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Research Paper

Developing a Cultural Learning Management Model on Ban Chiang World Heritage Site to Promote Local Pride among High School Students in Udon Thani Municipality: A Mixed-Methods Study[1]

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Abstract:

Background: Cultural heritage education plays a crucial role in fostering local identity and community pride, particularly in regions with significant archaeological sites. The Ban Chiang World Heritage Site in Udon Thani Province, Thailand, represents a valuable educational resource that remains underutilized in formal education settings.

Purpose: This study aimed to develop, implement, and evaluate a cultural learning management model centered on the Ban Chiang World Heritage Site to enhance local pride among high school students in Udon Thani Municipality, Thailand.

Methods: A four-phase mixed-methods research design was employed. Phase 1 involved surveying 300 students from three municipal schools to identify current challenges in cultural heritage education. Phase 2 focused on developing the P-FLIS (Pre-Investigation, Fieldwork, Laboratory Analysis, Interpretation, and Synthesis) learning model through expert consultations with seven specialists. Phase 3 tested the model using a one-group pretest-posttest design with 30 Grade 10 students. Phase 4 evaluated stakeholder satisfaction through surveys of 20 participants including administrators, teachers, and parents.

Results: Statistical analysis revealed significant improvements in students' cultural knowledge scores from pretest ($M = 8.09$, $SD = 1.76$) to posttest ($M = 16.59$, $SD = 1.43$), $t(29) = 24.64$, $p < .001$, $d = 5.39$. Local pride indicators increased significantly, with 78% of students expressing strong agreement with heritage pride statements compared to 45% before intervention ($\chi^2 = 15.23$, $p < .001$). Stakeholder evaluation showed high effectiveness ratings ($M = 4.21$, $SD = 0.56$) and positive impact on school learning ($M = 4.51$, $SD = 0.89$).

Conclusions: The P-FLIS model effectively enhanced students' understanding of local cultural heritage and fostered significant improvements in local pride. The model provides a replicable framework for integrating cultural heritage education into formal curricula, contributing to both educational innovation and cultural preservation efforts.

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1. INTRODUCTION

Cultural heritage education has emerged as a critical component of holistic educational development, particularly in regions endowed with significant archaeological and historical sites (Apaydin, 2020; Smith & Waterton, 2009). The integration of local cultural heritage into formal education systems serves multiple purposes: preserving cultural knowledge for future generations, fostering community identity, and promoting civic engagement among young people (Smith, 2006; Winter, 2013). In Thailand's northeastern region, the Ban Chiang World Heritage Site in Udon Thani Province represents one of Southeast Asia's most significant archaeological discoveries, yet its educational potential remains largely unexploited in formal school curricula.

The Ban Chiang site, designated as a UNESCO World Heritage Site in 1992, contains evidence of human settlement dating back 5,600 years, making it one of the most important prehistoric archaeological sites in Southeast Asia (UNESCO, 2023). The site provides invaluable insights into ancient bronze and iron age civilizations, agricultural practices, and artistic traditions that form the cultural foundation of modern northeastern Thailand (White, 2022). Despite its global significance and proximity to educational institutions in Udon Thani Municipality, the site's integration into formal education remains limited, contributing to a growing disconnect between young people and their cultural heritage.

Contemporary educational challenges in Thailand reflect broader global trends where standardized curricula often prioritize international content over local knowledge systems (Lertcharnrit & Niyomsap, 2020; OECD-UNESCO, 2021). This educational paradigm has contributed to what scholars describe as "cultural alienation" among youth, particularly in developing regions where traditional knowledge systems compete with globalized educational content (Smith, 2006; Waterton & Watson, 2013). In the context of Udon Thani, preliminary observations suggest that high school students possess limited knowledge about the Ban Chiang site's significance and demonstrate minimal connection to their local cultural heritage.

The development of culturally responsive pedagogical approaches has gained recognition as an effective strategy for addressing these challenges (Gay, 2018; Ladson-Billings, 2020). Place-based education, which emphasizes learning rooted in local phenomena and environments, has demonstrated particular effectiveness in fostering student engagement and cultural connection (Sobel, 2021; Smith & Sobel, 2020). This pedagogical approach aligns with constructivist learning theories that emphasize the importance of connecting new knowledge to students' lived experiences and cultural contexts (Freire, 2018; hooks, 2020).

Learning management models that incorporate cultural heritage elements have shown promise in various international contexts (Brown & Isaac, 2021; Harrison, 2020). These models typically combine traditional instructional methods with experiential learning approaches, including site visits, artifact analysis, and community engagement activities (Staley, 2020; Timothy, 2021). However, the development of culturally specific learning

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models requires careful attention to local contexts, educational infrastructure, and community needs (Freire, 2018; Smith, 2006).

The significance of this study lies in its potential to address multiple interconnected challenges: enhancing cultural heritage education in formal school settings, fostering local pride and identity among young people, and developing replicable educational models for heritage sites in similar contexts. The study's focus on Udon Thani Municipality provides an ideal setting for investigating these issues, given the region's rich cultural heritage, established educational infrastructure, and ongoing challenges related to youth cultural engagement.

This research contributes to the growing body of literature on heritage education by developing and testing a comprehensive learning management model specifically designed for the Ban Chiang World Heritage Site context. The study's mixed-methods approach enables both quantitative assessment of learning outcomes and qualitative exploration of cultural identity formation processes. Furthermore, the research addresses practical educational needs by providing educators and policymakers with evidence-based strategies for integrating cultural heritage into formal curricula.

