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How Do Digital Teaching Resources Foster Cultural Awareness in EFL Classrooms? A Mixed-Methods Study in the Chinese Primary Context

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Abstract

With the advancement of educational digitalization, digital teaching resources have become increasingly integrated into primary English education, offering new possibilities for cultivating students' cultural awareness. This study investigates how digital teaching resources contribute to the development of cultural awareness among primary EFL learners by examining the interrelationships among school-level digital resource construction, teachers' application practices, and students' cognitive perceptions. Adopting a mixed-methods design, questionnaire data were collected from 313 fifth and sixth-grade students in a public primary school in eastern China, complemented by semi-structured interviews with students. Descriptive statistics, correlation analysis, and structural equation modeling (SEM) were employed to analyze the data. The results indicate that digital teaching resources are significantly associated with all dimensions of cultural awareness, with a clear imbalance characterized by strong cultural knowledge but relatively weak intercultural communication competence. SEM results further reveal that teachers' application functions as a proximal driver of cultural awareness development, while school construction serves as a distal structural condition exerting its influence primarily through teachers' practices. In addition, student cognition initiates a progressive psychological pathway from cultural knowledge to intercultural communication competence. By modeling the multilevel mechanisms underlying technology-mediated cultural awareness development in primary EFL education, this study extends existing research on digital intercultural learning and highlights the critical mediating role of teachers in transforming digital resources into meaningful cultural learning experiences.

Keywords

Digital Teaching Resources, Cultural Awareness, Mixed-Methods Study, Intercultural Communication Competence

1. Introduction

Recent advances in educational digitalization have fundamentally reshaped how cultural content is presented and experienced in English as a Foreign Language (EFL) classrooms. Digital teaching resources, such as videos, animations, virtual environments, and interactive platforms, enable learners to access authentic cultural materials beyond the constraints of textbooks, thereby offering new possibilities for cultivating cultural awareness in language education (Godwin-Jones, 2020). In particular, digital environments allow young learners to encounter diverse cultural practices in a more vivid and situated manner, which is considered essential for developing intercultural sensitivity at an early stage of language learning.

At the same time, cultural awareness has been increasingly recognized as a core component of communicative competence in foreign language education. Rather than focusing solely on linguistic accuracy, contemporary EFL pedagogy emphasizes learners' ability to understand, interpret, and appropriately respond to cultural differences in communication. From this perspective, digital teaching resources are not merely instructional tools, but potential mediators that can support learners' gradual transformation from acquiring cultural knowledge to developing intercultural communication competence.

Within the context of educational reform in China, the integration of digital teaching resources has been strongly promoted at the level of basic education. National curriculum documents highlight both the advancement of educational informatization and the cultivation of students' cultural awareness as key educational goals, particularly in primary English education. These policy initiatives underscore the expectation that digital resources should play a meaningful role in supporting cultural learning rather than serving merely as supplementary teaching aids.

However, policy endorsement does not necessarily guarantee effective pedagogical implementation. Although digital resources are increasingly available in primary schools, their contribution to cultural awareness development remains uneven in practice. In many classrooms, digital materials are used primarily for information presentation, while opportunities for cultural interpretation, reflection, and intercultural practice remain limited. This discrepancy raises an important pedagogical question: how, and under what conditions, can digital teaching resources meaningfully contribute to the development of cultural awareness among young EFL learners?

Existing research on technology-enhanced language learning has demonstrated

the potential of digital tools to support cultural learning and intercultural communication. Nevertheless, several limitations remain. First, much of the existing literature focuses on secondary or tertiary learners, while empirical evidence from primary EFL contexts is relatively limited. Second, prior studies often examine the effects of digital resources at a single level, such as learner attitudes or learning outcomes, without sufficiently considering the interactions among school-level conditions, teachers' instructional practices, and learners' cognitive engagement. As a result, the underlying mechanisms through which digital teaching resources influence cultural awareness development remain insufficiently understood.

To address these gaps, the present study adopts a mixed-methods approach to examine the application of digital teaching resources in cultivating cultural awareness among primary EFL learners. By integrating questionnaire data, interview evidence, and structural equation modeling, this study seeks to model the multilevel relationships among school construction, teachers' application of digital resources, student cognition, and different dimensions of cultural awareness. In doing so, the study aims to contribute a more nuanced understanding of how digital resources function as mediating tools in the development of intercultural competence in primary EFL education. Building on the above discussion, this study seeks to clarify the mechanisms through which digital teaching resources contribute to the development of cultural awareness in primary EFL education. Rather than treating digital resources as isolated instructional tools, the study adopts a multilevel perspective that integrates school-level conditions, teachers' application practices, and students' cognitive engagement. Specifically, the study addresses the following research questions:

RQ1: What is the current pattern of digital teaching resource application in primary EFL classrooms with regard to school construction, teachers' application, and student cognition?

RQ2: How are different dimensions of digital teaching resource application associated with primary students' cultural awareness, including cultural knowledge, cultural understanding, intercultural communication awareness, and intercultural communication competence?

RQ3: Through what mechanisms do school construction, teachers' application, and student cognition interact to influence the development of cultural awareness among primary EFL learners?

2. Literature Review and Theoretical Framework

2.1. Cultural Awareness

Cultural awareness is a dynamic and evolving construct whose connotations continue to expand alongside social development and cultural change. The concept generally follows a progressive developmental trajectory, moving from the accumulation of cultural knowledge, to cultural understanding, and ultimately to critical cultural awareness. Broadly, it refers to individuals' cognition, interpretation, and attitudes toward cultural phenomena, encompassing perceptions of cultural

values, beliefs, customs, arts, and language practices.

In the context of China's basic education curriculum reform, the *Compulsory Education English Curriculum Standards* (2022 *edition*) define cultural awareness as learners' understanding and appreciation of both Chinese and foreign cultures, reflected through informed cultural cognition, attitudes, and behaviors (Ministry of Education, 2022). International scholarship, meanwhile, conceptualizes cultural awareness through multiple disciplinary lenses such as intercultural communication, language education, psychology, and sociology.

Hanvey (1979) described cultural awareness as the sensitivity to cultural factors in cross-cultural communication, outlining four developmental levels: recognition of surface cultural features, awareness of differences and potential resistance, rational acceptance of other cultures, and deep-level insider-like understanding. Tomalin and Stempleski (1993) defined cultural awareness as a conscious understanding of the role of culture in language learning and cross-cultural communication, involving active attention to cultural similarities and differences and respect for cultural diversity. Winkelman (2008) emphasized that cultural awareness emerges from recognizing cultural differences and their behavioral implications, forming the basis for effective cross-cultural communication. Hall (2000) further argued that intercultural awareness involves the ability to identify, interpret, and evaluate sociocultural perspectives of both one's own and the target culture.

