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Research Paper

# The Effectiveness of SIM-AE Learning Management Model on Academic Achievement and Cultural Preservation in Thai History Education: A Correlational Study in Nakhon Phanom Province[1]

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**Abstract**:

**Background:** History education in Thailand faces significant challenges including rote memorization approaches, limited integration of local histories, and inadequate teacher training in modern pedagogical methods. The underrepresentation of regional narratives, particularly in northeastern Thailand, creates disconnection between students and their cultural heritage.

**Purpose:** This correlational study examined the effectiveness of the SIM-AE (Self-directed, Interactive, Multimedia-based, Application, and Evaluation) learning management model on secondary students' academic achievement, engagement levels, and cultural preservation awareness in Thai history education, specifically focusing on Nakhon Phanom History in Nakhon Phanom Province.

**Methods:** Using a correlational research design, this study involved 485 secondary school students from 12 schools in Nakhon Phanom Province for quantitative analysis, with 45 students participating in qualitative focus groups. Data collection employed pre/post-test assessments, engagement surveys, cultural awareness questionnaires, and semi-structured interviews. Statistical analyses included Pearson correlation, multiple regression, and t-tests using SPSS 29.0.

**Results:** Strong positive correlations were found between SIM-AE model implementation and academic achievement ($r = 0.742$, $p < 0.001$), student engagement ($r = 0.689$, $p < 0.001$), and cultural preservation awareness ($r = 0.701$, $p < 0.001$). Post-test scores increased significantly from $M = 64.2$ ($SD = 8.7$) to $M = 82.6$ ($SD = 7.3$), $t(484) = 28.42$, $p < 0.001$, $d = 2.19$. The model explained 55.1% of variance in academic achievement outcomes.

**Conclusions:** The SIM-AE model demonstrates significant effectiveness in enhancing Thai history education outcomes while promoting local cultural preservation. Implementation

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challenges include resource requirements and teacher training needs. Findings support integration of interactive, multimedia-based approaches in history curricula to strengthen cultural identity and academic performance.

**Keywords:** SIM-AE model, Thai history education, cultural preservation, academic achievement, correlational study, Nakhon Phanom, multimedia learning, student engagement

## 1. INTRODUCTION

History education serves as a cornerstone for cultural preservation and national identity formation, yet contemporary Thai educational systems face substantial challenges in effectively delivering historical knowledge while maintaining student engagement (Chanprasert & Wongwanich, 2021). The traditional emphasis on rote memorization and centralized narratives often overlooks rich regional histories, particularly in northeastern Thailand, creating a disconnect between students and their cultural heritage (Thongthew & Wannapiroon, 2020). This phenomenon is particularly pronounced in Nakhon Phanom Province, where significant local historical events remain underrepresented in mainstream curricula despite their cultural importance.

The integration of local histories into formal education presents both challenges and opportunities for enhancing cultural preservation while improving academic outcomes (Siriporn & Prachayapruit, 2021). Nakhon Phanom Province, located in northeastern Thailand along the Mekong River, possesses a rich historical tapestry influenced by Lao, Vietnamese, and Thai cultures. The province's unique position as a border region has resulted in distinctive historical narratives that, when properly integrated into educational curricula, can significantly enhance student understanding and cultural appreciation (Rattanawicha & Seechaliao, 2020).

Contemporary educational research emphasizes the importance of student-centered learning approaches that incorporate multimedia technologies and interactive methodologies (Chen & Wang, 2021). The SIM-AE (Self-directed, Interactive, Multimedia-based, Application, and Evaluation) model represents an innovative framework designed to address current limitations in history education by combining constructivist learning principles with technological integration and cultural preservation objectives (Pornpimon et al., 2022). This model's emphasis on self-directed learning, interactive engagement, multimedia resources, practical application, and comprehensive evaluation aligns with current best practices in educational methodology while addressing specific needs in Thai history education.

The effectiveness of innovative learning models in enhancing academic achievement and cultural awareness requires empirical investigation through rigorous research methodologies (Kasemsap & Hatthakitt, 2021). Correlational research designs provide valuable insights into relationships between educational interventions and student outcomes, enabling educators and policymakers to make evidence-based decisions regarding curriculum development and instructional strategies (Suwannatthachote & Tantrarungroj, 2020). Understanding these relationships is particularly crucial in contexts where cultural preservation intersects with academic achievement, as demonstrated in the northeastern Thai educational landscape.

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This study addresses a significant gap in educational research by examining the effectiveness of the SIM-AE model specifically within the context of Nakhon Phanom Province's secondary education system. The research contributes to the growing body of literature on technology-enhanced learning while providing practical insights for educators seeking to improve history education outcomes through culturally responsive pedagogical approaches (Wannapiroon & Nilsook, 2021).

## 2. LITERATURE REVIEW

### 2.1 Challenges in Contemporary Thai History Education

Contemporary research highlights significant challenges within Thai history education systems, particularly regarding pedagogical approaches and content representation (Charoenwongse & Wongwanich, 2020). Traditional teaching methods emphasizing memorization of facts and dates fail to develop critical thinking skills necessary for historical analysis and cultural understanding (Pimthong & Wannapiroon, 2022). This approach creates passive learning environments where students struggle to connect historical events with contemporary relevance, resulting in decreased motivation and engagement (Siriporn et al., 2021).

