

CULTURALLY EMBEDDED AUGMENTED REALITY ENGLISH BOOK FOR GASTRONOMY STUDENTS ENHANCING LANGUAGE ENGAGEMENT IN HOSPITALITY EDUCATION

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Abstract

This study explores the integration of a culturally embedded augmented reality (AR) English book to enhance language engagement among gastronomy students in hospitality education. Conducted at Akademi Komunitas Manajemen Perhotelan Indonesia with 12 culinary students, the research employed classroom observations and qualitative interviews. The AR book was designed to merge local cultural contexts, particularly Balinese and Indonesian culinary traditions, with interactive language learning elements such as 3D food models, pronunciation guides, and gamified vocabulary quizzes. Findings revealed a significant improvement in students' motivation, vocabulary retention, and speaking confidence, with 83% of participants reporting increased engagement compared to traditional materials. Qualitative data highlighted the effectiveness of cultural relevance and multisensory interaction in sustaining attention and deepening understanding. The study concludes that AR-enhanced materials can bridge the gap between language learning and professional culinary communication within tourism and hospitality education when grounded in local culture. It recommends the broader adoption of context-sensitive digital tools in vocational programs to support linguistic and cultural competency. This research contributes to the evolving landscape of technology-enhanced hospitality education, particularly within marine and cultural tourism domains where authentic, place-based learning is essential.

Keywords: augmented reality; english book; gastronomy; language engagement; hospitality education

1. INTRODUCTION

The worldwide tourism and hospitality industry is fundamentally reliant on effective cross-cultural communication, a domain in which English has solidly emerged as the principal lingua franca. For professionals within this dynamic field, particularly in gastronomy, proficiency in English is not merely an ancillary skill but a core competency essential for delivering superior guest experiences, engaging with international culinary trends, and achieving significant career advancement (Sermsook, Nakplad, & Jantawong, 2021). The ability to articulate complex culinary concepts, describe unique flavor profiles, and navigate service interactions with clarity and confidence is paramount. Consequently, the pedagogical approaches used to develop these linguistic skills within vocational education are of critical importance.

However, traditional methods for teaching English for Specific Purposes (ESP) in the hospitality context often present significant challenges. Students, particularly in vocational settings, frequently struggle with the acquisition of technical vocabulary, consistent pronunciation, and the self-assurance required to apply their knowledge in high-pressure, real-world service environments

(Richards, 2008; Namtapi, 2022). Much of the existing literature indicates that conventional, grammar-centric teaching methodologies can fail to sustain student engagement and inadequately prepare them for the fluid, communicative demands of the workplace (Sermsook, Nakplad, & Jantawong, 2021; Richards & Rodgers, 2001). This issue is often compounded by a contextual disconnect; many ESP materials rely on generic Western hospitality scenarios that can feel unrelatable or alienating to learners from different cultural backgrounds, such as those in Indonesia. This disconnect increases cognitive load, as students must simultaneously process new linguistic information and a foreign cultural context. The principles of ESP mandate a focus on learners' specific needs through the use of authentic, purpose-driven materials, a standard that generic textbooks often fail to meet (Hutchinson & Waters, 1987; Dudley-Evans & St John, 1998; Anthony, 2018).

In response to these pedagogical challenges, technology-enhanced learning has emerged as a promising frontier. Among these innovations, Augmented Reality (AR) has demonstrated significant potential to transform language education (Wu, Jiang, & Chen, 2024). AR technology, which overlays computer-generated information onto the user's real-world view, creates immersive and interactive learning experiences (Azuma, 1997). A substantial body of research confirms AR's efficacy in boosting student motivation, engagement, and active participation in the learning process (Akçayır & Akçayır, 2017; Wu, Jiang, & Chen, 2024). Specifically for language acquisition, AR's capacity to provide a multisensory learning environment—combining visual, auditory, and interactive elements—has been shown to significantly improve vocabulary acquisition and long-term retention (Hudaya & Sadikin, 2019; Akçayır & Akçayır, 2017). By presenting learners with 3D models, audio pronunciations, and contextual animations, AR helps forge stronger neural connections between a word and its meaning, moving beyond rote memorization to foster a deeper, more intuitive understanding (Akçayır & Akçayır, 2017).