The developmental nature of cultural awareness is also highlighted in Bennett's Developmental Model of Intercultural Sensitivity (DMIS), which maps the transformation from ethnocentrism to ethnorelativism (Bennett & Hammer, 2017), and Byram's (Byram, 2008) model of intercultural communicative competence, which encompasses knowledge, attitudes, skills, and critical cultural awareness.

Based on the synthesis of domestic and international frameworks, this study conceptualizes cultural awareness as comprising four dimensions: 1) cultural knowledge, referring to learners' understanding of the history, customs, values, lifestyle, and artistic practices of English-speaking cultures; 2) cultural understanding, involving interpretation of cultural phenomena and their embedded meanings; 3) intercultural communication awareness, referring to students' sensitivity to cultural differences and their ability to adjust language comprehension and expression accordingly; and 4) intercultural communication ability, defined as applying cultural knowledge and awareness in practical communication contexts (Vishnyakova, 2020).

Extensive research confirms the positive role of cultural awareness in reducing communication conflicts, enhancing motivation, and cultivating global competence. Traditional approaches, literary texts, cultural lectures, and international exchanges, have been widely studied, yet scholars consistently note persistent limitations. Cultural content presented in traditional classrooms often lacks authenticity, timeliness, and representativeness, reinforcing stereotypes rather than deepening cultural insight (Asltaleb Maghferat et al., 2025; Davidson & Liu, 2020; Shadiev et al., 2024). Moreover, limited immersion and insufficient opportunities

for authentic intercultural interaction hinder students' ability to transform knowledge into communicative competence (Nelson & Luetz, 2021). Assessment methods also remain simplistic, making it difficult to capture learners' internalized attitudes and cultural dispositions. Existing studies further identify multiple factors influencing cultural awareness, including internal factors such as language proficiency, prior cultural background, personality traits, and motivation, as well as external factors such as teaching materials, instructional approaches, exposure to intercultural interaction, and access to supportive technological environments (Demirhan, 2025; Esmaeili et al., 2017; Jasim & Ismael, 2025).

2.2. Digital Teaching Resources

Scholars commonly define digital teaching resources as digitally encoded materials used to support teaching and learning. In China, these resources refer to teaching content transformed into digital formats via information technologies—such as digital textbooks, multimedia courseware, animations, and video materials (Lin & Liu, 2024). International scholars similarly define them as digital materials accessible through computers and networked devices to facilitate teaching processes (Higgins, 2020).

With rapid advancements in information technology, digital teaching resources have become central to educational transformation. Existing research shows that digital resources enrich instructional content, diversify pedagogical models, and enable personalized learning (Chen & Zou, 2025). However, challenges persist, including insufficient updates, limited adaptability, and uneven integration across subjects (Chen, 2025; Ait El Mokhtar et al., 2023). At the technological level, innovations such as cloud computing and artificial intelligence have enhanced the construction, management, and sharing of large-scale educational resources, improving their accessibility, security, and interoperability (Cao et al., 2025; Yan, 2024).

When applied to language education, digital resources serve not only as information carriers but as critical tools for creating authentic linguistic and cultural environments. Early CALL research emphasized vocabulary, grammar, and reading practice (Blake, 2013), whereas later studies, shaped by Web 2.0 developments, shifted toward computer-mediated communication, focusing on technology's role in enabling meaningful collaboration and intercultural interaction (Wang & Vasquez, 2012). Contemporary research affirms that digital resources provide authentic, contextualized language input, enhance motivation through multimodality and gamification, and support personalized, inquiry-based learning (Kakoulli-Constantinou & Papadima-Sophocleous, 2020; Dörnyei et al, 2015; Benson, 2013). Digital platforms also facilitate real-time intercultural communication through social media, virtual exchanges, and videoconferencing (O'Dowd, 2017).

In this study, the three core predictors are operationalized as follows. "School construction" refers to the institutional provision of digital teaching resources, including infrastructure availability, resource diversity, and technical support. "Teacher application" denotes the extent and quality of teachers' pedagogical use

of digital resources in classroom instruction, including frequency, interaction design, and instructional integration. "Student cognition" represents learners' perceptions, attitudes, and engagement with digital teaching resources, including interest, perceived usefulness, and learning involvement.

2.3. Research Gap

Despite notable advancements, three significant gaps persist: first, there is limited research in primary education. While digital teaching resources are extensively utilized in higher education, their application in primary English education remains insufficiently explored due to variations in learner characteristics, teacher digital literacy, and contextual constraints. Additionally, there is sparse research in English language and cultural instruction. Existing studies on digital resource development predominantly focus on STEM fields, with relatively few addressing English education, and even fewer examining cultural awareness in primary English contexts. Furthermore, there is insufficient attention to cultural awareness mechanisms. Although scholars have discussed the general benefits of digital resources, systematic investigations into how these resources influence cultural awareness, encompassing knowledge, understanding, awareness, and communicative ability, are limited. To address these gaps, this study aims to: 1) examine the current application of digital teaching resources in fostering cultural awareness in primary English classrooms; 2) analyze key influencing factors and underlying mechanisms; and 3) propose targeted strategies to optimize digital resource integration.

2.4. TPACK

The Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2005) provides an essential theoretical foundation for understanding the integration of technology, pedagogy, and subject content. TPACK comprises three primary knowledge domains, content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK), as well as their intersecting components. In this study, CK encompasses linguistic knowledge (e.g., vocabulary, grammar, discourse patterns) and fundamental cultural content suitable for primary learners, such as festivals, etiquette, food culture, and symbolic meanings. PK refers to age-appropriate teaching strategies tailored to young learners' cognitive characteristics, including gamified learning, experiential activities, visual scaffolding, and group collaboration. TK includes digital resources such as animations, interactive courseware, virtual cultural environments, and digital storybooks, as well as teachers' ability to select, adapt, and integrate these tools. The value of TPACK lies in the coherent integration of technology, pedagogy, and content. Within the context of this study, technology is not an independent variable but a means to support cultural learning. Thus, digital resources should simultaneously facilitate language learning and cultural perception, using multimodal representations to enhance students' intuitive understanding of cultural meanings.