The underrepresentation of regional histories in national curricula represents another significant challenge, particularly affecting students in northeastern provinces like Nakhon Phanom (Thanakit & Nilsook, 2020). Centralized curriculum development often prioritizes national narratives while neglecting local historical events that directly connect to students' cultural identities and lived experiences (Chanprasert & Wongwanich, 2021). This omission creates missed opportunities for meaningful learning experiences that could enhance both academic achievement and cultural preservation.

Teacher preparation and professional development present additional challenges in implementing effective history education practices (Kasemsap & Hatthakitt, 2021). Many educators lack training in modern pedagogical approaches, particularly those involving technology integration and interactive learning strategies (Pornpimon et al., 2022). This limitation affects teachers' ability to create engaging learning environments that accommodate diverse learning styles and preferences while maintaining academic rigor.

### 2.2 Technology Integration and Multimedia Learning in History Education

Research in technology-enhanced learning demonstrates significant potential for improving educational outcomes through multimedia integration and interactive technologies (Chen & Wang, 2021). Digital tools enable educators to create immersive learning experiences that combine visual, auditory, and kinesthetic elements, accommodating diverse learning preferences while enhancing content comprehension (Wannapiroon & Nilsook, 2021). These approaches align with constructivist learning theories that emphasize active knowledge construction through meaningful interaction with educational content.

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Multimedia learning environments provide opportunities for students to explore historical events through multiple perspectives and representations, fostering deeper understanding and critical thinking skills (Suwannatthachote & Tantrarungroj, 2020). Interactive technologies enable students to engage with primary sources, virtual tours, and simulations that bring historical events to life while developing analytical and interpretive skills essential for historical literacy (Thongthew & Wannapiroon, 2020).

The effectiveness of multimedia learning approaches depends significantly on pedagogical design and implementation strategies (Rattanawicha & Seechaliao, 2020). Successful technology integration requires careful alignment between educational objectives, content delivery methods, and assessment strategies to ensure coherent learning experiences that support academic achievement while maintaining student engagement (Charoenwongse & Wongwanich, 2020).

### 2.3 Cultural Preservation Through Education

Educational institutions play crucial roles in cultural preservation by transmitting historical knowledge, traditions, and values to future generations (Siriporn & Prachayapruit, 2021). Effective cultural preservation through education requires intentional integration of local histories, cultural practices, and community knowledge into formal curricula while maintaining academic standards and learning objectives (Thanakit & Nilsook, 2020).

Regional history education provides opportunities for students to develop deeper connections to their cultural heritage while understanding broader historical contexts and patterns (Pimthong & Wannapiroon, 2022). When local histories are meaningfully integrated into educational experiences, students demonstrate increased engagement, motivation, and academic achievement while developing stronger cultural identities and community connections (Kasemsap & Hatthakitt, 2021).

The relationship between cultural preservation and academic achievement suggests that educational approaches acknowledging and celebrating local heritage can enhance overall learning outcomes (Chanprasert & Wongwanich, 2021). This connection supports arguments for culturally responsive pedagogy that honors students' backgrounds while providing rigorous academic experiences that prepare them for future success (Wannapiroon & Nilsook, 2021).

### 2.4 Constructivist Learning Theory and Student-Centered Approaches

Constructivist learning theory provides theoretical foundations for understanding how students actively construct knowledge through interaction with their environment, prior experiences, and social contexts (Chen & Wang, 2021). This perspective emphasizes the importance of meaningful learning experiences that connect new information with existing knowledge structures while encouraging critical thinking and problem-solving skills (Suwannatthachote & Tantrarungroj, 2020).

Student-centered learning approaches derived from constructivist principles emphasize learner autonomy, collaborative learning, and authentic assessment strategies that support

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deep understanding rather than surface-level memorization (Thongthew & Wannapiroon, 2020). These approaches require educators to function as facilitators and guides rather than information transmitters, creating learning environments that encourage exploration, questioning, and knowledge construction (Pornpimon et al., 2022).

Implementation of constructivist principles in history education enables students to develop historical thinking skills including chronological reasoning, historical interpretation, and evidence-based analysis (Rattanawicha & Seechaliao, 2020). These skills transfer to other academic areas while supporting lifelong learning capabilities essential for success in contemporary society (Charoenwongse & Wongwanich, 2020).

### 2.5 The SIM-AE Model Framework

The SIM-AE (Self-directed, Interactive, Multimedia-based, Application, and Evaluation) model represents an integrated approach to educational design that combines multiple evidence-based strategies for enhancing learning outcomes (Siriporn et al., 2021). Each component of the model addresses specific aspects of effective teaching and learning while contributing to overall educational effectiveness and student engagement.

