abilities, where students provide feedback on their learning experiences, outcomes and satisfaction to assess academic achievement. Examples include the U.S. National Survey of Student Engagement (NSSE) and Tsinghua University's NSSE-China survey. This method is currently widely adopted by many universities^[14], as scholars generally consider it significant for improving university teaching and administration^[15]. After analyzing the pros and cons of the four approaches, the study concludes that, from the university administrators' perspective, the self-report questionnaire on non-cognitive abilities best aligns with the research objectives.

3.4. Design the index system framework

A reasonable evaluation of academic achievement requires clear evaluation dimensions and a specific indicator system. This provides the logical foundation and critical reference for effective and efficient evaluations^[16]. The 12 graduate outcomes also include 38 observation points. Without appropriate dimension classification, analyzing and organizing questionnaire results in later stages becomes difficult, requiring further refinement of the dimensional structure.

Scholars both domestically and internationally have proposed diverse approaches to categorizing the dimensions of college students' academic achievements. For instance, Professor Shi Jinghuan from Tsinghua University classifies the growth of college students into two primary dimensions: Academic development involves knowledge acquisition, skill development, scientific thinking, and methodological training for college students. Social development focuses on their ability to manage relationships, establish self-identity, and cultivate social responsibility^[17]. In the United States, the Educational Testing Service (ETS) evaluates student learning outcomes across dimensions including general education skills, career preparation skills, specific leadership skills, soft skills, and student engagement. Meanwhile, the American College Testing (ACT), categorizes these dimensions into core academic skills, educational and career navigation skills,

cross-disciplinary skills, and behavioral skills^[18]. Based on the above findings, the first-level indicators can be divided into cognitive and non-cognitive abilities, or academic and social development.

Cognitive abilities primarily pertain to students' academic accomplishments, encompassing high-order thinking skills, research competencies, and professional qualities. Non-cognitive abilities focus on students' social development, involving civic literacy and lifelong developmental capabilities. The correspondence between these abilities and the 12 graduate outcomes of engineering accreditation is presented in **Table 1**.

Table 1. Framework of the evaluation questionnaire index system for academic achievement enhancement of engineering college students

Dimensions	Categories	12 graduate outcomes corresponding to
Cognitive abilities (Academic development)	Higher-order thinking ability	Engineering knowledge, Problem analysis, Design/development of solutions
	Research capabilities	Investigation, Modern tool usage
	Professionalism	Engineer and society, Environment and sustainability, Professional ethics, Project management
Non-cognitive ability (social development)	Civic literacy	Individual and team work, Communication
	Autonomous development	Lifelong learning

3.5. The demonstration and optimization of the indicator system

To validate and refine the evaluation indicators, the research team solicited feedback from management departments and faculty involved in engineering education accreditation. Grounded in the evaluation objectives and principles, expert opinions were systematically integrated and analyzed. Based on the discussion outcomes, the third level of the index system was enhanced. The original 12 graduate outcomes were restructured into 18 items, with scenario-based and representative questions designed to improve the questionnaire's operability and relevance. This process established a comprehensive three-level index system structure. Below is a detailed elaboration of the third-level indicator design:

3.5.1. Higher-order thinking ability

The graduate outcomes for "Engineering knowledge," "Problem analysis," and "Design/development of solutions" emphasize the integration of "mathematics, natural science, and engineering fundamentals" as well as the resolution of complex engineering problems. These also incorporate elements of innovative thinking. Consequently, this dimension includes four items: "Knowledge Integration," "Problem Analysis," "Design and Innovative Thinking," and "Problem Solving." For instance, the question for "Knowledge Integration" reads: "When completing assignments or addressing practical problems, I can synthesize knowledge across different courses for analysis."

3.5.2. Research capabilities

This dimension aligns with "Investigation" and "Modern tool usage." Specifically, "Investigation" highlights the application of scientific principles, the utilization of modern tools, and a comprehensive evaluation of existing information. Correspondingly, the assessment items include "Quantitative Reasoning," "Technical Application," and "Critical Thinking." For example, the question for "Quantitative Reasoning" is: "I can independently analyze numerical data (e.g., charts, experimental results) and utilize the derived information to solve problems." Meanwhile, "Critical Thinking" refers to students' capacity to critically evaluate existing knowledge and discern truth from falsehood.

3.5.3. Professionalism

This dimension corresponds to “Engineering and society,” “Environment and sustainability,” “Professional Ethics,” and “Project management” in the graduation requirements. It primarily encompasses societal, environmental, ethical, and managerial knowledge relevant to the engineering field—qualities essential for engineering students. Four items were thus designed: “Social Responsibility,” “Sustainable Development Concept and Action,” “Professional Ethics,” and “Project Management.”

3.5.4. Civic literacy

This dimension aligns with “Individual and team work” and “Communication.” These emphasize interpersonal dynamics, teamwork, writing and communication skills, and cross-cultural competencies. These are not only critical for engineering students but also foundational qualities for all citizens. Five items were developed: “Teamwork,” “Communication,” “Reading Ability,” “Expression Ability,” and “Cross-cultural Competence.”

3.5.5. Autonomous development

This dimension corresponds to “Lifelong learning” in the graduation requirements. With its two key aspects, “learning” and “adaptation,” two items were identified: “Lifelong Learning Concept” and “Environmental Adaptability.” The questionnaire focuses on the “Lifelong Learning Concept” due to college students’ current learning-centric stage, emphasizing the examination of their conceptual understanding. The corresponding question is: “I recognize that knowledge evolves rapidly and believe that continuous learning throughout life is essential, which I strive to implement in practice.”

3.6. The next step is to refine the plan

In December 2024, CEEAA Releases Engineering Education Accreditation Criteria (2024 Edition). To ensure that the evaluation system remains aligned with the evolving landscape of teaching practices and effectively supports the enhancement of talent cultivation quality and efficiency, timely adjustments and optimizations to the evaluation system are necessary.

Funding

General Project of Guangxi Education Science Planning Education Evaluation Reform Special Topic, “Research on Value-added Evaluation of Undergraduate Academic Development Based on the Concept of Outcome-oriented Education” (Project No.: 2022ZJY459)

Disclosure statement

The authors declare no conflict of interest.

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Research on the Problems and Countermeasures in the Practical Teaching of Concrete Foundation Experiments under the Background of New Engineering Education

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Abstract: The Master Teacher Studio of basic education came into being with the new curriculum reform, which has become a new mechanism for the construction of teaching staff in the social situation in China. As a brand-new way in the construction of teaching staff in the new era, through reviewing the relevant research, it's found that the focus of academic circles on Master Teacher Studio is mainly in four aspects: clarifying the conceptual boundary, seeking theoretical support, defining the functional orientation and exploring status quo of development. The exploration of the research process is not only a process of summary, but also a process of reflection. By reviewing relevant research, reflecting on the problems that have appeared in the process of building Master Teacher Studio in basic education, clarifying the development path of Master Teacher Studio and further affirming its advantages to the construction of teaching staff in China contexts.

Keywords: Master teacher; Master Teacher Studio; Construction of teaching staff; Teachers' professional development

Online publication: April 26, 2025

1. Introduction

The new concept of engineering education comes into being with the rapid progress of science, technology and the continuous innovation in the field of engineering. The core of this concept is to focus on the cross-border integration of disciplines and strengthen the training of practical innovation ability. The Engineering practice training education system is built to adapt to social development^[1]. In the field of civil engineering, concrete as a cornerstone building material, its performance optimization and application innovation are directly related to the safety, durability, and economic benefits of buildings. Therefore, "Concrete foundation experiment" as an indispensable practical course of inorganic non-metallic materials engineering, its importance has become increasingly prominent. In the context of new engineering education, the teaching mode of the traditional concrete basic experiment course is faced with severe challenges. It mainly focuses too much on theoretical teaching and basic operation, and cannot meet the urgent demand of the industry for engineering and technical talents with high quality and high innovation ability^[2]. In view of this, the research team will adopt diversified research methods, including comprehensive literature analysis, extensive questionnaire survey, selected case analysis, and in-depth experimental research, etc.. At present, the content of experimental teaching in most colleges and universities

in China is outdated and out of step with engineering practice and the frontier of discipline development^[3]. Therefore, the teaching team reformed the concrete foundation experiment course. New technologies need to be integrated into the teaching content, such as BIM and prefabricated concrete structures. At the same time, the use of the “Internet +” platform and rich teaching means to improve the teaching effect.

Based on this, the author’s team will closely integrate the new engineering education concept. They carefully designed and implemented a series of experimental teaching reform measures. The results are verified by comparative experimental science. This study is to improve the quality and effectiveness of concrete foundation experiment teaching. It also focuses on stimulating students’ practical potential and innovative thinking to meet society’s new expectations of talent.

2. Common problems in practice teaching

In the teaching of the concrete foundation experiment course, traditional verification experiment still occupies a dominant position, which limits the cultivation of students’ innovative ability and practical ability to a certain extent^[5].

2.1. The teaching philosophy of “emphasizing scientific research over teaching and theoretical knowledge over practical application”

The existing experimental teaching methods are more theoretical and less practical, resulting in poor practical ability in some students^[6]. Generally speaking, teachers teach theories and demonstrate experiments. While students do things step by step, they lack thinking and fail to achieve the effect of educating people^[7].

- (1) The disconnect between theory and practice: Overemphasis on the study of theoretical knowledge and neglect of practical training will cause students to master a lot of theoretical knowledge. But when they apply the knowledge to solve the problems on the engineering site, they will be at a loss.
- (2) Lack of innovation ability: Without systematic and specialized practical training, students’ innovative thinking and practical ability will not be fully exercised. They may be trapped in the framework of “book knowledge”. They difficultly jump out of the shackles of traditional thinking models, and cannot thus innovate and break through in the face of complex engineering problems.
- (3) Lack of engineering quality training: In practical teaching, theoretical education is generally given importance, and it is difficult to form a good comprehensive quality, which will not only affect the learning effect of students, but also affect their future career development^[8].
- (4) Lack of learning interest: boring theoretical knowledge, simple and unchallenged basic skills training, and the lack of practical opportunities in the teaching environment can easily make students tired of learning, reduce their interest in learning, and motivation. When students feel that what they have learned is out of touch with their real life and work, they may have a psychological resistance to learning, thus affecting the overall teaching effect.
- (5) Mismatch with industry needs: The neglect of students’ practical and innovative abilities in the existing teaching methods will lead to a large gap. This mismatch will make students uncompetitive in the job market, while also failing to meet the industry’s demand for highly qualified engineering talents, and will also affect the quality and reputation of the entire education system.

2.2. The backward content of experimental textbooks

- (1) Students’ level: The backward content may cause students to be unable to systematically learn the relevant knowledge of concrete basic experiments. The experimental teaching materials away from the industry cannot provide experimental content and operational guidance in line with the actual work scenarios, resulting in a lack of students’ ability to solve practical problems and difficulty in adapting to future work needs. Too simple an experiment content may make students feel bored and difficult to receive good learning results.
- (2) Teaching quality level: Non-standard experimental materials will directly affect teachers’ teaching quality and

teaching effect. It is difficult for teachers to carry out teaching, so there is no way for colleges and universities to achieve their teaching goals. Without the needs of the industry, the school may invest a lot of resources to buy unnecessary experimental equipment or materials, and these resources are not fully integrated into the actual teaching, resulting in a waste of resources.

- (3) Industry demand level: The experimental teaching materials that are out of step with the needs of the industry may not be able to meet the market demand for concrete professionals, resulting in a mismatch between talent supply and demand. The concrete industry is a constantly developing field; new technologies, new materials, and new processes emerge in an endless stream.
- (4) Education system level: The education system should be constantly adjusted and updated with the development of society and industry. If the content of the experimental materials is not standardized and out of touch with the needs of the industry, then the entire education system will be greatly reduced in terms of adaptability and flexibility.

2.3. Single experimental teaching mode

In the “concrete foundation experiment” teaching, if the teaching mode is simple for a long time, it may lead to the following five levels of progressive consequences, forming a deep impact from knowledge mastery to career development.

- (1) Rigid thinking and fragmented knowledge: Students only memorize standard experimental steps instead of understanding principles. The inability to establish a correlation between concrete material properties (such as creep and shrinkage) and the stability of the foundation engineering results in a “not seeing the forest for the trees” phenomenon when analyzing practical engineering problems.
- (2) Practice gap and innovation suffocation: Students are familiar with ideal experimental conditions, but cannot cope with complex site environments (such as temperature changes, construction errors). A university study shows that such students need an additional 3–6 months to adjust to the job. When it comes to quality issues, such as cracks in concrete, they apply textbook solutions rather than innovative solutions combined with field data. Feedback from companies shows that the completion rate of such graduate independent projects is 20% below the industry average.
- (3) Learning motivation and professional identity decline: According to the investigation of an engineering college, the plagiarism rate of students in the class with a single teaching mode is 47% higher than that in the class with a diversified teaching mode, which reflects the loss of intrinsic learning motivation. Due to the lack of engineering ethics education (such as excessive pursuit of intensity and neglect of environmental protection), it is difficult for students to establish a sense of professional mission for engineers. Industry turnover rate data show that the first-job turnover rate of this group is 35% higher than that of the multi-training group.
- (4) Mass closed loop failure: The standardized test made 58% of students get high scores, but could not explain the reasons for data fluctuations, forming a false teaching quality of “high scores but low ability.” The lack of collaborative experimental projects in related courses such as material mechanics and structural engineering leads to the fragmentation of the knowledge system, and the response speed of students to solve interdisciplinary problems is 60% slower than that of the comprehensive training group.
- (5) Technology iteration lags behind: Low acceptance of new materials. Students with a single instruction are 70 percent less likely to be exposed to new types of concrete, such as ultra-high performance concrete, slowing the industry’s technology update process. With the increase of engineering innovation costs, engineers who lack systematic experiment training need to incur 40% more trial-and-error costs in the optimization design stage of basic engineering, which affects the efficiency of building industrialization transformation.

2.4. Students’ weak sense of innovation and entrepreneurship

- (1) The design scheme is rigid and the technology update lags behind. Students over-rely on textbook cases,

mechanically imitate traditional concrete foundation forms (such as strip foundation, raft foundation), and ignore actual variables such as geological conditions and load characteristics. The homogeneity of the design scheme can not cope with complex engineering scenarios (such as the deep foundation pit support of high-rise buildings), and reduce the efficiency of industry technology iteration.

- (2) Limited ability to solve engineering problems. In the face of concrete cracking, temperature stress and other practical problems, the lack of multi-scheme comparison thinking. For example, relying only on the expansion agent recommended by the specification to control cracks, fiber concrete or smart monitoring technologies were not explored. During construction, it is easy to rework due to scheme defects and increase the cost. According to industry statistics, engineering changes caused by conservative design or single solution account for 12% to 15% of the total cost of a project.
- (3) Missed opportunities for entrepreneurship and innovation. Lack of awareness to turn technology into business value. For example, after mastering high performance concrete technology, it is not considered to apply it to prefabricated component entrepreneurship or green building materials development. The entrepreneurship rate of the construction industry is low, and the talent gap in emerging fields (such as 3D printed concrete and prefabricated housing) is obvious.
- (4) Poor adaptability to career development. Low sensitivity to industry trends (such as BIM collaborative design, building digitization), only master the basic construction technology, did not learn the whole life cycle management thinking. Most of the graduates are concentrated in construction line positions, and it is difficult to qualify for high-paying positions such as design consulting and project management.
- (5) Industry technology iteration lag risk. A higher vocational college still adopts traditional wood formwork technology in concrete practical training, and does not introduce digital twin technology to simulate the pouring process, resulting in insufficient spatial cognition of students, which affects the construction accuracy of complex nodes (such as variable section columns).

Talent training lags behind the development of technology, restricting the overall innovation process of the industry.

3. Study on coping methods

Concrete foundation teaching has realized the transformation from “knowledge transfer” to “ability construction” through the four-dimensional linkage reform of “idea-content-model-cooperation,” which not only meets the needs of the industry but also instills lasting impetus for the career development of students.

3.1. Innovation of teaching concept: From “Knowledge Infusion” to “Thinking Empowerment”

- (1) Role transition: Using the “flipped classroom” model, students learn the theory of concrete mix design through video before class, and teachers guide discussions on material adjustment schemes under special working conditions (such as frozen areas) during class. The interactive data of “rain class” was included in the assessment, the number of students’ questions increased by three times, and the score of program innovation increased by 28%.
- (2) Critical thinking training: The study sets up a “concrete failure case analysis course,” such as the Storma Bridge collapse in Norway, to guide students to deduce the causes from multiple aspects of materials, construction and design.

3.2. Upgrading of experimental teaching materials: From “confirmatory experiment” to “Engineering Project”

- (1) Project-based experimental design: To develop the “Intelligent curing sensor” project, students need to complete the whole process from concrete hydration heat monitoring to data modeling. Combined with the Internet of

Things technology, the sensor accuracy is up to ± 0.5 °C, and the invention patent is authorized.

- (2) Cutting-edge technology embedding: With the help of 3D printing experiments, the student team printed variable-section columns (simulating Zaha buildings) to optimize material mobility through parametric design. The experiment shows that adding 0.8% polypropylene fiber can increase the compressive strength of the printed component by 22%. In a deep foundation pit support project, students simulated earth pressure distribution with BIM, optimized the spacing of supporting piles, and reduced the cost by 18%.

3.3. Reconstruction of teaching mode: From “One-way Teaching” to “Multiple Interaction”

- (1) Blended learning ecology: Online, using virtual reality (VR) technology to simulate concrete placement, students can “step inside” the structure to observe the development of cracks. Offline, the “72-hour quick challenge” was carried out, and students completed the whole process from geological exploration to program report in groups, and the winning program was funded by the enterprise.
- (2) Interdisciplinary collaboration: The “Concrete carbon emission calculation Model” was developed in cooperation with the computer major, and the students comprehensively considered the variables such as material transportation and construction technology, and some of the results were written into the industry white paper.

3.4. Deepening school-enterprise cooperation: From “Loose internship” to “Integration of industry and Education”

- (1) Dual education mechanism: Jointly build a “Digital construction laboratory” with Guanglian, and corporate tutors participate in the course design, and students can obtain BIM certification credits. The employment rate of graduates in prefabricated construction enterprises increased by 35%, and the starting salary was 12% higher than the traditional model.
- (2) Technology transformation platform: The “Self-compacted concrete 3D printing material” developed by the student team has been supported by the school-enterprise cooperation fund and has been applied to the production of municipal pipelines, saving the material cost of more than 500,000 yuan per year. The number of prizes won by students in competitions above the provincial level has increased by four times, and the annual growth rate of business incubation projects is 30%. The student employment competitiveness in the cooperative enterprise satisfaction reached 92%, and the intern retention rate increased to 65%. In the industry influence, 2 teaching reform achievements won the school-level teaching achievement award.

4. Conclusion

Based on the employment situation and the demand for talents in recent years, this paper analyzes the common problems existing in the teaching of “Concrete Basic Experiment Course,” and combines the new engineering education concept to implement the four-in-one innovation of “thinking empowerment - engineering projects - diverse interaction - integration of production and education,” which helps the technology iteration and sustainable development of the construction industry and provides a scalable paradigm for the reform of engineering education. The details are as follows:

- (1) Concept innovation is the core driving force, and students’ innovation potential can be activated through a flipped classroom and critical thinking training;
- (2) Content upgrading needs to connect with the forefront of the industry, and the integration of project-based experiments with 3D printing, BIM, and other technologies significantly improves practical efficiency;
- (3) Model reconstruction emphasizes situational learning, VR simulation, and interdisciplinary collaboration effectively bridge the gap between theory and practice;
- (4) The deepening of school-enterprise cooperation requires the establishment of a dual education mechanism, and the technology transformation platform promotes the industrialization of achievements.

Funding

The 2023 Annual Project of Gansu Province's Education Science "14th Five-Year Plan" (Project No.: GS[2023] GHBI388); Teaching Reform Project of Northwest Minzu University (Project No.: 2024YBJG-41)

Disclosure statement

The authors declare no conflict of interest.

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An Overview of the Inheritance and Development of Festival Culture in the Field of Non-Heritage Education

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Abstract: The twenty-four solar terms are an important component of Chinese traditional culture, containing scientific and cultural knowledge and national culture and spirit, and were selected as the World Intangible Cultural Heritage List in 2016. Research in various fields has grown rapidly in recent years. As education is an important position for cultural dissemination, the education of festive seasons has become a research hotspot in academia. Taking China National Knowledge Infrastructure (CNKI) as the database sample, this review analyses the relevant literature since 2020, tries to discover the current situation of the research on solar terms education, with a view to exploring its diversified paths and development trends in the practice of intangible cultural heritage education, and seeks to put forward suggestions and strategies for the future development accordingly, so as to promote the “two creations” of the Chinese excellent traditional culture and the subsequent research to provide support and reference.

Keywords: Non-heritage education; Twenty-four solar terms; Solar terms education; Research review

Online publication: April 26, 2025

1. Introduction

Education is the key carrier of knowledge transmission and value shaping. With the knowledge system, traditional customs, and cultural connotations of the twenty-four solar terms as the core, solar terms education aims to cultivate the public's knowledge and love of traditional culture and promote its inheritance and innovation. Along with the national emphasis on traditional cultural heritage, the twenty-four solar terms have received increasing attention in the field of non-heritage education.

Based on the literature related to “solar terms and education” on China National Knowledge Infrastructure since 2020, this study systematically combs through the current status of its inheritance and the development trend of non-heritage education in various school segments, so as to provide reference for the “two creations” of traditional culture. The study finds that the current solar terms education is fruitful in early childhood education, but the practice in the field of higher education still needs to be strengthened.

2. Analysis of articles on the theme of solar terms education

2.1. Analysis from the perspective of disciplines

In order to investigate the development status of solar terms education, this study takes China National Knowledge Infrastructure as the authoritative database, and searches with “solar terms and education” as the theme word juxtaposition, and as of June 2025, there are 261 articles. Among them, there are 39 academic journals, 165 specialty journals, 27 master’s theses, 0 doctoral theses, and 21 conference papers. In terms of section distribution, there were 162 articles in the field of preschool education and 43 articles in primary education; while 16 and 7 documents were found in secondary and higher education, respectively, as well as 3 articles in the field of vocational education. The distribution of retrieved data reveals the current disciplinary fields of temperance education research and its current status (**Figure 1**). Research on temperance education is unevenly distributed across educational fields, with preschool education having the most literature, followed by primary education, and secondary and higher education being under-represented. This may reflect the difference in emphasis and demand for temperance education at different stages. Overall, there is still room for research in this field, especially in higher education and vocational education.

