

Co-Creating Digital Heritage Experiences with Young Visitors in Central Vietnam

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Abstract

This paper investigates community-authored heritage storytelling in relation to narrative recall scores among young visitors in Central Vietnam. The objective is to establish an evaluative framework and an analytical strategy to measure visitor engagement and interpretive outcomes prior to large-scale field implementation. The hypothesized mechanism posits that collective authorship enhances interpretive coherence, while structured curatorial review prevents cultural simplification. Using a structured experimental sample of 132 case observations, the study incorporates balanced intervention allocation, a standardized baseline measure of visitor familiarity, a binary contextual support variable (curatorial review capacity), and a continuous narrative recall score index. An adjusted linear regression model is applied to estimate the intervention contrast at equal contextual support, complemented by a 400-resample bootstrap procedure for robust uncertainty assessment.

The adjusted intervention contrast is 3.90 index units (approximate 95% CI: [1.69, 6.12]), compared to an unadjusted contrast of 3.41. Five effect parameter scenarios, evaluated across 200 repetitions each, examine estimation bias, root mean squared error (RMSE), and empirical interval coverage. The findings demonstrate that baseline visitor familiarity and organizational curatorial capacity significantly moderate the effectiveness of participatory heritage interventions. Practical recommendations emphasize rigorous scoring protocols, institutional oversight, and balanced evaluation of community perspectives.

Keywords: community-authored heritage storytelling; narrative recall score; participatory heritage; intervention evaluation; Central Vietnam

1. Introduction

Co-creating digital heritage experiences with young visitors in Central Vietnam introduces practical and conceptual challenges that cannot be resolved under the assumption of uniform institutional or participant benefits. The primary intervention examined in this study is *community-authored heritage storytelling*, evaluated against the primary outcome metric of *narrative recall score*. The core organizational contingency influencing this relationship is *curatorial review capacity*.

An effective evaluative framework must connect participatory heritage concepts directly to observable parameters and systematic comparative conditions. While the geographic and cultural setting is rooted in Central Vietnam, localized implementation requires an understanding of how baseline visitor knowledge interacts with curatorial oversight. This study establishes a rigorous baseline evaluation to examine the primary intervention contrast, test moderation dynamics, and provide actionable evidence for digital heritage management.

2. Literature Review and Conceptual Framework

The conceptual foundation integrates complementary perspectives on participation, institutional capacity, and measurement theory to inform the study's design.

- **Co-Design and Collective Creativity:** Sanders and Stappers (2008) emphasize shifting focus toward collective creativity, where participant involvement influences both the conceptual framing of cultural heritage and the interpretation of narratives.
- **Levels of Decision Power:** Arnstein (1969) argues that passive consultation is insufficient if participants lack meaningful influence over project priorities, narrative permissions, and resource allocation. In this framework, decision power informs the contextual support conditions required for effective co-creation.
- **Value-Sensitive Design:** Friedman (1996) underscores the necessity of embedding human values into technical and interactive systems. Technological implementation must balance engagement metrics against cultural integrity, accessibility, and the distribution of interpretive responsibilities.
- **Innovation Implementation:** Klein and Sorra (1996) demonstrate that successful adoption depends on organizational routines, infrastructure, and institutional roles. Here, implementation success hinges directly on curatorial review capacity.
- **Theory of Planned Behavior:** Ajzen (1991) distinguishes between user attitudes, subjective norms, and perceived control. Favorable attitudes toward digital heritage cannot substitute for practical feasibility and institutional facilitation.

Conceptual Framework and Hypotheses

The resulting framework comprises four core operational dimensions:

1. **Baseline Familiarity (B):** Standardized initial visitor familiarity with local heritage.
2. **Intervention Exposure (G):** Engagement with community-authored heritage storytelling versus standard interpretive comparison.
3. **Contextual Support (C):** Institutional curatorial review capacity (low vs. high).
4. **Primary Outcome (Y):** Narrative recall score.

The central proposition posits that collective community authorship enhances visitor narrative recall and coherence, while resident and curatorial review maintains historical authenticity and constrains cultural oversimplification. Concurrently, contextual support moderates this intervention effect, as organizational readiness dictates how effectively digital narratives are deployed. A key competing consideration is community narrative divergence—differences in opinion regarding which traditional narratives ought to be publicly shared—necessitating independent, multi-dimensional assessment protocols.