Self-directed learning components encourage student autonomy and responsibility for learning outcomes while developing metacognitive skills essential for lifelong learning (Thanakit & Nilsook, 2020). Interactive elements foster collaborative learning and peer engagement while creating opportunities for students to share perspectives and construct knowledge together (Pimthong & Wannapiroon, 2022). Multimedia integration provides multiple modalities for content representation and engagement, accommodating diverse learning preferences and enhancing comprehension (Kasemsap & Hatthakitt, 2021).

Application components ensure that learning experiences connect to real-world contexts and practical applications, enhancing relevance and transfer of knowledge to new situations (Chanprasert & Wongwanich, 2021). Evaluation elements provide ongoing feedback and assessment opportunities that support continuous improvement and academic achievement (Wannapiroon & Nilsook, 2021). The integrated nature of these components creates synergistic effects that enhance overall educational effectiveness beyond what individual strategies might achieve independently.

## 3. RESEARCH QUESTIONS

This study addresses the following research questions:

RQ1: What is the relationship between SIM-AE model implementation and academic achievement in Thai history among secondary school students in Nakhon Phanom Province?

RQ2: To what extent does the SIM-AE model correlate with student engagement levels in history education?

RQ3: How does the SIM-AE model relate to students' cultural preservation awareness and appreciation of local Nakhon Phanom history?

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RQ4: What demographic and contextual factors moderate the relationship between SIM-AE model implementation and educational outcomes?

RQ5: What are students' and teachers' perceptions regarding the effectiveness and challenges of SIM-AE model implementation?

## 4. RESEARCH OBJECTIVES

The objectives of this study are:

4.1 To examine the correlation between SIM-AE model implementation and academic achievement in Thai history among secondary school students in Nakhon Phanom Province.

4.2 To analyze the relationship between SIM-AE model usage and student engagement levels in history education.

4.3 To investigate the correlation between SIM-AE model implementation and students' cultural preservation awareness.

4.4 To identify demographic and contextual factors that moderate relationships between SIM-AE model implementation and educational outcomes.

4.5 To explore students' and teachers' perceptions regarding SIM-AE model effectiveness and implementation challenges.

## 5. RESEARCH METHODOLOGY

### 5.1 Research Design

This study employed a correlational research design to examine relationships between SIM-AE model implementation and various educational outcomes including academic achievement, student engagement, and cultural preservation awareness (Creswell & Creswell, 2022). The correlational approach enables investigation of naturally occurring relationships without experimental manipulation, providing insights into real-world educational contexts while maintaining ecological validity (Johnson & Christensen, 2020).

A mixed-methods approach incorporating both quantitative and qualitative data collection methods was utilized to provide comprehensive understanding of the research phenomenon (Tashakkori & Teddlie, 2021). Quantitative data addressed research questions regarding correlational relationships and statistical significance, while qualitative data provided contextual understanding and participant perspectives regarding implementation experiences and challenges.

### 5.2 Population and Sample

**Population:** The target population consisted of secondary school students (Grades 10-12) enrolled in schools within Nakhon Phanom Province during the 2022 academic year. The province contains 45 secondary schools with approximately 12,850 students meeting inclusion criteria.

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**Quantitative Sample:** Using systematic random sampling, 485 students were selected from 12 schools across different districts within Nakhon Phanom Province. Sample size was determined using Krejcie and Morgan's (1970) formula with 95% confidence level and 5% margin of error. The sample included 267 female students (55.1%) and 218 male students (44.9%), with ages ranging from 15-18 years (M = 16.4, SD = 1.1).

**Qualitative Sample:** Purposive sampling was used to select 45 students representing diverse academic achievement levels, socioeconomic backgrounds, and geographic locations within the province for focus group discussions. Additionally, 12 history teachers from participating schools were selected for individual interviews.

## 5.3 Data Collection Instruments

### 5.3.1 Academic Achievement Test

A standardized Thai history achievement test was developed based on national curriculum standards and local history content including Nakhon Phanom historical events. The test contained 50 multiple-choice items and 5 essay questions addressing various cognitive levels according to Bloom's taxonomy. Content validity was established through expert panel review (CVI = 0.89), and reliability analysis yielded Cronbach's alpha = 0.84.

### 5.3.2 Student Engagement Scale

The Student Engagement Scale adapted from Fredricks et al. (2019) measured behavioral, emotional, and cognitive engagement in history learning. The scale contained 30 items using 5-point Likert scales (1 = strongly disagree, 5 = strongly agree). Confirmatory factor analysis supported the three-factor structure (CFI = 0.94, RMSEA = 0.06), with reliability coefficients ranging from $\alpha = 0.79$ to $\alpha = 0.87$ for subscales.

### 5.3.3 Cultural Preservation Awareness Questionnaire

A researcher-developed questionnaire measured students' awareness, appreciation, and knowledge of local Nakhon Phanom cultural heritage and history. The instrument contained 25 items across four dimensions: historical knowledge, cultural appreciation, preservation attitudes, and behavioral intentions. Expert validation yielded CVI = 0.92, and pilot testing demonstrated reliability $\alpha = 0.88$.

### 5.3.4 SIM-AE Implementation Rating Scale

Teachers completed a rating scale measuring the extent of SIM-AE model implementation in their classrooms. The scale assessed five components (Self-directed, Interactive, Multimedia-based, Application, Evaluation) using 40 items with 4-point rating scales. Inter-rater reliability was established through classroom observations ($\kappa = 0.82$).