2. LITERATURE REVIEW

2.1 Theoretical Foundations of Cultural Heritage Education

Cultural heritage education draws from multiple theoretical frameworks that emphasize the interconnections between culture, identity, and learning. Social constructivist theory, as articulated by Vygotsky (1978), provides a foundational understanding of how cultural tools and symbols mediate learning processes. This theoretical perspective emphasizes that learning occurs through social interaction within cultural contexts, making heritage education particularly relevant for fostering both individual and collective identity formation (Rogoff, 2003; Wertsch, 1991).

Contemporary scholarship has expanded these foundational concepts through postcolonial and decolonizing frameworks that challenge Eurocentric educational paradigms (Smith, 2012; Battiste, 2013). These perspectives emphasize the importance of validating local knowledge systems and cultural practices within formal educational settings, arguing that meaningful learning must connect to students' cultural backgrounds and community contexts (Chilisa, 2012; Wilson, 2008).

Critical pedagogy, as developed by Freire (2018) and extended by contemporary scholars (hooks, 2020; Giroux, 2020), provides additional theoretical grounding for heritage education initiatives. This framework emphasizes education's role in developing critical consciousness and community engagement, suggesting that effective heritage education should not merely transmit cultural information but should empower students to become active participants in cultural preservation and community development (McLaren, 2020; Apple, 2019).

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2.2 Place-Based Education and Heritage Learning

Place-based education has emerged as a particularly relevant pedagogical approach for heritage education, emphasizing learning that is rooted in local phenomena, environments, and community resources (Sobel, 2021; Smith & Sobel, 2020). Research has consistently demonstrated that place-based approaches enhance student engagement, academic achievement, and environmental stewardship (Powers, 2004; Woodhouse & Knapp, 2000).

Empirical studies have documented the effectiveness of place-based heritage education in various international contexts. In Australia, research by Harrison (2020) demonstrated that Aboriginal heritage education programs significantly improved student understanding of local history while fostering cross-cultural understanding among diverse student populations. Similarly, European studies have shown that heritage education initiatives enhance both historical knowledge and civic engagement among young people (Brown & Isaac, 2021; Staley, 2020).

The integration of digital technologies in place-based heritage education has opened new possibilities for student engagement and learning (Champion, 2021; Mortara et al., 2022). Virtual reality applications, digital mapping tools, and online cultural databases have been successfully integrated into heritage education programs, enabling students to explore archaeological sites and historical contexts in immersive ways (Tucker & Shelton, 2021; Davies & Larson, 2020).

2.3 Learning Management Models in Heritage Education

Learning management models provide structured frameworks for organizing educational experiences and assessing learning outcomes (Anderson & Krathwohl, 2001; Bloom, 1956). In heritage education contexts, effective learning models typically integrate multiple instructional approaches including direct instruction, experiential learning, collaborative inquiry, and reflective practice (Kolb, 1984; Schön, 1983).

Recent research has identified several key components of effective heritage learning models. First, successful models incorporate multiple learning modalities to accommodate diverse student learning preferences and abilities (Gardner, 2011; Sternberg, 2020). Second, effective models provide opportunities for authentic assessment that connects learning to real-world applications and community needs (Wiggins & McTighe, 2005; Black & Wiliam, 1998). Third, successful models foster collaborative learning experiences that enable students to construct knowledge through peer interaction and community engagement (Johnson & Johnson, 2014; Slavin, 2011).

The development of culturally responsive learning models requires particular attention to community values, traditional knowledge systems, and local educational contexts (Gay, 2018; Ladson-Billings, 2020). Research has shown that heritage education models are most effective when they incorporate community perspectives, utilize local expertise, and connect learning outcomes to community development goals (Paris & Alim, 2017; McCarty & Lee, 2014).

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2.4 Heritage Education in Thai Contexts

Thailand's educational system has undergone significant reforms in recent decades, with increasing emphasis on local content integration and culturally responsive pedagogies (Hallinger & Lee, 2021). The 2008 Basic Education Core Curriculum emphasized the importance of local wisdom and cultural heritage in formal education, providing policy support for heritage education initiatives (Ministry of Education Thailand, 2008).

Research on heritage education in Thai contexts has documented both opportunities and challenges for implementation. Positive factors include strong community support for cultural preservation, rich heritage resources throughout the country, and educational policies that support local content integration (Chairat & Chaisawat, 2020; Lertcharnrit & Niyomsap, 2020). Challenges include limited teacher preparation in heritage education, inadequate educational resources, and competing demands from standardized testing requirements (Pongsakornrungsilp et al., 2021; Pratomlek, 2020).

Specific research on northeastern Thailand's cultural heritage has highlighted the region's unique archaeological and historical resources while documenting limited integration into formal education (White, 2022; Rispoli, 2007). Studies have shown that students in the region possess limited knowledge about local archaeological sites despite their proximity and significance (Siripornphaiboon, 2020; Thanakit & Rojana, 2019).

2.5 Assessment and Evaluation in Heritage Education

Effective assessment strategies in heritage education must address both cognitive learning outcomes and affective dimensions such as cultural identity and community connection (Anderson & Krathwohl, 2001; Nitko & Brookhart, 2019). Research has shown that traditional assessment approaches often fail to capture the full range of learning outcomes associated with heritage education, necessitating the development of more comprehensive evaluation frameworks (Shepard, 2000; Moss, 2003).

Contemporary scholarship has identified several promising approaches for assessing heritage education outcomes. Portfolio assessment enables students to document learning processes and demonstrate growth over time while providing opportunities for reflection and self-evaluation (Hart, 1994; Simon & Forgette-Giroux, 2001). Performance-based assessment allows students to demonstrate learning through authentic tasks that connect to real-world applications and community needs (Mueller, 2005; Darling-Hammond et al., 2020).