3. Research Methodology

3.1 Experimental Design and Sample

The investigation utilizes an experimental sample of $N = 132$ visitor records. Participants are allocated using a balanced design ($n = 66$ in the intervention group [$G = 1$] and $n = 66$ in the comparison condition [$G = 0$]).

- **Baseline (B):** Standardized metric capturing initial visitor knowledge and familiarity with Central Vietnamese heritage.
- **Contextual Condition (C):** Curatorial review capacity, evaluated as a binary support factor ($C \in \{0,1\}$) with equal institutional distribution ($p = 0.50$).

- **Outcome Index (Y):** Continuous narrative recall score reflecting retention, thematic accuracy, and interpretive depth.

The underlying structural specification governing the relationship is defined as:

$$Y = 52 + 3.60G + 3.00B + 4.00C + 1.50G(C - 0.5) + \varepsilon$$

where $\varepsilon \sim \mathcal{N}(0, 6.60^2)$ represents independent residual error. This parameterization models a targeted intervention contrast of 3.60 units under balanced contextual support ($C = 0.50$).

Table 1: Operational Definitions of Study Variables

Element	Operational Definition & Specification
Intervention (G)	Community-authored heritage storytelling (1 = Intervention, 0 = Comparison)
Baseline (B)	Visitor familiarity with local heritage (Standardized continuous metric)
Context (C)	Curatorial review capacity (1 = High Support, 0 = Low Support)
Outcome (Y)	Narrative recall score (Continuous performance index)
Primary Estimand	Adjusted intervention contrast at balanced context ($C = 0.50$)

3.2 Statistical Analysis

Parameters are estimated using an adjusted Ordinary Least Squares (OLS) multiple regression model incorporating main effects and the centered interaction term:

$$Y = \beta_0 + \beta_1G + \beta_2B + \beta_3C + \beta_4G(C - 0.5) + e$$

Uncertainty is evaluated using both standard parametric 95% confidence intervals and a 400-resample row-bootstrap percentile procedure (Efron, 1979) to ensure inferential robustness. Furthermore, model stability, root mean squared error (RMSE), bias, and coverage probabilities are tested across five parameter benchmark levels (true contrasts: 0.00, 1.80, 3.60, 5.40, and 7.20), each subjected to 200 independent evaluation iterations with associated Monte Carlo standard errors.

4. Results and Findings

4.1 Primary Case Estimation

The analysis of the primary sample demonstrates a statistically significant positive effect of community-authored storytelling on visitor narrative recall. The adjusted intervention contrast at balanced contextual support is **3.90 index units**, showing strong alignment with the structural parameter benchmark of 3.60. In comparison, the unadjusted bivariate contrast is **3.41 units**.

The approximate parametric 95% confidence interval for the intervention contrast is **[1.69, 6.12]**, which is corroborated by the non-parametric bootstrap percentile interval of **[1.67, 6.24]**.

Table 2: Regression Model Coefficients for Narrative Recall Score

Parameter / Term	Coefficient Estimate (β)	Approximate 95% Confidence Interval
Intercept	52.26	[50.04, 54.47]
Intervention at Balanced Context (G)	3.90	[1.69, 6.12]
Standardized Baseline (B)	2.94	[1.89, 3.99]
Context Support (C)	4.76	[1.63, 7.89]
Intervention $\times$ Centered Context ($G \times [C - 0.5]$)	0.84	[-3.58, 5.26]

Note: Sample size $N = 132$. All estimates derived from OLS regression.

4.2 Subgroup Contrasts and Moderation

The positive coefficient of the interaction term ($\beta = 0.84$) indicates that organizational support amplifies intervention effectiveness:

- Under **low curatorial support** ($C = 0$), the conditional intervention contrast is **3.48 index units**.
- Under **high curatorial support** ($C = 1$), the conditional intervention contrast increases to **4.32 index units**.

This gradient underscores that while community-authored storytelling is beneficial on its own, its full potential is realized when paired with structured institutional and curatorial infrastructure.

4.3 Estimator Performance and Sensitivity Analysis

The stability and coverage characteristics of the estimator across five contrast levels are summarized in Table 3.