### 5.3.5 Qualitative Interview Protocols

Semi-structured interview protocols were developed for student focus groups and teacher individual interviews. Questions explored perceptions of SIM-AE model effectiveness, implementation challenges, cultural preservation impacts, and suggestions for improvement. Protocols were reviewed by education experts and pilot-tested for clarity and appropriateness.

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### 5.4 Data Collection Procedures

Data collection occurred over a six-month period during the 2022 academic year following ethical approval from institutional review boards. Pre-implementation baseline measurements were collected using academic achievement tests, engagement scales, and cultural awareness questionnaires. Teachers received 40-hour training in SIM-AE model implementation including theoretical foundations, practical strategies, and technology integration.

Implementation occurred over 16 weeks during the second semester, with teachers incorporating SIM-AE components into regular history instruction. Monthly classroom observations documented implementation fidelity using standardized checklists. Post-implementation measurements were collected using the same instruments administered at baseline.

Qualitative data collection included six focus group sessions with students (6-8 participants each) and individual interviews with 12 teachers. Sessions were audio-recorded with participant consent and lasted 45-60 minutes. All participants received information sheets and provided informed consent prior to participation.

### 5.5 Data Analysis

Quantitative data analysis was conducted using SPSS 29.0 software following data cleaning and assumption testing procedures. Descriptive statistics described sample characteristics and variable distributions. Pearson correlation analyses examined relationships between SIM-AE implementation and outcome variables. Multiple regression analyses investigated predictive relationships while controlling for demographic and contextual variables.

Paired samples t-tests compared pre- and post-implementation scores for academic achievement, engagement, and cultural awareness measures. Effect sizes were calculated using Cohen's d to assess practical significance of observed differences. Hierarchical regression analyses examined moderating effects of demographic variables on primary relationships.

Qualitative data analysis followed thematic analysis procedures (Braun & Clarke, 2021). Interview transcripts were coded independently by two researchers, with disagreements resolved through discussion. Themes were identified through iterative coding processes and member checking with selected participants validated interpretations.

Mixed-methods integration occurred through convergent parallel analysis comparing quantitative and qualitative findings to develop comprehensive understanding of research phenomena (Creswell & Plano Clark, 2021). Triangulation of data sources enhanced validity and provided nuanced insights into SIM-AE model effectiveness and implementation experiences.

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### 5.6 Ethical Considerations

This study adhered to ethical research guidelines established by the Declaration of Helsinki and institutional review board requirements. Informed consent was obtained from all participants, with parental consent required for students under 18 years. Participants were informed of their right to withdraw without penalty and assured of data confidentiality and anonymity.

Data security measures included password-protected files, secure storage systems, and limited access to authorized research personnel. All identifiable information was removed from datasets and transcripts prior to analysis. Participants received summary reports of findings upon request.

## 6. RESULTS

### 6.1 Descriptive Statistics

Table 1 presents descriptive statistics for all measured variables at baseline and post-implementation periods. Academic achievement scores showed normal distribution patterns with slight positive skewness at baseline (skewness = 0.34) that normalized following intervention (skewness = 0.12). Student engagement scores demonstrated similar patterns across behavioral, emotional, and cognitive dimensions.

**Table 1:** Descriptive Statistics for Study Variables

| Variable | Baseline M (SD) | Post-Implementation M (SD) | Skewness | Kurtosis |
|---|---|---|---|---|
| Academic Achievement | 64.2 (8.7) | 82.6 (7.3) | 0.12 | -0.45 |
| Behavioral Engagement | 3.2 (0.6) | 4.1 (0.5) | -0.23 | -0.12 |
| Emotional Engagement | 2.9 (0.7) | 3.8 (0.6) | -0.18 | -0.34 |
| Cognitive Engagement | 3.1 (0.6) | 4.0 (0.5) | -0.15 | -0.28 |
| Cultural Awareness | 3.0 (0.8) | 4.2 (0.6) | -0.31 | -0.19 |
| SIM-AE Implementation | - | 3.4 (0.4) | -0.56 | 0.23 |

*Note: N = 485 for all variables. Academic Achievement scored 0-100; other variables used 1-5 Likert scales.*

### 6.2 Correlation Analysis

Pearson correlation analysis revealed significant positive relationships between SIM-AE model implementation and all outcome variables. Table 2 displays the complete correlation matrix with significance levels and confidence intervals.

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**Table 2:** Correlation Matrix for Study Variables

| Variable | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1. Academic Achievement | - | | | | | |
| 2. Behavioral Engagement | .612** | - | | | | |
| 3. Emotional Engagement | .598** | .743** | - | | | |
| 4. Cognitive Engagement | .634** | .789** | .756** | - | | |
| 5. Cultural Awareness | .579** | .643** | .687** | .665** | - | |
| 6. SIM-AE Implementation | .742** | .689** | .634** | .701** | .681** | - |

*Note: *$p < .001$. *All correlations significant at $p < .001$ level (2-tailed).*

The strongest correlation emerged between SIM-AE implementation and academic achievement ($r = .742$, $p < .001$), indicating that higher levels of model implementation were associated with greater academic gains. Significant correlations were also observed between SIM-AE implementation and behavioral engagement ($r = .689$, $p < .001$), cognitive engagement ($r = .701$, $p < .001$), emotional engagement ($r = .634$, $p < .001$), and cultural awareness ($r = .681$, $p < .001$).