2.5. Conceptual Research Model

Grounded in the TPACK framework, the conceptual model developed in this study elucidates the role of digital teaching resources in enhancing primary school students' cultural awareness. The model comprises four interconnected levels (see Figure 1): 1) Objective Level: The primary objective is to enhance students' English cultural awareness across four dimensions: cultural knowledge, cultural understanding, intercultural communication awareness, and intercultural communication ability. 2) Integration Level: This core component of the model emphasizes the integrated application of digital resources with linguistic and cultural content to facilitate technology-enhanced cultural learning. 3) Dimension Level: This level provides a detailed articulation of the technological dimension (types and affordances of digital resources) and the content dimension (language and cultural content suitable for primary learners). 4) Foundation Level: This level encompasses the research hypothesis that deeply integrated digital resources enhance cultural awareness and the evaluation framework, which involves questionnaires and interviews. The central premise is that digital teaching resources, by vividly presenting linguistic and cultural content, enable learners to perceive, interpret, and apply cultural meanings, thereby fostering progressive development in cultural awareness.

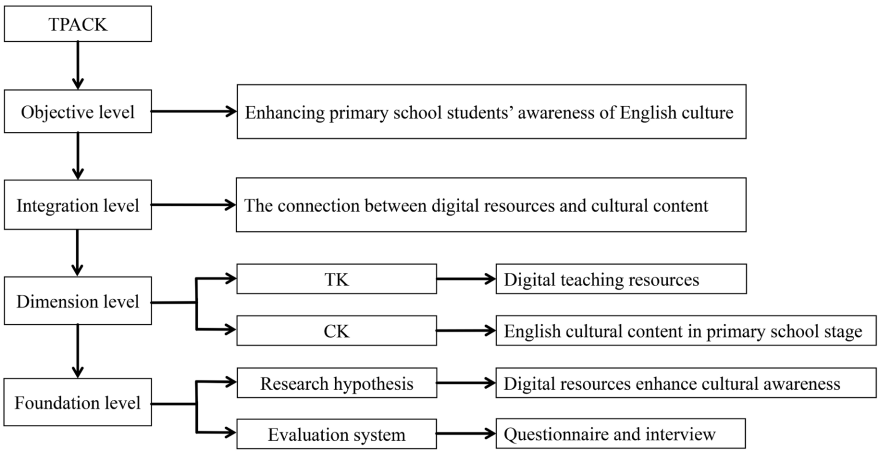

Figure 1. The conceptual research model.

3. Research Design and Methods

3.1. Research Design

This study employs a mixed-methods research approach, integrating both questionnaires and interviews. The primary advantage of this approach is its ability to achieve a "complementary integration of quantitative data and qualitative insights," thereby enhancing the scientific rigor, comprehensiveness, and depth of the research. Questionnaires effectively delineate macro-level characteristics, while interviews address the limitations of quantitative research by capturing individuals' subjective perceptions and underlying rationales. These two methods

mutually verify and complement each other, thus bolstering the credibility and validity of the research findings (Harris & Brown, 2010). The quantitative component utilizes a questionnaire survey to investigate the overall application status and influencing factors, whereas the qualitative component employs semi-structured interviews to gain a deeper understanding of students' actual experiences and perceptions, resulting in a mutual verification and complementation of data.

3.2. Participants and Context

In alignment with the objectives outlined in the *Compulsory Education English Curriculum Standards* (Ministry of Education of the People's Republic of China, 2022), which emphasize fostering students' interest in English learning and strengthening their understanding of Chinese and foreign cultures, this study targeted students in Grades 5 and 6. Participants were recruited from one primary school in Z City. The selected school is a typical public primary school with moderate levels of digital resource integration, including multimedia classrooms and access to online teaching platforms. It was chosen because it represents a common level of digital infrastructure in urban primary education in eastern China, thereby providing a meaningful context for examining the general applicability of the findings.

A total of 350 questionnaires were distributed, and 313 valid responses were retained after eliminating those with irregular response patterns or excessively short completion times, yielding an effective response rate of 89%. Among these respondents, 174 were male (55.6%) and 139 were female (44.4%); 158 were fifth graders (50.5%) and 155 were sixth graders (49.5%). As for weekly English class frequency, 203 students (64.9%) reported attending three classes per week, while 110 students (35.1%) attended four or more (**Table 1**).

Table 1. Profile of the participants.

Characteristics	Group	N	%
Gender	Female	139	44.4
	Male	174	55.6
Grade	Fifth	158	50.5
	Sixth	155	49.5
Frequency (English class per week)	3 times	203	64.9
	4 times or more	110	35.1
Total		313	100

In addition, written informed consent was obtained from parents or legal guardians, and assent was obtained from the participating students before data collection.

To complement quantitative findings, 10 students were selected through pur-

posive sampling to participate in semi-structured interviews (Table 2). The sample included equal numbers of males and females and balanced representation of Grades 5 and 6, ensuring diversity and representativeness.

Table 2. Basic information of respondents.

Number	serial number	Gender	Grade	Date
1	S1	Female	Fifth	2025.5.28
2	S2	Female	Fifth	2025.5.28
3	S3	Male	Fifth	2025.5.28
4	S4	Female	Fifth	2025.5.28
5	S5	Male	Fifth	2025.5.28
6	S6	Female	Fifth	2025.5.28
7	S7	Female	Sixth	2025.6.1
8	S8	Male	Sixth	2025.6.1
9	S9	Male	Sixth	2025.6.1
10	S10	Female	Sixth	2025.6.1

3.3. Instruments and Data Collection

3.3.1. Questionnaire

The questionnaire design was mainly based on the dimensional classification of digital teaching resources and cultural awareness by previous scholars. Recent studies have explored key dimensions across educational domains, including the construction, application, and perception of digital teaching resources (Guo, 2022); the cultivation of cultural knowledge, understanding, and intercultural communication competencies (Yang, 2022); and the redefinition of technology's role as a cognitive and cultural mediator in pedagogy (Wang, 2025). These dimensions collectively encompass resource infrastructure, learner development, and teacher transformation. Based on the design orientations of the aforementioned studies, the present research integrates the two frameworks. The questionnaire was developed based on previous studies and initially consisted of 33 items. The questionnaire is divided into three parts:

1) Basic information: Including gender, grade, and weekly English class frequency, used to analyze individual differences.