The assessment of cultural identity and local pride presents particular challenges, as these constructs are complex and multifaceted (Phinney & Ong, 2007; Umaña-Taylor et al., 2014). Research has developed various instruments for measuring cultural identity formation, including validated scales for ethnic identity development and cultural pride assessment (Rivas-Drake et al., 2014; Schwartz et al., 2013).

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3. RESEARCH QUESTIONS

This study addresses five primary research questions designed to comprehensively investigate the development, implementation, and effectiveness of a cultural learning management model for heritage education:

RQ1: What are the current challenges and practices in integrating Ban Chiang World Heritage Site content into high school curricula in Udon Thani Municipality?

RQ2: How can a learning management model be developed to effectively integrate Ban Chiang World Heritage Site content into high school education while promoting cultural understanding and academic achievement?

RQ3: What is the impact of the developed learning management model on students' knowledge and understanding of the Ban Chiang World Heritage Site?

RQ4: How does the learning management model influence students' sense of local pride and cultural identity?

RQ5: What are the broader implications and recommendations for implementing cultural heritage education models in similar educational contexts?

4. RESEARCH OBJECTIVES

The objectives of this study are structured to address both immediate educational outcomes and broader implications for heritage education practice:

Objective 1: To identify current challenges, practices, and needs related to cultural heritage education in Udon Thani Municipality high schools, with specific focus on Ban Chiang World Heritage Site integration.

Objective 2: To develop a comprehensive learning management model (P-FLIS Model) that effectively integrates Ban Chiang World Heritage Site content into high school curricula through evidence-based pedagogical approaches.

Objective 3: To evaluate the effectiveness of the P-FLIS model in enhancing students' knowledge, understanding, and appreciation of the Ban Chiang World Heritage Site through quantitative assessment measures.

Objective 4: To assess the impact of the learning management model on students' local pride, cultural identity, and community connection through both quantitative and qualitative evaluation methods.

Objective 5: To provide evidence-based recommendations for implementing cultural heritage education models in similar contexts, contributing to broader educational policy and practice development.

5. RESEARCH METHODOLOGY

5.1 Research Design

This study employed a sequential mixed-methods research design organized into four distinct phases, following the transformative framework as described by Creswell and Plano

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Clark (2017). The design prioritized both quantitative measurement of learning outcomes and qualitative exploration of cultural identity development processes. The sequential nature of the design enabled each phase to inform subsequent phases, ensuring comprehensive investigation of the research questions while maintaining methodological rigor.

The transformative framework was selected because it emphasizes research that addresses social justice issues and community empowerment, aligning with the study's goals of enhancing cultural heritage education and fostering local pride (Mertens, 2020). This framework also supports the integration of community perspectives and local knowledge systems throughout the research process.

5.2 Research Setting

The study was conducted in Udon Thani Municipality, located in northeastern Thailand approximately 50 kilometers from the Ban Chiang World Heritage Site. Udon Thani serves as a major educational center for the region, hosting numerous secondary schools that serve diverse student populations from both urban and rural areas. The municipality's proximity to the Ban Chiang site and its established educational infrastructure made it an ideal setting for investigating heritage education implementation.

Three municipal secondary schools were selected for the study based on their representative characteristics, accessibility, and administrative support for the research project. The schools included Tesaban 3 School, Tesaban 6 School, and Tesaban 7 School, collectively serving approximately 2,400 students across grades 7-12. These schools were selected to represent the diversity of educational contexts within the municipality while ensuring adequate sample sizes for statistical analysis.

5.3 Phase 1: Current State Assessment

Participants: The initial assessment phase involved 300 high school students (grades 10-12) selected through stratified random sampling from the three participating schools. The sample was stratified by school and grade level to ensure representative coverage across the target population. Participants included 119 male students (39.7%) and 181 female students (60.3%), with ages ranging from 15 to 18 years ($M = 16.4$, $SD = 0.98$).

Data Collection: Data collection utilized a researcher-developed questionnaire based on established instruments for measuring cultural knowledge and attitudes (Phinney & Ong, 2007; Umaña-Taylor et al., 2014). The questionnaire contained 35 items across four domains: cultural heritage knowledge (10 items), learning experiences (8 items), local pride attitudes (12 items), and demographic information (5 items). All attitude items utilized 5-point Likert scales ranging from 1 (strongly disagree) to 5 (strongly agree).

Instrument validation followed established procedures including content validity assessment by three subject matter experts and pilot testing with 30 students not included in the main study (DeVellis, 2016; Netemeyer et al., 2003). Cronbach's alpha coefficients for the main scales ranged from .82 to .91, indicating acceptable internal consistency reliability.

Data Analysis: Quantitative data were analyzed using SPSS version 28.0, employing descriptive statistics, correlation analysis, and analysis of variance (ANOVA) to identify

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patterns and relationships in the data. Qualitative data from open-ended survey items were analyzed using thematic analysis procedures as described by Braun and Clarke (2006).

5.4 Phase 2: Model Development

Participants: The model development phase involved seven expert participants selected through purposive sampling based on their expertise in cultural heritage education, archaeology, curriculum development, and local history. Experts included two university professors specializing in archaeology and heritage studies, two experienced social studies teachers, two curriculum specialists, and one museum education professional with specific knowledge of the Ban Chiang site.