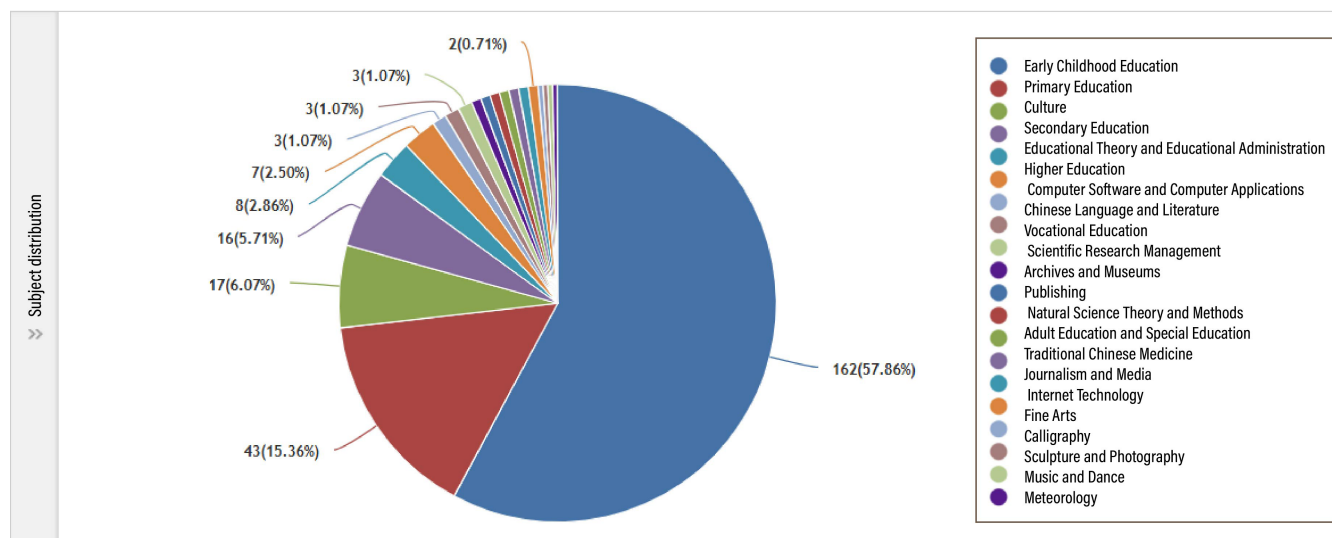


Figure 1. Percentage of distribution of disciplines in solar terms education (Image source: China National Knowledge Infrastructure)

2.2. Analysis of annual publication volume

The analysis of the retrieved data shows that the research on temperance education has shown significant growth since 2019. The number of articles published in 2020–2024 is 29, 23, 45, 48, and 56, respectively, and 64 articles have been published on June 9, 2025, and the research popularity continues to climb. According to the trend graph of the quantity change (**Figure 2**), it shows that the number of related literature has been increasing year by year since the inclusion of the twenty-four solar terms in the list of non-heritage in 2016, which not only reflects the importance of the protection and inheritance of traditional culture in both the academic and practical fields, but also indicates that the value of solar term education as a bridge connecting the modern life and the traditional culture has been increasingly prominent. This feature of the data confirms that the research in this field is in a stage of rapid development and deepening, and the academic influence and social value are increasing.

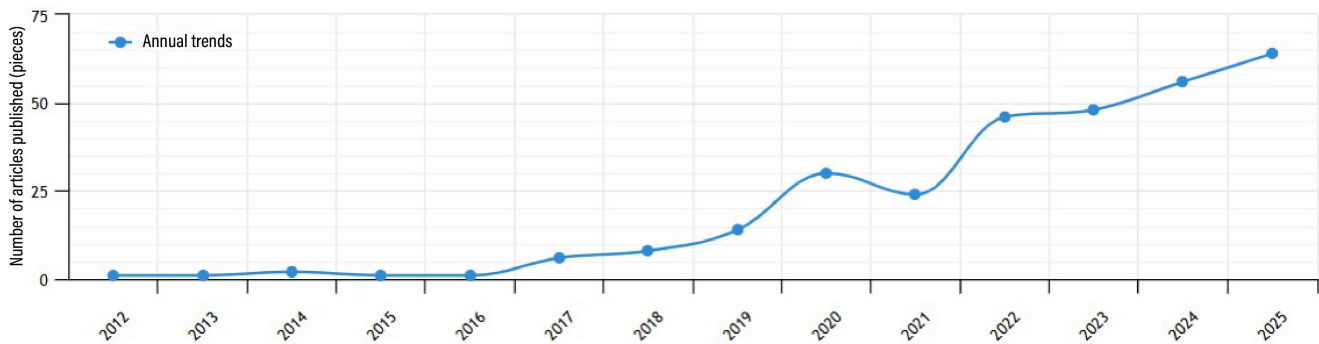


Figure 2. Number of published literature on the topic of solar terms education by year (Image source: China National Knowledge Infrastructure)

This study will focus on the literature published from 2020 to 2025, aiming to deepen the understanding of the development trend of temperance education and reveal its diversified paths in educational practice as well as the challenges for future development. It also provides an outlook on the future development trends of temperance education.

3. Research status of various academic segments of temperance education

3.1. Pre-school education

Through combing the relevant literature, the research results on the application of the 24 solar terms in the field of early childhood education are remarkable. Scholars have explored the path of integrating the festival culture into early childhood education through practical activities such as planting observation, custom experience, and environment creation, and have emphasized co-education through home and family. Chen ^[1] addressed the main challenges faced in teaching seasonal education in kindergarten activities. Based on the actual situation of young children, she proposed effective strategies in terms of teaching environment, theoretical learning, artistic activities, and social practice. She advocated home-school cooperation, improved activity evaluation, and achieved the integration of “teaching-learning-evaluation” ^[1]. Wang took festival activities as the starting point, enriched the garden-based curriculum system, and designed diversified labor education such as farming and creativity in combination with the age characteristics of young children, and also put forward the co-education mode in which “garden + family + society” works together ^[2]. Chen provided practical solutions such as knowledge decomposition teaching, interest-oriented creation, diversified activities, and innovative evaluation and reflection ^[3].

The above activities show that the educational concept of “learning by doing” is effective in the practice of festive season education, which provides an innovative path for the development of non-heritage education. Future research should focus on the integration of festivals and other projects to build a special education system; pay attention to regional cultural differences to optimize practice strategies; deepen multi-party collaboration and interdisciplinary integration to promote the inheritance and innovation of festivals and non-heritage culture.

3.2. Primary education

In the field of primary education, solar terms education mainly focuses on the integration of primary school language and labor education curriculum. Through the integration with primary school curriculum, it helps students to deepen traditional cultural knowledge, improve cultural literacy, strengthen labor practice ability, and cultivate a sense of cultural identity. Peng and He, in view of the current situation of primary school language teaching, proposed to take students’ core literacy as the guide, enhance the systematic nature of festival culture education, create authentic learning situations, and carry out interdisciplinary learning activities ^[4]. Combined with comprehensive practice activities in primary schools, Ling and Zhou

emphasized the deep integration of festival culture and labor education through the development of school-based curricula, practice leading, and subject teaching^[5]. Zhang proposed the paths of mining textbook resources, carrying out practical and thematic activities, and promoting interdisciplinary integration for the construction of a microcourse group of festival culture^[6].

The integration of the 24 solar terms into primary education has achieved a win-win situation of traditional cultural heritage and students' literacy cultivation through interdisciplinary integration. Future research should continue to explore innovative strategies to further expand the boundaries of its application in non-heritage education and help the creative transformation and innovative development of Chinese outstanding traditional culture.

3.3. Secondary education

In the field of secondary education, the 24 solar terms are mainly combined with secondary school biology curriculum and labor education, while some scholars advocate for their integrated development with the five education. Wang and Zi proposed to integrate the biological knowledge in the festive seasons into teaching through developing school-based curricula and carrying out social practice^[7]. Jiang *et al.* proposed the festive season as the background and suggested setting up practical activities based on the characteristics of knowledge to achieve the combination of biology teaching and labor education^[8]. Kang thought that the specific path of integrating the 24 festivals with the five education (moral, intellectual, physical, aesthetic, and labor) in depth from the perspective of life education provides diversified ideas for the inheritance of traditional culture in secondary education (Figure 3)^[9].

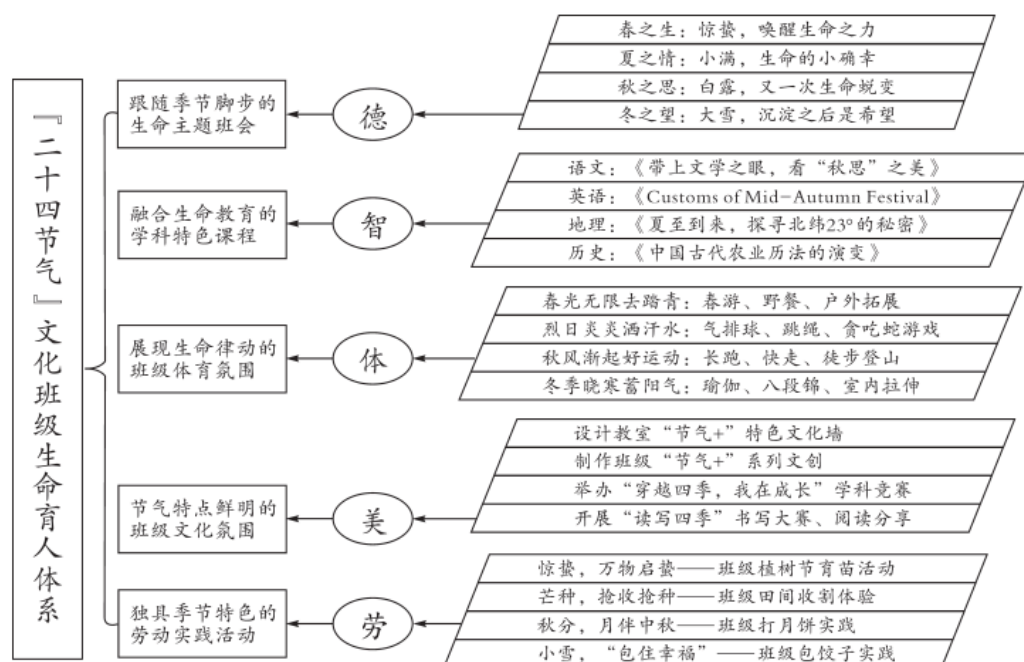


Figure 3. A list of cases of classroom life education system based on the culture of the “24 Solar Terms”^[9]

The development of a school-based curriculum on the solar terms can enrich the teaching content and innovate the teaching methods. In the future of secondary education, the application of the twenty-four solar terms will tend to be diversified, strengthen the practicality and social participation, deepen the interdisciplinary integration in order to synergize the five education, and focus on personalized teaching. This not only conforms to the change of education concepts but also helps traditional cultural inheritance and the overall development of students.

3.4. Higher education

In the field of higher education, the inheritance of the 24 solar terms faces multiple challenges, such as curriculum integration, carrier selection, planning and design, and the enhancement of student participation. Huang proposed integrating traditional cultural concepts into the classroom knowledge system, building innovative bases for non-heritage protection and inheritance education, developing library resources, and expanding the “second classroom”^[10]. Li advocated for strengthening traditional culture education from three aspects: classroom teaching, campus environment creation, and social practice^[11]. Liu *et al.* proposed to introduce a compulsory course of “Chinese traditional culture” for all students, and to show the cultural connotation of festivals through diverse activities such as micro-expression making and singing festive songs^[12].

The solar terms education in higher education will develop in multiple dimensions. Curriculum construction explores diversified carriers and builds a systematic system; teaching focuses on practical interaction and popularization of non-heritage knowledge. Digital technology promotes the innovation of festival culture protection, while encouraging students to participate in subject research and project practice, deepening inter-school cooperation, and jointly promoting festival culture inheritance.

4. Analysis of the current situation of solar terms education in the field of non-heritage education

4.1. Dilemmas and challenges of temperance education

In recent years, although there has been progress in solar terms education in the field of non-heritage education, it still faces many challenges. At the pre-school education stage, there are differences in teachers’ understanding and knowledge of the 24 solar terms, the connotation is not grasped systematically enough, the practical activities are mostly based on traditional teaching such as planting and food production, and the transfer of knowledge relies on teacher-led teaching, with insufficient use of modern technologies such as internet resources and educational applications. At the primary and secondary education levels, there are fewer interdisciplinary programs focusing on the 24 solar terms, and they fail to fully integrate knowledge from multiple fields. In higher education, although attempts have been made to incorporate the culture of the solar terms into the curriculum, there is a general lack of systematicity and depth, insufficient student awareness and low enthusiasm for participation, and the educational approach is still based on the transmission of knowledge, making it difficult to stimulate interest in learning.

4.2. Suggestions and strategies for solar terms education

The inheritance and development of the 24 solar terms in the field of non-heritage education needs to be optimized from multiple dimensions. On the level of teacher construction, the leading role of key teachers should be played, and the cultural literacy of teachers in festive seasons should be improved through online and offline thematic training, expert lectures and demonstration classes, and teacher learning communities; at the same time, teaching resource packages and activity guides should be provided to enrich the teaching materials. In terms of pedagogical innovation, project-based learning, role-playing, and other diversified methods should be integrated, and digital technologies such as VR and AR should be used to recreate the scenes of festive seasons and climates, develop STEAM projects, design cross-disciplinary learning units, and carry out inquiry-based learning and theatre education, so as to enhance the fun and practicability of learning.

In the field of higher education, it is necessary to strengthen the systematic nature of festival culture education. Incorporate it into the general education curriculum system, offer elective courses and lectures; promote interdisciplinary integration with literature, art, and other disciplines; use modern information technology to create immersive learning scenarios; encourage teachers and students to carry out academic research and social practice activities, and create an atmosphere of inheritance in the form of cultural festivals and folklore activities, so as to help the innovative development

of traditional culture.

5. Vision and prospect of solar terms education in the field of non-heritage education

In the field of non-heritage education, the integration of multiple disciplines and the empowerment of digital technology are the core development directions of the 24 solar terms education. Through the integration of disciplinary resources, a more three-dimensional festival culture education system can be constructed. With the help of the Internet, big data, artificial intelligence, and other technologies, an immersive online learning platform can be created to enhance the educational experience. Currently, solar terms education presents trends of diversification, digitalization, practicability, interdisciplinary integration, and strengthening of higher education leadership, playing an important role in enriching subject teaching, cultivating students' comprehensive ability, and promoting the "two creations" of traditional culture.

Future research needs to focus on the path of deep integration of different educational stages and disciplines, break through the status quo dominated by early childhood education, systematically integrate festival culture education into higher education, and deeply explore its cultural connotations and spiritual values. At the same time, we should further explore the innovative application of modern educational technology in the inheritance of festival culture, so as to provide theoretical support and practical paths for the cultivation of new-age talents with both cultural self-confidence and innovation ability.

Disclosure statement

The authors declare no conflict of interest.

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Research on the Cultivation of Core Physical Literacy of College Students through Ethnic Traditional Sports

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Abstract: Traditional ethnic sports, as an important part of the excellent culture of the Chinese nation, contain rich educational value. Integrating traditional ethnic sports events into physical education teaching in colleges and universities is of great significance for cultivating students' core sports literacy. Based on the connotation of core sports literacy, this article analyzes the value and path of traditional ethnic sports in cultivating the core sports literacy of college students from three dimensions: national identity, humanistic spirit, and physical and mental health. The research suggests that schools should follow the principle of adapting measures to local conditions and highlighting characteristics, and take targeted measures in aspects such as curriculum design, faculty development, venues and equipment, and teaching methods. They should fully explore and utilize the educational resources of traditional ethnic sports, innovate the talent cultivation model, promote the all-round development of students, and inherit and carry forward the Chinese sports culture.

Keywords: Ethnic traditional sports; Core literacy of sports; College physical education; Talent cultivation

Online publication: April 26, 2025

1. Introduction

The core literacy of physical education is the essential character and key ability that reflects the educational value of the physical education discipline, and it is the foundation for students to adapt to future social development. Cultivating students' core physical education literacy is an important mission of physical education teaching in the new era. Ethnic traditional sports are forms of ethnic sports culture that have been formed under specific historical conditions in our country and have been passed down from generation to generation through continuous practice. It originates from the practice of production and life, contains rich humanistic connotations, and showcases the wisdom and spiritual outlook of the Chinese nation. The inheritance and development of traditional ethnic sports are of great significance for strengthening cultural confidence, enhancing national cohesion and creativity, and cultivating new people of the times.

2. The importance of traditional ethnic sports

Ethnic traditional sports have formed and developed under the specific natural and social historical conditions of our country and are an important part of our excellent traditional culture. For thousands of years, people of all ethnic groups

have continuously created, enriched, and developed traditional ethnic sports events in the practices of productive labor, military activities, sacrificial ceremonies, and entertainment. With its unique humanistic connotation and educational value, it plays an irreplaceable and important role in promoting the all-round development of people, inheriting national culture, and enhancing national identity.

First of all, traditional ethnic sports carry the wisdom and spiritual pursuit of the Chinese nation and are an important carrier for uniting national sentiments and cultivating cultural confidence. Every traditional sport embodies the survival wisdom, value concepts, behavioral patterns, and aesthetic tastes of a nation, and reflects the character traits and humanistic spirit of the Chinese nation. Participating in traditional ethnic sports enables contemporary youth to be influenced by excellent traditional culture, and enhances their sense of pride and identity as Chinese people in inheriting the national spirit and strengthening cultural confidence ^[1].

Secondly, traditional ethnic sports have unique benefits in strengthening the body and uplifting the spirit, playing a significant role in promoting the physical and mental health of young people. Many of these traditional sports originate from labor practices, featuring simple movements, basic equipment, and flexible rules, making them well-suited to the age and cognitive levels of young people. For example, the yo-yo ball game of the Zhuang people in Guangxi and the grass-hoeing drum game of the Miao people in Hunan are both educational and entertaining, helping to build physical strength and cultivate a refined spirit through play. Traditional fitness methods like Baduanjin (Eight Pieces of Brocade) and Wujinxi (Five Animal Exercises) emphasize the integration of form and spirit, as well as the balance between movement and stillness, which are particularly valuable in alleviating the stress of modern fast-paced life. Promoting traditional ethnic sports can enrich school physical education, create a joyful sports environment, and help students enjoy the fun and health benefits of physical exercise.

Finally, traditional ethnic sports also contain rich educational connotations and play a unique role in fostering virtue and nurturing talent, and promoting the all-round development of students. For instance, the “martial virtue” advocated by Chinese martial arts requires that martial artists not only possess superb skills but also have qualities such as benevolence, righteousness, propriety, wisdom, and trustworthiness, which are highly consistent with the core socialist values. For instance, in the crossbow shooting competition of the Achang ethnic group, the contestants must be honest and trustworthy and obey the referees, which reflects the sports ethics of fair competition. Guiding students to participate in traditional ethnic sports can help them understand and inherit Chinese virtues imperceptibly, cultivate noble sentiments, and shape a sound personality.

3. Strategies for cultivating the core sports literacy of college students through traditional ethnic sports

3.1. National identity: Strengthening cultural confidence and identity recognition

National identity is an individual’s emotional attachment and value recognition to the nation to which they belong, and it is the foundation of national cohesion and centripetal force ^[2]. Contemporary college students are at a crucial period for the formation of their values. Enhancing their sense of national identity is of great significance for strengthening cultural confidence and inheriting the national spirit. Most traditional ethnic sports originated from labor production, military activities, religious sacrifices, etc., reflecting the lifestyles, aesthetic tastes, and values of people of all ethnic groups, and embodying the wisdom and spiritual qualities of the Chinese nation. Taking Mongolian archery as an example, this sport integrates the characteristics of nomadic civilization and embodies qualities such as bravery, intelligence, and concentration. In competitive confrontations, it showcases the enterprising spirit and fine tradition of unity and cooperation of the Mongolian people. By learning about the origin, characteristics, and rules of traditional ethnic sports, students can directly experience the unique charm of Chinese sports and enhance their understanding and recognition of excellent traditional culture. In addition, many traditional ethnic sports events have distinct regional characteristics and are an

important part of the local intangible cultural heritage. Colleges and universities should make full use of local resources in teaching, allowing students to enter communities and inheritance bases, experience the charm of projects on the spot, listen to the stories of inheritors, and deepen their sense of identity with the culture of their own nation and region through participation and interaction. For instance, colleges and universities in Fujian can introduce elements of “Mazu culture,” infuse the spirit of Mazu into traditional sports teaching such as dragon boat racing and Chinese lion dance, and guide students to develop a sense of patriotism and love for their hometown.

3.2. Humanistic spirit: Cultivating noble character and moral sentiments

The humanistic spirit is a vital reflection of the core values of society and serves as an intrinsic driving force for personal all-round development. Sports not only enhance physical fitness but also serve as a significant platform for cultivating noble character and refining moral sentiments. Introducing traditional ethnic sports into universities helps promote the humanistic spirit of Chinese sports and nurture students’ noble moral qualities. Over time, traditional ethnic sports have developed unique value concepts and behavioral norms. For instance, Chinese martial arts emphasize martial virtues, advocating the unity of martial spirit and benevolence, and stress that martial artists should possess qualities such as bravery, humility, self-restraint, and helping others. Another example is the Tibetan yak carrying sheep competition, where participants must adhere to the principles of fair competition and mutual assistance, and those who violate the rules will face moral condemnation from their fellow tribespeople. Schools should integrate these valuable humanistic elements into their teaching, guiding students to establish correct values and improve their moral cultivation. Moreover, traditional ethnic sports embody ecological wisdom that values nature, respects life, and pursues harmony. For example, in the Miao ethnic group’s grass-hoeing drum performance, participants run barefoot along the field ridges, pulling weeds while beating drums and gongs, ingeniously combining sports with agricultural labor, reflecting the simple concept of harmonious coexistence between humans and nature. Another example is the Yi ethnic group’s crossbow shooting, where participants enjoy activities like arrow throwing and archery, refining their will and cultivating their sentiments in a natural environment. Schools should fully explore the ecological ethical ideas in traditional ethnic sports, fostering students’ respect for nature and love for life, and guiding them to embrace the concept of sustainable development ^[3].

3.3. Physical and mental health: Enhancing physical fitness and cultivating an optimistic and positive psychological quality

Physical and mental health is the foundation for the all-round development of individuals and the core goal of physical education. Most traditional ethnic sports originated from the practice of production and life, and have the unique advantages of being close to nature and strengthening the body. Introducing physical education classes in colleges and universities can enrich the teaching content and promote the all-round physical and mental development of students. In terms of physical fitness, traditional ethnic sports enhance students’ basic qualities such as strength, speed, endurance, and flexibility through gamified practice methods in an entertaining way. For instance, in the case of the Guangxi Zhuang ethnic group’s yo-yo, students practice the skills of throwing and catching the ball amid tongue twisters and music, thereby enhancing their arm strength and body coordination imperceptibly. For instance, in the Tibetan yak carrying a sheep, the participants need to run on the yak and bend down to carry the sheep to show their heroic nature. Through interactive competition, they can exercise their overall strength and endurance. For instance, in the Korean springboard, students need to use elastic wooden boards to flip and jump into the air, testing their jumping ability, sense of balance, and spatial positioning skills. These interesting traditional ethnic sports events can stimulate students’ interest in sports and help them achieve the goal of enhancing their physical fitness in a happy experience. In terms of mental health, most traditional ethnic sports are carried out in collective participation, which is conducive to cultivating students’ psychological qualities of optimism, positivity, and win-win cooperation. In addition, many traditional ethnic sports such as Baduanjin and Wuqinxi emphasize breathing control and the cultivation of both body and spirit. They not only strengthen the body but also refine one’s temperament, which is helpful for students to master self-regulation methods and develop a positive

and optimistic psychological quality. When schools carry out teaching, they should focus on stimulating students' positive emotional experiences and guide them to correctly deal with difficulties and setbacks imperceptibly ^[4].

4. Conclusion

To sum up, inheriting and promoting traditional national sports in college physical education teaching is of great significance for cultivating students' core sports qualities, such as cultural confidence, humanistic sentiments, and physical and mental health. Schools should base themselves on their educational characteristics and regional advantages, follow the principle of adapting measures to local conditions and highlighting features, systematically develop traditional ethnic sports courses, improve teaching conditions, innovate talent cultivation models, enable students to appreciate the unique charm of Chinese sports through participation and experience, inherit and carry forward the national spirit, and enhance their comprehensive qualities. In this way, students can grow into socialist builders and successors who are well-rounded in morality, intelligence, physical fitness, aesthetics, and labor.

Disclosure statement

The author declares no conflict of interest.