2) Application status of digital teaching resources: it is divided into three dimensions: school construction (5 items, $\alpha = 0.791$), teacher application (5 items, $\alpha = 0.803$), and student cognition (5 items, $\alpha = 0.714$). The items are scored on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree).

3) Perception of cultural awareness cultivation: it is divided into four dimensions: cultural knowledge (3 items, $\alpha = 0.609$), cultural understanding (2 items, $\alpha = 0.678$), intercultural communication awareness (3 items, $\alpha = 0.649$), and intercultural communication competence (3 items, $\alpha = 0.611$). The scoring method is

the same as above.

To conduct further data analysis on the recycled samples, this study encoded the construction scale of school digital teaching resources, the application scale of digital teaching resources by teachers, the cognition scale of digital teaching resources by students, the perception scale of cultural knowledge by students, the understanding scale of culture by students, the awareness scale of cross-cultural communication by students, and the ability scale of cross-cultural communication by students. To verify the scientific rigor of the questionnaire, a pre-survey was conducted prior to the formal investigation following the completion of questionnaire design. The recovery rate of valid questionnaires exceeded 70%, indicating a relatively high data recovery rate and satisfactory quality of the collected data.

Before the formal survey, a pre-survey was conducted with 120 students, and the questionnaire was revised according to the pre-survey results. The KMO values of each dimension of the formal questionnaire are between 0.624 - 0.837, and the Bartlett spherical test is significant ($p < 0.001$), indicating that the scale has good structural validity.

The retained items were derived from the original item pool after removing A5, B2, C3, and E1. The final scales included five items each for school construction, teacher application, and student cognition. Most cultural awareness dimensions were measured with three items, including cultural knowledge, intercultural communication awareness, and intercultural communication competence, while cultural understanding consisted of two items after refinement.

3.3.2. Interview Protocol

The design of interview questions drew on the semi-structured interview method described in *Teachers' use of digital learning tools for teaching in higher education*: *Exploring teaching practice and sharing culture* (Mei et al., 2019). The study uses the TPACK-framework, which illustrates the relationship between technology, professional content knowledge and pedagogical approaches as its theoretical foundation. Following the design ideas of the above-mentioned paper, the interview outline is designed around five core themes: 1) Use of digital teaching resources (such as favorite tools and content focus); 2) Cultivation of cultural awareness (such as cultural scenes contacted and interest level); 3) Learning effect experience (comparison between digital resources and teacher explanation); 4) Feedback on teaching methods (preferred resource types); 5) Construction of school resources (expectations for resource construction).

Each interview lasts about 10 minutes, and the interview content is recorded and transcribed into text (about 4500 words). The purpose of this interview is to identify the existing problems in the application of digital teaching resources for cultural awareness cultivation in current primary school English teaching and propose corresponding suggestions. This study will strictly adhere to ethical norms, be used exclusively for academic research, and has obtained informed consent from the participating students, with their privacy and confidentiality guaranteed throughout the research process. Among them, the sub-questions under

Dimension 1 are Q1 and Q2, with the sub-topics being "Tool Preference", "Reason for Preference" and "Content Focus"; the sub-questions under Dimension 2 are Q3, Q4 and Q5, with the sub-topics being "Cultural Scenario", "Interest Degree", "Curiosity Exploration" and "Elegant Style"; the sub-question under Dimension 3 is Q6, with the sub-topic being "Comparison of Mathematicians" and "Reason Linkage"; the sub-question under Dimension 4 is Q7, with the sub-topic being "Cultural Key Tools" and "Selection Basis"; the sub-question under Dimension 5 has the number Q8, with the sub-topic being "Degree of Desire" and "Summary of Options" (see Table 3).

Table 3. Interview question design.

Core topics	Sub-themes	Related questions
Resource usage	Tool preference	Q1
	Reason for the Love	Q1
	Content Focus	Q2
Current state of cultural awareness	Cultural Scene	Q3
	Degree of interest	Q4
	Curiosity Leads to Understanding	Q4
	E-Elegant charm	Q5
Learning effect experience	Comparison between Digitalization and Teachers	Q6
	Reason Link	Q6
Feedback on teaching methods	Cultural Key Items	Q7
	Preferred basis	Q7
School resource development	Degree of desire	Q8
	Summary of Options	Q8

3.4. Data Analysis Procedures

3.4.1. Quantitative Data Analysis

Quantitative data were analyzed using a combination of statistical software and modeling tools. Descriptive statistics and Pearson correlation analyses were conducted in SPSS 25.0 to summarize sample characteristics and examine preliminary relationships among variables. Subsequently, structural equation modeling (SEM) was performed in Smart PLS 4.0 to investigate the structural relationships and underlying mechanisms among the studied factors.

3.4.2. Qualitative Data Analysis

Qualitative data were analyzed following a thematic analysis, supported by NVivo 13. The analysis involved a three-stage coding process: open coding, axial coding, and selective coding. This iterative procedure allowed for the systematic identification of themes and patterns, culminating in the extraction of core conceptual

categories. The qualitative findings were then used to triangulate and contextualize the results derived from the quantitative analysis. The qualitative strand was designed to complement the quantitative findings by providing in-depth explanations of the statistical patterns observed in the survey and SEM analyses. Specifically, the identified themes were used to interpret how and why digital teaching resources influenced different dimensions of cultural awareness, thereby triangulating and enriching the quantitative results.

4. Results

4.1. Descriptive Analysis of Digital Teaching Resource Application

4.1.1. School Construction

Table 4 presents the aggregated data of three core dimensions regarding digital teaching resource application, with a consistent sample size of 313 for all dimensions. Among the three dimensions, the mean value of Student Cognition is the highest (4.251) with the smallest SD (0.636), indicating that students' overall recognition of digital teaching resources is consistent and positive. The mean value of Teacher Application (3.862) is slightly higher than that of School Construction (3.766), reflecting that students perceive teachers' application of digital resources in classrooms as more effective than the school's infrastructure support. Meanwhile, the SD of Teacher Application (0.837) is slightly lower than that of School Construction (0.849), suggesting that the differences in students' perceptions of teachers' application behaviors are smaller than their perceptions of school construction (see Table 4).

Table 4. A comparative analysis across the school, teacher, and student dimensions.