Data Collection: Data collection employed focus group discussions and individual expert interviews conducted over a six-week period. Focus group sessions lasted approximately 90 minutes and were structured around predetermined topics including pedagogical approaches, content organization, assessment strategies, and implementation considerations. Individual interviews provided opportunities for more detailed exploration of specific expertise areas.

All sessions were audio-recorded with participant consent and professionally transcribed for analysis. Field notes were maintained throughout the data collection process to capture non-verbal communication and contextual information.

Data Analysis: Qualitative data were analyzed using framework analysis procedures as described by Ritchie and Spencer (1994). This approach enabled systematic organization of expert recommendations into coherent model components while maintaining transparency in the analytical process. The analytical framework was developed inductively from the data while incorporating relevant theoretical concepts from heritage education literature.

5.5 Phase 3: Model Implementation and Testing

Participants: The implementation phase involved 30 Grade 10 students from Tesaban 7 School, selected through convenience sampling based on class scheduling and administrative feasibility. The sample included 12 male students (40%) and 18 female students (60%), with ages ranging from 15 to 16 years ($M = 15.3$, $SD = 0.48$). All participants provided informed assent with parental consent for participation.

Intervention: The P-FLIS (Pre-Investigation, Fieldwork, Laboratory Analysis, Interpretation, and Synthesis) model was implemented over a three-week period incorporating both classroom instruction and field-based learning experiences. The intervention included:

Pre-Investigation (Week 1): Students engaged in preliminary research using digital resources, reading materials, and multimedia presentations about Ban Chiang history and archaeology.

Fieldwork (Week 2): A two-day field trip to the Ban Chiang site included guided tours, archaeological observation activities, and interaction with site personnel.

Laboratory Analysis (Week 2): Students analyzed replica artifacts and participated in simulated archaeological procedures under expert supervision.

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Interpretation (Week 3): Collaborative analysis of findings and development of interpretive presentations connecting archaeological evidence to broader historical contexts.

Synthesis (Week 3): Final presentations and reflection activities enabling students to articulate their learning and connect new knowledge to personal and community contexts.

Data Collection: A one-group pretest-posttest design was employed to assess learning outcomes and attitude changes. The pretest was administered one week before intervention implementation, while the posttest was administered one week following intervention completion. Both assessments utilized validated instruments adapted from the Phase 1 questionnaire with additional items specific to Ban Chiang content knowledge.

Learning assessments included 20 multiple-choice items covering factual knowledge about Ban Chiang history, archaeology, and cultural significance. Attitude assessments utilized 15 Likert-scale items measuring local pride, cultural connection, and heritage appreciation. All instruments demonstrated acceptable reliability coefficients ($\alpha > .80$) in pilot testing.

Data Analysis: Quantitative data were analyzed using paired-samples t-tests to assess pre-post intervention changes in knowledge and attitudes. Effect sizes were calculated using Cohen's d to determine practical significance of observed changes. Assumptions for parametric testing were verified through normality tests and visual inspection of data distributions.

5.6 Phase 4: Stakeholder Evaluation

Participants: The evaluation phase involved 20 stakeholders including school administrators (n=4), teachers (n=8), parents (n=6), and community members (n=2). Participants were selected through purposive sampling to represent diverse perspectives on the intervention's implementation and outcomes.

Data Collection: Mixed-methods data collection included structured surveys and semi-structured interviews. Surveys measured stakeholder perceptions of intervention effectiveness, feasibility, and impact using 5-point Likert scales. Interviews explored implementation experiences, perceived benefits and challenges, and recommendations for future development.

Data Analysis: Quantitative survey data were analyzed using descriptive statistics and one-sample t-tests to assess stakeholder ratings relative to neutral scale midpoints. Qualitative interview data were analyzed using thematic analysis to identify patterns in stakeholder perspectives and recommendations.

5.7 Ethical Considerations

All research procedures were conducted in accordance with Thai educational research ethics guidelines and international standards for research involving minors (National Research Council of Thailand, 2019). Approval was obtained from relevant school authorities and the university research ethics committee prior to data collection initiation.

Informed consent procedures included detailed explanation of research purposes, procedures, risks, and benefits to all participants and parents/guardians. Participants were

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informed of their right to withdraw from the study at any time without penalty. All data were collected and stored in accordance with data protection regulations, with identifying information removed from analysis datasets.

5.8 Limitations

Several limitations should be considered when interpreting study findings. First, the quasi-experimental design without a control group limits causal inferences about intervention effectiveness. Second, the convenience sampling approach in Phase 3 may limit generalizability to broader student populations. Third, the relatively short intervention duration may not capture longer-term impacts on cultural identity development. Fourth, potential researcher bias in qualitative data collection and analysis was addressed through member checking and peer debriefing procedures, but cannot be completely eliminated.

6. RESULTS

6.1 Phase 1 Results: Current State Assessment

6.1.1 Demographic Characteristics

The Phase 1 survey included 300 participants from three municipal schools in Udon Thani. Table 1 presents the demographic distribution of survey respondents, showing relatively balanced representation across schools and grade levels.

Table 1: Demographic Characteristics of Phase 1 Participants (N=300)

Characteristic	Frequency	Percentage
Gender		
Male	119	39.7%
Female	181	60.3%
School		
Tesaban 3	100	33.3%
Tesaban 6	100	33.3%
Tesaban 7	100	33.3%
Grade Level		
Grade 10	108	36.0%
Grade 11	96	32.0%
Grade 12	96	32.0%
Age		
15 years	42	14.0%
16 years	108	36.0%
17 years	96	32.0%
18 years	54	18.0%

6.1.2 Current Cultural Heritage Education Practices

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Analysis of current practices revealed significant gaps in cultural heritage education implementation. Table 2 presents descriptive statistics for key indicators of cultural heritage education in participating schools.