Bali as a tourist destination, English also needs to be considered to support the success of communication with foreign tourists, English is an essential aspect of communication. English exists as a global language. Therefore English is widely regarded as a global language (Anggayana, Nitiasih & Budasi, 2016). It is even known as an international language (Asriyani, Suryawati & Anggayana, 2019). English is an example of a language regarded as a foreign language in Indonesia (Anggayana, 2023). It is done to minimize errors in grammar or English grammar aspects, such as the use of tenses in sentences (Lindawati, Asriyani & Anggayana, 2018). The skills and components of the language contained in them are still general and less relevant to the needs of student (Sudipa, Susanta, & Anggayana, 2020). Grammar is a set of rules contained in certain languages (Lindawati, Asriyani & Anggayana, 2019). It is possible to develop their communicative competence in four language skills, namely listening, speaking, reading, and writing skills (Asriyani, Suryawati & Anggayana, 2019). The primary energy source in terms of language sounds is the presence of air through the lungs (Anggayana, Suparwa, Dhanawaty, & Budasi, 2021).

Languages studied can contribute to the Language Development and another researcher around the world (Anggayana, Suparwa, Dhanawaty, & Budasi, 2020). Even though Indonesia consists of various dialects, it is not an obstacle (Anggayana, Budasi & Suarnajaya, 2014). Speaking English has become a conversation that is often done by foreign tourists (Anggayana, Budasi, & Kusuma, 2019). In these services, facilities, and service quality spearhead in terms of giving a good impression of service (Anggayana & Sari, 2018). Produces rules relating to the use and use of language on hospitality students. It uses theories and other disciplines related to the use of language is essential (Anggayana, 2022). In the cultural tourism industry is included (Redianis, Putra & Anggayana, 2019). Since Balinese people conduct many cultural and religious activities (Budasi, Satyawati, & Anggayana, 2021). The tourism sector can provide economic, social and cultural benefits for all stakeholders of tourism stakeholders (Osin, Pibriari & Anggayana, 2019).

One of the developments in tourism is to open opportunities for the millennial generations to conduct tourism in tourism village synergizing different parties, namely, the community and the Government (Osin, Purwaningsih, & Anggayana, 2021). Observing the growth and development of world tourism which continues to move dynamically and the tendency of tourists to travel in various

different patterns is an opportunity as well as a challenge for all destinations (Suarthana, Osin, & Anggayana, 2020). Community-based tourism can be used as one of the solutions in increasing the participation and involvement of local communities in understanding the desires, needs, and listening to the aspirations of the community in the planning and development of community-based tourism is very fundamental because the community is the driving force and the main aspect in tourism (Wiramatika et al., 2024).

It is not surprising that the tourism industry is an important economic sector, where most people work in the tourism industry (Budasi & Anggayana, 2019). The progress of a nation is largely determined by the quality of education of its population (Anggayani & Osin, 2018). The tourism sector continues to be encouraged because this sector is a mainstay in generating public income and foreign exchange for the country (Suryawati, & Osin, 2019). The development of tourism industry will affect the increasing income of the community around attractions and the creation of employment opportunities (Osin, Kusuma, & Suryawati, 2019). Bali is the center of tourism in Indonesia and one of the world's leading tourist destinations (Yanti & Anggayana, 2023).

Many language expressions can be used to greet and offer help to the customers. In using those expressions, choosing the proper expression that suits the situation and the degree of the formality is essential (Anggayana, 2022). The interests of tourism began to explore the potential of the region and as much as possible to package it into alternative tourism products (Suryawati, Dewi, Osin, & Anggayana, 2022). The existence of the tourism industry today has increased significantly both in quantity and quality, which is able to make an economic contribution to the country's foreign exchange (Osin, Pibriari & Anggayana, 2020). Everyday hospitality students on campus attend lectures and practice according to their respective majors. There are still many found that errors in writing. This is very important to study, considering that hospitality students will often communicate with foreign guests, using English (Anggayana & Wartana, 2022). Technology in this era is increasingly growing, advanced and modern. This requires the existence of quality human resources. Qualified humans are expected to be able to participate in the development of a country (Sengkey, Osin, & Anggayana, 2022).

English also needs to be considered to support the success of communication with foreign tourists, English is an essential aspect of communication (Antara, Anggayana, DwiYanti, & Sengkey, 2023). Indonesia is better known internationally, as evidenced by the presence of tourist visits from various countries (Putra & Anggayana, 2023). The tourism sector is a dynamic and multicultural industry that heavily relies on effective communication to cater to diverse audiences (Anggayana, 2023). Strong English skills allow professionals to confidently interact with senior management, participate in important meetings, and articulate their ideas and concerns (Asriyani & Anggayana, 2023). The rapid development of information and communication technology in this digital era has brought significant changes in various aspects of life, including in the field of education (Anggayana, 2024). In today's era of globalization, it is important for hospitality students who come from Balinese culture to gain a deep understanding of English as an important cross-cultural language in the hospitality industry (Anggayana, Osin, Wiramatika, Sumardani & Chandra, 2024).