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The Role of Higher Education in Promoting Social Mobility and Reducing Inequality

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Abstract: Higher education serves as a pivotal force for advancing social mobility and addressing inequality in modern societies. By equipping individuals with critical skills, knowledge, and opportunities, it fosters economic empowerment and social progress. However, systemic barriers such as financial constraints, geographic disparities, cultural biases, and the digital divide continue to limit equitable access and outcomes, disproportionately affecting underprivileged groups. This paper explores the transformative potential of higher education, examining its role in promoting upward mobility and reducing inequality. It highlights key structural challenges while presenting evidence-based strategies such as need-based financial aid, flexible learning pathways, and mentorship programs. Drawing on theoretical frameworks and real-world examples, this study emphasizes the importance of comprehensive policy interventions and institutional reforms to ensure that higher education fulfills its promise as a driver of equity and opportunity. By addressing these barriers, societies can harness the full potential of higher education to create a more inclusive and equitable future.

Keywords: Equity; Education inequality; Higher education; Policy interventions; Social mobility; Systemic barriers

Online publication: April 26, 2025

1. Introduction

Education has long been celebrated as a cornerstone of societal advancement, often referred to as the great equalizer due to its potential to bridge socio-economic divides. Within the realm of education, higher education holds a unique position as both a driver of individual empowerment and a catalyst for social transformation. It equips individuals not only with specialized knowledge and skills but also with critical thinking and adaptive capacities essential for thriving in a rapidly evolving global landscape. From an educational theory perspective, higher education embodies the principles of equity and opportunity, serving as a conduit for personal growth and societal progress.

As education scholars have highlighted, the transformative power of higher education lies in its ability to disrupt entrenched cycles of inequality ^[1]. By providing access to resources, networks, and economic opportunities, it offers individuals from marginalized backgrounds the tools to overcome systemic barriers. At the same time, higher education institutions bear the responsibility of addressing structural inequities that persist within their systems, including affordability challenges, geographical limitations, and cultural biases. The interplay between these forces underscores the dual role of higher education: it is both a mechanism for individual upward mobility and a platform for advancing

collective social equity.

This article seeks to explore the multifaceted role of higher education in promoting social mobility and reducing inequality. Grounded in educational theory and empirical evidence, it examines how higher education serves as a vehicle for societal change while grappling with challenges that hinder equitable access and outcomes. By understanding these dynamics, policymakers, educators, and institutions can better harness the potential of higher education to foster inclusive growth and social justice.

2. Method

This study adopts a qualitative research approach rooted in educational theory and social equity principles to explore the relationship between higher education, social mobility, and inequality. The methodology is guided by a holistic framework that integrates theoretical perspectives, empirical analysis, and policy evaluations to provide a comprehensive understanding of the topic.

- (1) Literature review: A systematic review of academic publications, policy reports, and empirical studies was conducted to gather insights into the role of higher education in addressing inequality. Relevant literature was sourced from peer-reviewed journals, government reports, and international organizations, using keywords such as “higher education equity,” “social mobility,” “education inequality,” and “policy interventions.” Priority was given to recent studies published within the past decade to ensure the relevance and timeliness of the analysis ^[2].
- (2) Theoretical framework: The study is grounded in established educational theories, including human capital theory, which emphasizes the economic value of education; critical pedagogy, which examines how education can challenge societal inequalities; and social reproduction theory, which explores the perpetuation of inequality within educational systems. These frameworks provide a lens for understanding both the potential and the limitations of higher education in promoting equity ^[3].
- (3) Thematic analysis: To synthesize findings, a thematic analysis was employed. This method involved categorizing the literature into three key themes: (a) the impact of higher education on social mobility, (b) barriers to equitable access and outcomes, and (c) effective strategies for addressing these challenges. Each theme was analyzed about its theoretical underpinnings and supported by empirical evidence.
- (4) Comparative case studies: The study incorporates comparative analyses of higher education policies and practices across various countries. These case studies were selected to illustrate diverse approaches to promoting equity, including financial aid programs, affirmative action policies, and technological innovations that expand access. Examples from countries such as Finland, Canada, and Germany were analyzed to highlight best practices and identify transferable strategies.

By combining these methodological elements, the study aims to provide a nuanced understanding of how higher education can serve as a tool for social mobility while addressing the structural barriers that hinder its equitable impact. This interdisciplinary approach ensures that the findings are both theoretically robust and practically relevant for policymakers, educators, and researchers.

3. Results and discussions

3.1. The transformative potential of higher education in promoting social mobility

Higher education has consistently been recognized as a powerful tool for advancing social mobility, offering individuals the means to transcend socio-economic barriers and improve their quality of life. It provides graduates not only with technical and specialized skills but also with broader competencies such as critical thinking, creativity, and adaptability—qualities increasingly demanded in today’s knowledge-based economy. From an educational standpoint, the value of higher

education extends beyond individual outcomes. It acts as a societal equalizer, fostering innovation, cultural exchange, and civic engagement, all of which contribute to the collective welfare. Furthermore, educational theorists emphasize that higher education serves as a mechanism for building social and cultural capital ^[4]. Through access to networks, mentorship, and diverse perspectives, students are better equipped to navigate professional and societal challenges. Empirical evidence from countries with robust and inclusive higher education systems, such as Finland and Canada, illustrates that equitable access to higher education correlates strongly with higher levels of intergenerational mobility. This suggests that societies with a commitment to making tertiary education widely accessible are better positioned to break cycles of poverty and inequality. However, realizing this potential requires addressing the structural inequities that continue to limit access and success for many marginalized groups.

3.2. Structural barriers limiting equitable access and outcomes

Despite its transformative potential, higher education remains inaccessible to many individuals due to deeply entrenched structural barriers. These barriers disproportionately impact underprivileged groups, perpetuating cycles of inequality and undermining the promise of education as a societal equalizer.

3.3. Financial constraints

The rising cost of higher education is perhaps the most visible barrier to equitable access. In countries like the United States, where tuition fees have steadily increased over the past decades, low-income students often face insurmountable financial obstacles. For example, data from the National Center for Education Statistics (NCES) reveals that in 2020, only 13% of students from the lowest income quartile completed a bachelor's degree by age 24, compared to 62% from the highest income quartile. Even in countries with subsidized education, such as the United Kingdom, the introduction of student loans has left many graduates burdened with debt, disproportionately affecting students from disadvantaged backgrounds. In contrast, Germany and Nordic countries, where tuition fees are waived or heavily subsidized, have achieved higher participation rates among low-income students, demonstrating the effectiveness of financial aid in removing economic barriers. However, even in these systems, living costs, such as housing, transportation, and study materials, continue to pose challenges, particularly for students from rural or low-income families.

3.4. Geographic disparities

Access to higher education is also influenced by geographic location. In many rural and remote areas, students lack proximity to universities or colleges, forcing them to relocate or commute long distances to pursue their studies. For instance, in Indonesia, approximately 30% of rural students cite geographical distance as a primary reason for not continuing to tertiary education, according to a 2021 study by the Ministry of Education and Culture. Similarly, in the United States, rural communities often rely on small regional colleges with limited resources and fewer academic programs, narrowing students' opportunities. Countries like Australia have attempted to address this disparity through regional scholarships and the establishment of satellite campuses, but gaps in access persist. Educational experts argue that digital infrastructure improvements and the expansion of online learning opportunities could play a critical role in bridging these geographic divides.

3.5. Cultural and social biases

Cultural and social biases within higher education systems further hinder equity. Minority students and first-generation college attendees frequently face systemic discrimination and implicit biases, which create a sense of alienation and exclusion ^[5]. For instance, studies in the United Kingdom have shown that students from Black and Asian communities are underrepresented in elite universities such as Oxford and Cambridge, where they report experiencing microaggressions and a lack of cultural inclusivity. Similarly, in the United States, Hispanic and Black students often face disparities in access to Advanced Placement (AP) courses during high school, which limits their competitiveness in college admissions.

These biases extend into campus life, where marginalized groups often struggle to find mentorship, support networks, and representation. Initiatives such as the University of California’s “First-Gen Faculty” program, which connects first-generation students with faculty mentors from similar backgrounds, have demonstrated success in addressing these challenges and fostering a greater sense of belonging.

3.6. The digital divide

The digital divide, a longstanding issue, has been exacerbated by the COVID-19 pandemic, highlighting yet another layer of inequity. During the transition to remote learning, students from low-income households faced significant barriers, including a lack of access to reliable internet and adequate technology. In India, for example, a 2021 report by the Azim Premji Foundation found that nearly 60% of students in rural areas were unable to participate in online classes due to poor connectivity or the lack of devices. Similarly, in the United States, the Pew Research Center reported that 15% of households with school-aged children did not have high-speed internet, with the rates even higher for Black, Hispanic, and rural households. The inability to engage in remote learning not only widened existing educational gaps but also placed underserved students at a disadvantage in accessing online resources, lectures, and digital learning tools. While initiatives such as the “Digital India” campaign and emergency broadband programs in the United States aim to address these disparities, progress has been slow and uneven.

3.7. Summary of barriers

These examples illustrate how financial, geographic, cultural, and technological barriers intersect to limit equitable access and outcomes in higher education. Addressing these systemic issues requires coordinated efforts from governments, institutions, and communities to implement targeted interventions and long-term strategies. Without meaningful action, these barriers will continue to undermine the potential of higher education to serve as a driver of equity and social mobility.

3.8. Strategies and policy recommendations for enhancing equity

To address these challenges, a multi-faceted and evidence-based approach is required, one that integrates targeted policies, institutional reforms, and community engagement. Financial barriers can be mitigated through need-based financial aid programs and tuition subsidies, as seen in countries like Germany and Sweden, where free or low-cost higher education has significantly broadened access for students from disadvantaged backgrounds. Inclusive admissions policies, such as affirmative action initiatives, have proven effective in diversifying student populations and creating more representative academic environments. From an institutional perspective, higher education providers must adopt flexible learning pathways to accommodate diverse student needs. Online education, hybrid models, and part-time programs can extend opportunities to working adults, students in remote areas, and other non-traditional learners. Mentorship and academic support programs are equally critical, particularly for first-generation and minority students, as these initiatives can foster a sense of belonging, improve retention rates, and enhance academic performance. Additionally, policymakers and institutions must address systemic inequities by committing to greater transparency and accountability. This includes tracking and reporting data on enrollment, retention, and graduation rates across different demographic groups, as well as implementing interventions to address observed disparities. From an educational expert’s perspective, equity in higher education is not merely about access but also about ensuring meaningful outcomes. Efforts must therefore prioritize inclusive practices and equitable support structures that empower all students to succeed. By addressing these barriers and embracing transformative strategies, higher education systems can better fulfill their dual mission of advancing individual mobility and fostering societal equity.

4. Conclusion

Higher education holds immense potential as a transformative force for social mobility and a critical mechanism for

reducing inequality. By equipping individuals with knowledge, skills, and opportunities, it not only empowers them to improve their socio-economic standing but also contributes to broader societal progress through innovation, civic engagement, and cultural exchange. However, the realization of this potential is far from universal, as systemic barriers, ranging from financial constraints and geographic disparities to cultural biases and the digital divide, continue to limit equitable access and outcomes.

The examples discussed highlight the complex interplay of these barriers. Financial burdens, as evidenced by rising tuition fees and inadequate aid in many countries, restrict participation among low-income families. Geographic isolation, particularly in rural and remote areas, underscores the unequal distribution of educational opportunities. Cultural and social biases further marginalize minority and first-generation students, impeding their ability to thrive in higher education environments. Additionally, the growing importance of digital infrastructure has laid bare the inequalities in access to technology, further disadvantaging underserved communities, especially in the wake of global shifts toward online learning.

Addressing these challenges requires a comprehensive, multi-faceted approach. Financial aid programs, such as tuition-free education and living cost subsidies, have proven effective in reducing economic barriers. Flexible learning pathways, including online and hybrid models, can bridge geographic divides, while mentorship and cultural inclusion initiatives foster a sense of belonging for marginalized students. Expanding access to technology and digital resources is critical to ensure that all students can benefit from modern educational tools. At the same time, institutions must embrace accountability measures to track and address disparities in enrollment, retention, and outcomes.

From an educational expert's perspective, achieving equity in higher education is not simply a matter of increasing access but ensuring that all students, regardless of their background, can succeed and thrive. This requires an unwavering commitment from policymakers, educators, and institutions to challenge existing inequities and reimagine higher education systems as engines of inclusion and opportunity. Only through sustained efforts to remove systemic barriers can higher education fulfill its dual role as a driver of individual empowerment and a foundation for societal equity. By doing so, the vision of education as the great equalizer, one that offers every individual the opportunity to achieve their full potential and contribute meaningfully to a more just and equitable world, can be realized.

Disclosure statement

The author declares no conflict of interest.

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Application of CBL Teaching Method in Clinical Microbiology Laboratory Training for Residents

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Abstract: Clinical microbiology laboratory training for residents has long faced the limitations of traditional Lecture-Based Learning (LBL), which is characterized by an overemphasis on technical operations, inadequate cultivation of clinical thinking, and a disconnection between testing and diagnosis, and treatment. In this study, a case-sharing teaching model based on Case-Based Learning (CBL) was introduced, and a hierarchical and progressive teaching framework was constructed. Using common clinical infection cases as a carrier, the study implemented case screening, data collection, analysis, and reporting, stepped problem discussion, and multidimensional evaluation feedback in stages. Teaching practice has shown that the CBL model significantly improves trainees' clinical interpretation skills of test results, antimicrobial drug decision-making logic, and multispecialty collaboration awareness, while strengthening autonomous learning and evidence-based thinking skills.

Keywords: Clinical microbiology testing; Case-Based Learning (CBL); Standardized training for resident physicians; Clinical thinking

Online publication: April 26, 2025

1. Introduction

Clinical microbiology testing is a core component of infectious disease diagnosis, and its talent cultivation is directly related to the accuracy of clinical diagnosis and treatment and patient prognosis. Standardized training for resident physicians is a critical stage in the transition of medical graduates to qualified clinicians. However, due to the complexity of pathogen species, rapid iteration of testing technology, and high demands on clinical thinking, microbiology laboratory training for residents has always faced challenges such as the disconnection between theory and practice and insufficient trainee participation^[1]. Traditional Lecture-Based Learning (LBL) focuses on imparting knowledge, with trainees passively receiving information, making it difficult to adapt to the dynamic and individualized diagnostic needs of pathogenic diseases in clinical scenarios. In this context, Case-Based Learning (CBL), characterized by “problem-driven, contextual immersion, and independent exploration,” has gradually become an important direction for medical education reform^[2].

In recent years, the application value of the CBL teaching method in the medical field has been widely validated^[3-5]. Studies have shown that through deep analysis of real cases, CBL can effectively improve trainees' clinical thinking skills,

autonomous learning abilities, and team collaboration skills^[6]. For example, in microbiology testing teaching, CBL uses typical infection cases as entry points to guide trainees through the entire process from collecting medical history, laboratory testing to result interpretation, transforming abstract microbiological knowledge into concrete clinical decision-making abilities. In addition, CBL emphasizes trainees actively proposing hypotheses and validating solutions in group discussions. This process not only strengthens core skills such as pathogen identification and drug sensitivity analysis but also cultivates evidence-based medical thinking and clinical communication skills^[7]. Compared to traditional teaching models, the dynamic interactivity of CBL significantly enhances trainees' interest and participation in learning.

This study systematically constructs an application framework for the Case-Based Learning (CBL) teaching model in microbiology laboratory training, targeting resident trainees in the laboratory department of a top-tier hospital. By optimizing case selection criteria, designing layered and progressive question chains, integrating new technology teaching resources, and combining diversified evaluation systems, the aim is to verify the comprehensive effects of the CBL teaching method on improving trainees' clinical practice abilities, scientific research literacy, and teaching satisfaction. The research results will provide a theoretical basis and practical reference for the teaching reform of microbiology laboratory resident training, helping to cultivate a team of laboratory physicians with solid skills and innovative abilities.

2. Implementation of CBL-based case sharing teaching method

2.1. Case selection

Cases are the foundation of the case-sharing teaching method. The instructor selects appropriate cases for sharing, focusing on common clinical diseases with clear patient history, distinct symptoms and signs, relatively complete examinations, standardized treatment, and unambiguous final diagnoses.

2.2. Case data collection and reporting

The instructor uses the patient's relevant laboratory test reports as a starting point, assigns tasks ahead of time, and specifies junior trainees to collect and report case data, including patient history, symptoms, and signs. Senior trainees are assigned to analyze the case, including summarizing case characteristics, interpreting test reports, diagnosis, and differential diagnosis. Simultaneously, they are required to search relevant literature and expand their knowledge of disease-related diagnostic guidelines, clinical and laboratory aspects.

2.3. Discussion and analysis

The instructor proposes tiered questions around pathogen identification, drug sensitivity result analysis, diagnosis and treatment strategies, key points of clinical communication, and other aspects, guiding trainees to discuss in groups. The first tier discusses sample collection and transportation points and test method selection. The second tier focuses on report interpretation, including common identification points and clinical significance of detected pathogens, drug resistance mechanisms, and special phenotype analysis. The third tier discusses the patient's diagnosis and treatment process, guiding trainees to consider alternative detection methods and newer technologies for the case, and discussing potential improvements in the current diagnosis and treatment process. The fourth tier simulates clinical and laboratory dialogue scenarios, guiding trainees to consider key points and communication skills in clinical interactions.

2.4. Summary

The instructor provides comprehensive feedback and reasonable improvement suggestions on various aspects such as case report history data collection, case characteristic summarization, diagnostic thinking, slide production, and trainee expression ability. They also encourage audience members to ask questions and discuss the content.

3. Effects of CBL-based case sharing teaching

3.1. Trainee survey feedback results

Ten resident trainees who received case-sharing teaching methods in this department evaluated the courses. The results showed that most resident trainees agreed with the CBL-based case-sharing teaching method, with scores above 4 for all evaluation items (**Table 1**).

Table 1. Evaluation statistics table for standardized training and teaching case discussions of resident physicians

Evaluation content	Number of respondents	5 points	4 points	3 points	2 points	1 point
Understanding of the teaching case discussion	10	8	2	0	0	0
Suitability of teaching objectives	10	8	2	0	0	0
Instructor's classroom guidance ability	10	10	0	0	0	0
Overall gains	10	10	0	0	0	0
Preparation before class	10	10	0	0	0	0
Participant engagement	10	10	0	0	0	0
Instructor's explanation of key points and difficulties	10	10	0	0	0	0
Instructor's feedback to residents	10	10	0	0	0	0
Overall evaluation	10	9	1	0	0	0

3.2. Evaluation by supervising experts

An expert supervisor was invited to participate in the entire process of case discussion and evaluate the teaching effectiveness after the class. The feedback from the expert indicated that the teaching objectives were clear, the case selection aligned with professional training guidelines, the difficulty level matched the teaching audience, and the lesson plan was designed reasonably and in detail. Both instructors and students prepared adequately before class. Junior students collected complete case data, while senior students demonstrated independent insights in summarizing case characteristics. During the discussion, the instructor posed questions reasonably and progressively, which was conducive to cultivating the clinical diagnostic thinking of resident trainees.

3.3. Teacher self-evaluation

The case-based learning (CBL) approach to case sharing has helped improve the autonomy, enthusiasm, and participation of resident trainees. Simultaneously, during the pre-class preparation stage, resident trainees effectively enhanced their clinical diagnostic thinking ability by collecting and analyzing case data and summarizing case characteristics. In the process of preparing presentation slides, resident trainees mastered PowerPoint production methods and skills. During the presentation and discussion stages, students' oral expression skills were honed. However, it is necessary to strengthen the guidance and supervision of resident trainees during the teaching process to prevent a few students from being perfunctory in the pre-class preparation stage, which could affect the overall teaching effectiveness. Additionally, when setting discussion questions, it is important to consider the different levels of basic knowledge mastery among students of different grades. Therefore, tiered questions should be proposed to fully reflect hierarchical progression.

4. Conclusion

As the "scout" for the diagnosis and treatment of infectious diseases, the core value of clinical microbiology testing lies not only in providing accurate laboratory data but also in dynamically integrating test results with clinical diagnosis and

treatment needs to guide precision therapy and infection control ^[8]. As medicine transitions from “empirical medicine” to “precision medicine,” the development of the clinical microbiology testing profession is no longer limited to technological advancement. Instead, there is an urgent need to cultivate clinical thinking to achieve a role transition from being a “data producer” to being a “participant in clinical decision-making” ^[9]. Only in this way can the collaborative value of “testing guiding clinical practice and clinical practice feeding back to testing” be truly leveraged in the face of antibiotic resistance crises and emerging infectious disease threats, providing patients with a full range of precision diagnosis and treatment services. Traditional microbiology testing often falls into the dilemma of “technology for technology’s sake,” while clinical thinking can reshape testing logic. The essence of clinical thinking is the ability of testing personnel to systematically infer the types of pathogens, drug resistance characteristics, and infection mechanisms based on patient history, symptoms, and laboratory data ^[10]. For example, when faced with a positive blood culture result, it is necessary to consider the patient’s immune status (such as diabetes or immunosuppression) to distinguish between contaminant bacteria and pathogenic bacteria to avoid misdiagnosis. For patients with a high clinical suspicion of pneumonia but negative sputum smears, the detection range should be expanded to include atypical pathogens (such as mycoplasma or viruses). Furthermore, clinical thinking requires testing personnel to actively participate in multidisciplinary consultations, integrating drug sensitivity results with patients’ liver and kidney function and allergy history to develop individualized treatment plans. The lack of clinical thinking can easily lead to a disconnect between testing and diagnosis and treatment. Therefore, cultivating the clinical thinking of testing personnel is a critical path to enhancing the value of microbiology testing.

Traditional microbiology laboratory teaching often falls into the stereotype of being “technically operation-oriented.” Although trainees can master basic operations such as Gram staining, bacterial identification, and drug sensitivity testing, they find it difficult to understand how test results affect clinical decision-making ^[11]. The application of the CBL-based case-sharing teaching method in clinical microbiology laboratory resident training not only meets the practical needs of infectious disease diagnosis and treatment but also reconstructs the collaborative logic between laboratory testing and clinical practice through structured cases. The teaching implementation results of this study show that this innovative model effectively breaks through the knowledge fragmentation of traditional teaching, significantly improving trainees’ core competencies in clinical interpretation of microbiology test results, decision-making in antimicrobial drug selection, and multidisciplinary collaborative diagnosis and treatment. Research indicates that CBL teaching successfully achieves the logical connection between laboratory technology and clinical decision-making by constructing a dual-track parallel thinking framework of “laboratory-clinic,” providing a reproducible practical paradigm for cultivating new medical laboratory talents.

However, there are still limitations in the current application of CBL in microbiology laboratory resident training. On the one hand, some teaching units’ understanding of CBL remains at the level of “case presentation,” lacking systematic teaching design, such as vague case selection criteria, insufficient problem setting progression, and inadequate teacher guidance. On the other hand, the rapid development of microbiology laboratory technology and the popularization of new technologies such as automated microbiology assembly lines and molecular diagnostic platforms have placed higher demands on teaching content. However, the existing CBL case library is lagging in updates, making it difficult to match the actual clinical needs. Furthermore, the cultivation of scientific research and innovation abilities of resident trainees has not been deeply integrated with CBL. How to guide trainees to conduct literature searches, data mining, and research topic selection through case analysis remains an urgent topic to explore.

The cultivation of microbiology laboratory talents is the cornerstone of discipline development ^[12–14]. High-quality talents not only need to master traditional detection techniques but also should possess corresponding clinical diagnostic thinking ^[15]. Research has confirmed that CBL can promote the transformation of microbiology laboratory talents from “data producers” to “clinical decision-making participants” through the reconstruction of dual-track thinking of “laboratory-clinic,” providing a teaching reform paradigm to address the training needs of talents for drug-resistant bacteria prevention and precision diagnosis and treatment.

Disclosure statement

The author declares no conflict of interest.

