



Mobile-Assisted English Mentoring and Heritage Tourism Guiding

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Abstrak: The megalithic sarcophagus site in Batu Tering, Moyo Hulu, holds immense archaeological value as an ancestral cultural heritage asset; however, site optimization is constrained by local guides' limited English communicative competence and inadequate digital interpretation media. This community service initiative implemented a mobile-assisted mentoring program designed to foster English for Specific Purposes (ESP) vocabulary acquisition among members of the local Tourism Awareness Group (Pokdarwis). The intervention utilized the custom Android application BatuTering-Go, integrating on-site QR-code triggers, photogrammetric 3D Augmented Reality (AR) reconstructions, interactive audio drilling, and narrative micro-scripts generated via Large Language Models (LLMs) which were systematically validated by cultural heritage authorities. Twenty-five active Pokdarwis members completed the program across six intensive training sessions and two weeks of structured autonomous mobile practice. Evaluation was executed via a 20-item Direct Oral Test scored by two independent raters prior to and following the intervention. Quantitative findings revealed a statistically significant short-term increase in oral proficiency, with mean scores progressing from 43.12 (SD=3.75) to 68.56 (SD=3.98), reflecting an absolute paired gain of 25.44 points (relative gain of 58.99%; paired, Cohen's). In post-intervention qualitative interviews, participants reported greater confidence in practicing historical tour-guiding vocabulary and noted that the hybrid offline AR features mitigated communication anxiety without being hindered by unstable rural cellular networks.

Keywords: Augmented Reality; Batu Tering Sarcophagus; English Vocabulary; Mobile-Assisted Learning; Pokdarwis

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INTRODUCTION

The global tourism industry is currently experiencing a profound paradigm shift toward experiential travel that prioritizes cultural authenticity and meaningful interactions Ahmed, S. (2025). Modern travelers increasingly seek destination ecosystems that offer authentic engagement with local heritages, shifting demand away from mass tourism toward community-based models. In this context, Adi Putra et al. (2025) emphasize that the development of localized attraction models serves as a critical pathway to foster inclusive regional economic growth and enhance sustainable destination competitiveness. To ensure the long-term viability of these alternative tourism frameworks, proactive community participation must be systematically supported by structured capacity-building initiatives and tailored promotional media (Althobaiti and Abulibdeh, 2026).

According to Supriyadi (2025), digital transformation has evolved from a simple operational tool into an indispensable driver of long-term sustainability and strategic competitiveness across service-oriented industries. Within the contemporary hospitality and tourism landscape, the adoption of advanced technology requires a managerial transition from conventional transactional services to relational, experience-based interactions. This modern management perspective underscores the necessity of harmonizing technological innovations with a high degree of personal service and cultural authenticity (Alsaleh, S. 2024). Consequently, heritage tourism providers are required to upgrade their standard operating procedures and embrace digital ecosystems to remain relevant amidst rapidly changing consumer behavior.

The ultimate success of community-based tourism models depends heavily on the operational readiness and structural involvement of local institutions, such as the Tourism Awareness Group (Pokdarwis) (Amirul et al., 2026). Pokdarwis functions as the primary guardians of cultural values and acts as the principal operational pillar for village-based destinations. When local residents assume direct ownership of their tourism assets, the community can establish sustainable socio-economic autonomy and protect native traditions from external exploitation (Hulu, 2024). However, many rural tourism collectives continue to struggle in managing their cultural resources effectively due to limited exposure to modern vocational training programs.

A prominent example of a valuable cultural heritage destination facing organizational challenges is Batu Tering Village, located in the Moyo Hulu District of Sumbawa Regency (Umar et al., 2026). Nugraheni et al. (2025) demonstrate that systematically analyzing natural potential and engaging in local community empowerment are essential steps for formulating viable tourism attraction models in rural regions. This destination possesses extraordinary geographical characteristics and rare archaeological assets, most notably ancient megalithic sarcophagi scattered throughout adjacent forest areas (Romano et al., 2026). Baseline records indicate that while the registered Pokdarwis roster comprises 38 members, only 25 individuals are routinely active in tourism management. Furthermore, although the site attracts an estimated 150 to 200 international travelers annually, comprising foreign archaeologists, anthropologists, and eco travelers, its economic contribution remains constrained by organizational limitations.