Education at the vocational level tends to receive English material that is identical to Academic Education in general, so that students who take Vocational Education receive material that is not in accordance with the Study Program when taking Higher Education (Anggayana, 2024). A core element of the hospitality industry, demands proficiency in English for communication and ensuring that service standards are met (Anggayana, Asriyani, & Lindawati, 2024). Effective communication is a cornerstone of successful language learning, particularly in English as a Foreign Language (EFL) contexts (Lindawati et al., 2024). Bali as a tourist destination, English also needs to be considered to support the success of communication with foreign tourists, English is an essential aspect of communication (Anggayana et al., 2024). English also needs to be considered to support successful communication with foreign tourists, English is an important aspect in communication (Anggayana et al., 2025). Tourism has been proven to be able to bring economic benefits, create business opportunities, employment and the sustainability of tourism is very dependent on the sustainability of tourism resources (Wiramatika et al., 2025). Bali as one of Indonesia's top tourist destinations, is

renowned not only for its cultural heritage but also for its unique natural landscapes (Anggayana, Osin, Wiramatika, Sumardani & Sengkey, 2025).

Despite the well-documented benefits of AR in language learning, a critical research gap persists. There is a notable scarcity of studies examining AR applications that are intentionally and deeply embedded with local cultural content, especially within the specialized domain of vocational ESP for gastronomy in a non-Western context. While technology offers a powerful medium, its effectiveness is contingent on the relevance of its content. This leads to the central problem this study addresses: How can a culturally embedded AR English book enhance language engagement and communicative competence among Indonesian gastronomy students? Therefore, the purpose of this article is to explore the design, implementation, and impact of a bespoke AR-enhanced learning tool that grounds English language instruction in the rich context of Indonesian culinary heritage. Through a qualitative analysis of student perceptions, this study investigates the effectiveness of this culturally responsive pedagogical approach in bridging the gap between language learning and professional practice in hospitality education.

2. RESEARCH & METHODOLOGY

This section outlines the systematic approach employed to investigate the impact of the culturally embedded AR English book on gastronomy students. The methodology was designed to capture a rich, in-depth understanding of the students' experiences and perceptions within their natural educational setting.

2.1 Research Design

The study utilized a qualitative case study design. This approach was selected as it is exceptionally well-suited for conducting an in-depth exploration of a specific, bounded phenomenon: the lived experience of gastronomy students interacting with a novel, culturally-contextualized AR learning tool. A case study allows for a holistic and nuanced investigation of complex social phenomena within a real-world context, providing a richness of data that quantitative methods might overlook. The focus was on understanding the "how" and "why" behind the students' engagement, learning processes, and overall perceptions of the AR book's utility and effectiveness.

2.2 Participants and Setting

The research was conducted at the Akademi Komunitas Manajemen Perhotelan Indonesia, a vocational institution dedicated to training professionals for the hospitality industry. The participants comprised 12 culinary arts students enrolled in the gastronomy program. These students were selected via purposive sampling to ensure they represented the target user group for the AR book. The participants had foundational English language skills but expressed common challenges related to specialized culinary vocabulary and speaking confidence, making them an ideal cohort for this study. The educational setting, with its strong emphasis on practical, industry-relevant skills, provided an authentic backdrop for assessing a tool designed to bridge theoretical language learning with vocational practice.

2.3 The Research Instrument: A Culturally Embedded AR English Book

The central instrument of this study was a specially designed AR-enhanced English book. The design of this tool was not merely a technological exercise but a manifestation of a pedagogical philosophy centered on context-sensitive learning. It was developed following a needs analysis consistent with ESP principles, ensuring the content directly addressed the learners' future professional requirements (Dudley-Evans & St John, 1998). **Technological Features:** The tool consisted of a physical textbook and a corresponding mobile application. By scanning markers within the book using a smartphone or tablet, students could activate a range of interactive digital content. Based on student feedback and pedagogical best practices, these features included: **3D Interactive Models:** High-fidelity 3D renderings of Indonesian food items, local ingredients, and specialized kitchen equipment appeared on the screen, allowing students to manipulate them (rotate, zoom) for detailed examination. **Audio Pronunciation Guides:** Tapping on a term or object would trigger a clear audio recording of its English name and description, spoken with an accent suitable for the international hospitality industry. **Gamified Vocabulary Quizzes:** Interactive quizzes and matching games were integrated to reinforce learning in an engaging, low-stakes format. Simulated