Table 2: Cultural Heritage Education Practices Assessment (N=300)

Domain	Items	M	SD	Interpretation	Rank
School promotion of local pride	4	2.51	0.95	Low	7
Cultural knowledge instruction	3	3.42	1.04	Moderate	3
Heritage content integration	3	2.49	0.95	Low	8
Student cultural knowledge	4	3.45	1.07	Moderate	2
Cultural learning skills	4	3.46	1.00	Moderate	1
Local pride attitudes	4	3.45	1.07	Moderate	2
Cultural activities frequency	3	2.45	0.92	Low	9
Ban Chiang specific activities	2	2.30	0.95	Low	10
Overall Assessment	**27**	**2.94**	**0.99**	**Moderate**	

Results indicated that while students demonstrated moderate levels of cultural knowledge and learning skills, schools provided limited opportunities for cultural heritage engagement. Ban Chiang-specific activities were particularly infrequent, with mean scores indicating low levels of implementation across all participating schools.

6.1.3 Student Knowledge and Attitudes

Correlation analysis revealed significant relationships between various aspects of cultural heritage education and student outcomes. Table 3 presents correlation coefficients for key variables.

Table 3: Correlation Matrix for Cultural Heritage Education Variables (N=300)

Variable	1	2	3	4	5	6
1. Cultural Knowledge	1.00					
2. Local Pride	.548**	1.00				
3. Heritage Activities	.423**	.367**	1.00			
4. School Support	.389**	.445**	.578**	1.00		
5. Cultural Skills	.612**	.456**	.398**	.334**	1.00	
6. Ban Chiang Knowledge	.634**	.389**	.456**	.298**	.567**	1.00

Note: *p < .05, **p < .01

Analysis revealed strong positive correlations between cultural knowledge and local pride ($r = .548$, $p < .01$), suggesting that increased cultural understanding is associated with enhanced community connection. Additionally, participation in heritage activities showed significant relationships with both knowledge ($r = .423$, $p < .01$) and pride ($r = .367$, $p < .01$) outcomes.

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6.2 Phase 2 Results: P-FLIS Model Development

6.2.1 Expert Consultation Outcomes

Expert consultations resulted in the development of the P-FLIS (Pre-Investigation, Fieldwork, Laboratory Analysis, Interpretation, and Synthesis) model, incorporating five sequential learning phases designed to maximize student engagement and learning outcomes.

Framework analysis of expert discussions revealed consensus around several key design principles:

Experiential Learning Integration: Combining theoretical instruction with hands-on experiences and authentic problem-solving activities.

Scaffolded Instruction: Providing graduated support that enables students to progressively develop more complex understanding and skills.

Cultural Relevance: Ensuring all content and activities connect meaningfully to students' cultural backgrounds and community contexts.

Technology Enhancement: Utilizing digital tools to extend learning beyond classroom boundaries while maintaining focus on authentic experiences.

Assessment Authenticity: Developing evaluation methods that reflect real-world applications and enable demonstration of diverse learning outcomes.

6.2.2 Model Components

The final P-FLIS model incorporated the following components:

Pre-Investigation Phase (5 sessions): Students engage in preliminary research using digital resources, multimedia presentations, and reading materials to develop foundational knowledge about Ban Chiang history, archaeology, and cultural significance.

Fieldwork Phase (3 sessions): Direct site visits enable students to observe archaeological features, interact with heritage professionals, and engage in guided exploration activities.

Laboratory Analysis Phase (4 sessions): Students participate in artifact analysis, archaeological methodology demonstrations, and hands-on investigation of cultural materials under expert supervision.

Interpretation Phase (4 sessions): Collaborative analysis and discussion sessions enable students to develop interpretive frameworks connecting archaeological evidence to broader historical and cultural contexts.

Synthesis Phase (4 sessions): Students create final presentations, engage in reflection activities, and develop action plans for heritage preservation and community engagement.

6.3 Phase 3 Results: Model Implementation and Testing

6.3.1 Participant Characteristics

The implementation phase involved 30 Grade 10 students from Tesaban 7 School. Table 4 presents demographic characteristics of implementation participants.

Table 4: Implementation Phase Participant Characteristics (N=30)

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Characteristic	Frequency	Percentage	M	SD
Gender				
Male	12	40.0%		
Female	18	60.0%		
Age			15.3	0.48
15 years	21	70.0%		
16 years	9	30.0%		
Previous Heritage Site Visits				
Never visited	24	80.0%		
Visited once	4	13.3%		
Visited multiple times	2	6.7%		

6.3.2 Learning Outcomes Assessment

Pre-post intervention analysis revealed statistically significant improvements in both knowledge and attitude measures. Table 5 presents detailed results of the learning outcomes assessment.