Dimensions	Sample capacity	Mean	Standard deviation
School Construction	313	3.766	0.849
Teacher Application	313	3.862	0.837
Student Cognition	313	4.251	0.636

4.1.2. Teacher Application

The mean score for teacher application of digital teaching resources was 3.86 (SD = 0.84). Among the sub-dimensions, students rated application effectiveness (M = 4.19) and classroom interaction (M = 4.04) relatively highly. In contrast, application duration received the lowest mean score (M = 3.49), with approximately 22% of students reporting that digital resources were seldom used throughout the entire lesson. These results suggest noticeable variation in how digital teaching resources are integrated into classroom instruction.

4.1.3. Student Cognition

Students demonstrated generally positive perceptions of digital teaching resources, with an overall mean score of 4.25 (SD = 0.64). Interest (M = 4.44) and preference (M = 4.37) were the highest-rated aspects, whereas perceptions of re-

source completeness were comparatively lower (M = 4.08). Approximately 20.1% of students reported a neutral attitude toward the adequacy of existing digital resources. A comparative analysis across the three dimensions indicates a gradient pattern, with student cognition scoring the highest, followed by teacher application and school construction (Table 4).

4.2. Descriptive Analysis of Cultural Awareness Development

4.2.1. Cultural Knowledge and Cultural Understanding

Students reported relatively high levels of cultural knowledge acquisition through digital teaching resources, with a mean score of 4.21 (SD = 0.76). A total of 84.3% of students agreed that digital resources helped them learn English cultural knowledge, and 47.9% indicated frequent exposure to cultural topics such as festivals and etiquette. Cultural understanding received the highest overall mean score (M = 4.30, SD = 0.68). Most students (83.4%) agreed that understanding English culture facilitates language learning, and 57.2% considered cultural comparison to be an important learning activity.

4.2.2. Intercultural Communication Awareness and Competence

Table 5 presents the aggregated data of four core dimensions of cultural awareness cultivation, with a consistent sample size of 313 for all dimensions. Among the four dimensions, Cultural Understanding has the highest mean value (4.295) and the smallest SD (0.682), demonstrating that students have a highly consistent and positive perception of their ability to understand English cultures. The mean values show a successive decreasing trend: Cultural Understanding (4.295) > Cultural Knowledge (4.214) > Intercultural Communicative Awareness (4.129) > Intercultural Communicative Competence (3.585), indicating a gradual decline in students' self-perceived levels from cultural cognitive dimensions to practical ability dimensions. In contrast, the SD shows a successive increasing trend: Cultural Understanding (0.682) < Cultural Knowledge (0.756) < Intercultural Communicative Awareness (0.838) < Intercultural Communicative Competence (1.063), which means that the differences in students' perceptions expand as the dimension shifts from cognitive to practical, with the greatest divergence in views on intercultural communicative competence.

Table 5. Analysis of the four dimensions of cultural awareness.

Dimensions	Sample capacity	Mean	Standard deviation
Cultural Understanding	313	4.295	0.682
Cultural Knowledge	313	4.214	0.756
Intercultural Communication Awareness	313	4.129	0.838
Intercultural Communication Competence	313	3.585	1.063

4.3. Correlation Analysis

The results of the correlation analysis indicate the following. First, a strong and significant positive correlation is observed between school construction and teacher application (r = 0.697, $p < 0.01$), suggesting that improvements in school-level digital infrastructure are closely associated with teachers' application of digital teaching resources.

Second, school construction, teacher application, and student cognition are all significantly and positively correlated with the four dimensions of cultural awareness (r = 0.372 - 0.535, $p < 0.01$). Among the three dimensions of digital teaching resource application, teacher application shows the strongest correlation with cultural knowledge (r = 0.506), while school construction demonstrates the strongest association with intercultural communication competence (r = 0.535). This pattern indicates that different dimensions of digital resource application are related to distinct aspects of cultural awareness development.

Third, the four dimensions of cultural awareness are significantly and positively correlated with one another (r = 0.372 - 0.573, $p < 0.01$), suggesting that the development of cultural awareness is a synergistic and interrelated process, in which progress in one dimension is likely to facilitate growth in others. It should be noted that the correlation analysis reveals associative relationships rather than causal effects, which are further examined through structural equation modeling in the subsequent analysis. (Table 6)

Table 6. Correlation analysis table of variables.

	A	B	C	D	E	F	G
School Construction	1						
Teacher Application	0.697**	1					
Student Cognition	0.483**	0.501**	1				
Cultural Knowledge	0.462**	0.506**	0.478**	1			
Cultural Understanding	0.483**	0.432**	0.481**	0.413**	1		
Intercultural Communication Awareness	0.408**	0.387**	0.484**	0.401**	0.573**	1	
Intercultural Communication Competence	0.535**	0.463**	0.383**	0.372**	0.451**	0.506**	1

Note: In Table 6, to avoid repetition, the terms "School Construction", "Teacher Application", "Student Cognition", "Cultural Knowledge", "Cultural Understanding", "Intercultural Communication Awareness", and "Intercultural Communication Competence" have been replaced with letters A, B, C, D, E, F, and G respectively.

4.4. Structural Equation Modeling Results

Structural equation modeling (SEM) was employed to further examine the mechanisms underlying the relationships among digital teaching resource application and cultural awareness development. Prior to model construction, reliability and validity analyses were conducted. Items B2, C3, and E1 were removed due to av-

erage variance extracted (AVE) values below 0.50.

The model demonstrated an acceptable level of fit according to commonly adopted criteria in exploratory SEM studies ($\chi^2/df = 2.837$, RMSEA = 0.085, CFI = 0.881). The standardized path coefficients are presented in Figure 2 and Table 7.

Table 7. Direct effects of digital teaching resources and cultivation of cultural awareness.

Path	Coefficient (β)	M	SD	T	P
School Construction → Student Cognition	0.004	0.002	0.085	0.025	0.980
School Construction → Teacher Application	0.822	0.728	0.079	9.245	0.000
Student Cognition → Cultural Knowledge	0.558	0.487	0.109	4.456	0.000
Teacher Application → Student Cognition	0.623	0.387	0.112	3.445	0.001
Teacher Application → Cultural Knowledge	0.451	0.244	0.058	4.223	0.000
Cultural understanding → Intercultural Communication Awareness	0.961	0.984	0.126	7.813	0.000
Cultural knowledge → Cultural Understanding	0.859	1.180	0.197	5.979	0.000
Intercultural Communication Awareness → Intercultural Communication Competence	0.837	1.191	0.163	7.311	0.000