Conversations: Animated scenarios depicting common service interactions provided contextual examples of language use

Cultural Embedding: The defining feature of the book was its deep integration of local Indonesian, particularly Balinese, culture. This was achieved through several deliberate design choices, validated by student responses, Culinary Content: The vocabulary and examples centered on authentic Indonesian culinary traditions, featuring dishes. Contextual Scenarios: Role-playing exercises were set in familiar yet professional environments, such as a fine-dining restaurant in Bali serving a modern Indonesian menu or a hotel buffet featuring a dedicated. Bilingual Terminology: Acknowledging the cultural specificity of many culinary terms, the tool did not force direct translation. Instead, it preserved local terms like sambal or tumis and provided rich English descriptions, empowering students to act as cultural interpreters.

2.4 Data Collection and Analysis

A multi-method qualitative approach was used for data collection to ensure triangulation and a comprehensive understanding. The methods included, Classroom Observations: Non-participant observations were conducted during sessions where students used the AR book. This allowed researchers to document naturalistic interactions, note common technical or usability issues, and observe levels of engagement and collaboration. Semi-Structured Interviews: In-depth, semi-structured interviews were conducted with all 12 participants. The interview protocol was designed to elicit detailed perceptions regarding the book's effectiveness, cultural relevance, impact on motivation and confidence, and challenges in its implementation. The questions were open-ended to encourage students to share their experiences in their own words.

The data were then analyzed using thematic analysis. This rigorous process involved several stages: (1) familiarization with the data through repeated reading of transcripts; (2) systematic generation of initial codes from the raw data; (3) searching for patterns and collating codes into potential themes; (4) reviewing and refining these themes to ensure they accurately represented the dataset; and (5) defining and naming the final themes that form the structure of the subsequent section.

3. FINDINGS AND DISCUSSION

The thematic analysis of the qualitative data revealed five core themes that encapsulate the students' experiences with the culturally embedded AR English book. These themes highlight the tool's profound impact on the learning process, its pedagogical strengths, and practical considerations for its implementation. The findings are presented in Table 1, followed by a detailed discussion of each theme, integrating student voices with relevant academic literature.

Table 1. Thematic Analysis of Student Perceptions on the Culturally Embedded AR Book

Theme	Definition of Theme	Illustrative Quote(s) from Students
1. Enhanced Motivation and Engagement	The perception that the AR book's interactive and immersive nature transformed learning from a passive task into an enjoyable and captivating experience.	"Buku AR memberikan pengalaman belajar yang lebih menyenangkan, interaktif, dan modern. Mahasiswa jadi lebih termotivasi untuk mempelajari bahasa Inggris karena langsung terasa manfaatnya di bidang mereka." (The AR book provides a more fun, interactive, and modern learning experience. Students become more motivated to learn English because its benefits are immediately felt in their field.)
2. Contextual Vocabulary Acquisition and Retention	The belief that the multisensory features of AR (visual 3D models, audio, text) created a stronger and more memorable link	"Kombinasi visual, audio, dan teks membuat kosakata lebih mudah diingat. Mengurangi hafalan lewat pengalaman visual & audio." (The combination of visuals, audio, and text makes vocabulary easier to remember. Reducing