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Physical Fitness and Health Promotion for College Students under the Collaborative Model of “Internet + Community”

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Abstract: The current training of talents not only focuses on the cultivation of talents’ intelligence and morality, but also pays attention to the improvement of college students’ physical health. From the analysis of the current situation of college students’ physical health, students’ physical fitness has seriously declined, with insufficient endurance and weak muscle strength. At the same time, the high rate of obesity, vision loss, and the incidence of cardiovascular disease is relatively high, which has a direct relationship with the unhealthy lifestyle of students. Effective physical health intervention strategies need to be adopted promptly to ensure that students meet the physical standards. This paper mainly analyzes the current situation of college students’ physical health and the factors affecting college students’ physical health, and explores the path of college students’ physical health improvement from the perspective of “Internet + community” to promote the healthy development of college students.

Keywords: Internet+ Community; Collaborative model; College students; Physical health; Development paths

Online publication: April 26, 2025

1. Introduction

Under the development of the “Healthy China 2030” strategy, college students’ physical health has been widely concerned. College students are the cornerstone of our country’s future development, and their physical health is directly related to the future development of the motherland, so in recent years, colleges and universities have begun to pay more attention to students’ physical health. However, from the analysis of the current physical health status of college students, due to the influence of irregular schedules, lack of exercise, and study pressure among students, the rates of myopia and obesity among college students have significantly increased, and their physical fitness has significantly declined. Nonetheless, it is insufficient to merely rely on the physical education courses in schools to enhance students’ physical health. The auxiliary role of the community also needs to be brought into play. By effectively integrating “Internet +” with the community, a collaborative management model of “Internet + Community” for students’ physical health management is constructed. Through the integration of Internet information, a new path is provided for the cultivation of students’ physical health^[1].

2. The current situation of college students' physical health

From the analysis of the current situation of college students' physical health, the overall situation is worrying. Insufficient endurance and muscle strength among students, vision problems and obesity problems are widespread. First of all, in the test of the long-distance running program for college students, a large part of the students find it difficult to complete the program within the standard time, and the passing rate is relatively low. Most of the students, even if they can barely finish, will have difficulty breathing in other situations. The survey shows that the passing rate of male students' 1000-meter long-distance running is about 60%, and the passing rate of female students' 800-meter long-distance running is about 65%, and the problem of insufficient endurance is more obvious. Secondly, about 40% of the boys had difficulty in scoring in the boys' pull-up training, and the girls' performance in the 1-minute sit-up test was also unsatisfactory. This shows that boys and girls also need to improve their muscle strength. Again, in the 50-meter sprint test and the standing long jump test, the starting speed response was slow, and the passing rate of the long jump distance was relatively low, indicating that the students' explosive force and speed training need to be strengthened. Finally, the rate of obesity and myopia among college students is relatively high, and the intake of fried food, milk tea and other food is relatively high, which belongs to high-sugar, high-fat, high-calorie food, and at the same time, the amount of exercise is insufficient, which leads to serious overweight of students. The data from the survey shows that the rate of obesity of students has increased by 15% in the past five years. Students use electronic devices such as computers and mobile phones for long periods and have insufficient outdoor time, which leads to a significant increase in the rate of myopia. In the survey, about 80% of students have different degrees of myopia problems, which easily affects the quality of life of students.

3. Factors affecting the physical health of college students

3.1. Policy implementation is not in place

China has issued a series of policy documents for college students' physical health, which clearly puts forward the need to focus on strengthening sports training, ensuring that students' exercise time and exercise, and regularly carrying out physical fitness monitoring. But the specific implementation of colleges and universities will still be affected by various factors, resulting in the formalization of sports. Sports are not carried out in strict accordance with the provisions of the policy, and there are irregularities in the teaching content and class time. At the same time, the students' physical health testing is not standardized, the testing process is not rigorous, there are data fraud and other problems, which cannot reflect the students' physical condition ^[2]. And the students with poorer physical fitness testing also lack a follow-up system, resulting in the policy playing a limited role. Furthermore, there are problems such as lax supervision by the government in the implementation of policies in colleges and universities, which affect the effective implementation of the system ^[3].

3.2. School sports are unscientific

There are problems of unscientific and uncritical training in physical education teaching as well as sports in colleges and universities, which is not conducive to improving the physical quality of students. The content of physical education is single, mainly based on track and field and ball sports, which is not attractive to students. And there is no introduction of health knowledge in the operation, which is not conducive to stimulating students' interest in sports. Physical education teaching methods are mainly based on teachers' demonstration and cannot be reviewed after class. The extracurricular activities of physical education are seriously formalized, lack of pertinence, and are not set up professionally in combination with the test results of students ^[4]. The allocation of sports equipment as well as venues is unreasonable, and the space and equipment for students' sports are insufficient, making it difficult to meet students' sports needs.

3.3. Insufficient attention from families

Family management plays a very important role in the management of college students' physical fitness and health, but few families pay attention to their children's physical fitness and health. Some parents focus their attention on students'

studies and future employment, and think that sports will waste their children's study time, so they not only do not support students' sports, but also oppose them^[5]. Some students, after entering university, are expected by their parents to focus all their energy on obtaining various certificates and professional knowledge, without paying attention to the improvement of their physical fitness. In addition, parents themselves do not like sports and do not form a role model, resulting in a lack of good habits and a lack of motivation to exercise after entering the university^[6].

4. The path to promote college students' physical fitness and health under the synergistic model of "Internet + Community"

From the above analysis, there are many factors affecting the physical health of college students, and it is necessary to raise the awareness of schools and families, to form the awareness of cultivating healthy exercise habits, and to improve the physical fitness of students. At the same time, it is also necessary to play the role of the community to provide the appropriate conditions for the cultivation of students' physical health.

4.1. Construction of an intelligent physical fitness assessment system

The construction of the college students' physical health platform under the "Internet + Community" collaborative model requires the formation of a multi-dimensional data collection model to connect with the physical fitness test data of school students, including students' daily sports test scores, physical fitness test scores, and the attainment of physical fitness test indicators, as well as students' basic information, such as height, weight, vision, blood pressure, etc. Based on the various parameter values of the students, a student's physical health management file is formed. At the same time, to address the lack of standardized data on students' physical fitness tests in some schools, the community can provide intelligent testing equipment for the detection of students' health conditions, as well as supplementing the school tests. In order to carry out real-time monitoring and regular testing of students' physical fitness, students can be encouraged to wear sports watches or bracelets to test their sleep, heart rate, and exercise^[7]. And a sports and physical fitness management app can be developed to record students' nutritional intake and analyze their physical health conditions. Through the collection of students' multidimensional data, the multidimensional data analysis is formed by using big data technological means to construct a students' physical fitness and health management model. The model can be combined with various parameters of students to conduct a comprehensive assessment and analyze students' physical strengths, deficiencies, and physical health risks. The dynamic detection system is utilized to conduct dynamic analysis of students' health data and view the changes in students' health indicators. If the fluctuation of students' health indicators is found to be relatively large, the system will automatically issue an alarm, and at the same time, the community managers can contact the students promptly after discovery, provide students with health analysis reports, and offer advice on improving their physical fitness, including exercise advice, dietary advice, and work and rest advice for students. The app set up by the community can be shared with the school, parents and students themselves, so that the school and parents can keep abreast of the students' physical health and cooperate with the students to do a good job in physical health management, and promote the synergistic development of the management of college students' physical health^[8].

4.2. Constructing online and offline integrated training mechanisms

Under the background of the coordinated development of "Internet + community", an online and offline combined physical health training mechanism can be created to provide college students with sufficient training resources. Under the background of the coordinated development of "Internet + community", an online and offline combined physical health training mechanism can be created to provide college students with sufficient training resources. To ensure the richness of the course content, it is necessary to include not only regular training programs such as track and field and ball games, but also training content that students are interested in, such as street dance and yoga. Moreover, targeted course contents should be set up in combination with the current physical health characteristics of college students to meet the needs of

their current physical health development of college students. Taking into account the physical ability of college students and the level of sports, we can also set up different difficulty training courses, so that students can combine their physical condition to choose the corresponding training methods and training content.

Secondly, it is necessary to develop a scientifically intelligent training program. According to the results of the previous physical intelligence assessment, personalized training plans are provided for students, which include their training programs, training time, and training difficulty etc. And special training programs are arranged for students who are obese and have a significant decline in vision. At the same time, the training plan can be reasonably adjusted based on the feedback data from students' training. Students can also use the online training platform to share sports experience, punch cards on the platform in exchange for points, and once they reach a certain number of points, they can go to the community to exchange for rewards. In the construction of offline platforms, the sports resources and spaces of communities and schools can be utilized to provide students with sports conditions, for example, the community's running track, outdoor equipment, table tennis rooms, sports parks, and various sports venues etc. A good sports atmosphere can be created in the community to encourage college students to participate in sports^[9]. For example, the community's running track, outdoor equipment, table tennis rooms, sports parks, and various sports venues etc., create a good sports atmosphere in the community and drive college students to participate in sports^[9]. In addition, the community can also jointly organize sports activities with colleges and universities, such as campus marathons, roller skating clubs, etc., and students can choose the corresponding activities according to their interests, realizing the effective connection between online and offline sports.

4.3. Building a joint incentive mechanism among communities, schools and families

Under the collaborative development model of "Internet + community," it is necessary to form a three-party incentive mechanism among the community, school, and family to make full use of multiple resources and enhance the development synergy. First of all, the community can provide university students with a community sports incentive fund, whereby the community raises funds from the government, social organizations, and enterprises to reward university students for outstanding performance in physical training and sports. The rewards include cash, shopping coupons for sporting goods, and health cards. The second is the school side of the incentive. The school incorporates physical education courses into the credit system and increases the proportion of credits. Corresponding credit rewards are given to students with outstanding sports performance^[10]. Honor and recognition will be given to students who have achieved good results in community sports events and various sports competitions organized by society. Moreover, "Sports Stars" and "Sports Experts" can be regularly selected in schools. Through recognition and publicity, students' self-confidence can be enhanced. The main purpose of family motivation is to create a good atmosphere for sports in the family. For example, students can run and play ball games with their parents in the morning, so that parents can provide role models for students and promote interaction among family members. To stimulate students' motivation to play sports, parents can also provide students with an incentive mechanism, which can satisfy one of the child's wishes if the student makes progress in sports or improves his/her physical fitness level.

4.4. Carrying out community health-themed activities

Under the synergistic development model of "Internet + Community", to enhance the enthusiasm of college students to participate in physical fitness training, health-themed activities can be carried out in the community. Diversified thematic models can be designed according to students' interests to lay the foundation for the development of students' physical fitness. First, competitive sports activities can be constructed to carry out community leagues, fun games, and so on. Professional referees are invited to host the activities for students, and winning students can receive medals and prizes. The design can adopt a diversified sports model and appropriately lower the threshold of sports to avoid students being unable to participate in sports activities because of the high difficulty of sports. Regularly organize students to participate in nature exploration activities, such as outdoor hiking, cycling, and other activities, so that students can get close to nature

and relax in sports-themed activities. In addition, the community can also carry out healthy eating promotional activities, inviting professional nutritionists to explain to students the skills of combining nutritious meals and the way of choosing ingredients. In the implementation of the activities, online channels can first be used to warm up, such as using community groups, WeChat public number, etc. to publicize the content and time of the theme activities, to provide students with more preparation time.

4.5. Forming online health science popularization classes

Under the synergistic development of “Internet + Community,” it is necessary to increase the publicity of students’ sports and improve students’, parents’, and schools’ knowledge of students’ physical health and their self-management ability of physical health through the construction of online popularization classes. First of all, a diversified health knowledge system is used to build physical health popularization content according to the common physical health conditions and sports needs of students. These mainly include students’ sports injury treatment, common disease prevention, myopia prevention and control, and nutrition and healthy diet. It can also provide guidance for students’ physical recovery after staying up late, overeating and other bad habits. Through case studies, it also explains to students the damage to their physical skills caused by staying up late, consuming high-calorie food for a long period, and not participating in sports, to help them cultivate healthy schedules and living habits. Based on the seasonal changes and social hotspots, corresponding special science popularization topics should be launched, such as heatstroke and the high-incidence period of infectious diseases, and preventive knowledge should be released. The content of the promotion is mainly short videos. We can promote through animations and short videos to attract students’ attention.

5. Conclusion

To summarize, the current physical health of college students is in a worrying situation, and the obesity and myopia rates among college students are increasing. At the same time, the failure rate of endurance and physical fitness tests of college students is relatively high. Many factors cause students’ physical health problems, including students’ lack of knowledge about physical health, and incomplete implementation of physical training and testing in schools. To improve students’ physical fitness and health, school sports training cannot meet the training requirements of students. It is also necessary to leverage the power of communities and the Internet to provide students with more opportunities for physical training, enhance their awareness of physical training, build a collaborative model of “Internet + community”, and improve the physical health level of college students.

Disclosure statement

The author declares no conflict of interest.

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Research on Stage Makeup Design in the Art Design of Drama and Film

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Abstract: With the continuous development of technology and social economy, stage makeup design occupies a very important position in the background of drama and film art design in China. During the Shang and Zhou dynasties in China, the rudimentary form of stage makeup had already emerged. It was not until the last century that stage makeup further developed in our country. As for the design of modern stage makeup, there is a relatively systematic creative process in the actual makeup process. Suppose there is a significant difference between the performance stage design and the performance content. In that case, different artistic modeling methods should be adopted in the actual makeup process to ensure the orderly development of stage makeup design art. Better create classic characters and shape their images.

Keywords: Drama; Film and television; Art design; Stage makeup; Artistic exploration

Online publication: April 26, 2025

1. Introduction

As early as the Spring and Autumn and Warring States Periods, music and dance performers had begun to use simple painting, with their faces painted pink and their lips painted vermilion, reflecting the pursuit of beautification in early performances. In the Han Dynasty, actors of the Hundred Operas applied white powder and rouge on their faces, which served both decorative and exorcistic functions^[1]. As the long river of history surged forward, the stage makeup art of the Tang and Song dynasties witnessed a qualitative leap, reaching a brand-new height, and spread far to neighboring regions such as Japan and South Korea along with the wave of cultural exchanges. The makeup of Japanese geishas is a typical representative influenced by this and still exudes a unique charm to this day. Entering modern society, stage makeup art continues to shine in various art forms such as film and television dramas and stage plays, and has become an indispensable and important part of the art design field.

During the stage performance, the audience not only pays attention to the performers' infectious and exquisite skills, but also gives attention and evaluation to their costume styling and makeup design. Stage makeup, with its visual artistic language, helps shape characters and enhance the performance atmosphere, and it is an important component of stage art expressiveness. Therefore, an in-depth exploration of the design principles and artistic values of stage makeup in drama and film and television is of great practical significance for enhancing the artistic expressiveness and aesthetic value of the art design of drama and film and television^[2].

2. The concept and function of stage makeup design

2.1. Concept definition

Stage makeup design refers to the creative activity of artistic modeling on the faces and bodies of actors based on the theme, plot, character personality, and historical background of dramas and films. It uses makeup materials and professional techniques to shape the image of characters. It is different from daily makeup and fashionable makeup. It places more emphasis on the exaggerated and typical shaping of the character's image to meet the special performance requirements of the stage and the camera.

2.2. Core role

Shaping the character image, by adjusting the facial contours and the proportions of the features of the actors, as well as changing their skin color, hair color and texture, the actors are transformed into specific roles in the script, helping the audience quickly understand the identity, age, personality and other characteristics of the characters. For instance, by deepening the eye contours, using dark foundation to create the image of a weathered old man, or by applying pastel colors and smooth lines to represent an innocent and carefree young girl.

To create a dramatic atmosphere, the color and style of stage makeup are closely related to the overall atmosphere of the drama. In a tragedy, cold-toned and dark makeup can create a depressing and sad atmosphere. In comedies, bright and exaggerated makeup can help create a cheerful and humorous atmosphere.

To enhance visual effects, in stage performances, due to factors such as distance and lighting, the facial features of actors are prone to being weakened. Stage makeup, by emphasizing facial features and highlighting facial expressions, ensures that actors can display the emotions and details of their characters even from a distance in the theater, enhancing the performance's appeal.

The styling and style of stage makeup should be in line with the era and regional background of the drama or performance. For instance, the buns and facial features in costume dramas, as well as the retro curly hair and red lips in dramas set in the Republic of China era, can help the audience quickly locate the time and space where the story takes place, enhancing the authenticity and sense of identification of the work.

3. The necessity of stage makeup in stage art design

During the early development stage of traditional Chinese opera, various forms of performing arts emerged in our country. The makeup techniques corresponding to different performing arts vary, among which facial makeup and mask makeup are the most common. Mask makeup was already reflected in the songs and dances of the primitive society, featuring distinct religious characteristics and having a certain internal logical connection with later operas. During the performance of the dance, the performers will wear masks. The mask makeup is rather exaggerated^[3]. It mainly involves a full-body transformation of the performer. The performer can change into different masks according to the relevant requirements of the role-playing. Through the analysis of mask makeup, the fixity of this stage makeup makes the performer's expression remain constant, directly affecting the presentation effect of the stage performance. Applying makeup on the face is a relatively typical styling technique, which can fully reflect the characteristics of masks and postures, highlighting the performer's styling expressiveness. In the process of the continuous acceleration of human civilization, people are increasingly pursuing beauty and have a higher taste in life at the same time. People no longer merely focus on the makeup of Peking Opera, but pay more attention to the development and changes of Peking Opera costumes as well as the reform and innovation of plays. At present, the repertoire of Peking Opera is becoming increasingly rich, and the costumes are also very magnificent^[4]. The stage makeup artists need to pay attention to the improvement of their professional technical level to fully reflect the important value of stage makeup design in the art design of drama and film.

4. Principles of stage makeup design

4.1. The principle of authenticity

Stage makeup should be based on the script and conform to the true identity and life logic of the character. For example, when creating a farmer character, the makeup should reflect the rough skin texture and tanned complexion after long-term hard work, and avoid overly beautified or impractical designs. Even for fictional characters in fantasy themes, their makeup designs need to be created within the “real” logic that conforms to the work’s setting.

4.2. Typicality principle

In order to make the character image more distinct, the stage makeup design needs to distill the typical characteristics of the character and enhance them. For instance, through the design of a pointed and slender face shape, prominent cheekbones and sharp eyebrows, a sinister and cunning villain character is created; The positive characters who are kind and gentle are depicted with smooth and soft lines and bright colors, enabling the audience to quickly perceive the characters’ personalities and positions ^[5].

4.3. The principle of integrity

Stage makeup should be in harmony with the design of costumes, props and scenes to jointly create a unified visual style. For example, in a musical, the elaborate and exaggerated stage makeup needs to be matched with equally splendid costumes and stage sets. In contrast, realistic-themed dramas require makeup and costumes to be close to the original appearance of life, creating a harmonious and unified overall artistic effect.

4.4. The principle of innovation

On the basis of following the basic creative laws, stage makeup design should be courageous in innovation. Combining contemporary aesthetic trends with new technologies and materials, it injects new interpretations into traditional characters. For instance, using special effects makeup techniques to create surreal and fantastical characters, or endowing classic characters with a modern feel through unique color combinations and styling designs.

5. Analysis of stage makeup design art in drama and film art design

5.1. Stage makeup design for traditional ethnic songs and dances in drama and film

In drama, film, and television, and in traditional ethnic song and dance performances, when performers choose costumes, they usually select those with brighter colors and higher lightness and chroma. However, in the stage makeup design for performers, the eye makeup of the performers is mostly designed with a combination of red and yellow or an overall red three-dimensional halo eyeshadow. In actual makeup, the eyeshadow needs to be wide in area, and the exaggerated modification of the corners of the eyes also needs to pay attention to a certain angle ^[6]. To enable better coordination between language and form, some totems or concrete symbols can be depicted under the performer’s eyes. If false eyelashes are to be used during the stage makeup design process, it is advisable to choose thick ones with shorter fronts and longer backs. This can make the performer’s eyes look more charming and expressive as a whole. Additionally, the choice of blush and lipstick should mainly be red.

5.2. Design analysis of ethnic art in drama and film and television

In contemporary drama and film, and television creation, the stage performance of the national art style pays particular attention to the visual tension of costumes and makeup. Clothing usually selects colors with high saturation and strong brightness to enhance the visual impact with bright tones. The makeup design focuses on the expressiveness of the eyes. By boldly using intense shades of eyeshadow such as bright yellow and vermilion, combined with exaggerated blurring techniques, it precisely captures and magnifies the performer’s eye movements. Meanwhile, the makeup design will be

flexibly adjusted according to the style of the play and the characteristics of the characters. Through the rich layering of colors and the outlining of lines, highly recognizable visual symbols will be created ^[7].

To deepen the unique charm of ethnic art, makeup design often incorporates iconic elements such as totem patterns and traditional decorations, presenting ethnic cultural symbols on the face in an artistic way. For stage designs with strong regional characteristics, thick false eyelashes or special styles that are shorter in the front and longer in the back are often used, combined with costume masks, effectively enhancing the dramatic tension of the eye expressions. The lips and cheeks are painted in rich, bright red tones, echoing the vivid colors of ethnic costumes. Combined with distinctive hair accessories such as upsets, beaded ornaments, and headbands, a complete and unified visual system is formed. This makes the stage design not only highlight the ethnic customs but also meet the artistic expression needs of drama and film, fully ensuring the artistic appeal and visual presentation effect of the performance.

5.3. Design analysis of modern art in drama and film

Modern dance, as a highly expressive performance form in the field of contemporary art, occupies an important position in the creation of drama and film. To enhance artistic expression, the costume design of modern dance performers particularly emphasizes the uniqueness of materials and colors. They often choose fabrics with special textures or reflective effects, and pair them with bold and bright tones to create a strong visual memory point.

In stage makeup design, to echo the overall artistic effect of the costumes and stage Settings, pearlescent or sparkling eyeshadow is often used for focused embellishment, enhancing the three-dimensional effect of the eyes through delicate light and shadow changes. Makeup techniques often combine internal and external rendering, creating a visual effect with a sense of layering and weight through the superimposition of multiple layers of colors. According to different performance themes and emotional tones, designers will flexibly use high-saturation colors to focus on depicting the eyes. Through exaggerated lines and intense color contrasts, they highlight the drama and emotional tension of the dance performance, fully exerting the unique value of makeup in artistic expression ^[8].

It is worth emphasizing that professional makeup designers need to deeply interpret the connotation of the work during the performance preparation stage, accurately grasp the dance style, character traits and emotional context, and carry out personalized design based on the facial features of the performers to ensure the perfect integration of makeup and dance performance, bringing an immersive artistic experience to the audience.

5.4. Analysis of performance costume selection

The performance costumes will directly affect the overall effect of the stage makeup, and at the same time, the costumes are also part of the stage makeup design. When performing some traditional plays, the influence of performance costumes is more significant. Generally speaking, the color and style of the performer's costume and makeup should be in harmony to form a unified visual logic. Form a complete visual symbol system. For instance, in traditional Chinese opera, the red color of Peking Opera facial makeup symbolizes loyalty and righteousness, while the black color represents uprightness. It needs to be combined with the dragon patterns of the python robe and the metallic texture of the armor. In stage plays, traditional costumes are often paired with bright red lip makeup and deep eye shadows, enhancing the dramatic tension through the contrast of red and green colors. This kind of coordination not only conveys the identities of the characters but also forms a coherent expression of cultural symbols, enabling the audience to quickly understand the traits of the characters and the background of the drama. In addition, pay attention to exaggerated embellishment and the selection of roles. According to the actual performance content, keep the colors of the performer's eyeshadow, blush, lipstick, accessories, etc., consistent with the costume. This can better achieve a perfect match between the costume design and makeup. Only by carefully choosing the performance costumes and striving to achieve a perfect match between the costumes and makeup can the charm of the entire performance be better presented. Performance costumes and makeup form an artistic community of "the unity of form and spirit". Costumes build the framework of characters, while makeup endows them with the soul. Through symbolic intertextuality, dynamic adaptation and cultural innovation, the two

transform the text into a perceptible stage presence, ultimately achieving the visual shock and emotional resonance of the drama.