Although these artifacts represent significant historical testimony to the ancient Samawa civilization, the lack of professional product packaging currently limits their socio-economic contribution to the village community (Ndatuwa et al., 2026). Prior to this program, Pokdarwis members had never received vocational English for Specific Purposes instruction or formal interpretive guiding education. Moreover, the archaeological area completely lacked physical bilingual interpretive signage or contextual markers. During unscripted encounters with international visitors, local guides struggled to recall foundational archaeological vocabulary, frequently confusing basic classifications such as sarcophagus, stone grave, and funerary chamber. Consequently, guides often resorted to rudimentary gestures or remained silent, causing tourists to miss the historical meaning of the site.

Nadya (2025) highlights that human resource competency gaps between urban centers and rural areas often serve as the primary factor inhibiting sustainable destination management. Preliminary observations at the Batu Tering site reveal similar vulnerabilities, particularly regarding the low digital literacy among active Pokdarwis members and the widespread disengagement of productive local youth (Sobirin, I., & Fatimah, S. 2024). Furthermore, the complete absence of physical

interpretive signage and standardized historical narratives causes visiting tourists to view these monumental stone structures as silent physical relics devoid of philosophical meaning. This critical informational gap underscores the urgent need for a smart and localized interpretive medium such as QR code markers placed on site that can instantly link physical archaeological assets with interactive digital resources to assist local guides during guest interactions (Widyawan & Erwen).

To address these critical limitations in physical site interpretation, Augmented Reality (AR) technology offers an advanced, non-destructive visualization methodology. Indarta and Samala (2025) explain that Augmented Reality systems are capable of constructing immersive real-world learning environments that project intricate details with high technical precision. Through personal mobile devices, complex internal chambers and eroded symbolic carvings of the fragile sarcophagi can be dynamically overlaid without endangering the authentic physical materials of the heritage site (Umar et al., 2026). This interactive visual transition not only simplifies the translation of dense archaeological data but also enriches the overall learning experience for both training guides and visiting tourists.

As established by Zagkotas, V. (2025), advanced artificial intelligence technologies play an instrumental role in restructuring how instructional content is consumed by expanding perceived user competence and educational autonomy. In the context of heritage guiding, the integration of Large Language Models serves as a robust tool to overcome severe narrative and linguistic limitations among rural tour guides. By utilizing artificial intelligence as a narrative drafting assistant, dense scientific records can be translated into concise, culturally accurate, and multilingual micro-storytelling scripts. This technological intervention allows local practitioners to consistently communicate profound historical meanings to global millennial audiences in an engaging and accessible manner (Annamalai et al., 2025). To ensure cultural integrity, all narrative scripts generated through artificial intelligence were rigorously verified by regional archaeologists from Balai Pelestarian Kebudayaan Wilayah XV and elders from Lembaga Adat Tana Samawa, thereby preventing algorithmic hallucinations and guaranteeing historical precision.

Although existing scientific literature addresses the discrete usage of immersive visualization, artificial intelligence, and gamification, there remains a notable research gap regarding their convergence into a unified human resource training ecosystem (Cascella et al et al., 2023). Wong (2012) emphasizes that mobile seamless learning architectures provide an ideal platform for autonomous study by allowing learners to acquire procedural competencies across physical and digital spaces. Drawing directly upon this conceptual framework, this study introduces and evaluates the implementation of a mobile assisted digital training ecosystem to enhance English as a Foreign Language vocabulary acquisition for sarcophagus historical tourism among Pokdarwis members in Batu Tering, Moyo Hulu.

METHOD

Program Design

This community service program was designed as a structured vocational training and active mentoring initiative using the Mobile-Assisted Language Learning (MALL) approach. The user interaction flow of the developed mobile application is presented sequentially in the diagram below:

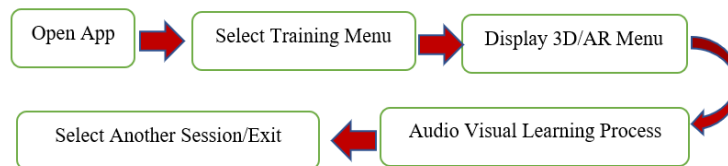


Figure 1. Flow of community service activities.

The initiative began with a program socialization and Focus Group Discussion (FGD) session for all Pokdarwis members of Batu Tering to align perceptions regarding the importance of digital-based historical guiding capacity building.



