

## RESEARCH ARTICLE

# Evaluating the Usability and User Engagement of Herbal Heritage as a Medium for Gamified Learning of Kenyah and Kayan Traditional Medicinal Knowledge Using Extended Reality

Ally Dian Hendrick<sup>1</sup> | Suriati Khartini Jali<sup>2</sup> | Nurul Farizah Ridzuan<sup>1</sup> | Jane Labadin<sup>1</sup> | Abby Lian Hendrick<sup>1</sup> | Mohd Harith Syazwan Samsawi<sup>1</sup>

<sup>1</sup>Faculty of Computer Science and Information Technology, Universiti Malaysia Sarawak, Kota Samarahan, Malaysia | <sup>2</sup>Institute for Tourism Research and Innovation, Universiti Malaysia Sarawak, Kota Samarahan, Malaysia

**Correspondence:** Suriati Khartini Jali ([jskhartini@unimas.my](mailto:jskhartini@unimas.my))

**Received:** 9 January 2026 | **Revised:** 16 June 2026 | **Accepted:** 2 July 2026

**Keywords:** augmented reality | cultural heritage | extended reality | gamification | virtual reality

## ABSTRACT

Indigenous knowledge of traditional medicine, which has sustained Borneo's ethnic tribes for generations, is facing extinction due to the preference for modern medicine and a lack of motivation to pass down this wisdom. To combat this potential loss, this study explored the usability and user engagement of a smartphone-based extended reality application, Herbal Heritage, a gamified learning tool for Kenyah and Kayan medicinal practices. The study employed a mixed-methods approach to identify which gamification elements would best motivate users when utilizing augmented reality (AR) and non-immersive virtual reality (VR). Data collection methods included a post-test questionnaire that used the System Usability Scale (SUS), Intrinsic Motivation Inventory (IMI), observations, and open-ended interviews. The data collection was conducted at the FORUM Cultural Centre, Miri, with the Kenyah and Kayan communities. It found that a unified device offering both gamified AR and VR experiences was well-received by the community. The final prototype was highly successful, with participants deeming the immersive, gamified elements a valuable and effective means of preserving this indigenous knowledge.

## 1 | Introduction

Sarawak—Malaysia's largest state—is recognized for its diverse ethnic composition and rich tropical biodiversity. Its indigenous communities have inhabited its forests for generations, accumulating extensive ecological knowledge and traditional practices that enhance their daily lives and well-being. In addition to their deep connection with nature, these communities are renowned for their craftsmanship and cuisine, making the region a cultural attraction.

A significant aspect of indigenous knowledge in Sarawak is the use of medicinal plants, which varies across communities depending on their cultural beliefs and accumulated expertise. Although Malaysia's healthcare system is primarily based on modern Western medicine, traditional medicine (TM) has long been integrated into primary healthcare, playing a significant role in medical practices and patient care [1]. In Sarawak, TM is often used alongside conventional healthcare practices to address medical needs [2]. Rural populations, in particular, possess extensive knowledge of herbal medicine due to their long-standing reliance