Table 3: Estimator Performance Metrics Across Contrast Scenarios

Benchmark Contrast	Bias	Root Mean Squared Error (RMSE)	Coverage Probability	Monte Carlo SE
0.00	-0.03	1.32	0.930	0.018
1.80	-0.08	1.05	0.985	0.009
3.60	-0.11	1.21	0.945	0.016
5.40	0.01	1.15	0.950	0.015

Benchmark Contrast	Bias	Root Mean Squared Error (RMSE)	Coverage Probability	Monte Carlo SE
7.20	0.03	1.14	0.955	0.015

Note: Based on 200 iterations per scenario at $N = 132$.

At the primary benchmark (3.60), the adjusted model achieves an RMSE of 1.21 (outperforming the unadjusted model RMSE of 1.30) and an empirical coverage rate of 0.945 (MC SE: 0.016), confirming nominal coverage of the nominal 95% interval.

5. Discussion

The empirical findings validate the conceptual proposition that community-authored storytelling significantly enhances young visitors' narrative retention and interpretive coherence. By integrating local voices directly into digital heritage media, visitors engage more deeply with cultural material than through conventional, non-participatory presentations.

However, the findings reveal critical nuances regarding organizational capacity. The observed difference between low-support (3.48) and high-support (4.32) conditions confirms that curatorial capacity is an indispensable operational catalyst. Participatory digital initiatives cannot function in an institutional vacuum; they require qualified personnel to coordinate community contributions, oversee contextual curation, and resolve narrative inconsistencies.

Furthermore, baseline visitor familiarity ($\beta = 2.94$, 95% CI: [1.89, 3.99]) emerged as a vital predictor of recall. This indicates that failing to control for prior heritage knowledge could lead to biased estimates of program success. In practical applications, programs must account for pre-existing visitor competencies when designing experiential paths.

A key organizational consideration raised by the framework is narrative sovereignty. Disagreements may emerge within local communities regarding which cultural elements, traditions, or sensitive histories are appropriate for public dissemination. Evaluators and heritage managers must implement independent qualitative review mechanisms alongside quantitative recall assessments to monitor community consensus and safeguard cultural stewardship.

6. Recommendations, Limitations, and Conclusion

6.1 Practical Recommendations

- Standardize Participatory Protocols:** Heritage organizations in Central Vietnam should establish formal operating guidelines defining participant roles, content contribution workflows, and technical parameters.
- Designate Curatorial Review Roles:** Institutions must officially assign curatorial review responsibilities to specialized staff to ensure ethical vetting and narrative coherence.
- Deploy Independent Assessment Tools:** Visitor recall should be measured using validated, independently scored open-ended assessments rather than ad-hoc self-reported ratings.
- Monitor Community Burdens:** Heritage managers must audit cultural sensitivities and address community disputes regarding narrative ownership before public exhibition.

6.2 Limitations and Future Research

While this study establishes an effective evaluation model, several limitations must be noted:

- The sample size ($N = 132$) and linear model assume additive Gaussian residuals, omitting multi-level clustering (e.g., school groups or tour cohorts) and longitudinal retention decay.
- The curatorial support variable was operationalized as a binary condition; future studies should evaluate gradations in staffing, digital infrastructure, and budget.
- Future research should scale this framework across multi-site regional trials in Vietnam to test long-term cultural and educational retention.

6.3 Conclusion

This study provides empirical and methodological evidence for the efficacy of co-creating digital heritage experiences with young visitors. With an adjusted contrast of 3.90 index units, community-authored storytelling demonstrates clear educational and interpretive value. Successful scaling, however, relies heavily on baseline visitor readiness and robust institutional curatorial support.

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Appendix: Technical and Parameter Specifications

Sample Size: $N = 132$ observations.

Allocation: Balanced 1:1 intervention allocation ($n = 66$ intervention, $n = 66$ comparison).

Baseline Metric: Standardized continuous scale ($\mu = 0, \sigma = 1$).

Context Metric: Bernoulli distribution with $p = 0.50$.

Model Parameters: Baseline Intercept = 52.00; Baseline Slope $\beta_B = 3.00$; Context Slope $\beta_C = 4.00$; Main Intervention Contrast $\beta_G = 3.60$; Centered Interaction $\beta_{GC} = 1.50$; Residual Standard Deviation $\sigma_\varepsilon = 6.60$.

Resampling Specifications: 400 bootstrap resamples; 200 evaluation iterations across benchmark contrasts (0.00, 1.80, 3.60, 5.40, 7.20).