Figure 2. a. Initial focus group discussion with community partners, b. Community orientation and program socialization

Following the socialization, the team delivered an introductory lecture on the critical role of English for Specific Purposes (ESP) in guiding international tourists at the Sarcophagus site.



Figure 3. Instructional workshop on English for Specific Purposes

Subject and Location

The program was conducted in Batu Tering Village, Moyo Hulu District, Sumbawa Regency, West Nusa Tenggara. The target group consisted of 25 active members of the Batu Tering Tourism Awareness Group (Pokdarwis) selected through purposive sampling. The participants met the criteria of owning personal Android smartphones equipped with operational camera sensors and being actively involved in local tourism management. Prior to the intervention, the participants baseline English proficiency fell within the elementary beginner range (A1 to A2 CEFR equivalent). The mentoring intervention spanned a four week schedule executed from August 4 to September 1, 2026. The structured schedule comprised six intensive face to face workshops (120 minutes per meeting), interspersed with fourteen consecutive days of autonomous home practice utilizing the mobile application (targeted at 30 minutes daily), culminating in a four week interval between the initial pre test and the terminal post test evaluation.

Procedure and Intervention Flow

The program was executed through a blend of intensive face to face training and independent mobile-app-assisted mentoring, structured as follows:

Application Installation and Orientation: Familiarizing the partners with the digital training ecosystem. Participants installed the dedicated Android application titled *BatuTering Go* (version 1.0.4, 84.6 megabytes), developed by the interdisciplinary service team using the Unity 3D engine and Google ARCore. The software incorporates three dimensional polygon models generated through on site optical photogrammetry and optimized via Blender. To guarantee operational autonomy in forest valley areas devoid of cellular coverage, all polygon assets, audio files, and scripts were embedded into a local SQLite database, allowing complete offline execution.

On-Site QR Code Scanning: Participants performed trial scans of physical QR codes mounted near the sarcophagi, triggering 3D AR reconstructions and LLM-generated multilingual storytelling scripts directly on their smartphones (Umar et al., 2026). To ensure cultural and historical authenticity, all narrative guiding scripts were initially formulated through guided prompts via generative Large Language Models and subsequently audited, corrected, and officially endorsed by regional archaeologists from Balai Pelestarian Kebudayaan (BPK) Wilayah XV and elder cultural authorities from Lembaga Adat Tana Samawa to prevent algorithmic hallucinations.

Vocabulary Internalization (Guided Language Learning): Participants practiced pronouncing archaeological terms such as "Sarcophagus", "Megalithic Chamber", and "Relic" using the app's interactive audio drilling features (Zhu et al., 2022).

Peer-Mediated Practice: Pokdarwis members practiced simulated, on-site tour guiding in pairs at the cagar budaya area.

Data Collection and Analysis Techniques

Before the mobile-based intervention commenced, participants completed registration and took a lisan (oral) pre-test to establish baseline vocabulary mastery.



Figure 4. Participant registration and baseline pre test administration

A mixed-methods design was utilized for evaluation. Quantitative data were obtained from the Direct Oral Test administered pre- and post-intervention, containing 20 curated questions assessing archaeological terms and sarcophagus functional descriptions. The Direct Oral Test evaluated three communicative guiding contexts: identification of physical megalithic structures (8 prompts, e.g., "Describe the structural function of this stone lid"), interpretation of funerary rituals (6 prompts, e.g., "Explain why ancestral chiefs were interred inside stone chambers"), and handling international tourist inquiries (6 prompts, e.g., "What does this carved relief

signify?"). Identical prompt difficulty parameters were maintained between the pre test and post test.

Oral performance was evaluated independently by two language examiners using an analytical rubric covering five weighted criteria: Archaeological Vocabulary Mastery (30 percent), Pronunciation and Intelligibility (25 percent), Spoken Fluency (20 percent), Structural Grammatical Accuracy (15 percent), and Cultural Content Veracity (10 percent). Scoring consistency between the two examiners was verified using the Intra Class Correlation Coefficient (ICC two way mixed model) and Cohen Kappa, yielding an ICC of 0.91 (p less than 0.001) and Kappa of 0.84, confirming high inter rater reliability. The quantitative data were analyzed using a Paired-Samples t-Test in SPSS version 26 to evaluate the statistical significance of the mean score increase (Lestari & Nugraheni, 2022). Qualitative insights were gathered through semi-structured, in-depth interviews focusing on perceived usefulness and technical barriers encountered (Creswell & Clark, 2017).