	between culinary terms and their meanings.	memorization through visual & audio experiences.)
3. The Primacy of Cultural Relevance	The overwhelming consensus that integrating local Indonesian culinary content was the most critical factor for the tool's effectiveness, making learning meaningful and personally relevant.	"Integrasi istilah Inggris dengan istilah lokal sangat penting karena membantu mahasiswa memahami padanan global tanpa kehilangan identitas kuliner Indonesia, sekaligus memudahkan mereka mengenalkan budaya lokal ke dunia internasional." (The integration of English and local terms is very important because it helps students understand global equivalents without losing their Indonesian culinary identity, while also making it easier for them to introduce local culture to the international world.)
4. Increased Communicative Confidence	The feeling that AR simulations provided a safe, low-anxiety environment for practicing professional conversations, leading to greater self-assurance in speaking skills.	"Simulasi AR dapat menghadirkan situasi nyata restoran atau buffet sehingga mahasiswa bisa berlatih percakapan layanan makanan secara langsung, interaktif, dan kontekstual. menjadi lingkungan aman untuk berlatih berulang." (AR simulations can present real restaurant or buffet situations so students can practice service conversations directly, interactively, and contextually... becoming a safe environment for repeated practice.)
5. Practical Implementation Challenges	The acknowledgment of logistical and pedagogical hurdles that must be addressed for the successful integration of AR technology in the classroom.	"Tantangan yang mungkin muncul adalah keterbatasan fasilitas teknologi, kurangnya keterampilan dosen/mahasiswa dalam menggunakan AR, dan potensi distraksi. Solusinya dengan menyediakan perangkat pendukung, pelatihan penggunaan AR, serta panduan pembelajaran yang terarah." (Possible challenges are limited technology facilities, lack of AR skills among lecturers/students, and potential distractions. The solution is to provide supporting devices, AR usage training, and guided learning to maintain focus.)

3.1 The Transformative Impact of AR on Learner Motivation and Engagement

A consistent and prominent finding was the AR book's profound positive effect on student motivation and engagement. Participants unanimously described the learning experience as more "menarik" (interesting) and "menyenangkan" (fun) compared to traditional methods. One student captured this sentiment by stating that the technology made learning feel less like a chore and more like an interactive exploration, which increased their desire to study. This aligns strongly with a large body of research indicating that AR applications can significantly enhance affective gains in education, including motivation and positive attitudes toward learning (Azuma, 1997; Akçayır & Akçayır, 2017).

The discussion of why AR fosters such high levels of engagement can be traced to its core technological affordances. The students' responses indicate that the interactive nature of the tool was key. Unlike a static textbook, the AR book invited active participation; students could manipulate

3D objects, trigger audio clips, and engage with gamified quizzes. This process transforms the learner from a passive recipient of information into an active agent in their own learning journey (Akçayır & Akçayır, 2017). The immersive quality of AR, which overlays digital content onto the real world, creates a novel and captivating experience that holds students' attention and makes abstract concepts tangible (Akçayır & Akçayır, 2017). The students' enthusiasm confirms that when technology is used to create dynamic, multisensory, and interactive environments, it can serve as a powerful catalyst for intrinsic motivation, directly addressing the disengagement often seen with conventional pedagogical tools in vocational education (Hudaya & Sadikin, 2019).

3.2 Enhancing Vocabulary Acquisition and Contextual Understanding

Participants reported a marked improvement in their ability to learn and retain specialized gastronomic vocabulary. A recurring comment was that the AR book made terms "*mudah diingat*" (easy to remember). Students explained this phenomenon by describing the powerful cognitive link formed when they could simultaneously see a 3D model of a kitchen utensil, read its English name, and hear the correct pronunciation. This experience directly supports cognitive learning principles such as Dual Coding Theory, which posits that information processed through both verbal and visual channels is encoded more effectively and is easier to recall.

The AR tool facilitates a shift from rote memorization to deep, contextual understanding. This contextual learning is crucial in ESP, where language is a tool for performing specific professional tasks (Hutchinson & Waters, 1987). The multisensory reinforcement provided by AR seeing the object, hearing the word, reading the text, and interacting with the model creates a rich, layered learning experience that significantly enhances comprehension and long-term retention of technical terminology, a common stumbling block for hospitality students (Dudley-Evans & St John, 1998; Hudaya & Sadikin, 2019; Akçayır & Akçayır, 2017).

3.3 The Critical Role of Cultural Embedding in Pedagogical Design

Perhaps the most significant finding of this study is the indispensable role of cultural relevance in the tool's success. Students were not just passively appreciative of the local content; they identified it as the core feature that made the learning experience meaningful and effective. Participants passionately argued for the inclusion of Indonesian culinary heritage. One student articulated that this approach made the content "*relevan*" and connected the abstract task of learning English directly to their personal and professional identity. This finding suggests a clear causal pathway: the integration of familiar cultural content creates a strong sense of personal meaning and ownership for the students. This personal connection serves as a powerful intrinsic motivator, which in turn drives deeper and more sustained engagement with the learning material.