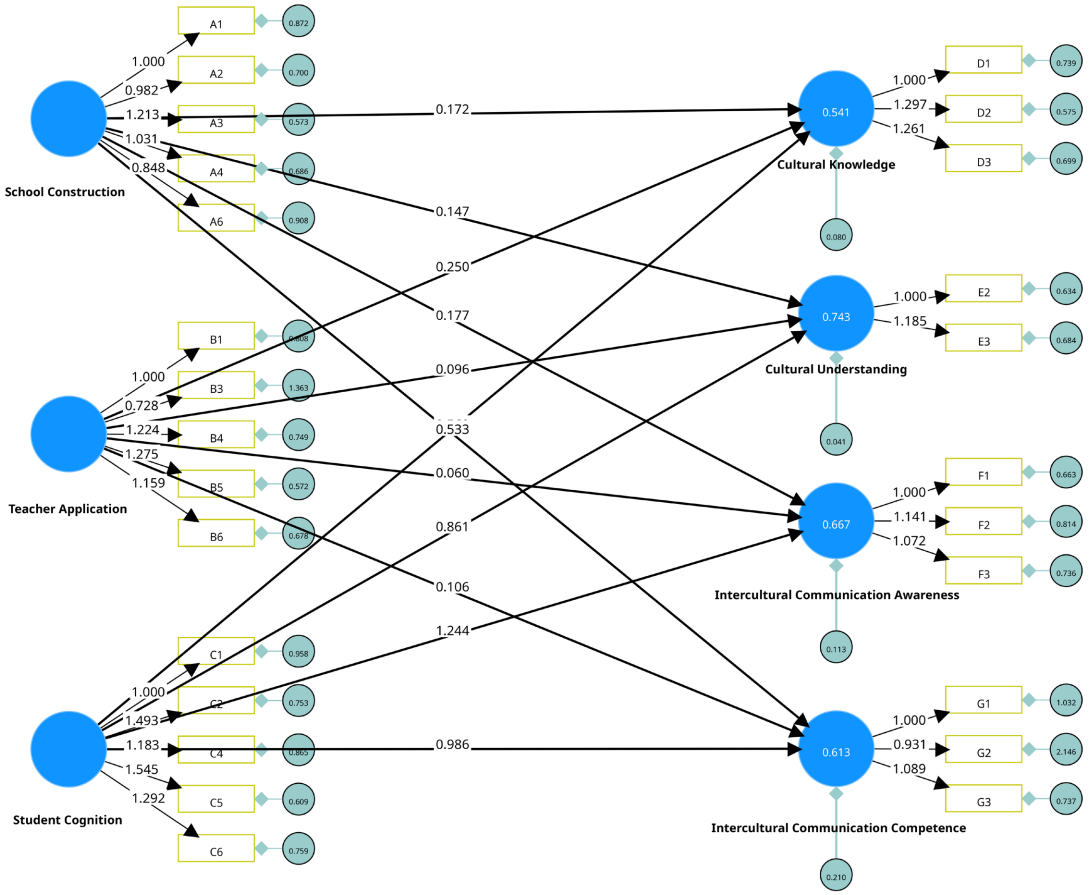

Figure 2. Structural equation model.

The results indicate that school construction had a strong direct effect on teacher application (β = 0.822, $p < 0.001$), whereas its direct effect on student cognition was not significant (β = 0.004, $p > 0.05$). Teacher application exerted significant direct effects on both student cognition (β = 0.623, $p < 0.001$) and cultural knowledge (β = 0.451, $p < 0.001$). Student cognition also significantly predicted cultural knowledge (β = 0.558, $p < 0.001$).

In addition, cultural knowledge significantly predicted cultural understanding (β = 0.859, $p < 0.001$), which in turn strongly predicted intercultural communication awareness (β = 0.961, $p < 0.001$). Intercultural communication awareness further predicted intercultural communication competence (β = 0.837, $p < 0.001$).

Indirect effects indicate that school construction influenced cultural awareness through teacher application and student cognition, while student cognition affected intercultural communication competence through a sequential pathway involving cultural knowledge, cultural understanding, and intercultural communication awareness.

4.5. Qualitative Interview Results

The qualitative findings are presented to complement the quantitative results, offering explanatory insights into the mechanisms underlying the observed statistical relationships. The data from this interview survey were statistically analyzed using N-vivo 13, and the very classic and standardized "three-level coding" was adopted in the qualitative research. Specifically, this study read and conducted open coding on the interview texts, forming initial concepts; then, through continuous comparisons, the initial coding was aggregated into sub-themes; finally, the sub-themes were summarized as core themes, thereby constructing a thematic framework reflecting the current application status of digital teaching resources in the cultivation of cultural awareness. The first-level coding (open coding) corresponds to the "initial coding" column; the second-level coding (axial coding) corresponds to the "sub-theme → core theme" column; the third-level coding (selective coding) corresponds to the "core theme → interview objective" column.

Based on a systematic analysis of student interview data, the application of digital teaching resources in cultivating English cultural awareness presents five dimensions of typical characteristics.

First, tool preference demonstrates an orientation toward interactivity and intuitiveness. Students' preferences for digital teaching tools are significantly concentrated on devices with high interactivity and strong sensory stimulation. Interactive whiteboards, frequently mentioned for their large screens, touch functionality, and support for multi-person collaborative games, are regarded as "game consoles" that enhance classroom engagement. Tablets, on the other hand, are perceived as "personal learning assistants" due to their personalized and controllable app-based learning games. As Student 1 stated: "*I like tablets the most*! *Because I can tap around to play word games*, *just like playing video games*." This indicates that students do not merely favor the "digital" form itself, but pursue

"deeper interaction and more vivid experiences enabled by digital technology."

Second, the cultivation of cultural awareness has initially achieved results, with interest stemming from novelty and global perspective. Digital resources, particularly animations and live-action videos, have effectively opened a window for students to glimpse foreign cultures. Students can clearly recall cultural scenarios such as Halloween, Christmas, foreign campus life, and dining customs. For instance, Students 2 and 8 mentioned: *The teacher showed videos of American kids celebrating Halloween—they wore monster costumes to ask for candies! In the videos, I saw foreign manor life, kangaroos appearing in yards, and families keeping monkeys.* Their interest is driven primarily by two factors: first, the novelty and fun of cultural content (e.g., Halloween as a costume-play-like activity), and second, the sense of broadening horizons brought by digital presentation, which stimulates curiosity and yearning for the wider world. This confirms that digital resources play a significant role in igniting cultural interest and providing intuitive cultural impressions.