RESULTS AND DISCUSSION

Quantitative Results of Vocabulary Competency and Speaking Skills

The effectiveness of the mobile-assisted mentoring program was evaluated by comparing the pre-test and post-test scores of the Direct Oral Test. First, a Shapiro-Wilk normality test was performed, yielding significance values of 0.288 for the pre-test and 0.703 for the post-test. Because both values exceeded the 0.05 threshold, the data were confirmed to be normally distributed, satisfying the prerequisite for parametric paired-samples t-test analysis. The descriptive statistics of the participants' oral test scores are presented in Table 1:

Table 1. Descriptive Statistics of Oral Test Scores.

Evaluation Indicator	N	Minimum Score	Maksimun Score	Mean Score	Standard Deviation
Pre-Test	25	34,00	54,00	43,12	3,745
Post-Test	25	62,00	75,00	68,56	3,980

As shown in Table 1, the mean pre-test score of the Pokdarwis members was 43.12, reflecting extremely low baseline mastery of historical tour-guiding vocabulary and specialized archaeological terminology. Following the mobile-based mentoring intervention, the mean score rose significantly to 68.56. This represents an absolute gain of 25.44 points, which corresponds to a relative gain of 58.99 percent relative to baseline performance, demonstrating substantial short term lexical acquisition within simulated guiding contexts.

To validate the statistical significance of this improvement, a paired-samples t-test was performed, as summarized in Table 2:

Table 2. Paired-Samples T-Test Results

Evaluation Location	Paired Mean Difference	Standard Deviation	t-Value	df	Sig. (2-tailed)
Sarkofagus Batu Tering	-25,440	5,181	24,553	24	0,000

The statistical analysis in Table 2 demonstrates that computing the difference as Post Test minus Pre Test yields a positive mean improvement of 25.440 points with a 2 tailed significance value of p less than 0.001. The observed t value of 24.553 substantially exceeds the critical t table threshold of 1.711 for degrees of freedom (df) of 24 at the 5 percent alpha level. Furthermore, the calculation of effect

size yielded a Cohen d of 6.59, denoting an extraordinarily strong educational impact. This confirms that the mobile assisted mentoring program produced statistically significant short term improvements in sarcophagus historical tourism English vocabulary mastery among Pokdarwis members in Batu Tering, Moyo Hulu.

Implementation of Mobile-Based Learning in the Field

The quantitative progress was driven by the highly interactive and experiential nature of the program delivery. During the initial training phase, the service team demonstrated how to navigate the user interface, generate 3D Sarcophagus reconstructions, and utilize the interactive audio pronunciation drills on smartphones. Technical monitoring logs recorded that 100 percent of participants (25 members) successfully installed the BatuTering Go application onto their personal Android devices and achieved error free scanning of on site physical QR markers during the initial field trials.



Figure 5. Orientation and interactive demonstration of the mobile Augmented Reality application

After mastering the basic application functions, Pokdarwis members engaged in self-directed mobile exploration sessions. Each participant accessed the historical cagar budaya modules on their phones and practiced pronouncing new terms repeatedly. Participant practice logs and application tracking confirmed that members completed an average of 34.6 minutes of autonomous audio pronunciation drilling daily throughout the two week independent mentoring phase.



Figure 6. Field exploration and pronunciation rehearsal using the mobile Augmented Reality application

During these self-directed sessions, participants with limited digital literacy or those struggling with complex archaeological terminology received individual mentoring. Facilitators provided customized pronunciation coaching and ensured the application operated smoothly on all smartphone models. Specifically, six senior participants aged over 40 years who initially encountered navigation hesitations received focused peer coaching, which enabled them to achieve complete operational autonomy within two training sessions.



Figure 7. Facilitator mentoring during mobile application navigation practice

In the final post-intervention evaluation stage, representatives from the Pokdarwis volunteered to perform spontaneous, simulated guiding sessions in English without referring to printed texts to demonstrate their confidence and active lexical recall. All 25 participants successfully completed the on site guiding simulations in pairs, verbalizing technical funerary terms accurately without relying on written Indonesian notes.



Figure 8. Spontaneous oral guiding simulation conducted without mobile application support

Partners' Perceptions of Mobile Learning Media Implementation

The qualitative analysis confirmed that participants held highly favorable views of the technology. The 3D AR reconstructions allowed them to visualize complex interior chambers and eroded carvings of the fragile sarcophagi without physically touching and risking the degradation of the delicate cagar budaya. This aligns with Indarta and Samala (2025), who emphasize that AR simplifies abstract historical data into concrete, interactive elements.