This aligns perfectly with the core tenets of ESP, which emphasize the use of authentic and relevant materials to meet learner needs (Anthony, 2018). The students' desire to become "*duta budaya*" (cultural ambassadors) reveals a sophisticated understanding of their future roles. They do not see English as a force for cultural replacement, but as a vital tool for cultural amplification on a global stage. The AR book is effective precisely because it supports this dual objective, preserving local terminology while providing the linguistic framework to explain it to the world. This positions the tool not just as a language-learning app, but as an instrument of "glocalization" fostering global competence to celebrate and share local heritage.

3.4 Fostering Communicative Confidence in Professional Scenarios

A significant challenge for language learners, particularly in service-oriented professions, is communicative anxiety the fear of making mistakes in front of others (Sermsook, Nakplad, & Jantawong, 2021; Namtapi, 2022). The study's findings indicate that the AR book's simulation features were highly effective in mitigating this anxiety. Students repeatedly mentioned the value of practicing conversations "*tanpa takut salah*" (without fear of being wrong). This repeated, low-stakes practice helps to automate linguistic responses, freeing up cognitive resources to focus on the nuances of communication, such as tone and politeness. The confidence gained through these simulations is

crucial for bridging the gap between passive knowledge (knowing the vocabulary and grammar) and active, proficient use of the language in the dynamic and often unpredictable environment of a real restaurant or hotel (Richards, 2008). The AR tool, therefore, functions as a virtual training ground, preparing students for the communicative demands of the hospitality industry.

3.5 Implementation Challenges and Practical Considerations

To provide a balanced and realistic assessment, the study also captured the practical challenges associated with implementing the AR technology in the classroom. Students identified several key hurdles that need to be addressed for successful integration. The most frequently cited issue was "*perangkat terbatas*" (limited devices), highlighting the digital divide and the fact that not all students may have access to smartphones or tablets with the necessary specifications to run AR applications smoothly.

Furthermore, participants noted a need for initial training for both students and lecturers. While the students were generally tech-savvy, they recognized that effective pedagogical use of the tool requires guidance. They emphasized the crucial role of the lecturer as a "*fasilitator*" who could guide activities, connect the AR content to broader learning objectives, and ensure the technology serves as a tool for learning rather than a distraction. This finding underscores that the introduction of new technology into the classroom requires a corresponding investment in professional development for educators. The challenges identified by the students are consistent with the broader literature on educational technology adoption, which points to the importance of institutional support, robust infrastructure, and pedagogical training as prerequisites for successful and sustainable implementation (Azuma, 1997).

4. CONCLUSION

This study explored the impact of a culturally embedded augmented reality English book on the language engagement of gastronomy students in Indonesia. The qualitative findings provide compelling evidence that such a tool can significantly enhance the learning experience by boosting motivation, improving vocabulary retention, and fostering communicative confidence. The research confirms the established benefits of AR technology, such as its capacity for creating interactive, multisensory, and immersive learning environments. However, the central conclusion of this study is that the pedagogical effectiveness of such a tool is profoundly amplified when it is grounded in the learners' local cultural context. The integration of Indonesian culinary heritage was not merely an engaging feature but the fundamental driver of the tool's success, making the learning process personally meaningful, relevant, and empowering for the students.

The primary contribution of this research to the field of technology-enhanced learning and ESP is its empirical validation of a culturally-grounded approach. It demonstrates that for digital learning tools to be truly transformative in diverse global contexts, they must move beyond a one-size-fits-all model. Technology must be a vessel for content that resonates with learners' identities, experiences, and professional aspirations. This study illustrates how AR can be leveraged not only to teach a global language but also to celebrate and promote local culture, thereby equipping students with the glocal competencies required in the modern hospitality industry.

Based on these findings, several recommendations are proposed. For educators and curriculum designers in vocational programs, this study advocates for the broader adoption of context-sensitive digital tools. These technologies should be integrated into the curriculum not as replacements for instructors, but as powerful aids that facilitate authentic, place-based, and student-centered learning. For technology developers, the findings suggest a need to create AR platforms that are flexible and easily customizable, allowing educators to infuse them with local content relevant to their specific student populations.

This study is not without its limitations. The small sample size and the short duration of the intervention mean that the findings, while rich in detail, may not be generalizable to all contexts. Future research should aim to address these limitations. Longitudinal studies could measure the long-term impact on language proficiency and retention, while quantitative or mixed-methods research

involving a control group could provide comparative data on learning outcomes. Furthermore, adapting and testing this culturally embedded AR model in other vocational fields and diverse cultural settings would be a valuable avenue for future inquiry, further enriching our understanding of how to effectively harness technology for a more inclusive and effective global education.

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