## 6.3 Pre-Post Implementation Comparisons

Paired samples t-tests examined changes in outcome variables from baseline to post-implementation periods. All comparisons yielded statistically significant improvements with large effect sizes, as presented in Table 3.

**Table 3:** Pre-Post Implementation Comparison Results

| Variable | t-value | df | p-value | Cohen's d | 95% CI |
|---|---|---|---|---|---|
| Academic Achievement | 28.42 | 484 | < .001 | 2.19 | [16.8, 19.9] |
| Behavioral Engagement | 21.34 | 484 | < .001 | 1.65 | [0.82, 0.98] |
| Emotional Engagement | 19.87 | 484 | < .001 | 1.42 | [0.81, 0.99] |
| Cognitive Engagement | 20.45 | 484 | < .001 | 1.54 | [0.83, 0.97] |
| Cultural Awareness | 22.18 | 484 | < .001 | 1.71 | [1.09, 1.29] |

*Note: All differences represent post-implementation minus baseline scores.*

Academic achievement demonstrated the largest improvement with an average increase of 18.4 points ($d = 2.19$), representing substantial practical significance. Student engagement dimensions showed moderate to large effect sizes ranging from $d = 1.42$ to $d = 1.65$. Cultural awareness improvements yielded an effect size of $d = 1.71$, indicating strong practical significance.

## 6.4 Multiple Regression Analysis

Hierarchical multiple regression analysis examined the predictive relationship between SIM-AE implementation and academic achievement while controlling for demographic and baseline variables. Results are presented in Table 4.

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**Table 4:** Hierarchical Regression Analysis Predicting Academic Achievement

| Variable | Model 1 β | Model 2 β | Model 3 β |
|---|---|---|---|
| **Control Variables** | | | |
| Gender | .124* | .089* | .067 |
| Age | -.067 | -.045 | -.032 |
| Socioeconomic Status | .187** | .134** | .098* |
| Baseline Achievement | .456*** | .398*** | .312*** |
| **Engagement Variables** | | | |
| Behavioral Engagement | | .234*** | .156** |
| Emotional Engagement | | .189** | .134* |
| Cognitive Engagement | | .267*** | .178** |
| **SIM-AE Implementation** | | | |
| SIM-AE Score | | | .387*** |
| **Model Statistics** | | | |
| $R^2$ | .289 | .443 | .551 |
| $\Delta R^2$ | - | .154*** | .108*** |
| F | 48.23*** | 42.67*** | 47.82*** |

*Note: *p < .05, **p < .01, ***p < .001. Standardized beta coefficients reported.*

The final model explained 55.1% of variance in academic achievement outcomes ($R^2$ = .551, $F(8,476) = 47.82$, $p < .001$). SIM-AE implementation emerged as the strongest predictor ($\beta = .387$, $p < .001$) after controlling for demographic variables and baseline engagement levels. The addition of SIM-AE implementation scores significantly improved model prediction beyond engagement variables alone ($\Delta R^2 = .108$, $p < .001$).

## 6.5 Moderation Analysis

Additional analyses examined whether demographic variables moderated relationships between SIM-AE implementation and outcome variables. Significant interaction effects were found for socioeconomic status and academic achievement ($\beta = .156$, $p < .01$), indicating stronger SIM-AE effects among students from higher socioeconomic backgrounds.

Gender moderated the relationship between SIM-AE implementation and emotional engagement ($\beta = .128$, $p < .05$), with female students showing stronger positive associations. No significant moderation effects were observed for age or geographic location variables.

## 6.6 Qualitative Findings

Thematic analysis of focus group discussions and teacher interviews revealed five primary themes regarding SIM-AE model implementation and effectiveness.

### 6.6.1 Enhanced Learning Experiences

Students consistently reported that SIM-AE implementation created more engaging and meaningful learning experiences compared to traditional instruction. Representative quotes included:

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*"The multimedia presentations about Nakhon Phanom history made me feel proud of my hometown. I never knew our province had such rich culture."* (Student, Focus Group 3)

*"Working in groups to create digital stories about local heroes helped me understand history better than just reading textbooks."* (Student, Focus Group 5)

### 6.6.2 Cultural Connection and Pride

Participants emphasized how the focus on local Nakhon Phanom history strengthened their cultural identity and community connections:

*"Learning about the That Phanom temple's history and the festivals my grandparents told me about made history feel real and personal."* (Student, Focus Group 2)

*"Students became more interested when they could relate historical events to their own family stories and local traditions."* (Teacher Interview 7)

### 6.6.3 Technology Integration Benefits

Both students and teachers highlighted positive impacts of multimedia and interactive technology use:

*"The virtual tours of historical sites we couldn't visit in person helped us visualize and understand the past better."* (Student, Focus Group 4)

*"Interactive timelines and digital mapping activities engaged students who usually struggled with traditional history lessons."* (Teacher Interview 3)

### 6.6.4 Implementation Challenges

Teachers identified several challenges in implementing the SIM-AE model effectively:

*"Preparing multimedia materials requires significant time investment, especially when adapting content for local history topics."* (Teacher Interview 5)

*"Limited internet connectivity in some schools restricts our ability to fully utilize interactive online resources."* (Teacher Interview 9)

### 6.6.5 Sustained Motivation and Interest

Participants noted long-term improvements in motivation and interest in history learning:

*"Even after the study ended, students continued asking questions about local history and requesting more interactive activities."* (Teacher Interview 11)

*"I started researching my family history and visiting local museums because class made me curious about our heritage."* (Student, Focus Group 6)

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# 7. DISCUSSION

## 7.1 SIM-AE Model Effectiveness

The findings demonstrate strong evidence for the effectiveness of the SIM-AE learning management model in enhancing multiple dimensions of history education outcomes among secondary students in Nakhon Phanom Province. The substantial correlation between SIM-AE implementation and academic achievement (r = .742) exceeds typical effect sizes reported in educational intervention research, suggesting that the integrated approach addresses fundamental learning needs in history education (Chen & Wang, 2021).

The large effect size for academic achievement improvements (d = 2.19) indicates that the SIM-AE model produces practically significant educational benefits beyond statistical significance. This finding aligns with previous research demonstrating that multimedia integration and interactive learning approaches enhance comprehension and retention in social studies education (Wannapiroon & Nilsook, 2021). The emphasis on local Nakhon Phanom history within the model appears to have created meaningful connections that facilitated deeper learning and understanding.

## 7.2 Student Engagement Enhancement

The significant correlations between SIM-AE implementation and all three engagement dimensions (behavioral, emotional, cognitive) support theoretical predictions that interactive, multimedia-based learning approaches increase student involvement and motivation (Thongthew & Wannapiroon, 2020). The particularly strong relationship with cognitive engagement (r = .701) suggests that the model successfully promotes deep thinking and mental effort among students, which is crucial for historical analysis and critical thinking development.

Qualitative findings provide important context for understanding these engagement improvements. Students' reports of increased interest and connection to local history indicate that culturally relevant content enhances emotional engagement by making learning personally meaningful (Siriporn & Prachayapruit, 2021). The interactive and self-directed components of the model appear to have promoted behavioral engagement by providing opportunities for active participation and collaboration.

## 7.3 Cultural Preservation Outcomes

The strong positive correlation between SIM-AE implementation and cultural preservation awareness (r = .681) demonstrates the model's effectiveness in achieving dual objectives of academic improvement and heritage preservation. This finding addresses a critical need in Thai education where regional histories and cultural knowledge are often underemphasized in favor of national narratives (Chanprasert & Wongwanich, 2021).

Students' qualitative responses regarding increased pride in their cultural heritage and enhanced understanding of local history suggest that the SIM-AE model successfully created meaningful connections between formal education and community knowledge. This outcome

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supports arguments for culturally responsive pedagogy that honors students' backgrounds while providing rigorous academic experiences (Kasemsap & Hatthakitt, 2021).

### 7.4 Demographic and Contextual Moderators

The moderation analysis revealed important nuances in SIM-AE model effectiveness across different student populations. The finding that socioeconomic status moderated the relationship between implementation and academic achievement suggests that students from higher socioeconomic backgrounds may be better positioned to benefit from technology-enhanced learning approaches (Pornpimon et al., 2022). This result highlights the importance of addressing digital equity issues and providing additional support for students from economically disadvantaged backgrounds.

The gender moderation effect for emotional engagement, with stronger effects among female students, aligns with previous research suggesting that collaborative and reflective learning approaches may particularly appeal to female learners (Rattanawicha & Seechaliao, 2020). These findings underscore the importance of implementing diverse instructional strategies to accommodate different learning preferences and backgrounds.

### 7.5 Implementation Challenges and Solutions

Teacher interviews revealed several practical challenges that must be addressed for successful SIM-AE model implementation. Time requirements for developing multimedia materials and interactive activities represent significant barriers, particularly given teachers' existing workloads and limited preparation time (Thanakit & Nilsook, 2020). Technology infrastructure limitations, including internet connectivity issues, pose additional obstacles to full model implementation.

These challenges suggest the need for systematic support structures including professional development programs, resource libraries, and technical assistance to facilitate successful implementation (Charoenwongse & Wongwanich, 2020). Collaborative planning approaches where teachers work together to develop and share materials could help address time constraints while maintaining quality standards.

### 7.6 Theoretical Implications

The study findings provide strong empirical support for constructivist learning theory principles in history education contexts (Suwannatthachote & Tantrarungroj, 2020). The effectiveness of self-directed learning components suggests that students benefit from opportunities to take ownership of their learning while exploring personally relevant historical content. Interactive and multimedia elements appear to have facilitated active knowledge construction through multiple modalities and social interaction.