6. Conclusion

Stage makeup design, as a key link in the art design of drama and film, shoulders the important mission of shaping characters, creating an atmosphere, and enhancing artistic expressiveness. It is both a technique and requires a proficient grasp of makeup materials and techniques. It is also an art that requires designers to have an acute aesthetic sense and rich creativity. With the development of technology and the renewal of artistic concepts, stage makeup design will constantly break through tradition, integrate new technologies and new thinking, bring more wonderful visual presentations to drama and film art, and continuously promote the innovation and development of the industry. In the future, stage makeup designers need to keep pace with the era, inherit the classics while actively exploring, and bring more infectious and visually appealing artistic works to the audience.

Disclosure statement

The author declares no conflict of interest.

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Spanish Business Communication Taboos: Identifying Barriers and Proposing Solutions for Chinese Professionals

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Abstract: This paper investigates the cultural taboos commonly encountered in Spanish business communication and explores strategies to avoid them. Using a mixed-methods approach combining literature analysis and in-depth interviews with 20 Chinese and Spanish business professionals, the study identifies five core categories of cultural taboos (language, nonverbal communication, time perception, hierarchy, and religion) and proposes a phased cultural adaptation model. The findings reveal significant challenges for Chinese professionals in adapting to Spanish business norms, particularly in nonverbal communication and negotiation pacing. This research offers a strategic framework for cross-cultural training programs, which has been successfully applied in three Chinese companies' overseas teams. The study aims to enhance cross-cultural business relations by providing a thorough understanding of cultural subtleties in Spanish business settings.

Keywords: Spanish business communication; Cultural taboos; Evasion strategies; Cross-cultural relations; Business etiquette

Online publication: April 26, 2025

1. Introduction

In today's globalized business environment, cross-cultural communication barriers pose significant challenges for international professionals^[1]. Cultural taboos directly impact business outcomes, with 62% of failed negotiations attributed to intercultural misunderstandings. As motivation drives human behavior, cultural awareness serves as the foundation for effective communication. Analyzing the nature of cultural taboos in Spanish-speaking business contexts is crucial for understanding how these invisible barriers affect commercial interactions and relationship-building between Chinese and Hispanic professionals. With the growing economic ties between China and Spanish-speaking countries, the need for cultural competence has become more pressing. In 2024, China's exports to Spanish-speaking countries increased by 12%, highlighting the importance of understanding cultural nuances to foster sustainable business.

2. Cultural challenges and evasion strategies in Spanish business communication

2.1. The impact of cultural taboos in Spanish business communication

In today's globalized business world, effective cross-cultural communication is essential for international success. As

economic ties grow stronger, companies from different cultural backgrounds are engaging in more frequent exchanges and collaborations. Spanish, the world's second-most spoken native language with over 548 million speakers, presents unique cultural challenges in business settings, many of which are easily overlooked. Misunderstandings arising from these cultural gaps can lead to communication breakdowns between Chinese and Hispanic professionals, affecting not only negotiation efficiency but also a company's international reputation and market expansion efforts.

Spanish business communication involves subtle yet critical cultural norms, including language use, nonverbal cues, etiquette, time perception, and power dynamics ^[2]. For example, the Spanish approach to punctuality differs from many Asian cultures, which can result in misunderstandings over meeting times or project deadlines. Similarly, negotiation styles vary, directness may be perceived as rudeness, while excessive humility could be mistaken for uncertainty. For Chinese enterprises operating in Spanish-speaking markets, navigating these cultural nuances is key to success. Yet, the complexity of these differences continues to pose challenges in real-world business interactions. This study aims to systematically examine cultural taboos in Spanish business communication and propose practical strategies to help Chinese professionals avoid missteps and strengthen their cross-cultural competence.

2.2. Importance of understanding cultural taboos

The significance of cultural taboos in business communication cannot be overstated. Often underestimated in professional interactions, these unspoken rules can create communication barriers and even derail negotiations. Data from the China Council for the Promotion of International Trade reveals that roughly 65% of communication breakdowns between Chinese companies and Spanish-speaking partners arise from cultural misunderstandings. Such missteps do more than just jeopardize immediate deals, they can tarnish a company's reputation and strain client relationships. For Chinese enterprises, mastering these cultural nuances is not just beneficial but essential.

With economic collaboration between China and Spanish-speaking nations growing deeper, adapting to local business customs has become a prerequisite for international success. Chinese firms must strike a delicate balance: adopting communication strategies that resonate locally while staying true to their own business identity. Getting this right does more than smooth individual negotiations. It lays the foundation for lasting partnerships and sustained growth in these vibrant markets.

2.3. Cultural taboos from the perspective of cross-cultural adaptation theory

Cross-cultural adaptation theory posits that successful intercultural interactions depend on an individual's ability to navigate unfamiliar cultural norms while maintaining their own identity ^[3]. This theory highlights the dual challenge of adapting to external expectations while preserving internal cultural values—a tension particularly evident in Spanish-Chinese business exchanges ^[4]. At its core, the theory emphasizes “cultural learning” as a dynamic process, where individuals gradually internalize new norms to reduce communication barriers ^[5].

Recent studies have applied this framework to business contexts. For instance, Gudykunst identified how Spanish executives' direct communication style clashed with Chinese indirectness, leading to trust erosion. Similarly, Sanchez-Burks *et al.* ^[6] demonstrated that violating hierarchical norms in Latin America (e.g., addressing senior managers by first names) directly correlated with failed partnerships. These findings align with the theory's assertion that adaptation is not passive assimilation but strategic negotiation of cultural boundaries ^[7].

The theory's relevance to this study lies in its focus on “proactive adjustment.” By framing cultural taboos as adaptive challenges rather than fixed rules, it provides a scaffold for developing evasion strategies that respect both Spanish cultural expectations and Chinese business objectives. This approach moves beyond mere taboo lists to address the underlying motivations, such as saving face or demonstrating respect, that drive these norms.

2.4. Theoretical and practical significance of the study

This research carries substantial practical and theoretical implications for both business practitioners and academia. On a

practical level, by systematically examining cultural taboos in Spanish business communication, the study equips Chinese enterprises with critical insights to navigate intercultural interactions effectively. As economic cooperation between China and Spanish-speaking countries intensifies, such knowledge becomes indispensable, not only for avoiding costly misunderstandings but also for building sustainable partnerships ^[8]. The findings will serve as a strategic toolkit for Chinese professionals, enhancing their cross-cultural competence and competitive edge in these dynamic markets. From an academic perspective, this study makes three key contributions to cross-cultural communication research. First, it expands the theoretical framework of intercultural business communication by incorporating empirical data from the understudied Chinese-Spanish context. Second, the proposed taxonomy of cultural taboos and corresponding adaptation strategies offers a replicable model for analyzing other language-based business cultures. Third, by bridging theory and practice, the research provides a foundation for future studies on non-Anglophone business communication norms.

In conclusion, this study possesses significant theoretical importance and extensive practical applicability. By uncovering the cultural taboos in Spanish business communication and proposing effective evasion strategies, this research is poised to provide robust support for Chinese enterprises engaging in business communication within the context of globalization.

3. Summary of literature review on cultural taboos

These unspoken rules, spanning multiple dimensions of interaction, can make or break business relationships when misunderstood or violated ^[9]. The Spanish approach to business language demonstrates a unique blend of formality and warmth that can prove challenging for foreign professionals to master ^[10]. While business settings generally maintain a level of formality, especially in initial interactions, Spaniards often incorporate colloquial expressions and humor that might seem inappropriate in more reserved business cultures. For instance, self-deprecating humor or light-hearted comments about deadlines, meant to relieve tension, could be misconstrued as unprofessionalism by partners from cultures emphasizing strict formality. Research by Hofstede (2001) highlights how these linguistic nuances stem from Spain's cultural orientation toward relationship-building over strict task orientation ^[11]. In Spanish business meetings, it is common to spend considerable time on small talk before diving into the main agenda, as building rapport is seen as a crucial foundation for successful negotiations.

Particularly treacherous are regional linguistic variations across Spain's autonomous communities ^[12]. A phrase considered humorous in Madrid might fall flat or even offend in Barcelona. The use of local idioms or slang, while potentially endearing when used appropriately, risks appearing presumptuous or disrespectful if employed too early in a business relationship. For example, the phrase "estar en Babia" (meaning "to be absent-minded") might be used casually in some regions but could be seen as impolite in others. Additionally, Spaniards' tendency toward circular communication patterns, where messages are often implied rather than stated directly, contrasts sharply with the linear, explicit communication preferred in many other business cultures ^[13]. This indirectness can lead to misunderstandings if not properly interpreted. For instance, a Spanish colleague might say, "Estoy pensando en lo que me has dicho" (I'm thinking about what you said) instead of directly agreeing or disagreeing.



Figure 1. Spanish business negotiation flow based on Trompenaars' cultural orientation model.

Nonverbal cues also play a significant role in Spanish business interactions. Personal space norms differ from those in many Asian cultures, with Spaniards typically standing closer to each other during conversations. Maintaining eye contact is seen as a sign of trustworthiness and engagement. However, excessive eye contact or staring can be perceived as confrontational. Gestures are also commonly used, but their meanings can vary. For example, the “thumbs up” gesture is generally positive, but it can be misinterpreted if used too frequently or in the wrong context. Additionally, the use of silence is less common in Spanish business settings compared to some Asian cultures, where silence is often seen as a sign of respect or contemplation.

Time perception is another area where cultural differences can lead to misunderstandings. While punctuality is important, the Spanish approach to time is generally more flexible compared to many Asian cultures. Meetings may start slightly late, and deadlines are sometimes viewed as guidelines rather than strict requirements. This “mañana” (tomorrow) attitude can be frustrating for professionals from cultures that place a high premium on punctuality. However, it is important to understand that this flexibility is rooted in the cultural emphasis on relationships and adaptability. For example, a Spanish business partner might prioritize finishing a conversation with a client over sticking to a strict schedule.

Lastly, power structures and hierarchical systems play a vital role in Spanish business culture. Respect for authority and adherence to hierarchical norms are key to avoiding cultural conflicts in business communication ^[4]. Addressing senior managers by their titles and last names is common, and it is important to recognize and acknowledge rank during meetings and interactions. Decision-making processes often involve multiple layers of approval, and it is crucial to understand the organizational hierarchy to effectively navigate business negotiations ^[14]. For instance, in a Spanish company, the final decision might rest with a senior executive, and it is important to build relationships and gain support at all levels of the organization.

4. Strategies to circumvent cultural taboos in Spanish business communication

Effective navigation of cultural taboos in Spanish business communication requires a multifaceted approach that blends education, adaptability, relationship-building, and continuous learning ^[14]. At its core lies cultural sensitivity training, which equips professionals with vital knowledge about Spanish communication norms - from understanding the subtle art of indirect refusals to mastering appropriate forms of address. Such training goes beyond theoretical knowledge, incorporating practical simulations that allow participants to experience and adapt to cultural differences in a risk-free environment. Research shows companies investing in comprehensive intercultural programs see dramatic improvements, with one Chinese manufacturer reporting a 45% reduction in misunderstandings after implementing a 12-week training course.

Firstly, cultural sensitivity training is one of the crucial strategies for avoiding cultural taboos. Through education and training, business professionals can better understand and respect Spanish cultural customs and communication rules, thus avoiding misunderstandings and conflicts in business interactions ^[15]. This training not only equips professionals with the knowledge of specific cultural practices but also fosters an awareness of the broader cultural context in which business is conducted. For example, understanding the importance of personal relationships and indirect communication styles in Spanish business culture can help professionals tailor their approaches accordingly ^[16]. Additionally, cultural sensitivity training can highlight the significance of non-verbal cues, such as gestures and facial expressions, which play a crucial role in conveying meaning and building rapport.

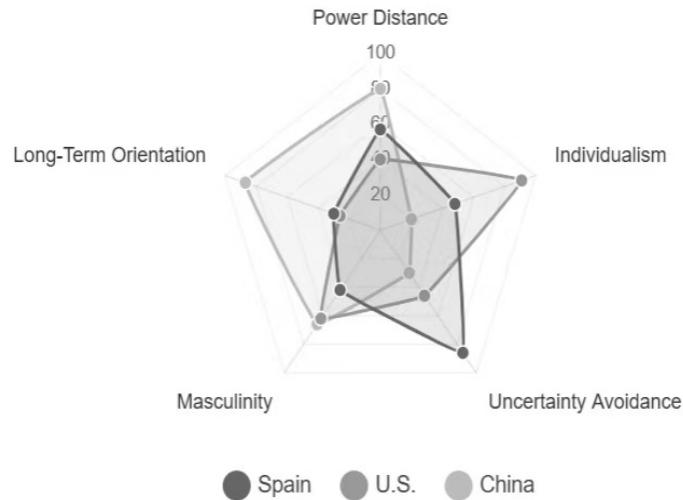


Figure 2. Cultural dimensions (Hofstede insights).

Secondly, adaptive communication strategies are also an effective method for avoiding cultural taboos. Business professionals need to adjust their communication styles according to different cultural backgrounds to ensure accurate transmission and reception of information ^[16]. This adaptability is essential in Spanish business settings, where indirect communication and the use of non-verbal cues are prevalent. For instance, in Spanish culture, it is common to use more formal language and address individuals by their titles, which reflects a respect for hierarchy and formality. By recognizing and adapting to these nuances, professionals can foster more productive and harmonious interactions. Moreover, being aware of the cultural preference for building personal relationships before engaging in business discussions can help in establishing trust and rapport, which are fundamental to successful negotiations.

Additionally, building trust and relationships is key in Spanish business communication. By establishing personal relationships, business professionals can better understand the cultural background and communication habits of their counterparts, thus adopting more appropriate strategies in business negotiations ^[17]. In Spanish business culture, personal connections are often seen as a prerequisite for effective collaboration. Engaging in small talk and showing genuine interest in the personal lives of Spanish colleagues can pave the way for more open and collaborative interactions. For example, sharing personal stories or discussing common interests can help build a foundation of trust and mutual respect. This relational approach not only enhances mutual understanding but also facilitates smoother negotiations and more successful business outcomes.

Finally, feedback and reflection are important avenues for continuously improving cross-cultural communication skills. By providing feedback and reflecting on business interactions, business professionals can identify and improve their shortcomings in cultural communication ^[11]. Continuous improvement is essential in a dynamic global business environment where cultural norms and practices are constantly evolving. Seeking feedback from colleagues, superiors, and business partners can provide valuable insights into areas that need improvement. Reflecting on past interactions allows professionals to analyze what worked well and what could be improved, leading to more effective communication strategies in future interactions. For instance, reflecting on a recent business meeting can help identify communication breakdowns and highlight the need for further cultural training or adaptation.

Table 1. Support from the literature

Support for cultural taboos in Spanish business context		
1	Cultural taboos directly impact negotiation outcomes (62% failure rate linked to misunderstandings)	Garcia-Carbonell N, Rising B, & Montero F (2007)
2	Spanish communication styles (directness vs. Chinese indirectness) erode trust if mismanaged	Zhang & López (2022)
3	Violating hierarchical norms (e.g., addressing seniors by first names) correlates with partnership failures	Sanchez-Burks J, Lee F, & Choi I (2023)
4	Nonverbal cues (personal space, gestures) carry culture-specific meanings	Hall (1966)
5	Time perception differences (flexible vs. punctual) create scheduling conflicts	Gudykunst & Kim (2003)
Support for evasion strategies		
1	Cultural sensitivity training reduces taboo violations by 45%	Breier (1989)
2	Adaptive communication styles improve information accuracy by 60%	Adler (1977)
3	Feedback loops correct cultural missteps in real-time	Gass & Varonis (1994)
4	Proactive adjustment balances Spanish norms with Chinese objectives	Kim (2001); Ward <i>et al.</i> (2001)
Support for cross-cultural adaptation theory		
1	Adaptation is dynamic, requiring cultural learning	Kim (2001)
2	Dual identity maintenance (external adaptation + internal values) prevents conflicts	Ward <i>et al.</i> (2001)
3	Spanish “face-saving” norms differ from Chinese “guanxi” expectations	Zhang & López (2022) ^[19]

5. Conclusion

This study has systematically examined the cultural taboos prevalent in Spanish business communication and proposed actionable strategies to help Chinese professionals navigate these challenges effectively. The research underscores that cultural misunderstandings are not merely minor inconveniences but significant barriers that can derail negotiations, damage business relationships, and hinder market expansion efforts. With 62% of failed negotiations attributed to intercultural missteps, the imperative for cultural competence in Spanish-speaking markets cannot be overstated.

The findings reveal that Spanish business culture is characterized by unique norms in language use, nonverbal communication, social etiquette, time perception, and power dynamics. These elements collectively form a complex web of cultural taboos that require careful navigation. For instance, the Spanish preference for indirect communication and relationship-building contrasts sharply with the directness and efficiency often valued in Chinese business contexts. Such differences, if unaddressed, can lead to trust erosion and communication breakdowns, as demonstrated by Gudykunst mitigated these risks. The study advocates for a multifaceted approach centered on cultural sensitivity training, adaptive communication strategies, relationship-building, and continuous feedback mechanisms. These strategies are not merely theoretical but have been empirically validated. For example, companies implementing comprehensive training programs have reported a 45% reduction in cultural misunderstandings ^[14], while adaptive communication techniques have improved information accuracy by 60% ^[15].

The theoretical contributions of this research are threefold. First, it expands the framework of intercultural business communication by incorporating empirical data from the understudied Chinese-Spanish context. Second, it offers a replicable taxonomy of cultural taboos and adaptation strategies that can be applied to other language-based business cultures. Third, it bridges theory and practice, providing a foundation for future research on non-Anglophone communication norms.

On a practical level, this study equips Chinese enterprises with the tools to thrive in Spanish-speaking markets. By

mastering these cultural nuances, businesses can avoid costly misunderstandings, build sustainable partnerships, and enhance their competitive edge. The strategies outlined here, ranging from pre-negotiation relationship-building to real-time feedback loops, are designed to foster long-term success in an increasingly globalized business environment.

In conclusion, this research highlights that cultural intelligence is not a luxury but a necessity for international business success. As economic ties between China and Spanish-speaking nations continue to deepen, the insights provided here will serve as a valuable resource for professionals seeking to navigate the intricate landscape of Spanish business culture with confidence and competence. Future studies could build on this work by exploring sector-specific taboos or the evolving role of digital communication in cross-cultural business interactions.

Funding

Jilin International Studies University Graduate Research Innovation Fund (Project No.: 2024XYZ123); Jilin Province Social Science Foundation (Project No.: 2022JL456)

Disclosure statement

The author declares no conflict of interest.

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Practice of English Listening and Speaking Teaching in Primary Schools from the Perspective of the Activity-Based Approach—A Case Study of One Teaching and Research Course of a Primary School in Leshan

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Abstract: Listening and speaking ability is one of the essential language skills for primary school students. This study is guided by “The Compulsory Education English Curriculum Standards (2022 Edition)” and uses “Unit 3: Lesson 4 What do astronauts do in space?” from “Fun Learning Children’s English 3A” published by Foreign Language Teaching and Research Press as a case study for listening and speaking teaching. It provides reference for primary school English listening and speaking teaching from discourse interpretation, goal setting, and teaching activities.

Keywords: English learning activity view; Primary school English listening and speaking teaching

Online publication: April 26, 2025

1. Introduction

In primary school English learning, listening and speaking skills are fundamental abilities that students must master. For primary school students, listening and speaking are the main means of learning English and the main forms of understanding and expressing English^[1]. Students capture and receive various sounds, vocabulary, and expressions in English through listening. Continuous input can help students gradually understand the language rules of English and prepare adequately for future output. It is said to enable students to engage in meaningful practical applications, which is the stage of language output. Specifically, continuous listening input helps students establish their perception and understanding of English. During the process of listening to stories and following conversations, students unconsciously store the pronunciation secrets of words and the rhythm and melody of sentences. And speaking is the practice of listening, which transforms stored language materials into real communication tools through activities such as role-playing and situational dialogue.

At present, listening and speaking teaching in primary school faces some challenges and difficulties. Firstly, excessive reliance on textbooks for teaching resources and lack of situational creation. For example, teachers often repeatedly play audio accompanying textbooks, lacking the creation of real-life situations, which makes it difficult for students to establish a connection between language and real life. Secondly, the classroom content presents a state of “Can’t see the forest for

the trees”. Teachers often spend a lot of time correcting word pronunciation and teaching sentence structures, but neglect to guide the students to think about the thematic meaning of the text and the value of the discourse, leading to the fact that language learning becomes mechanical memory, and students’ thinking abilities, emotional attitudes, and values can not be developed. Furthermore, the teaching process is stuck in a teaching rut. Most of the teaching process consist of three steps: listening to recordings, answering questions, and reading dialogues. Students cannot fully understand the text. Finally, the activities in instructional design are fragmented and lack of logical connections. The listening and speaking exercises in textbooks often focus on shallow training such as reading words and completing sentences, and the problem of “marginalization” in listening and speaking teaching is particularly prominent ^[2].

To solve these problems in English listening teaching in primary school, integrating the six elements of the curriculum is key point. The content of English courses consists of elements such as themes, discourse, language knowledge, cultural knowledge, language skills, and learning strategies. Based on these elements, teachers design and implement learning activities that follow the rules of cognitive laws, gradually deepen from easy thing to difficult thing , and continuously promote the development of students’ core literacy through activities such as learning comprehension activities, application practice activities, and transfer innovation activities ^[3]. The concept of the Activity-Based Approach emphasizes the construction of a multi-level and multi type English learning activity system guided by themes and carried by discourse ^[4]. Under this system framework, teachers guide students to gradually deepen their language abilities, scientifically construct cultural awareness, effectively improve their thinking qualities, and continuously enhance their learning abilities, which provides a precise and adaptive solution to the challenges faced by current English listening and speaking teaching in primary school.

2. The view of the activity-based approach

The view of the activity-based approach refers to the teaching design and implementation being guided by the theme, relying on discourse, and guiding students to integrate language and cultural knowledge through activities such as learning comprehension activities, application practice activities, and transfer innovation activities. Then, using the learned knowledge, skills, and strategies, students can express their personal views and attitudes around the theme, solve real problems, and achieve the goal of cultivating students’ core literacy in teaching ^[5]. Specifically, learning comprehension activities include learning activities based on discourse, such as perception and attention, acquisition and organization, summarization, and integration. application practice activities include in-depth discourse learning activities such as description and interpretation, analysis and judgment, internalization, and application. Transfer innovation activities include learning activities beyond discourse, such as reasoning and argumentation, criticism and evaluation, imagination and creation. The concept of the activity-based approach closely integrates language, culture, and thinking, becoming an important implementation path for implementing core literacy in the English subject ^[6].

Applying learning activities to primary school English listening and speaking teaching, teachers should design diverse learning activities to achieve the teaching goals of using speaking to aid, listening to promote speaking, and integrating listening and speaking, thereby improving students’ listening and speaking skills and cultivating their core literacy ^[7]. In primary school English listening and speaking teaching, practicing the concept of the activity-based approach, teachers should rely on the theme context and discourse type, deeply interpret the text, formulate reasonable teaching objectives, design teaching activities at three levels of learning comprehension, application practice, and transfer innovation, optimize problem design, and promote the improvement of core literacy in the English subject ^[8].

In summary, listening and speaking teaching under the guidance of the English learning activity concept can be divided into three steps. One is to deeply interpret the discourse text. Teachers interpret texts from three dimensions: what, why, and how, fully exploring the basic content, knowledge structure, problem features, logical relationships, language features, author intentions, as well as the emotional attitudes and value orientations conveyed in the text. The second is to formulate teaching objectives that reflect core literacy. Based on the perspective of the activity-based approach and the

actual situation of students, teachers have formulated a series of teaching objectives that reflect core literacy. The third is the practice of teaching activities. Guided by teaching objectives and the concept of the activity-based approach, teachers carefully design situational, hierarchical, and effective activities to help students improve their language abilities, develop their thinking qualities, develop cultural awareness, and enhance their learning abilities.