Third, digital resources and teachers' explanations are not substitutes but form a collaborative relationship. When comparing the effectiveness of digital resources and teachers' direct explanations, students generally agreed that both have unique advantages, and the optimal model lies in their integration. They argued that digital resources (e.g., videos, animations) are more effective in creating contexts and providing intuitive impressions ("*helping me understand visually*"), while teachers' explanations are indispensable for addressing doubts, deepening contextual understanding, and summarizing key points ("*helping me comprehend thoroughly*"). What students desire is not the mere sophistication of technology, but the efficient empowerment of technology under teachers' guidance. As Student 7 expressed: "*I prefer the teacher to explain first, then watch digital resources. Learning through this combination is the most solid.*"

Fourth, preferences for resource forms lean toward "authenticity" and "gamification." Among various types of digital resources, students favor live-action videos and interactive animations the most. The former, with their "authenticity" and "liveliness," satisfy their desire to learn about the real lives of foreign peers; the latter, through robust "game mechanisms" (e.g., quick quizzes, matching exercises, level-based challenges), transform the learning process into an enjoyable experience, enabling students to implicitly absorb cultural knowledge while having fun.

Fifth, students hold high expectations for the development of digital resources, desiring more investment in "intelligence" and "interactivity." The vast majority of students expressed a strong wish for schools to vigorously develop digital resources. Their demands have transcended the basic level of "viewing" and shifted toward a desire for advanced intelligent interaction, such as AI writing assistants, virtual conversation partners, VR experience scenarios, and online competitive games. This indicates that the future development of teaching resources needs to place greater emphasis on the integration of artificial intelligence technology and

the design of immersive interactive experiences.

5. Discussion

5.1. Patterns and Challenges in the Use of Digital Teaching Resources for Cultivating Cultural Awareness

Overall, the application of digital teaching resources in cultivating primary school students' English cultural awareness exhibits a pattern of relatively active student engagement, statistically significant associations, and uneven developmental outcomes. At the student level, learners demonstrate comparatively high levels of self-efficacy, willingness to engage with digital learning tools, and generally positive attitudes toward digital resources. Correspondingly, students report relatively strong acquisition and recognition of cultural knowledge.

This tendency is consistent with recent international research indicating that multimodal and technology-mediated learning environments can expand learners' cultural exposure and enhance engagement, particularly in early-stage foreign language learning contexts (Godwin-Jones, 2023; Liu et al., 2025). However, as previous studies have cautioned, heightened engagement does not necessarily translate into higher-level intercultural competence without appropriate pedagogical mediation.

Both correlation analysis and Structural Equation Modeling (SEM) indicate that school construction, teacher application, and student cognition are significantly and positively associated with the four dimensions of cultural awareness: cultural knowledge, cultural understanding, intercultural communication awareness, and intercultural communication competence. Among these factors, teacher application emerges as the most influential proximal factor, whereas school construction functions as a more distal structural condition whose effects are largely mediated through teachers' classroom practices.

This finding aligns with international empirical evidence suggesting that teachers' pedagogical mediation of digital tools plays a more decisive role in intercultural learning outcomes than access to technology alone (Dooly, 2023). While students' positive perceptions of digital resources are primarily associated with cultural understanding and awareness, school-level infrastructure appears to provide foundational support, particularly for the acquisition of basic cultural knowledge.

Despite these positive associations, the application of digital teaching resources across the three dimensions remains uneven, following a gradient pattern from student cognition to teacher application and then to school construction. Although students exhibit strong readiness and motivation for digital learning, limitations in institutional investment and variability in teachers' implementation practices constrain the effective and sustained use of digital resources. Comparable structural challenges have been reported internationally, where fragmented infrastructure development and insufficient professional training hinder the systematic integration of digital tools into intercultural instruction (Kukulska-Hulme et al., 2024). These findings suggest that student readiness alone is insuffi-

cient to ensure meaningful cultural learning without coordinated support at the institutional and pedagogical levels.

In terms of cultural awareness development, the results reveal an imbalanced progression across dimensions, moving from cultural knowledge to cultural understanding, intercultural communication awareness, and finally intercultural communication competence. While students generally acquire cultural facts and develop preliminary understanding, opportunities to transform this knowledge into practical intercultural communication competence remain limited. International research on virtual exchange and digitally mediated intercultural learning similarly indicates that exposure to cultural content alone produces constrained outcomes unless learners engage in reciprocal interaction and guided reflection (O'Dowd, 2023; Okumura, 2025). From this perspective, the observed "knowledge-practice gap" reflects a broader pedagogical challenge in digital intercultural education rather than a context-specific limitation.

5.2. Mechanisms Underlying Technology-Mediated Cultural Awareness Development

School construction and teacher application function as key external drivers of cultural awareness development, with teachers occupying a central mediating position within the overall mechanism. Regression analysis and SEM results confirm that school-level digital infrastructure significantly predicts teachers' application behaviors, which in turn shape students' learning experiences. This mechanism corresponds with international findings emphasizing that facilitating conditions and institutional support constitute necessary preconditions for teachers' effective pedagogical use of digital tools in intercultural contexts (Kukulska-Hulme et al., 2024; Lee, 2025).

Teacher application serves as the primary transmission mechanism through which digital resources exert educational influence. Teachers' instructional design competence, classroom scaffolding strategies, and ability to integrate digital resources meaningfully determine whether these tools function merely as presentation aids or as catalysts for deeper cultural internalization. This result resonates with studies highlighting teachers' roles as cultural and pedagogical mediators who organize interaction, guide reflection, and support meaning-making in technology-enhanced intercultural learning environments (Hauck, 2019; Tafazoli, 2024).

At the internal level, student cognition constitutes the psychological foundation of cultural awareness development. SEM reveals a stable and progressive chain mechanism: student cognition → cultural knowledge → cultural understanding → intercultural communication awareness → intercultural communication competence. All path coefficients are statistically significant, indicating a coherent developmental trajectory. This sequential process mirrors international research suggesting that intercultural competence develops gradually through staged learning experiences supported by guided interaction, reflective dialogue, and sustained pedagogical scaffolding (Hauck, 2019; O'Dowd, 2023).

5.3. Pedagogical Implications for Digital Cultural Instruction

5.3.1. School Level: Building an Ecological Digital Resource Support System

First, to optimize the resource supply structure, investment should prioritize interactive and practice-based digital resources. This includes developing virtual cultural exchange platforms, introducing AI-powered conversational tools, and establishing "cultural communication practice zones", measures that directly address the current shortage of hands-on application opportunities (Luo, 2025; Machwate et al., 2021; Xia et al., 2024).