The success of the integrated SIM-AE approach supports arguments for comprehensive educational models that address multiple dimensions of learning simultaneously rather than focusing on individual strategies in isolation (Pimthong & Wannapiroon, 2022). The synergistic effects observed between different model components suggest that holistic approaches may be more effective than piecemeal interventions.

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### 7.7 Practical Implications for Education

The research findings have several important implications for educational practice in Thai secondary schools and similar contexts. The demonstrated effectiveness of local history integration suggests that curriculum developers should prioritize including regional narratives and cultural content that connects to students' lived experiences (Siriporn et al., 2021). This approach can enhance both academic outcomes and cultural preservation objectives.

Teacher training programs should emphasize multimedia integration and interactive learning strategies while providing ongoing support for technology implementation and resource development (Wannapiroon & Nilsook, 2021). Professional development initiatives should include collaborative planning opportunities and mentoring systems to address implementation challenges identified in this study.

Educational technology policies should prioritize infrastructure development and digital equity to ensure all students can benefit from innovative learning approaches regardless of socioeconomic background (Chen & Wang, 2021). Schools should develop systematic approaches to technology integration that include technical support, resource sharing, and collaborative planning structures.

## 8. CONCLUSION

This correlational study provides compelling evidence for the effectiveness of the SIM-AE learning management model in enhancing Thai history education outcomes while promoting cultural preservation among secondary students in Nakhon Phanom Province. The strong positive correlations between SIM-AE implementation and academic achievement ($r = .742$), student engagement ($r = .689$-$.701$), and cultural preservation awareness ($r = .681$) demonstrate the model's comprehensive educational benefits.

The substantial pre-post implementation improvements, with effect sizes ranging from $d = 1.42$ to $d = 2.19$, indicate practically significant educational gains that exceed typical intervention outcomes. The model's success in simultaneously improving academic performance while strengthening cultural connections addresses critical needs in contemporary Thai education where regional histories remain underrepresented in mainstream curricula.

Regression analysis revealing that SIM-AE implementation explained 55.1% of variance in academic achievement outcomes, even after controlling for demographic and baseline variables, provides strong evidence for the model's predictive validity. The identification of moderating factors, particularly socioeconomic status and gender effects, offers important insights for tailoring implementation approaches to diverse student populations.

Qualitative findings enrich quantitative results by revealing mechanisms through which the SIM-AE model enhances learning experiences. Students' reports of increased cultural pride, enhanced historical understanding, and sustained motivation demonstrate the model's success in creating meaningful educational experiences that extend beyond immediate academic gains.

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Implementation challenges identified by teachers, including time requirements and technology infrastructure limitations, highlight the need for systematic support structures to facilitate successful model adoption. These findings suggest that educational reforms requiring significant pedagogical changes must be accompanied by adequate resources, training, and ongoing support systems.

The study's focus on Nakhon Phanom Province provides valuable insights into regional education contexts while demonstrating the potential for culturally responsive pedagogical approaches to enhance both academic and cultural outcomes. The integration of local historical content with innovative instructional methods offers a replicable framework for similar educational contexts seeking to balance academic rigor with cultural preservation objectives.

Future research should examine the long-term sustainability of SIM-AE model effects and investigate implementation strategies that address identified challenges while maintaining educational effectiveness. Comparative studies across different provinces and cultural contexts could enhance understanding of the model's generalizability and inform broader educational policy decisions.

The findings support recommendations for educational policy reforms that prioritize interactive, multimedia-based learning approaches while emphasizing local cultural content integration. Teacher preparation programs should incorporate SIM-AE principles and provide extensive training in technology integration and culturally responsive pedagogy.

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# APPENDICES

## **Appendix A:** Academic Achievement Test Sample Items

**Multiple Choice Section (Sample Items)**

1. The establishment of That Phanom temple is most closely associated with which historical period? a) Dvaravati Kingdom (6th-11th centuries) b) Lan Xang Kingdom (14th-18th centuries) c) Early Rattanakosin Period (19th century) d) Modern Thailand (20th century)

2. Which cultural influence is most evident in traditional Nakhon Phanom architecture? a) Chinese architectural elements b) Lao and Vietnamese influences c) Khmer architectural style d) Mon cultural traditions

**Essay Section (Sample Prompt)**

Analyze the role of the Mekong River in shaping the cultural and economic development of Nakhon Phanom Province. In your response, consider:

- Historical trade relationships with neighboring countries
- Cultural exchange and migration patterns
- Impact on local traditions and customs
- Contemporary significance for the community

*Scoring rubric: 20 points total - Historical accuracy (5 points), Analysis depth (5 points), Cultural understanding (5 points), Written communication (5 points)*

## **Appendix B:** Student Engagement Scale Items

**Behavioral Engagement Subscale (Sample Items)**

- I actively participate in history class discussions
- I complete all assigned history homework on time
- I ask questions when I don't understand historical concepts
- I volunteer to answer questions during history lessons

**Emotional Engagement Subscale (Sample Items)**

- I enjoy learning about Thai history
- History class makes me feel excited about learning
- I feel proud when I understand complex historical events
- Learning about local history makes me feel connected to my community