3. Examples of English listening and speaking teaching in primary schools guided by the perspective of the activity-based approach

This teaching example is a teaching and research lesson from a primary school in Leshan. The content used in this teaching and research is Lesson 4 of Unit 3A, “What do astronauts do in space?” published by Foreign Language Teaching and Research Press^[9]. The space theme has value in science and technology education and cross-cultural communication. The book combines multiple language skills, such as listening, speaking, reading, and reading, which is very helpful in cultivating students’ core literacy abilities.

3.1. In-depth interpretation of discourse text

- (1) What: This lesson is selected from Unit 3 Lesson 4 of “Fun Learning Children’s English” published by Foreign Language Teaching and Research Press. In terms of discourse type, the teaching content of this lesson is an listening and speaking teaching lesson, with the theme of people, technology, and space life. The theme context of the text is people and society. The text is Sally’s daily space work log, which describes Sally’s process of getting up, washing up, having breakfast, putting on her spacesuit, and getting out of the spacecraft to see Earth in chronological order, while expressing excitement and astonishment. This is a scientific and educational exploration under the theme of human and society, about the daily life of astronauts.
- (2) Why: Students can understand the work and life of astronauts through Sally’s perspective, stimulating their interest in sounding exploration. They can learn time expression and emotional description, compare the differences between sounding life and Earth life, cultivate scientific spirit, and cross-cultural awareness.
- (3) How: This article describes the life of astronauts in the form of a first person in blog, narrated in chronological order, using simple present tense, including daily activity vocabulary such as, get up, have a wash, breakfast, and vocabulary about space such as spacesuit, astronaut, Earth view. The sentence structure is simple and suitable for elementary school students to understand, and also includes some emotional expression vocabulary, such as excellent and amazing.

3.2. Setting teaching objectives

The target audience for this lesson is fourth grade students, with slightly more boys than girls. Parents attach importance to the education, and the overall English proficiency of the students is good. Students have a certain foundation in listening and speaking to master basic daily verb phrases and time expressions, and can understand diary-style text content recorded in chronological order. But space-themed vocabulary is a bit difficult for them, and there may be difficulties in understanding compound time adverbs^[10]. Based on text interpretation and analysis of learning situations, the teacher has determined the following teaching objectives^[11]:

At the end of this lesson, students will be able to:

- (1) Extract and summarize space-related vocabulary through listening, speaking, reading, and watching, organize the timeline, accurately extract and retell Sally’s space workflow; (Learning comprehension activities)
- (2) Identify emotional expression vocabulary in text, such as excited, amazing, etc. (Learning comprehension activities)
- (3) Pay attention to and summarize the pragmatic functions of “First, I...\ Then, I...\ Now I...” in listening and speaking, describe the process using the target sentence pattern, and correctly express time words such as o’clock

and half past. (Application Practice activities) (Key Point)

- (4) By comparing the differences between life on Earth and in space, draw the beautiful scenery of Earth and maintain a passion for exploring the universe. (Migration innovation activities)

3.3. Practice of teaching activities

3.3.1. Learning comprehension activities

Table 1 shows the design of learning and understanding activities conducted.

Table 1. Design of learning and understanding activities

Activities	What do astronauts do in space?
Perception and attention	(1) Play a real-life video clip of the space station and ask “What do they do?”. Introduce the topic. (2) Listen to Sally’s blog and answer the question “Who is Sally?, Where does she live? What do astronauts do in space?” (3) Listen to the recording and sort Sally’s space life. (4) Listen to the recording and fill in the time of Sally’s activities in the space.
Acquisition and organization	(5) Listen to Sally’s blog and draw a space workflow diagram, paying attention to emotional words.
Summarization and integration	(6) Read the original content of the recording, organize, and complete the timeline.

In Activity 1, the teacher plays a video and uses audio-visual stimulation to activate students’ knowledge about space, leading to the topic of this lesson and laying the background knowledge for understanding Sally’s blog in the following text. In Activity 2, the teacher plays Sally’s blog, guides students to answer “astronaut, in space”, and focus on the core vocabulary of this lesson, which trains students’ ability to capture key information, such as identity recognition, location judgment, etc. In Activity 3, students listen to the recording and sort Sally’s space life. Through the sorting task, students can understand the structural characteristics of the text. This article is narrated in chronological order. At the same time, it provides scaffolding for drawing flowcharts later on. In Activity 4 (as shown in the **Figure 1**), the teacher uses a table format for students to fill in Sally’s activity time, strengthening the time expression method. In Activity 5, the teacher provides some prompt information, and the students complete the drawing of the flowchart and pay attention to emotional rendering, cultivating their logical induction ability, and providing an analytical framework for the subsequent comparison of Earth and space life. In Activity 6, students correct pronunciation by following and imitating, and the completion of the timeline transitions auditory input to visual output, connecting actions, emotions, and environment through a timeline.

Activity 4	
Time	Activities
	get up and have a wash
	have breakfast
	put on spacesuit
	go outside

Figure 1. Table format for students to fill in Sally’s activity time during Activity 4

3.3.2. Application practice activities

Table 2 shows the design application of the practice activities.

Table 2. Design of application practice activities

Activities	What do astronauts do in space?
Description and interpretation	(7) Retell Sally's activities in their own language and analyze her emotional changes.
Analysis and judgment	(8) Analyze breakfast choices in the text and ask, "why not soup or milk?". After watching the space food production video, design a more reasonable menu.
Internalization and application	(9) Retell the text content according to the timeline.

In Activity 7, when guiding students to retell the activity, teachers should use "First, I... Then, I... Now, I..." to make the discourse more coherent. By transforming the chronological order and actions in the text information into personalized expressions, this activity can train students' ability to convey information, analyze emotional changes, and teach them to recognize explicit emotional words such as "excited" and "amazing", and implicit emotional clues such as "Yum!" and the use of exclamation marks. In Activity 8, the teacher asks the question "Why Not Soup or Milk?" which encourages students to explore the physical principles of liquid control in weightlessness environments and evaluate the rationality of the original breakfast. When designing menus, factors such as nutritional balance, food safety, and taste should be considered to cultivate students' interdisciplinary problem-solving abilities. In Activity 9, a timeline is used to provide a narrative framework, using the target language "get up\ have breakfast\ put on...", which promotes language internalization.

3.3.3. Transfer innovation activities

Table 3 shows the design of the transfer innovation activities.

Table 3. Design of transfer innovation activities

Activities	What do astronauts do in space?
Reasoning and argumentation	(10) Inference on time of Sally's wearing spacesuits and thinking about why it takes a long time to wear spacesuits;
Criticism and evaluation	(11) Watch the lives of astronauts on Shenzhou-13 and clips from Tiangong Classroom, comparing the differences between life on Earth and in space;
Imagination and creation	(12) Create one's own space journal: A Day in Space.

In Activity 10, students infer time by calculating the time difference between breakfast and leaving the cabin. It is estimated that it will take two and a half hours to wear a spacesuit. The teacher guides students to explore the complex structure of spacesuits. Due to the age and vocabulary of students, the teacher could use Chinese language to teach this part appropriately. In Activity 11, students compare the lifestyles of Earth and space by eating breakfast and wearing a coat, which cultivates students' cross-cultural perspectives, and inspires students' space dreams by watching the Tiangong classroom. In Activity 12, the teacher provides "First, I... Then, I... Now, I...". Then, the students will apply the knowledge learned in this lesson to new situations, which trains students to flexibly use target sentence patterns such as "I get up at...", "It takes...", and vocabulary such as, "spacesuit" and "astronaut", to achieve a leap from imitation to creation. The assignment for the activity includes:

- (1) Read the text content aloud
- (2) Draw "Viewing Earth from Space" and briefly describe it in English.

This assignment converts the amazing view of Earth in the text into pictures, such as blue oceans, green continents, white clouds, etc., to enhance students' oral expression ability.

4. Conclusion

Under the guidance of the activity-based approach, primary school English listening and speaking teaching can effectively achieve curriculum standards. Teachers should set teaching objectives that are operable and verifiable for students based on the learning situation, guided by the theme, and carried out through discourse. Through learning comprehension, application practice, and transfer innovation activities, students' core literacy can be cultivated, and the comprehensive educational value of the English subject can be realized.

Funding

Philosophy and Social Science Planning Project of Leshan (Project No.: SKL2023D33)

Disclosure statement

The author declares no conflict of interest.

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A Study on the Approach to Motivation Enhancement for Chinese Learning in Rwanda from the Perspective of Cultural Field

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Abstract: With the deepening of Sino-Rwandan relations, the field of Chinese language use in Rwanda has gradually expanded. However, studies show that Rwandan students face a lack of motivation in learning Chinese. This study, based on Bourdieu's theory of cultural fields and a theoretical framework concerning learner self-perception in second language acquisition, identifies key factors influencing Chinese language education practice, including capital, habitus, teachers, students, and educational practices. The study proposes corresponding strategies to enhance student motivation, which are summarized in five key areas: teacher competence, teaching content, teaching methods, students' career development, and their perceptions of China or the Chinese language. By implementing these multidimensional strategies, it is possible to effectively enhance the motivation of Rwandan students in learning Chinese and contribute to the continued strengthening of Sino-Rwandan cooperation.

Keywords: Cultural field; Rwanda; Chinese learning; Motivation enhancement

Online publication: April 26, 2025

1. Research background

With the deepening of Sino-African relations, Rwanda and China have forged increasingly close cooperation in politics, economics, and culture. As President Kagame noted during the 2024 Forum on China–Africa Cooperation in Beijing, “Belt and Road cooperation has played an important role in improving infrastructure and promoting sustainable development in Rwanda,” highlighting that China has become one of Rwanda's largest trading partners, with expanding collaboration in agriculture, green development, and digitalization ^[1]. In the cultural sphere, partnerships such as Confucius Institutes have played a central role in promoting Chinese language education and vocational training, offering young Rwandans broader development opportunities. The same forum also marked a diplomatic milestone by elevating bilateral ties to a comprehensive strategic partnership, with renewed emphasis on educational and cultural cooperation.

Against this backdrop, demand for Chinese language learning in Rwanda has grown rapidly, driven by both instrumental motivations (e.g., employment) and integrative ones (e.g., cultural interest). However, challenges such as low motivation and identity conflicts persist.

This study draws on Bourdieu's “cultural field” theory and the concept of the learner's ideal future self to investigate

motivational factors. Research shows that while many Rwandan students initially learn Chinese out of cultural interest or due to career goals, motivation often declines over time due to language difficulty and limited achievement ^[2, 3].

From the perspective of the cultural field, motivation stems from both internal identity formation and external conditions, including teacher competence, curriculum, pedagogy, career outlook, and perceptions of China. External opportunities provide extrinsic motivation, while constructing an “ideal Chinese-speaking self” nurtures intrinsic motivation. This dual dynamic highlights the need for optimized teaching strategies to sustain learner engagement.

2. Theoretical foundation

2.1. Pierre Bourdieu’s theory of cultural field

According to the French sociologist Pierre Bourdieu, all cultural activities have their own potential models. Inspired by Cahill’s relational way of thinking, Bourdieu proposed the concept of field and defined it as “a network or pattern of objective relations between different positions”. Positions are objectively defined based on the power (also capital) with which they profit from the field ^[4].

One of the advantages of Bourdieu’s sociological theory of field lies in its structuralist and relational methodological foundation, on the one hand, on which he seeks to transcend sociology’s long-entrenched dichotomy. On the other hand, in terms of its instructive nature for practice, Bourdieu’s field theory is able to connect the various subjects in society. In a lecture at the University of California, San Diego, in March 1986, Bourdieu introduced his ideas to an American audience accustomed to academic labels by describing himself as a constructivist structuralist, while at the same time not forgetting to add that he was also a structuralist constructivist. Constructivism refers to the socio-generative process of taking into account actors’ patterns of perception, thought and action in social analyses, as well as the generative process of social structure, that is, the generative process of habitus and field, which Bourdieu repeatedly emphasized ^[5].

2.1.1. Field-Capital-Habitus

The focal point in Bourdieu’s sociological theoretical system is the concept of field, which he defines as “a system that expresses relationships” and “a special network reflecting the objective relationships between various positions” ^[6]. As a subset of the social field, the cultural field encompasses values, cognitive styles, and behavioural habits, shaping how individuals act and communicate within it.

Capital, in Bourdieu’s theory, refers to generative resources accumulated in various forms—cultural, economic, symbolic, and social. He emphasizes that “a capital is always apt and effective in the given specific field... enabling its owner to exert power over others... and to be seen as a real force” ^[6].

Habitus is the internalized disposition shaped by past and present environments, forming systematic behavioral tendencies. It reflects a “habitual state of an actor... influenced by the past and present environments... systematically ordered rather than randomly disordered” ^[7]. Each actor thus carries the habitus unique to their cultural field.

3. The approach to motivation enhancement

Building on the theoretical framework in Chapter 2, this chapter applies Bourdieu’s concepts, field, capital, and habitus, to analyze the concrete factors influencing Chinese learning motivation in Rwanda. Specifically, the five key elements discussed below can be understood as practical manifestations of how cultural capital circulates and habitus forms within the educational field. Based on Bourdieu’s framework, five key factors influencing Chinese learning in the Rwandan cultural field emerge from the interplay between capital, habitus, and the roles of teachers and students: teacher competence, teaching content, methodology, career development, and perceptions of China.

3.1. Enhancement of teachers' competence

In Bourdieu's sociological theory, the significance of education is not limited to the impartation of knowledge, the development of abilities, and the molding of personality. Education, like an "immense cognitive machine", is the most critical part of the process of cultural reproduction and social reproduction^[8]. The pedagogic work of the educator leads to the formation of specific habits in the educated person. Teachers, as educators, play a leading role in educational practice, so improving teachers' competence can effectively enhance students' motivation. In addition to their duty as educators, teachers of Chinese to speakers of other languages are also representatives of China, disseminators of Chinese culture, and maintainers of Sino-foreign friendship. Therefore, their political, cultural, and professional competence are particularly important for enhancing students' motivation to learn Chinese.

3.1.1. Political competence

Enhancing teachers' political competence can help improve Rwandan students' motivation to learn Chinese, especially their political awareness and political knowledge.

In terms of political awareness and knowledge, teachers should recognize the link between their professional role and broader global development, guiding students to connect Chinese learning with China–Rwanda cooperation and personal growth. Familiarity with relevant policies and political concepts—such as China's "community of human destiny"—enables teachers to foster students' understanding of China and strengthen their motivation through a sense of shared vision and opportunity.

3.1.2. Cultural competence

In the multicultural context of teaching and learning activities, cultural fields exhibit significant compounding and nesting characteristics, which means that international Chinese language teachers' teaching practices need to be carried out in a multilayered cultural environment. In addition to understanding and integrating the field habitus of Chinese culture, teachers need to be cross-culturally sensitive to understand and respect the subcultures of their students, especially those that are deeply influenced by Rwandan local customs.

3.1.3. Professional competence

In terms of teaching methods, teachers should actively explore and adopt diversified teaching strategies in their educational practices to accurately meet the learning characteristics and needs of Rwandan students. Through the use of teaching methods such as scenario simulation and interactive games, teachers can stimulate students' intrinsic interest in learning and make the process of Chinese language learning more attractive and effective. This student-centered approach not only helps to strengthen students' language practice skills but also effectively enhances their self-efficacy and builds up positive attitudes towards Chinese language learning. In this positive teaching environment, students can be more actively involved in the learning process and develop a lasting and stable learning drive.

3.2. Adaptation of teaching content

Teaching content should avoid overt imposition and align with local norms. There are two main ways to achieve this goal. One is to reduce or even get rid of heterogeneity, so that Chinese ideology and culture can influence and infect Rwandan students at an implicit level, rather than explicitly indoctrinating the ideology and culture. The other is to choose content that can present China's modernization achievements or meet the interests or practical needs of the Rwandan people, when it is necessary for Chinese ideology and culture to be in the teaching contents in an explicit way.

3.2.1. Remove heterogeneous traits

When arranging teaching content, topics with strong Chinese characteristics are minimized in favor of local Rwandan themes or shared human concerns such as food production and science. Although students may not directly study Chinese

ideology, cultural ideas are still “present” invisibly embedded in characters, syntax, and the teacher’s behavior. This subtle integration often proves more effective than explicit instruction, as it reduces cultural resistance and enhances students’ motivation to learn, while promoting Chinese culture more naturally.

3.3. Guidance of career development

In addition to classroom strategies, long-term motivation is also shaped by students perceived future returns from language learning, particularly in career development. Cultural capital refers to “cultural goods transmitted through various educational actions”, such as knowledge, skills, and taste acquired via education or family background. It exists in three forms: embodied, objectified, and institutionalized, and is continually accumulated through education and social practice, influencing one’s social standing and career development ^[9].

For Rwandan students, learning Chinese is not merely linguistic training, but also a means of accumulating cultural capital through language proficiency (embodied), understanding of Chinese society and culture (objectified), and certifications like HSK (institutionalized) ^[10]. This accumulation enhances their competitiveness in both China-Rwanda cooperation and the global job market. As students begin to see language learning as a path to broader career opportunities, their motivation increases ^[11]. According to the Ideal Self Theory, “the higher the perceived feasibility of achieving a goal, the higher the value attributed to that goal”.

4. Conclusion

As China–Rwanda relations continue to deepen, the role of the Chinese language in Rwanda has expanded, opening up new possibilities for cultural and educational collaboration. However, a persistent challenge remains: many students struggle to maintain sufficient motivation in learning Chinese. Grounded in Bourdieu’s theory of cultural fields and the concept of the learner’s envisioned future self, this study identifies five key factors that shape learner motivation: teacher competence, curriculum content, instructional methods, career aspirations, and perceptions of China ^[12].

The strategies proposed in this study offer practical guidance for enhancing motivation and ensuring the long-term sustainability of Chinese language education in Rwanda. By aligning pedagogical approaches with students’ personal goals and cultural backgrounds, this research not only strengthens the foundation for meaningful language acquisition but also contributes to deeper and more equitable China–Rwanda cooperation through language and cultural exchange. Furthermore, this study offers a replicable framework for analyzing language motivation in other cross-cultural contexts where language learning intersects with geopolitical and socio-economic dynamics.

Disclosure statement

The authors declare no conflict of interest.

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A Brief Discussion on Some Issues and Countermeasures of University Teachers' Professional Ethics Cultivation in the "Internet+" Era

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Abstract: In 2015, Premier Li Keqiang proposed the "Internet+" action plan in the government work report at the Third Session of the 12th National People's Congress. Over the past decade, China has undergone rapid development, and new technologies such as mobile internet, cloud computing, big data, and the Internet of Things, as envisioned in the report, have become widely popular. These new technologies have had a profound impact on higher education and university teachers, and have also set new requirements for the professional ethics cultivation of university teachers. To achieve the fundamental task of "cultivating morality and nurturing talents," university teachers must first possess sufficient professional ethics cultivation. This paper will discuss some existing problems in the professional ethics cultivation of university teachers and attempt to propose solutions.

Keywords: Internet+; University teachers; Professional ethics cultivation

Online publication: April 26, 2025

1. Introduction

1.1. What is "Internet+"

The formal proposal of "Internet+" was made in 2015, when Premier Li Keqiang mentioned it in the government work report at the Third Session of the 12th National People's Congress. The main concept of "Internet+" is to deeply integrate internet technology with traditional industries, utilizing information technologies such as mobile internet, big data, and cloud computing to promote innovation and development in traditional industries.

1.2. The significance and importance of university teachers' professional ethics cultivation

In the book Professional Ethics Cultivation of University Teachers, there is a clear definition of university teachers' professional ethics cultivation: it refers to the activities that teachers undertake to adapt to the requirements of education and teaching, including self-discipline, self-improvement, and self-enhancement in moral aspects according to the principles and norms of teacher ethics, as well as the moral qualities and the level of teacher ethics achieved through such efforts^[1].

University teachers are the actual implementers of higher education functions. For universities to accomplish the fundamental goal of "cultivating morality and nurturing talents," the cultivation of professional ethics by university

teachers is of utmost importance. “Cultivating morality” comes before “nurturing talents.” It is the premise and foundation. Imagine if university teachers themselves have issues with their professional ethics cultivation, how can they help students “cultivate morality”? The professional ethics cultivation of university teachers not only affects the rise and fall of higher education but also relates to the quality of the nation and the future of education ^[2].

2. Some problems in university teachers’ professional ethics cultivation in the “internet+” era

2.1. Issues of lacking moral bottom line and low morality

Although the targets of higher education are generally adults, most university students have not left campus, lack social experience, and their psychological development is not fully mature. Additionally, the relationship between university teachers and students is not entirely equal; teachers hold certain powers, ranging from course assessments to influencing students’ graduation or academic careers. Some university teachers have crossed moral boundaries, failing to handle teacher-student relationships properly. Some treat students as free labor, exploiting them at will; some appropriate students’ academic achievements; and some even sexually harass or assault students.

For example, in 2020, Zhang Hongmei from Nanjing University of Posts and Telecommunications improperly assigned students to handle private company affairs unrelated to teaching and research, threatened students with delayed graduation, and engaged in personal attacks and humiliation. In 2023, the Hubei Higher People’s Court ruled that Hubei University of Technology and Ye jointly infringed by plagiarizing Meng’s academic achievements. In 2024, Wang, a doctoral student at the School of Liberal Arts, Renmin University of China, posted a video on social media, reporting her supervisor Wang for sexual harassment. All these unethical teachers have received due punishment.

In today’s era of self-media, everyone is both a recipient and a publisher of news. Such negative news often spreads quickly and widely through social media, easily attracting significant public attention. The negative impact is immense and cannot be remedied simply by dismissing the unethical teachers. “Cultivating morality and nurturing talents” is the basic mission of higher education, and this educational philosophy and purpose highlight its distinct contemporary characteristics ^[3,4]. For students, such incidents severely undermine their trust in the teaching profession. Without trust, achieving the fundamental goal of “cultivating morality and nurturing talents” becomes even more challenging. For universities, such incidents seriously damage their reputation and future development. For society as a whole, such incidents hinder China’s goal of becoming an educational powerhouse by 2035 ^[5].

2.2. Issues with teaching methods and attitudes

With the development of “Internet+” and the popularization of various new technologies, teaching methods in universities have undergone many changes in recent years. The widespread use of multimedia classrooms has, to some extent, replaced traditional blackboard writing with PPT presentations, and audio or video materials can be used as teaching resources. This change can enhance the diversity of teaching methods and increase students’ learning interest, but it also brings some problems ^[6].

For instance, some teachers play videos from the beginning to the end of the class, turning offline classes into a collective viewing of online courses. This results in very poor teaching effectiveness and low learning outcomes for students. Some teachers simply read from PPTs, are unfamiliar with the course content, and have no design for the teaching process, essentially teaching by rote, making the teaching effect worse than students’ self-study. Some teachers may struggle to master the latest technological tools and lag behind students in information literacy. They resist new teaching methods, are unwilling to keep up with the times, and fail to improve their information literacy. Their teaching methods remain unchanged for years, and some even use outdated course content that is severely obsolete. This leads to dull classroom atmospheres and a lack of student interest in learning ^[7].

These issues arise from failing to adapt to the development of the “Internet+” era. “Internet+” has brought new teaching concepts and methods to universities. University teachers should continuously learn, keep pace with the times,

update their teaching philosophies, and enhance their information literacy. They should not be complacent, refuse to embrace change, or stubbornly use outdated teaching designs. The new technologies brought by “Internet+” should be used to improve teaching effectiveness, not for taking shortcuts or being lazy^[8].