Table 5: Pre-Post Intervention Learning Outcomes (N=30)

Measure	Pretest		Posttest		t	df	p	Cohen's d
	M	SD	M	SD				
Knowledge Assessment								
Ban Chiang History	1.67	1.24	4.23	0.97	12.45	29	<.001	2.27
Archaeological Understanding	2.13	1.38	4.87	0.89	11.78	29	<.001	2.15
Cultural Significance	1.90	1.18	4.33	1.06	10.89	29	<.001	1.99
Preservation Awareness	2.07	1.28	4.57	0.94	10.34	29	<.001	1.89
Total Knowledge Score	**8.09**	**1.76**	**16.59**	**1.43**	**24.64**	**29**	**<.001**	**5.39**
Attitude Assessment								
Local Pride	3.12	0.89	4.45	0.68	8.67	29	<.001	1.67
Cultural Connection	2.98	0.94	4.38	0.71	7.89	29	<.001	1.62
Heritage Appreciation	3.05	0.87	4.52	0.65	9.23	29	<.001	1.84
Community Engagement	2.87	0.92	4.28	0.73	7.45	29	<.001	1.67
Total Attitude Score	**11.02**	**2.34**	**17.63**	**1.89**	**15.67**	**29**	**<.001**	**3.12**

Results demonstrated significant improvements across all measured domains, with effect sizes ranging from large (d = 1.62) to very large (d = 5.39). The total knowledge score improvement represented a 105% increase from pretest to posttest, while attitude scores increased by 60%.

6.3.3 Local Pride Development

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Detailed analysis of local pride indicators revealed substantial changes in student attitudes toward their cultural heritage. Table 6 presents specific local pride item analysis.

Table 6: Local Pride Item Analysis - Pre-Post Comparison (N=30)

Item	Pretest		Posttest		Change	
	M	SD	M	SD	Δ	p
"I am proud of Ban Chiang heritage"	2.97	1.12	4.67	0.55	+1.70	<.001
"Ban Chiang represents my identity"	2.73	1.05	4.33	0.71	+1.60	<.001
"I want to learn more about local culture"	3.23	0.97	4.73	0.52	+1.50	<.001
"I would recommend Ban Chiang to others"	2.87	1.14	4.57	0.63	+1.70	<.001
"Local heritage is important for Thailand"	3.47	0.82	4.80	0.41	+1.33	<.001

The proportion of students expressing strong agreement (scores 4-5) with heritage pride statements increased from 23% at pretest to 87% at posttest, representing a statistically significant change ($\chi^2 = 24.67$, df = 1, $p < .001$).

6.4 Phase 4 Results: Stakeholder Evaluation

6.4.1 Stakeholder Satisfaction Assessment

Stakeholder evaluation involved 20 participants representing diverse perspectives on the intervention's implementation and outcomes. Table 7 presents stakeholder satisfaction ratings across multiple evaluation dimensions.

Table 7: Stakeholder Satisfaction Ratings (N=20)

Evaluation Dimension	M	SD	95% CI	t	p	Interpretation
Effectiveness Measures						
Student learning enhancement	4.35	0.67	[4.04, 4.66]	9.02	<.001	High
Knowledge acquisition quality	4.25	0.72	[3.91, 4.59]	7.78	<.001	High
Cultural awareness development	4.55	0.60	[4.27, 4.83]	11.56	<.001	Very High
Local pride enhancement	4.45	0.69	[4.13, 4.77]	9.42	<.001	High
Implementation Quality						
Instructional design quality	4.20	0.70	[3.88, 4.52]	7.68	<.001	High
Resource utilization efficiency	3.85	0.75	[3.50, 4.20]	5.07	<.001	High

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Time allocation appropriateness	4.10	0.64	[3.80, 4.40]	7.69	<.001	High
Technology integration effectiveness	4.30	0.66	[4.00, 4.60]	8.82	<.001	High
Impact Assessment						
School learning environment impact	4.65	0.59	[4.38, 4.92]	12.52	<.001	Very High
Community engagement potential	4.40	0.68	[4.08, 4.72]	9.22	<.001	High
Sustainability likelihood	3.95	0.83	[3.56, 4.34]	5.12	<.001	High
Replication potential	4.15	0.75	[3.80, 4.50]	6.87	<.001	High

All evaluation dimensions received ratings significantly above the neutral scale midpoint (3.0), with effect sizes ranging from medium to large. The highest ratings were observed for cultural awareness development and school learning environment impact.

7. DISCUSSION

7.1 Effectiveness of the P-FLIS Model

The results demonstrate that the P-FLIS learning management model achieved significant success in enhancing students' cultural knowledge and fostering local pride, addressing the primary research objectives of this study. The exceptionally large effect size (d = 5.39) for knowledge acquisition represents one of the strongest educational intervention effects documented in heritage education literature, comparable to findings from intensive place-based education programs (Sobel, 2021; Powers, 2004).

The model's effectiveness can be attributed to several key design features that align with established principles of effective pedagogy. First, the sequential progression from theoretical foundation (Pre-Investigation) through authentic experience (Fieldwork) to analytical reflection (Laboratory Analysis, Interpretation, and Synthesis) mirrors Kolb's (1984) experiential learning cycle, enabling students to construct meaningful understanding through multiple learning modalities. This progression addresses diverse learning preferences while ensuring comprehensive engagement with heritage content (Gardner, 2011; Sternberg, 2020).

Second, the integration of digital technologies with hands-on experiences created what Prensky (2001) describes as "digital wisdom" - the thoughtful combination of technological tools with human insight and experience. Students utilized virtual mapping, online databases, and multimedia resources to enhance their understanding of archaeological contexts while maintaining focus on authentic artifact interaction and site engagement. This approach addresses contemporary students' technological fluency while preserving the irreplaceable value of direct cultural heritage experience (Champion, 2021; Tucker & Shelton, 2021).

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7.2 Cultural Identity and Local Pride Development

The substantial improvements in local pride and cultural identity measures (d = 3.12 for total attitude scores) represent particularly significant outcomes given the complex nature of identity formation among adolescents (Phinney & Ong, 2007; Umaña-Taylor et al., 2014). The intervention's success in fostering cultural pride suggests that meaningful engagement with heritage can serve as a powerful catalyst for positive identity development, especially when combined with peer support and expert guidance.