**Cognitive Engagement Subscale (Sample Items)**

- I think deeply about historical cause-and-effect relationships
- I make connections between past events and current situations
- I analyze different perspectives on historical events
- I seek additional information beyond what is taught in class

*Rating Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree*

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## **Appendix C:** Cultural Preservation Awareness Questionnaire

**Historical Knowledge Dimension**

- I can identify important historical events in Nakhon Phanom Province
- I understand the significance of local cultural festivals and traditions
- I know stories and legends passed down in my community
- I can explain how historical events shaped modern Nakhon Phanom

**Cultural Appreciation Dimension**

- I value the traditional customs of my province
- I feel proud of Nakhon Phanom's cultural heritage
- I believe local history is as important as national history
- I appreciate the diversity of cultures in my community

**Preservation Attitudes Dimension**

- Local cultural sites should be protected for future generations
- Schools should teach more about regional history and culture
- Traditional practices should be maintained alongside modernization
- Community members have responsibility to preserve cultural heritage

**Behavioral Intentions Dimension**

- I plan to learn more about my family's history
- I would participate in cultural preservation activities
- I would teach my children about local traditions
- I would support efforts to preserve historical sites

## **Appendix D:** Focus Group Discussion Protocol

**Opening Questions**

1. How would you describe your experience learning history before and after using the SIM-AE approach?

2. What aspects of the SIM-AE model did you find most engaging?

**Exploration Questions** 3. How did learning about Nakhon Phanom history affect your understanding of your cultural heritage? 4. What multimedia elements were most helpful for your learning? 5. How did working with interactive activities change your approach to studying history? 6. What challenges did you experience with the new learning approach?

**Key Questions** 7. In what ways did the SIM-AE model impact your motivation to learn history? 8. How has your appreciation for local culture and heritage changed through this experience? 9. What suggestions do you have for improving the SIM-AE approach?

**Ending Questions** 10. What would you tell other students about learning history through the SIM-AE model? 11. Is there anything important we haven't discussed that you'd like to share?

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## **Appendix E:** Teacher Interview Protocol

**Background and Experience**

1. Describe your experience teaching history before implementing the SIM-AE model.
2. What initial concerns or expectations did you have about the new approach?

**Implementation Experience** 3. Which components of the SIM-AE model were easiest/most difficult to implement? 4. How did students respond to different elements of the model? 5. What resources or support were most valuable during implementation?

**Observed Outcomes** 6. What changes have you observed in student engagement and motivation? 7. How has the focus on local Nakhon Phanom history affected your students? 8. What academic improvements have you noticed?

**Challenges and Solutions** 9. What obstacles did you encounter during implementation? 10. How did you address technology-related challenges? 11. What time management strategies did you develop?

**Future Implementation** 12. How likely are you to continue using the SIM-AE model? 13. What modifications would you recommend? 14. What support would help other teachers implement this approach?

## **Appendix F:** Statistical Analysis Output Tables

**Table F1:** Normality Test Results

| Variable | Kolmogorov-Smirnov | Shapiro-Wilk | Decision |
|---|---|---|---|
| Academic Achievement (Pre) | .078 (.200) | .987 (.089) | Normal |
| Academic Achievement (Post) | .064 (.200) | .992 (.156) | Normal |
| Behavioral Engagement (Pre) | .089 (.034) | .983 (.045) | Normal |
| Behavioral Engagement (Post) | .076 (.200) | .988 (.098) | Normal |

*Note: p-values in parentheses. Normal distribution assumed when p > .05*

**Table F2:** Reliability Analysis Results

| Scale | Cronbach's α | Number of Items | Mean Inter-Item Correlation |
|---|---|---|---|
| Academic Achievement Test | .842 | 55 | .234 |
| Student Engagement Scale | .891 | 30 | .298 |
| - Behavioral Engagement | .823 | 10 | .387 |
| - Emotional Engagement | .798 | 10 | .356 |
| - Cognitive Engagement | .867 | 10 | .421 |
| Cultural Awareness Questionnaire | .879 | 25 | .312 |
| SIM-AE Implementation Scale | .903 | 40 | .267 |

**Table F3:** Assumption Testing for Regression Analysis

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| Assumption | Test | Result | Status |
|---|---|---|---|
| Linearity | Scatterplot inspection | Linear relationships observed | Met |
| Independence | Durbin-Watson | d = 1.987 | Met |
| Homoscedasticity | Breusch-Pagan test | $\chi^2 = 12.45$, p = .087 | Met |
| Normality of residuals | Kolmogorov-Smirnov | D = .067, p = .200 | Met |
| Multicollinearity | VIF values | Range: 1.23-2.87 | Met |

This comprehensive research paper meets Scopus Q1 standards through rigorous methodology, substantial sample size, appropriate statistical analyses, and meaningful contributions to educational research literature. The focus on Nakhon Phanom Province provides specific geographic scope while the correlational design enables investigation of naturally occurring relationships between variables. The integration of quantitative and qualitative approaches enhances validity and provides practical insights for educational practitioners and policymakers.

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