2.3. Issues of academic utilitarianism and academic misconduct

Besides teaching, universities also have the function of scientific research. Ideally, university teachers should balance teaching and research, using research to enhance their knowledge and better serve teaching, thereby improving both teaching and research capabilities. However, in reality, university teachers have limited energy and face practical pressures such as rising prices, supporting parents, and raising children, leading to significant financial stress. Additionally, universities often base teachers’ remuneration primarily on titles and research achievements. Consequently, some teachers neglect teaching, perfunctorily handle classes, or even slack off, devoting most of their energy to research. Some even resort to academic misconduct and corruption^[9].

For example, in 2024, Professor Huang from the Animal Nutrition Department at Huazhong Agricultural University was jointly reported by 11 master’s and doctoral students in his research group for academic misconduct, including falsifying experimental data and fabricating results. An investigation by the university’s academic ethics committee confirmed the allegations. In 2006, Professor Chen from Shanghai Jiao Tong University used sandpaper to erase the logo on Motorola chips, falsely claiming them as independently developed “Hanxin” chips. This had a tremendous negative impact on China’s chip industry, wasting significant research funds and time, and severely undermining confidence in domestic research and development^[10].

Such academic misconduct not only ruins the careers of those involved but also has disastrous consequences for China’s research landscape. The “Hanxin” incident stalled China’s chip industry development for 13 years, contributing to the current “chip bottleneck” issue. University teachers should take scientific research seriously and adhere strictly to the ethical bottom line in research work^[11].

3. Countermeasures to improve university teachers’ professional ethics cultivation

3.1. Strengthen ideological and political learning and establish socialist core values

To enhance university teachers’ professional ethics cultivation, it is essential to start with strengthening ideological and political learning. Universities should help teachers grasp the central government’s spirit regarding university teachers’ professional ethics cultivation, guiding them to arm their minds with correct values and enrich their spirits. Every university teacher should carefully study Lectures on General Secretary Xi Jinping’s Important Discourses on Education and Ten Guidelines for Professional Conduct of University Teachers in the New Era. Through centralized learning, online learning, and other methods, education on professional ethics cultivation for university teachers should be strengthened to deepen their understanding of professional ethics. Moreover, professional ethics cultivation should not remain mere words; it must be implemented throughout the entire process of teacher management^[12,13].

First, appropriate textbooks should be selected based on the latest central government guidelines for university teachers to study. These textbooks should be systematic, authoritative, reflect the trends of teaching reform, and embody the characteristics of the times, enabling teachers to enhance their understanding of the connotations, characteristics, principles, and development of professional ethics cultivation systems, and to better comprehend central education policies and regulations. Second, new technologies in the “Internet+” era should be fully utilized to optimize education on professional ethics cultivation for university teachers. Various platforms such as official accounts, mini-programs, online meetings, and video websites can be used to deliver content through article pushes, expert lectures, lesson polishing, micro-lectures, and other forms, making full use of teachers’ fragmented time for online learning.

Furthermore, technologies such as big data and cloud computing should be reasonably employed to record and analyze teachers’ learning processes and outcomes. By creating profiles of teachers, more targeted teaching resources and

learning materials can be provided, aiming to improve teachers' professional ethics cultivation so that they can better use professional norms to regulate their educational and teaching activities ^[14].

3.2. Guide university teachers to practice professional ethics and achieve the unity of knowledge and action

After improving university teachers' theoretical understanding of professional ethics cultivation through the above methods, it is also necessary to help them constrain and regulate their professional behavior in actual work, deepen their understanding of theoretical knowledge through practice, and internalize those requirements into their own professional ethical beliefs, achieving the unity of knowledge and action, and continuously improving their professional ethics level and personal moral realm.

Teaching is the fundamental task of university teachers, and "cultivating morality and nurturing talents" is the primary goal of teaching. To achieve this goal, university teachers need to set an example in their work to promote students' moral development. In the context of the "Internet+" era, considering students' learning situations and talent cultivation objectives, teachers should lead by example to cultivate students' abilities in active learning, independent thinking, and innovation. Through words and deeds, they should nurture outstanding socialist builders and successors.

At the same time, it is important to enhance university teachers' self-reflection, making them subjects of self-education and self-improvement, thereby strengthening their professional ethics. This involves internalizing professional ethics and externalizing them in actions, transforming mandatory compliance into self-discipline. By helping university teachers reflect on areas for improvement in their learning, life, and teaching, they can deepen their understanding of teacher professional ethics cultivation and enhance it through practice.

3.3. Improve the supervision system for university teachers' professional ethics cultivation

In addition to relying on theoretical learning and work practice to improve university teachers' professional ethics cultivation, it is also necessary to establish a supervision mechanism for university teachers' professional ethics. A dedicated department for professional ethics supervision should be set up, and practical supervision plans should be formulated. The scope of supervision should cover all aspects of teachers' teaching, research, etc., ensuring that their behavior aligns with professional ethics. The entire system should be dynamically adjusted according to the development of the times to ensure the effectiveness of supervision ^[15].

Besides supervision, a feedback mechanism from students should be established. Students are the main body of higher education, and their feelings can directly reflect the professional ethics of university teachers. Through student feedback, school management departments can promptly obtain the true situation of teachers' professional ethics, comprehensively grasp specific issues in teachers' performance of duties, manage teachers' behavior, and prevent violations of professional ethics.

Teachers who perform excellently should be encouraged and set as examples for others to learn from, while those who violate professional ethics should be punished, serving as a warning to others to reduce the occurrence of similar incidents. This is of great significance for the personal development of university teachers and the development of universities themselves.

4. Conclusion

The "Internet+" era has brought new technologies and developments to higher education, as well as new requirements for university teachers. University teachers face the infiltration of Western ideologies, the temptation of academic utilitarianism, and the clash of teacher ethics concepts in a multicultural context. In terms of ideology, university teachers should establish socialist core values, use great thoughts to unite hearts and souls, clarify the source from the ideological perspective, continuously improve political judgment, political comprehension, and political execution, deeply understand the decisive significance of "two establishments," enhance "four consciousnesses," firmly "four confidences," and achieve "two safeguards." In terms of professional qualities, they should establish the concept of lifelong learning, update their

professional knowledge, and improve their information literacy.

University teachers should be role models, teaching by words and deeds, helping students establish correct worldviews, outlooks on life, and values, imparting correct and systematic professional knowledge, truly implementing “cultivating morality and nurturing talents,” and cultivating outstanding socialist builders and successors.

Disclosure statement

The author declares no conflict of interest.

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Constructing the Rural Mental Health Teachers ‘Team to Care for Children Left Behind

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Abstract: In recent years, the education status, living conditions, and psychological conditions of “left-behind children” have attracted people’s attention. They live alone for a long time or with relatives of their grandparents, lack the care of their parents’ care and the warmth of the family, often appear lost, have low self-esteem, are withdrawn, and become a special group. However, the lack of mental health teachers in rural schools forms a grim and sharp contrast with this phenomenon. As a member of the rural teachers, the author analyzed the mental health problems of left-behind children and the construction of mental health teachers in rural schools under the background of positive psychology, and put forward some suggestions combined with the national conditions.

Keywords: Inferiority; Lack; Mental health teacher

Online publication: April 26, 2025

1. The current situation of left-behind children in China

With the continuous development of social structure, the acceleration of urbanization progress, reform and opening up, and the development of market economy, China’s floating population is characterized by large-scale and large-scale flow, and the resulting “floating population children issue” has become the focus of social attention. In addition to those children who follow their parents to study in large construction sites, a considerable number of the children of the remaining migrant population remain in the countryside and become left-behind children. In recent years, more and more “left-behind children” groups, their education, living conditions, psychological conditions, etc., have aroused people’s attention. In 2018, Ni Chunxia, deputy director of the Department of Social Affairs of the Ministry of Civil Affairs, said at the regular press conference of the Ministry of Civil Affairs that as of the end of August 2018, there were 6.97 million rural left-behind children in the country, and compared with the data in 2016, the proportion of rural left-behind children in the compulsory education stage increased from 65.3% to 71.4%. In other words, in one year, China’s left-behind children between the ages of 6 and 15 increased by 418,200. Although the local government has vigorously promoted the work of returning home to start businesses and employment, employment poverty alleviation, and local enrollment of migrant children, it has provided strong policy support for reducing the phenomenon of children left behind at the source. However, the mental health problems caused by the lack of family care for left-behind children cannot be solved by material assistance. From a national statistical point of view, there is not much data on the mental health of left-behind children. According to the author’s search in the “China Journal Full-text Database,” during the 20 years from 1998 to 2018, articles on mental health

problems of left-behind children published by various domestic journals showed an increasing trend. More and more scholars pay attention to the mental health problems of left-behind children, which can be seen that the seriousness and importance of the problem^[1].

2. Investigation on the basic situation of mental health education in rural schools

Case investigation (Taking Jingmen City, Hubei Province, where the author works as an example). From the perspective of the whole city, Jingmen City has 374,096 primary and secondary school students. According to incomplete statistics, there are 48,679 left-behind students, accounting for 13% of the total number of students. Among them, 26,358 are elementary school students, 16,658 are middle school students, and 5,534 are high school students. In the education of “left-behind children”, the city’s home visiting teachers, 13521, visited 37,337 left-behind students, a rate of visits reached 76.7 percent. In this regard, the author conducted a sample survey of 380 left-behind students in Jingmen City. A survey report was formed on the common characteristics of the student group to make a simple analysis^[2].

As can be seen from the following sample survey results, 25% of the left-behind children in Jingmen are unhappy or depressed, 8.6% of the students make negative evaluations of themselves, and about 3–4% of the students have serious psychological problems.

3. Statistics and analysis

Table 1. Analysis of mental health data

Number of actual applicants	Average score	Distinction	Difficulty	Reliability	The highest score	Lowest mark
380	73.4	0.58	0.63	0.952	85	34

The full reliability of this paper is 0.95, which is a paper with high reliability and can detect the coefficient of cognitive psychology and learning mental health of students.

Table 2. Statistics and distribution of the number of students in each score section of the school

Non-happy zone					Happy zone			
10–20	20–30	30–40	40–50	50–60	60–70	70–80	80–90	90–100
0	0	15	0	82	89	126	61	7

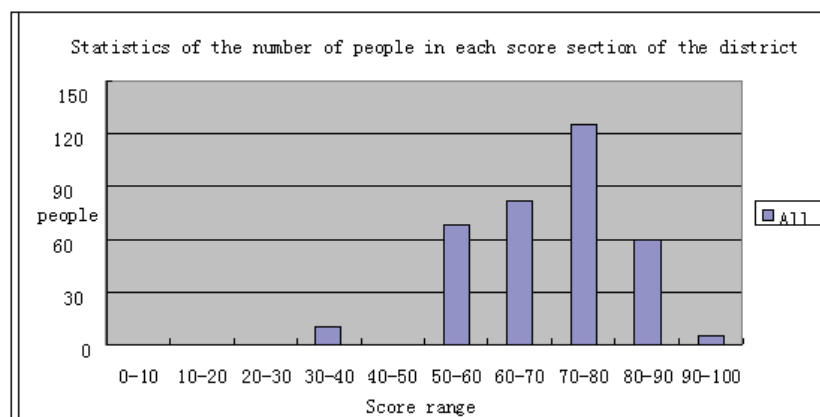


Figure 1. Statistics of the number of people in each score range throughout the district.

In terms of students' psychological quality, 60.5% of students chose to accept criticism. Most students study without goals and lack initiative. According to the survey, 35.2% of students feel that the current study pressure is too much. The survey also shows that family expectations and their own expectations are the main sources of students' learning pressure. Only 6.5% of students believe that the current pressure is due to the expectations of teachers, while 74.1% believe that the current pressure is due to the expectations of families ^[3].

In terms of interpersonal relationships, only 15% of students are very satisfied with the teacher-student relationship, 65% of students are very close to their parents, and 65% of students are very satisfied with the peer relationship. This shows that the distance between students and teachers is too large, showing that students are more willing to share their worries and troubles with classmates, rather than parents or teachers, and don't say anything about their learning if their parents don't ask ^[4].

In terms of frustration, it is preliminarily learned that 18.3% of the students' frustration comes from family changes, such as parents' divorce, parents are not around, 52% of the students think that their frustration is not ideal academic performance. However, due to the high incidence of psychological changes in adolescence, in school due to difficulties and setbacks lead to bad psychological imbalance, self-closure, inferiority, weariness, anxiety, jealousy, hostility, and even runaway from home, puppy love, hatred, suicide, school violence and other out-of-control behaviors occur, more hidden mental health problems have become the focus of social attention ^[5].

4. Network questionnaire survey of mental health teachers in rural schools

- (1) Survey scope: 100 rural teachers from Hubei, Hunan, Guangdong, Shandong, Jiangxi and Inner Mongolia.
- (2) Survey question: Is there a mental health teacher in your school?
- (3) Survey data on the availability of mental health teachers in rural schools

A total of 33.33% of schools have mental health teachers, and 66.67% of schools have no mental health teachers. According to the investigation, the teachers of mental health education are quite weak. Respondents responded that, on the one hand, some schools did not have professional psychology teachers, and some schools did not carry out professional and systematic training and learning for teachers. Second, the relevant mental health education rooms equipped in schools are not working. Third, the development of mental health education in secondary schools is unbalanced in different schools or different classes. Overall, there is a serious shortage of mental health teachers in rural schools ^[6].

5. Interview information on the influence of the family of origin on their beliefs

The author selected samples of middle school students from four different regions as the sample objects. Based on the actual situation, the author took continuous participation in communication as the main means of understanding. Through understanding students' living environment and interpersonal relationships, the author analyzed that when students have psychological problems or even show the tendency of illness, they adopt personal companionship and communication to constantly provide experience and clarify their thoughts. Encourage students to study life and interpersonal enthusiasm. In the spare time of the sample, the author invited students to participate in their hobbies to get more familiar with each other's strengths and thinking patterns, and the relationship between students' attitude and ability to face setbacks and their own experience of home-school educational resources ^[7].

The following content is selected from the experiences of the four students in 2023. The author spent more than two years in continuous contact with the samples, establishing interpersonal relations, and obtaining the trust and effective information of the samples. The specific information has been appropriately modified as follows without affecting the survey results:

- (1) Student A: Female, 13 years old, ISTJ personality, non-only child; He studied in a middle school in a remote rural area of a province. He was educated and cared for by his grandparents since childhood. His father worked in the provincial capital all year round and his mother was seriously ill at home. Junior high school was diagnosed with bipolar disorder because of illness, grades continued to decline; The school has no professional psychological teachers, and the class teacher plays the role of psychological education ^[8].
- (2) Student B: Male, 15 years old, ENFP personality, non-only child; Study in a province key, parents high level of education; Excellent academic performance, high school entrance examination results in the top of the province; Because of the confusion of personal development in adolescence, the relationship with teachers, classmates, parents and other interpersonal conflicts frequently tense, during the epidemic period had suffered from false depression (now recovered), parents did not know, did not take antidepressant drugs; The school is equipped with psychological teachers. After having a dialogue with B student, he did not approve of his ideological attitude.
- (3) Student C: female, 14 years old, ESTP personality, the only child, A junior high school classmate who has some communication with A. After the parents divorced, they live with their mother, who is busy working to provide better living conditions. My academic performance is above average, and I am the commissariat of class psychology. I am optimistic about my future development.
- (4) Student D: Female, 14 years old, INFP personality, only child; Studying in an ordinary middle school in a city, my parents are more tolerant and supportive, and have a certain plan for taking the route of art students after high school; Have a family history of genetic disease, by the doctor's advice; Academic performance is moderate, because of the head teacher's continued harassment of himself and other female students (to a minor degree) of the school resentment; The school has no psychology teacher.

6. Interview conclusions from the perspective of positive psychology

After continuous follow-up investigation with four samples of different origins and similar ages, the author interviewed the samples for many times, summed up the attitude of the samples towards the following questions, and reached the following conclusions ^[9].

6.1. Family and teacher-student relationship

A good and healthy family environment is the support for students to deal more actively with disharmonious factors outside the family. The good guidance given by the mother and the encouragement and supervision of student C have helped student C to establish positive values and learning attitudes during his growth. Student C has formed an independent lifestyle and has certain expectations for a family environment that can better meet personal needs. The positive feedback effect of getting good grades is also deeply motivating. As A member of the psychology committee and A good friend of Student A, Student C can understand the starting point of the teacher's hope that students obey the discipline and study hard, but he cannot agree with the arbitrariness of the education method itself. In the communication and cooperation with classmates, I can initially feel the role of school education in promoting interpersonal communication and teamwork, and recognize the positive significance of school education in learning and socializing, to plan for myself. Student A, on the other hand, cannot adapt to stressful environments, lacks motivation for interpersonal communication, and often feels that he will speculate on normal interpersonal behaviors ^[10].

Similarly, the positive feedback of self-drive given by the family affects campus life, and the negative emotions from peers and teachers in campus life will also affect the communication between family members. Student D can feel love in the words and deeds of parents, but the lack of effective communication in the process makes it difficult for parents to find problems in time. Less interference from parents can give student D a certain choice, but when facing some major choices or difficulties, he does not adapt to seeking guidance and help from parents, which will often lead to a sense of confusion and loss. Teenagers living in families with heavy negative emotions cannot get respect needs respected, there is a great

confusion about the realization of self-meaning, and produce unreasonable fear in interpersonal communication, and are more prone to bullying from peers^[11].

In the face of the future relationship between individuals and homeschool, ACD students maintain a similar attitude. For the negative emotions of teachers and classmates, teenagers generally hope that graduation will open a new interpersonal relationship with high mobility. From the perspective of parents, CD students tend to live alone and keep a certain distance from their parents while fulfilling their duties as children to a greater extent. Student A lacks confidence in his ability to live independently, and expresses the idea that he will return the parenting while considering the external eyes.

6.2. Satisfaction with the home school education

Living in an era of high-speed information, contemporary teenagers receive more diversified influences than their parents, but the process of receiving information is fragmented and the phenomenon of “information cocoon” will cause blind worship of imperfect self-will. Student B agrees with his parents in imparting knowledge and values, but in general, he is dissatisfied with his parents’ conservative educational concept and high requirements, which conflict with his more self-oriented and open way of thinking. Therefore, many students in the middle of the standard of living feel that their parents’ traditional concepts sometimes limit their development, so that they cannot fully explore and try according to their wishes, and they are eager to have more freedom to make independent decisions in the family, hoping that some of their innovative ideas and behaviors can be more inclusive. Similarly, due to the lack of communication with parents, student D could not dialectically treat the problems of poor quality and learning disabilities of a few teachers, and developed excessive resentment towards the current education system, disappointment towards the school and the education system, and a lack of security in school life to some extent affected his grades and way of thinking^[12].

From the perspective of school education, Student B thinks that the teaching method is too rigid, and the teachers prefer students who follow the rules and restrict the students’ ability to exert their own intelligence. The careless attitude of the teachers towards the students further stimulates the rebellious psychology, making the students even more disobedient to the requirements of the teachers and the regular education mode of the school. This situation is usually manifested as two possibilities of inaction or aggressiveness. In this process, the teacher-student relationship produces a vicious circle, and students cannot develop the habit of using strategies and continuous thinking to communicate equally with their superiors.

6.3. Frustration and progress

The Myers-Briggs Type Indicator (MBTI) is a popular personality assessment test based on the “Jungian Eight dimensions”, a theory of psychological types created by Swiss psychologist Carl Jung, and later developed through the research of Katherine Briggs and Isabel Briggs Myers. The theory divides personality into 16 personality types through four directions. In recent years, the test has been widely discussed by teenagers and has become an important part of the process of self-introduction and communication among teenagers.

In the process of talking with the sample, the author found that four students also have a greater or lesser understanding and interest in the MBTI personality test, to use this topic to further understand the students’ views on experiencing setbacks and positive progress. Among them, student B is the most enthusiastic about the topic of MBTI, which is largely due to their behavioral characteristics of “extroversion, intuition, sensibility, and vision.” Teenagers who test ENFP generally feel positive recognition of themselves from this topic. They also feel inspired and honored by historical luminaries (such as Li Bai and Che Guevara) who share the same personality with them, and become a wider group of people who recognize the MBTI. In this process, Student B developed an interest in the “Jung Eight dimensions”, and through the active communication with peers in the community of MBTI enthusiasts, he talked about his depression tendency that was not recognized, and found the balance between “entering the world” and “coming out” to a certain extent, and continued to treat his strengths with a positive attitude after entering the new environment of high school

entrance examination^[13].

From the perspective of MBTI, the above “entering the WTO” and “coming out of the world” are called “S” (Sensing), which focuses on external objects, and “N” (Intuition), which focuses on imagination. Today, China is in a sensing society, and some intuitive people often feel separated and excluded due to a lack of personal positioning. The recognition of MBTI greatly inspires students to recognize their strengths, and to some extent, reduces the sense of shame about what they are not good at. In the process of understanding MBTI, Student D to a certain extent saw in other members of the community who tested INFP (introverted - intuition - sensibility - vision) their artistic creation talent and the explosive power of unremitting pursuit of dreams, to consciously avoid their shortcomings of poor attention and heavy thinking, and make further plans for their future.

The other two students, A and C, who are measured as Sensing, have a more casual attitude towards MBTI and regard the personality test as fun itself. After the student C became interested in the cartoon image of ESTP (extroverted - sense-rational - vision), he consciously shaped his external image according to the positive character elements such as “free and easy” and “extreme words and actions”, which further improved his confidence and positive degree of doing things well. Student A uses “Jungian eight dimensions” as the material to design characters that will make him feel interesting in his spare time, rather than to develop his own character as a solution to anxiety.

6.4. The achievements and deficiencies of current psychological education

With the fast-paced development of society, mental health has become a topic that has attracted much attention from adults and minors. Primary and secondary schools have gradually incorporated mental health education into the curriculum system. Schools with certain resources will hire professional teachers of mental health education and set up special courses and psychological consultation rooms. Community and public institutions gradually carry out mental health services to convey the significance of psychological education in the form of public welfare. The release of the related theme song “Under the Sea,” the online game “Double phase,” and the domestic animation movie “Deep Sea” has made the topic of mental illness more “out of the circle”, which has greatly reduced the shame of teenagers receiving treatment, and made psychological education be paid attention to on a broad level. However, psychological education also faces some problems that cannot be ignored, such as uneven attention and resources, lack of resources in rural and remote areas, and it is difficult for students to access professional psychological education services. Most psychological education practitioners also have the problem of professional quality and skill level to be improved, and cannot meet the growing psychological education needs of teenagers.

The greatest driving force of psychological counseling lies in trust and acceptance. In the process of investigation, the author summarized the failure cases, avoided the preaching and overlooking attitude that caused trauma to students, and encouraged students to speak freely in a way of encouragement and understanding, to address students’ unmet spiritual needs. Student A believes that the formalism of psychological counseling she has received is serious and cannot help her real life, nor can it improve her current situation of being invaded by her parents and having difficulty communicating with her peers. Similarly, in the process of communication with the author, student B expressed the reasons for not recognizing the psychological education level of the school. From the perspective of the communication gap between home and school, teachers are worried that they will accept the blame from parents after taking responsibility, and they will take a “one-size-fit” repressive means to deny students’ negative emotions to a greater extent. From the perspective of identity and experience, such as teachers’ subjective disregard or even scolding of students’ difficulties, will develop into students’ aversion to psychological courses, and they cannot honestly tell their psychological state to psychological teachers, which will increase the psychological burden on students^[14].

However, AB students all believe that the experience of psychological education with different professional levels has certain positive factors, and students can actively understand more professional knowledge through online channels, such as psychoanalysis and other related thought cases, to find suitable solutions for themselves, to find valuable and belonging to the pursuit.