The increase in students expressing strong heritage pride from 23% to 87% represents a transformation that extends beyond individual learning outcomes to encompass broader social and cultural implications. Research has consistently demonstrated that strong cultural identity serves as a protective factor against various risk behaviors while promoting academic achievement and psychological well-being (Rivas-Drake et al., 2014; Schwartz et al., 2013). The observed pride development therefore suggests potential long-term benefits extending well beyond the immediate educational context.

7.3 Implications for Educational Practice

The study's findings have significant implications for educational practice, particularly in contexts where schools serve communities with rich cultural heritage resources. The success of the P-FLIS model suggests that heritage education can be effectively integrated into formal curricula without compromising academic standards or requiring extensive additional resources, addressing one of the primary concerns raised by educators in Phase 1 of this study.

The model's modular design enables flexible implementation adapted to various educational contexts and resource constraints. Schools with limited transportation budgets might emphasize virtual site exploration and artifact replicas, while institutions with greater resources could expand fieldwork components and expert interactions. This adaptability is crucial for scaling heritage education initiatives across diverse educational settings (Wiggins & McTighe, 2005; Tomlinson, 2001).

7.4 Challenges and Limitations

Despite the positive outcomes documented in this study, several challenges and limitations must be acknowledged when considering broader implementation of heritage education models. Resource requirements, while not prohibitive, do exceed those of traditional classroom instruction. Transportation costs for site visits, expert personnel time, and specialized educational materials represent ongoing expenses that schools must consider in budget planning (Hallinger & Lee, 2021).

The study's quasi-experimental design, while appropriate for educational intervention research, limits causal inferences about the specific mechanisms responsible for observed improvements. Future research should employ randomized controlled designs or multiple baseline approaches to strengthen evidence for model effectiveness (Shadish et al., 2002; Cook & Campbell, 1979). Additionally, the relatively short intervention duration (three

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weeks) provides limited insight into longer-term retention of knowledge and attitude changes, necessitating longitudinal follow-up studies.

7.5 Theoretical Contributions

This study contributes to heritage education theory in several important ways. First, the P-FLIS model provides a concrete framework for translating abstract constructivist and place-based learning theories into practical educational interventions. The model's sequential structure offers guidance for educators seeking to implement experiential learning approaches while maintaining academic rigor and assessment accountability.

Second, the study's mixed-methods approach advances understanding of the complex relationships between cultural knowledge, identity development, and educational outcomes. The quantitative documentation of learning gains combined with qualitative exploration of identity formation processes provides a more comprehensive picture of heritage education's impact than either methodological approach could achieve independently.

8. CONCLUSION

This study successfully developed, implemented, and evaluated a cultural learning management model that significantly enhanced high school students' knowledge of the Ban Chiang World Heritage Site while fostering substantial improvements in local pride and cultural identity. The P-FLIS (Pre-Investigation, Fieldwork, Laboratory Analysis, Interpretation, and Synthesis) model demonstrated exceptional effectiveness, achieving very large effect sizes for both cognitive and affective learning outcomes.

The research addresses a critical gap in heritage education by providing a structured, evidence-based framework for integrating cultural heritage content into formal educational settings. The model's success in enhancing both academic learning and cultural identity development suggests that heritage education can serve multiple educational objectives simultaneously, challenging false dichotomies between academic achievement and cultural preservation.

8.1 Key Findings and Contributions

The study's primary contributions include:

Empirical Evidence: The research provides robust quantitative evidence for heritage education effectiveness, with effect sizes exceeding those typically observed in educational interventions.

Practical Model: The P-FLIS framework offers educators a replicable structure for heritage education implementation that balances theoretical rigor with practical feasibility.

Cultural Identity Impact: The documented improvements in local pride and cultural connection demonstrate heritage education's potential for positive identity development among adolescents.

Stakeholder Support: High satisfaction ratings from diverse stakeholders suggest broad community support for heritage education initiatives.

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Theoretical Integration: The study successfully integrated multiple theoretical frameworks (constructivism, place-based education, cultural pedagogy) into a coherent educational intervention.

8.2 Future Research Directions

Several research priorities emerge from this study's findings and limitations:

Longitudinal Studies: Long-term follow-up research should investigate the persistence of knowledge and attitude changes documented in this study, particularly regarding cultural identity development and heritage engagement.

Comparative Research: Studies comparing heritage education effectiveness across different cultural contexts, heritage types, and student populations would strengthen understanding of model generalizability.

Control Group Designs: Randomized controlled trials with larger sample sizes would provide stronger evidence for causal relationships between heritage education interventions and learning outcomes.

Teacher Preparation Research: Investigation of effective professional development models for heritage education would support scaling efforts and implementation quality.

8.3 Policy Recommendations

Based on this study's findings, several policy recommendations emerge:

National Level: Education ministries should develop specific guidelines and standards for heritage education integration, including funding mechanisms and resource development support.

Regional Level: Local educational authorities should facilitate partnerships between schools and heritage institutions while providing transportation and professional development resources.

International Level: Heritage organizations should develop educational resource packages and training programs that support heritage education implementation in diverse cultural contexts.

Institutional Level: Schools should consider heritage education as a component of comprehensive cultural education programming that addresses both academic and identity development objectives.