Furthermore, teacher training must be strengthened through specialized programs focused on "integrating digital resources into cultural instruction." These initiatives should aim to enhance educators' ability to design culturally-rich learning activities and guide intercultural communication practice. Additionally, creating professional learning communities would support the ongoing sharing of effective pedagogical examples (Alonso-Díaz et al., 2018; Marwa et al., 2025).

Finally, establishing a clear evaluation framework is essential. Integrating cultural awareness development into both student comprehensive assessments and teacher performance reviews would systematically encourage schools and instructors to prioritize cultural teaching (Velez et al., 2022).

5.3.2. Teacher Level: Implementing Guided Digital Cultural Instruction

In terms of instructional design, digital tools should be used to create in-depth cultural learning activities, such as comparative analysis, cultural inquiry projects, and simulated intercultural dialogues. This approach helps students move beyond merely "understanding cultural phenomena" toward critically "reflecting on cultural meanings" (Nolan et al., 2024; Vukić et al., 2019).

Moreover, instruction should be tailored to grade-level readiness. For fifth graders, greater use of game-based digital tools can stimulate engagement and interest (Lampropoulos et al., 2019). Conversely, for sixth graders, cultural content should increase in authenticity and complexity—for example, through documentaries and real-person interviews—to align with their advancing cognitive development.

Importantly, strengthening the connection between classroom learning and homework is also key. Assigning digital-based cultural exploration tasks after class (Kong, 2014), such as having students research cultural stories from English-speaking countries online and present them in class, can effectively extend and deepen cultural learning.

5.3.3. Student Level: Fostering Active Cultural Learning Awareness

To begin with, students should be encouraged to undertake independent cultural exploration using digital tools (Fukuda & Nishikawa Chávez, 2021). Meaningful activities, such as creating cultural newsletters, producing short videos, and developing skills in information gathering and presentation, offer valuable opportunities for self-directed learning.

Beyond individual exploration, participation in structured intercultural communication activities, such as school-organized "international pen pal exchanges" or "cultural exchange salons", enables students to transform cultural awareness into practical communication skills (Abe, 2020).

Ultimately, developing critical cultural thinking represents a crucial goal. Educators should guide students in using digital resources to objectively compare cultures, avoid stereotyping, and cultivate a mindset that emphasizes "respecting differences while seeking common ground" (Akramova, 2017).

6. Conclusion

Against the backdrop of globalization, digitalization, and China's educational informatization agenda, the cultivation of intercultural communication competence has become an increasingly important goal in primary English education. At the same time, a persistent gap remains between the widespread adoption of digital technologies and their effective use in fostering deep cultural awareness. Addressing this issue, the present study systematically examined the application of digital teaching resources in cultivating English cultural awareness among primary school students through a mixed-methods design.

The findings provide empirical evidence that digital teaching resources are positively associated with the development of cultural awareness, particularly in supporting the acquisition of cultural knowledge. Students generally demonstrated strong willingness to engage with digital resources and expressed positive attitudes toward their use in English learning. These results suggest that, rather than functioning primarily as sources of distraction, digital tools can serve as effective pedagogical resources when appropriately integrated into instruction. Nevertheless, the study also identified several key challenges, including a structural imbalance between school-level digital infrastructure and teachers' application capabilities, as well as a predominance of one-way, presentation-oriented resource use. Together, these factors contribute to a learning pattern in which cultural knowledge is relatively accessible, while opportunities for practical intercultural communication remain limited.

The results further underscore the central role of teachers in mediating the educational value of digital resources. While technology can provide vivid cultural contexts and multimodal input, the transformation of these resources into meaningful learning experiences depends largely on teachers' instructional design, classroom guidance, and scaffolding strategies. In this sense, effective cultural learning emerges from a collaborative instructional model in which digital resources and teacher mediation function in complementary ways. Based on these findings, the study proposes several implications: at the school level, greater emphasis should be placed on developing interactive and integrative digital platforms; at the teacher level, efforts should focus on enhancing intercultural instructional design and the creation of authentic communicative contexts; and at the student level, greater opportunities for application and practice are needed to support the tran-

sition from cultural knowledge to intercultural competence.

This study contributes to the existing literature by modeling the multilevel mechanisms through which digital teaching resources support cultural awareness development in primary EFL contexts. Unlike studies that focus primarily on learner outcomes or the effectiveness of specific tools, the present research highlights teachers' application as a proximal driving factor and school construction as a distal structural condition. In addition, the identified psychological pathway from student cognition to intercultural communication competence offers a clearer explanation of how technology-mediated learning can facilitate the progression from cultural knowledge to practical communicative ability.

Several limitations should be acknowledged. First, the sample was drawn from a single city, which may limit the generalizability of the findings; future studies could expand the sample scope across regions and school types. Second, the cross-sectional design does not capture the dynamic and longitudinal nature of cultural awareness development; longitudinal or intervention-based studies would be valuable in tracing long-term effects. Third, the present study focused primarily on students' perceptions; incorporating perspectives from teachers and parents could provide a more comprehensive, multi-stakeholder understanding of digital cultural instruction. It should be noted that some subscales consist of a relatively small number of items (three per dimension). Moreover, the current design was adopted to ensure age-appropriateness and reduce cognitive burden for primary school students. While shorter scales may limit measurement precision, all constructs demonstrated acceptable reliability coefficients. Future research may consider expanding item numbers to enhance measurement robustness. Looking ahead, as artificial intelligence, big data, and immersive technologies continue to evolve, future research may explore how intelligent and adaptive digital systems, such as AI-supported learning platforms and virtual reality environments, can further enhance the cultivation of English cultural awareness in primary education.

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Ethics Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. This study was approved by the Medical Ethics Committee of Jiangsu University. Informed consent was obtained electronically from all participants. All respondents were clearly informed that their participation was anonymous, and that their personal information would remain confidential. The data collected will be used exclusively for scientific research purposes.

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Author Contributions

Yingying Zhao drafted the original manuscript, collected the data, conducted the formal data analysis, and curated the datasets. Yuanyuan Shi led the study's conceptualization, designed the overall research framework, supervised the project, and provided critical revisions to the manuscript. Xin Lin conducted the formal data analysis, curated the datasets, and assisted in interpreting the results. All authors reviewed and approved the final manuscript.

Data Availability

The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest

No potential conflict of interest was reported by the authors.

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