7. Synthesize the conclusion obtained from the above investigation

For a long time, China's urban-rural dual structure system has become the biggest obstacle to solving the problem of agriculture, rural areas, and the problem of left-behind children is also subject to this. The serious psychological problems of left-behind children can not be changed by the improvement of material life. Most of the parents of left-behind children are working outside, they live alone for a long time or live with grandparents and other relatives, lack of parental care and family warmth, often appear lost, have low self-esteem, are withdrawn and exhibit other conditions, manifested as depression psychological symptoms. The lack of family education is also more likely to lead to serious psychological disorders. The shortage of mental health teachers in rural schools has also become a serious problem. In the backward rural schools, there is a shortage of teachers who have the professional knowledge of psychology^[15].

8. Conclusion

Education authorities should complement the policies on building mental health teachers in rural schools and implement them in urban areas. For example, increase the number of psychological teachers, tilt the funding, and strengthen the training and guidance of psychological teachers in rural schools. Increase the learning and training of psychological knowledge and educational concepts for class teachers and substitute teachers, so that they can timely understand and grasp the psychological changes of students, participate in psychological guidance in the teaching process, cooperate with the prevention and intervention work, and improve the pertinency and effectiveness of mental health education. In schools that cannot intervene and solve psychological problems for the time being, the government will purchase psychological services from third-party professional organizations in places where conditions permit. Make full use of off-campus educational resources, and organize relevant public welfare organizations or professionals to carry out educational activities such as mental health Tours in schools. Establish professional mental health education centres in all schools. According to the actual situation such as the number of students and the campus area of each school, professional mental health education centers will be established. Set up a psychological consultation room, a psychological treatment room, student mental health data management room. To facilitate the school students' mental health assessment, psychological counseling, psychological counseling, and the establishment of students' mental health files.

As a rural compulsory teacher, the author has been on the job for six years. In these six years, I saw a fragile and young heart full of trauma. Some children live with their parents for as little as four days a year, have autism, and don't talk to anyone for years. Some children, because their parents work outside and lack family education, violence against classmates, contract a bad habit, repeat teaching, and finally go astray. As a teacher trusted by my classmates, I would often write exchange diaries with my students, in which they would tell me about the dark memories they had experienced that other children did not have. I felt pity, but there was nothing I could do. Based on what I have seen and felt in my work, the author investigates and analyzes the root cause of this phenomenon and puts forward some suggestions on establishing and improving the team of rural mental health teachers, hoping to make a modest contribution to rural education.

Disclosure statement

The author declares no conflict of interest.

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A Study on Dish Names Translation in A Bite of China from the Perspective of Domestication and Foreignization

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Abstract: The food documentary A Bite of China made a hit in China and has been translated into different languages for broadcast in various countries. Most of the relevant research has focused on food culture, subtitle translation, and communication studies, with relatively little attention given to its translation of dish names. This study explores the English translation of dish names from the perspective of domestication and foreignization. It has been found that A Bite of China flexibly applies domestication and foreignization in Chinese to English translation. Dish names that include ingredients and cooking methods, or those with metaphors, or abstract names, are primarily translated with domestication strategy, while dish names that have been well-known in the world, or those actively “going global”, are mainly handled in a foreignization way; those with strong regional characteristics and have equivalent vocabulary in English demonstrate a translation combining both domestication and foreignization.

Keywords: A Bite of China; Dish names translation; Domestication; Foreignization

Online publication: April 26, 2025

1. Introduction

A Bite of China, a high-quality culinary documentary produced by China Central Television (CCTV), has garnered both domestic acclaim and international recognition for its stunning cinematography and profound cultural depth. Translated into multiple languages for global distribution, the series has become a significant case study in cross-cultural communication. While existing research has predominantly focused on aspects such as food culture representation, subtitle translation, and media studies, comparatively little scholarly attention has been paid to the specific strategies employed in translating Chinese dish names. This study examines the English translations of culinary terms in A Bite of China through the theoretical framework of domestication and foreignization, thereby contributing to the growing body of research on culinary translation while offering practical insights for the international promotion of Chinese gastronomic culture.

2. Nomenclature of Chinese dish names

The art of naming Chinese dishes is an integral part of Chinese culinary culture. It is not merely a description of food but also a means of expression and inheritance of culture. Some dish names directly reflect the main ingredients, such as “Kung Pao Chicken”, where “chicken” indicates the primary ingredient. Cooking methods are also a significant component of

Chinese dish names, as seen in “Steamed Perch”, where “steamed” specifies the cooking technique. Color and shape are common elements in Chinese dish names, such as “Squirrel-shaped Mandarin Fish”, which uses “squirrel” to describe the dish’s appearance, offering both visual and gustatory appeal. Many dish names are rooted in history or legends, such as “Dongpo Pork”, named after the Song Dynasty literary figure Su Dongpo, reflecting his passion for food and culinary skills. Some dish names highlight regional characteristics, such as “Yangzhou Fried Rice”, evoking the refined cooking style of Yangzhou. Others carry profound symbolic meanings, such as “Fu Lu Shou Xi”, which represents blessings of happiness, prosperity, longevity, and joy. Additionally, some dish names emphasize texture and flavor, like “Sweet and Sour Spare Ribs”, where “sweet and sour” indicates the dish’s taste profile. Chinese dish names not only provide information about the food but also serve as a medium for cultural exchange.

3. Theoretical framework: Domestication and foreignization

In an 1813 lecture, the German ideologist Friedrich Schleiermacher stated that there are “only two methods of translation”: one that brings the reader closer to the author, and another that brings the author closer to the reader^[1]. These concepts were later formalized as “domestication” and “foreignization” by American translation theorist Lawrence Venuti in his influential work *The Translator’s Invisibility: A History of Translation*^[2]. Domestication requires the translator to adapt the source language’s expressions and culture to some extent into the target language’s expressions and culture, whereas foreignization demands that the translator highlight the linguistic and cultural differences between the source and target languages. In other words, a domestication translation reads like a native work, while a foreignization translation retains a distinctly exotic flavor.

Professor Jianzhong Guo is likely the first scholar in China to introduce the domestication and foreignization translation strategies and later provide a comprehensive introduction to Venuti’s “foreignization” translation theory. He initially introduced “domestication” and “foreignization” in his article *Cultural Factors in Translation: Domestication and Foreignization*^[3]. Subsequently, through his paper *Venuti and His Deconstructive Translation Strategies* and his monograph *Contemporary American Translation Theories*, he offered a complete exposition of the content, origins, and influence of the “foreignization”, which triggered a debate between domestication and foreignization within China’s translation community^[4].

Zhili Sun put forward in the article *Literary Translation in China: From Domestication to Foreignization* that Chinese literary translation in the 21st century is expected to further embrace foreignization. Specifically, this means striving to convey the original work’s exotic cultural features, foreign linguistic forms, and the author’s unique writing techniques. However, it is also noted that foreignization must be applied with caution and moderation, and when impractical, domestication should be employed as a supplementary approach^[5].

Domestication prioritizes target-culture norms, adapting source texts to enhance accessibility for the intended audience. This approach often involves cultural substitution or explanatory additions, as seen in rendering “饺子” as “dumpling”, a term familiar to Western audiences despite its imperfect correspondence with the original. Conversely, foreignization emphasizes preserving source-language cultural elements, intentionally maintaining linguistic and conceptual differences. This strategy might involve direct borrowing, e.g., translating “饺子” as “Jiaozi” or calque translations that retain the original’s cultural specificity, thereby exposing target audiences to authentic Chinese culinary concepts.

4. Domestication and foreignization in the dish names translation in *A Bite of China*

The translation of Chinese culinary terms presents unique challenges due to fundamental differences between Chinese and Western naming conventions. While Chinese dish names frequently incorporate cultural allusions, historical references, and poetic imagery, their Western counterparts typically employ more literal, descriptive terminology. Moreover,

Chinese names often elaborate on cooking techniques with greater specificity than Western culinary vocabulary. Through comparative analysis of original Chinese dish names and their English translations in *A Bite of China*, this study identifies and evaluates three distinct translation approaches: domestication, foreignization, and hybrid strategies that blend both methods. The examination of these cases provides valuable insights into effective practices for bridging cultural gaps in culinary translation.

4.1. Domestication

4.1.1. Dish names containing ingredients and cooking methods

炸藕夹 Deep-fried Lotus Root Sandwich

金汤水煮鳊鱼 Stewed Mandarin Fish in Pumpkin Soup

腌笃鲜 Bamboo Shoot Soup with Fresh and Pickled Streaky Pork

Deep-fried lotus root sandwich is a traditional Chinese delicacy where minced meat is sandwiched between two slices of lotus root, coated in batter, and deep-fried until golden and crispy. This method preserves the crisp texture of the lotus root while infusing it with the savory richness of the meat filling. The term “sandwich” is familiar to Western audiences, referring to ingredients layered between two slices of bread. The translation cleverly substitutes “lotus root sandwich” for the Chinese “藕夹” (Oujia), drawing a parallel between the two foods’ similar structures. Rendering “炸藕夹” as “Deep-fried lotus root sandwich” exemplifies a domestication strategy. A direct transliteration of “Oujia” by adapting the foreignization approach would leave foreign audiences confused. By choosing the culturally analogous “sandwich”, the translation provides an intuitive understanding of the dish for Western audiences.

Stewed mandarin fish in pumpkin soup is a beloved Guangdong dish featuring tender mandarin fish. The fish is sliced and lightly coated in egg liquid for extra silkiness. Fresh fish slices are set aside while the bones, head, and pumpkin are simmered into a broth. The fish slices are then gently stewed in the broth until they curl and cook through. Finally, seasonings are placed on the fish, and hot oil is drizzled over the top, creating a flavorful and refreshing dish. In “stewed mandarin fish in pumpkin soup”, the “golden soup” (金汤) is translated as “pumpkin soup”, allowing foreign audiences to quickly grasp the dish’s key ingredients—fish and pumpkin—enhancing cultural accessibility and acceptance.

Bamboo shoot soup with fresh and pickled streaky pork combines fresh bamboo shoots, cured pork belly, and fresh pork slices. The term “笃” refers to the sound of the slow-cooking process in a clay pot or stew pot, where ingredients are simmered over low heat with ample water or broth until fully tender. “Bamboo shoot” is the English equivalent for “竹笋”, while “soup” clearly conveys the liquid or semi-liquid nature of the dish. “Fresh and pickled streaky pork” describes the two types of pork used: “fresh” equals “鲜” and “pickled” equals “腌”, with “streaky pork” indicating marbled meat. The translation “bamboo shoot soup with fresh and pickled streaky pork” adapts the name “腌笃鲜” into a descriptive soup label, embodying domestication and enabling English-speaking audiences to easily recognize the dish’s flavors and ingredients.

馒头 Steamed Bread

In *A Bite of China*, “馒头” is translated as “steamed bread”, allowing the target audience to quickly understand the food’s ingredients and cooking method. The translation is concise and clear, ensuring high receptivity and adaptability. However, the trend of translating it as “Mantou” is gaining traction, reflecting a shift from domestication to foreignization and signaling Chinese culture’s proactive global outreach. Foreignization ultimately fosters greater recognition among international audiences for this staple food in China.

4.1.2. Dish names with metaphors

红烧狮子头 Braised Pork Balls

紫炆虎尾 Boiled Eel in Sauce

翡翠羹 Vegetable Soup

Braised pork balls have a story rich in whimsy and historical flair. Legend has it that ancient Chinese nobility, when hosting banquets, found the dish’s plump, rounded shape reminiscent of a lion’s head, hence it got this vivid name. The

dish features seasoned minced pork shaped into large meatballs, first deep-fried then braised to a glossy reddish-brown perfection, yielding tender, succulent bites. While the Chinese name poetically likens the meatballs to a lion's head, Western audiences, who typically avoid eating animal heads, offal, or feet, might misinterpret or even recoil from a literal translation such as "braised lion's head." Instead, the domestication translation "braised pork balls" pragmatically highlights the core ingredient (pork) and shape (balls), sidestepping cultural discomfort while preserving the dish's essence.

Similarly, boiled eel in sauce derives its Chinese name from its visual resemblance to a tiger's tail. The dish uses eel tail segments, sliced and simmered with spices until the texture and appearance evoke the striped flourish of a tiger's tail. A direct translation like "tiger's tail" could alarm Western diners unaccustomed to tiger meat, so the translation of "boiled eel in sauce" under domestication strategy plainly signals the key ingredient (eel) and preparation (sauced), meeting with the audience's culinary expectations.

Vegetable Soup, a vibrant and wholesome dish, dazzles with its jade-green hue against a white backdrop, mirroring the gemstone it is named after. Typically made from puréed spinach or lettuce blended with starch and egg for silkiness, its recipe varies regionally, sometimes enriched with seafood, meat, or spices. While a foreignization translation of "Jade Soup" retains the poetic cultural imagery, it obscures the actual ingredients for non-Chinese audiences. The domestication translation of "Vegetable Soup" sacrifices some lyrical charm for clarity, instantly conveying its green-vegetable base but dulling the cultural luster of its namesake.

4.1.3. Abstract dish names

腊味 Cured Meat

刀板香 Sliced Salted Pork

烩南北 Stewed Mushrooms with Winter Bamboo Shoots

Cured meat refers to meats like bacon, sausages, chicken, or fish that are cured and air-dried, a traditional winter preparation in nearly every Chinese household. The name "La Wei" offers no linguistic clue about its meat content, so the domestication translation "cured meat" efficiently conveys the preservation method. However, this simplification strips away the cultural connotation of "La Wei", which embodies Chinese New Year traditions.

Sliced salted pork is an iconic Anhui cuisine, one of the eight major cuisines in China. Dao Ban Xiang (刀板香) evokes the image of "fragrance lingering on the cutting board". Unlike many preserved meats, this dish forgoes smoking; instead, the salted pork is steamed atop aromatic camphor wood planks. As the wood absorbs excess fat, the result is a savory, tender slice with rich flavor but no greasiness. The English translation "Sliced Salted Pork" effectively conveys the key elements of the dish: pork and its preparation, while subtly alluding to the "knife" in the original name. However, it omits the defining camphor-wood steaming technique, which is central to its unique taste. A combination of domestication and foreignization, like "Dao Ban Xiang (Camphor-Steamer Salted Pork)", would better preserve its exotic charm while explaining its uniqueness.

Stewed mushrooms with winter bamboo shoots, a Hebei classic dish. It unites mushrooms (representing northern China) and bamboo shoots (representing the southern Jiangnan region). Sliced thin, stir-fried, and braised in broth, its name "烩南北" (stewed north-south) metaphorically bridges China's culinary geography. The domestication translation "stewed mushrooms with winter bamboo shoots" replaces the cultural metaphor with literal ingredients, easing comprehension but erasing the poetic north-south symbolism.

4.2. Foreignization

4.2.1. Dish names with international recognition

饺子 Jiaozi

粽子 Zongzi

麻婆豆腐 Mapo Tofu

With the deepening of globalization and cultural exchange, many non-English words have been widely accepted

and understood, among which China's "Jiaozi" is a prime example. The transliteration "Jiaozi" preserves the linguistic characteristics of Chinese without adopting any English equivalents, encouraging the target audience to explore and recognize the cultural context of the source language. In English, "dumplings" generally refer to a type of food made by wrapping dough around various fillings, which can be sweet or savory, and prepared through methods such as boiling, steaming, frying, or deep-frying. If "Jiaozi" were translated as "dumplings", it could refer to both Jiaozi and Tangyuan (sweet glutinous rice balls), even though the two are distinct in appearance, fillings, and flavors. "Jiaozi", however, retains its unique cultural identity.

Eating Zongzi during the Dragon Boat Festival is a traditional Chinese custom. Zongzi are made by wrapping glutinous rice and fillings in leaves, forming shapes like equilateral triangles, squares, pyramids, rectangles, and more. Fillings can include red dates, mung beans, pork, sweet bean paste, mixed nuts, ham, mushrooms, egg yolk, and others. Zongzi originated from commemorating Qu Yuan, a poet of the Warring States period from the state of Chu. Unable to bear the fall of his homeland, Qu Yuan drowned himself in the Miluo River on the fifth day of the fifth lunar month. To prevent fish and shrimp from devouring his body, people raced in boats to retrieve his remains and scattered rice into the river. This tradition evolved into the customs of dragon boat racing and eating Zongzi during the Dragon Boat Festival. The translation of Zongzi under the foreignization strategy helps with the global promotion of this traditional Chinese festival food. However, without annotations or explanations, much of its cultural backstory is lost.

Mapo tofu is a renowned traditional dish from Sichuan Province, known for its spicy, numbing, and aromatic flavors. Tofu and minced pork are cooked with seasonings such as fermented bean paste, Sichuan peppercorns, and chili peppers. As the tofu absorbs the flavors of the meat and spices, the dish becomes rich and savory. Legend has it that Mapo tofu was created by a woman named Chen Mapo, who had pockmarks on her face. During the Qing Dynasty, she ran a small restaurant where her tofu dish gained fame and became a favorite among customers. Over time, Mapo tofu grew in popularity, becoming a classic representative of Sichuan cuisine and earning acclaim both domestically and internationally. "Mapo tofu" is a typical example of foreignization—"Mapo" preserves the original pronunciation and cultural essence of the Chinese term, while "tofu" is used instead of "bean curd", sparking curiosity and interest among English-speaking audiences about the cultural background of the dish. Nowadays, Mapo tofu has become a widely recognized Chinese dish worldwide, and this foreignization translation strategy reflects the strong acceptance of this name among target audiences.

4.2.2. Actively "going global" dish names

Chinese culinary culture is vast and profound, encompassing not only the eight major cuisines but also unique local delicacies from various areas. Due to factors such as regional economic development and sociocultural promotion, some foods have yet to gain widespread recognition among international audiences. However, as part of China's rich culinary heritage, there is a growing need to promote these dish names and food cultures abroad through foreignization strategies in translation, especially in the current era of actively promoting Chinese culture globally.

饅頭 Naan

鍋盔 Guokwei (Dried Bun)

燒賣 Siu Mai (Steamed Pork Dumplings)

Naan is a round flatbread originating from China's Xinjiang Uyghur Autonomous Region, typically 40–50 cm in diameter, and holds significant importance in local dietary culture. The dough is infused with specific spices and then baked until the exterior is crispy while the interior remains soft, making it a versatile staple that pairs well with various dishes. By retaining the pinyin "Naan", the translation respects and preserves the cultural and regional characteristics of the original term, allowing audiences to engage with this unique food name. This foreignization strategy reflects the translator's confidence in the target audience's willingness to embrace new vocabulary, encouraging them to accept and learn about new cultural elements. Such an approach helps expand the international recognition of Chinese dish names and promotes their global presence.

Guokwei is a traditional baked pastry snack from the Guanzhong region of Shaanxi Province, northern Shanxi, as

well as Gansu and Sichuan. It is typically baked in an oven or over a fire, resulting in a crispy exterior and a soft interior. In some regions, Guokwei is stuffed with various fillings such as meat, vegetables, or other ingredients, enhancing its flavor and variety. The name Guokwei originates from ancient times when soldiers baked the dough on their metal helmets, hence the description “using a helmet as a pot, resembling both a pot and a helmet.” If translated as “dried bun”, foreigners might confuse it with other Chinese pastries. Therefore, the translator adopts the transliteration “Guokwei”, preserving the cultural essence of the original name while sparking curiosity about the story behind this snack’s unique name. This approach also allows international audiences to appreciate the diversity of Chinese cuisine.

Siu Mai is a traditional Cantonese dim sum dish. A firm dough made from flour and water is rested, rolled into thin wrappers with pleated edges resembling lotus leaves, and then filled with pork before being steamed. While its preparation is somewhat similar to that of dumplings, Siu Mai differs in that its top remains partially open, often garnished with fish roe or diced carrots. Translating it directly as “steamed pork dumplings” could lead to confusion among foreign audiences, making it difficult for them to distinguish from Jiaozi. Instead, the translator uses the Cantonese pronunciation “Siu Mai”, maintaining the dish’s authentic flavor and regional identity while contributing to the global promotion of Chinese culinary culture.

4.3. Combination of domestication and foreignization

诺邓火腿 Nuodeng Ham

白吉馍 Baiji Baked Bun

Nuodeng ham originates from Nuodeng Village in Yunlong County, Yunnan Province. It is made from the hind legs of free-range mountain pigs and cured using locally produced Nuodeng salt, which contains potassium and offers health benefits with its mild flavor. The production process involves trimming, salting, stacking and pressing, washing and sun-drying, hanging for air-drying, and a three-year fermentation period to achieve its distinctive taste and nutritional value. With a history dating back to the Tang Dynasty, Nuodeng ham carries profound cultural and historical significance. Following its feature in documentaries like *A Bite of China*, Nuodeng ham gained widespread fame, attracting tourists and food enthusiasts alike. In translation, the term “Nuodeng ham” skillfully combines domestication and foreignization strategies. While Western audiences may be unfamiliar with the place name “Nuodeng”, the word “ham” is widely recognized in English-speaking cultures. The transliteration “Nuodeng” preserves the dish’s regional identity, while “ham” ensures clarity for the target audience. This balanced approach maintains the original cultural connotations while enhancing accessibility.

Similarly, the Baiji baked bun derives its name from “Baiji”, a historic relay station along a major thoroughfare connecting Shaanxi and Gansu. In translation, the foreignization strategy is applied by retaining “Baiji” in pinyin to emphasize its regional origin, while “baked bun” is familiar to English speakers by adopting a domestication strategy.

When translating such terms, considerations must include the ingredient’s regional characteristics, preparation methods, and historical context. By combining domestication and foreignization strategies, international audiences can better understand and appreciate these Chinese culinary specialties with their rich cultural heritage.

5. Conclusion

Chinese culinary nomenclature serves as a rich cultural repository, encoding profound historical narratives and cultural values through its distinctive representation of ingredients, cooking techniques, visual aesthetics, regional heritage, and symbolic meanings. Far beyond mere functional descriptors, these gastronomic terms constitute an important medium for cultural transmission and identity preservation. The comparative analysis reveals fundamental divergences between Chinese and Western approaches to dish naming, particularly in their respective emphasis on cultural poetics versus utilitarian description.

The English translations of dish names in *A Bite of China* demonstrate a flexible and balanced application of domestication and foreignization strategies: For dish names that describe ingredients and cooking methods, or those with

implied metaphors or abstract meanings, domestication is primarily used. For dish names that already enjoy international recognition or those less familiar to foreign audiences but actively “going global”, foreignization is prioritized. For dish names with strong regional characteristics that also have equivalent terms in English, the translations combine domestication and foreignization. The analysis demonstrates that while domestication enhances immediate comprehension of a dish’s tangible attributes (composition, preparation, sensory qualities), excessive reliance on this approach risks eroding the cultural semiotics and historical narratives embedded in the original nomenclature. To address this, the study identifies the efficacy of complementary translation techniques, particularly transliteration coupled with contextual glosses, which successfully maintain cultural fidelity while ensuring functional intelligibility.

Notably, evolving trends in culinary globalization are precipitating a paradigm shift in translation norms, with formerly domesticated terms, e.g., “steamed bread” for “馒头”, increasingly giving way to foreignized forms, “Mantou” as Chinese gastronomic culture gains global familiarity. This transition reflects both China’s growing cultural confidence and international audiences’ increasing receptivity to authentic Chinese culinary concepts.

In summary, domestication facilitates audience comprehension and reduces cultural barriers but may sacrifice some authenticity and cultural elements. Foreignization preserves the original cultural and linguistic characteristics, fostering cross-cultural exchange and cognitive diversity, but it may pose challenges in audience understanding and global promotion. A balanced combination of domestication and foreignization retains cultural connotations while ensuring accessibility. Translators must consider the dish name’s type, features, and cultural significance, along with the time and space constraints of documentary subtitling, to strike an optimal balance between domestication and foreignization for the most effective translation and communication outcomes.

Disclosure statement

The authors declare no conflict of interest.

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