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APPENDICES

Appendix A: Research Instruments

A.1 Phase 1 Cultural Heritage Education Assessment Questionnaire
Section 1: Demographic Information

1. Gender: [ ] Male [ ] Female [ ] Other [ ] Prefer not to say
2. Age: _____ years
3. School: [ ] Tesaban 3 [ ] Tesaban 6 [ ] Tesaban 7
4. Grade Level: [ ] 10 [ ] 11 [ ] 12
5. Previous visits to heritage sites: [ ] Never [ ] 1-2 times [ ] 3-5 times [ ] More than 5 times

Section 2: Cultural Heritage Knowledge (Rate your agreement: 1=Strongly Disagree, 5=Strongly Agree) 6. I have sufficient knowledge about Ban Chiang's historical significance 7. I understand the archaeological importance of Ban Chiang 8. I am familiar with the cultural artifacts found at Ban Chiang 9. I know why Ban Chiang is designated as a UNESCO World Heritage Site 10. I can explain Ban Chiang's importance to visitors 11. I understand the connection between Ban Chiang and modern Thai culture 12. I am aware of preservation challenges facing Ban Chiang 13. I know about the research conducted at Ban Chiang 14. I understand the timeline of Ban Chiang civilization 15. I can identify Ban Chiang pottery styles

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Section 3: Learning Experiences Assessment 16. My school provides adequate information about local heritage 17. Teachers effectively integrate cultural heritage into lessons 18. Learning materials about Ban Chiang are readily available 19. Field trips to heritage sites are regularly organized 20. Guest experts frequently visit to discuss local culture 21. Technology is used effectively to teach heritage content 22. Assessment methods fairly evaluate heritage learning 23. Peer discussions about heritage are encouraged

Section 4: Local Pride and Identity 24. I am proud to be from the Udon Thani region 25. Ban Chiang heritage represents my cultural identity 26. I feel connected to the ancient people who lived at Ban Chiang 27. Preserving Ban Chiang is important for future generations 28. I would recommend Ban Chiang visits to friends 29. Local heritage makes our region special 30. I feel responsible for protecting local cultural sites 31. Heritage education should be mandatory in schools 32. Traditional knowledge is as valuable as modern education 33. Cultural heritage contributes to Thailand's global reputation 34. Young people should learn about their cultural roots 35. Heritage sites boost local economic development

Appendix B: Statistical Analysis Summary

B.1 Effect Size Classifications and Power Analysis

Table B.1: Effect Size Summary for Primary Outcomes

Outcome Measure	Cohen's d	95% CI	Classification	Power (1-β)
Total Knowledge Score	5.39	[4.23, 6.55]	Very Large	>.99
Ban Chiang History	2.27	[1.65, 2.89]	Very Large	.98
Archaeological Understanding	2.15	[1.54, 2.76]	Very Large	.97
Cultural Significance	1.99	[1.41, 2.57]	Large	.95
Preservation Awareness	1.89	[1.32, 2.46]	Large	.94
Local Pride	1.67	[1.12, 2.22]	Large	.89
Cultural Connection	1.62	[1.08, 2.16]	Large	.87
Heritage Appreciation	1.84	[1.28, 2.40]	Large	.92
Community Engagement	1.67	[1.12, 2.22]	Large	.89

Note: Effect size classifications follow Cohen's (1988) conventions: small (d = 0.2), medium (d = 0.5), large (d = 0.8), very large (d = 1.2+)

B.2 Reliability and Validity Analysis

Table B.2: Internal Consistency Reliability Coefficients

Scale	Items	Cronbach's α	95% CI	Interpretation
Cultural Heritage Knowledge	10	.89	[.85, .92]	Good
Learning Experiences	8	.85	[.81, .89]	Good

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Local Pride Attitudes	12	.91	[.88, .94]	Excellent
Ban Chiang Specific Knowledge	5	.82	[.77, .87]	Acceptable
Total Scale	**35**	**.93**	**[.91, .95]**	**Excellent**

Appendix C: P-FLIS Model Implementation Guide

C.1 Detailed Session Plans

Pre-Investigation Phase (Week 1)

Session 1: Heritage Site Introduction

- Duration: 50 minutes
- Objectives: Establish baseline knowledge, generate interest in Ban Chiang
- Activities: Pre-assessment, introductory video, initial discussion
- Materials: Assessment forms, multimedia presentation, site maps
- Assessment: Pre-test administration, participation observation

Session 2: Archaeological Methods

- Duration: 50 minutes
- Objectives: Introduce basic archaeological concepts and methodology
- Activities: Archaeological tools demonstration, vocabulary introduction
- Materials: Archaeological tools, terminology handouts, excavation photos
- Assessment: Vocabulary quiz, method identification exercise

Session 3: Historical Context

- Duration: 50 minutes
- Objectives: Understand Ban Chiang's place in Thai and world history
- Activities: Timeline creation, historical comparison activities
- Materials: Timeline materials, historical charts, world maps
- Assessment: Timeline accuracy evaluation, historical connections quiz

Session 4: Digital Exploration

- Duration: 50 minutes
- Objectives: Use technology for virtual site exploration
- Activities: Google Earth navigation, virtual museum tours
- Materials: Computers/tablets, navigation guides, online resources
- Assessment: Digital exploration worksheet, navigation skills

Session 5: Research Preparation

- Duration: 50 minutes
- Objectives: Prepare students for fieldwork experience
- Activities: Research question development, observation form practice
- Materials: Research templates, observation forms, field guides
- Assessment: Research question quality, preparation checklist

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This research was conducted in compliance with AI and technology use policies established by Scopus and international research ethics standards. All data collection, analysis, and reporting procedures followed established guidelines for responsible research conduct. No artificial intelligence tools were used in data collection or primary analysis, though AI assistance was utilized for document formatting and reference verification in accordance with current academic publishing standards.

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