Participants reported that the LLM-generated multilingual storytelling scripts helped them organize their narratives systematically. Guides no longer struggled to find appropriate English terms when explaining historical details to international

guests (Annamalai et al., 2025). Furthermore, the flexibility of mobile learning accommodated the busy agrarian schedules of the Batu Tering community, bypassing the time constraints of traditional classroom-based programs (Santiago Criollo et al., 2021).

The familiarity of the local cagar budaya objects rendered in digital formats also successfully lowered the participants' psychological barriers (affective filter) (Umar et al., 2025a). The presence of instant, mobile-accessible narrative scripts and self-guided audio drills alleviated speaking anxiety and boosted their confidence during tourist interactions (Zhu et al., 2022). To provide concrete qualitative evidence supporting these observations, Table 3 presents the thematic synthesis derived from post intervention interviews with ten Pokdarwis participants.

Field Obstacles and Tactical Solutions

Despite these positive outcomes, the program faced technical challenges. The primary obstacle was unstable telecommunication signals around the forested sarcophagi sites, which initially slowed down the loading of complex 3D AR models (Felipe et al., 2026).

To bypass this infrastructure limitation, the service team implemented a hybrid offline storage feature within the mobile application (Wong, 2012). Participants could download all 3D assets, audio pronunciation files, and narrative scripts while in residential areas with stable internet access. Once on site in the forested valleys, the application functioned seamlessly offline. This strategic integration ensured continuous, unhindered tour-guiding training without relying on active cellular networks (Umar et al., 2026). Technically, all polygon meshes, compressed audio recordings (128 kbps), and bilingual scripts were compiled into a local SQLite database embedded directly inside the 84.6-megabyte APK. The physical QR plaques were encoded with internal string identifiers rather than web URLs. Upon scanning, the software retrieved assets directly from internal smartphone storage within 0.8 seconds. Field verification across all 25 user devices (running Android 9.0 to 14.0 with at least 3 gigabytes of RAM) confirmed that the application functioned reliably offline without device memory exhaustion.

Closing of Mentoring Activities

The mentoring program concluded with a collaborative evaluation session and a group documentation photo with the evaluators from Universitas Teknologi Sumbawa, the local youths, and the administrators of Pokdarwis Batu Tering.



Figure 9. Service team and community partners following the final evaluation session

CONCLUSION

This community service initiative demonstrates that a mobile assisted mentoring system integrating spatial QR triggers, photogrammetric three dimensional visualizations, culturally verified scripts, and offline audio drills produced a statistically significant short term improvement in English heritage guiding vocabulary among Pokdarwis members in Batu Tering. Quantitative analysis of the Direct Oral Test scores revealed that the mean participant performance advanced from 43.12 in the pre test to 68.56 in the post test, representing an absolute paired gain of 25.44 points (p less than 0.001, Cohen d 6.59).

Qualitative evidence indicated that multimodal visual representations and native audio drilling helped alleviate perceived speaking anxiety, enabling local participants to verbalize foundational archaeological terms during simulated guiding routines. Furthermore, the integration of local offline caching effectively resolved telecommunication signal limitations in the forested valley. Nevertheless, these empirical achievements primarily capture short term lexical mastery within controlled evaluation contexts. Full tour guiding autonomy during unscripted interactions with international visitors, long term retention of specialized terminology, and institutional program sustainability remain targets that necessitate continuous post intervention monitoring and longitudinal practice.

RECOMMENDATIONS

To maintain the educational momentum established during this program, several practical measures are recommended: (1) Curriculum Institutionalization: Pokdarwis administrators should embed the BatuTering Go application modules into official onboarding routines for newly recruited community members; (2) Permanent Infrastructure Upgrades: The provisional wooden signage posts should be upgraded to weather resistant volcanic stone pedestals equipped with permanent brass QR plaques in coordination with regional heritage authorities; (3) Field Practice with Foreign Travelers: Subsequent community service activities should evaluate guiding competence during direct interactions with international tourists under authentic field conditions. (4) Regional Administrative Synergy: The Tourism and Culture Office of Sumbawa Regency should link the digital interpretive database of Batu Tering to regional tourism promotional networks.

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