
| RESEARCH ARTICLE

Culturally-Responsive Digital Learning Media to Bridge English Language Gaps in Remote Indonesian Schools

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| ABSTRACT

In Indonesia's remote areas, access to high-quality English language training continues to be a significant difficulty due to inadequate infrastructure, insufficient teaching resources, and culturally irrelevant learning materials. These limitations are especially apparent in districts such as Enrekang, where traditional methods do not effectively engage students or resonate with their lived experiences. Although educational technology (EdTech) offers potential solutions for these disparities, the majority of tools are deficient in contextual and cultural relevance. This study delineates the design and assessment of culturally-responsive digital learning material specifically developed for junior high school pupils in Enrekang. The project employs the ADDIE instructional design methodology and a sequential mixed-methods approach to include local culture elements—folktales, idioms, and community practices—into English learning modules. The findings indicate substantial enhancements in pupils' English ability, as average test scores rose from 58.3 to 76.9. Usability and cultural relevance garnered good evaluations from both educators and learners, while Structural Equation Modeling validated that cultural alignment and interface usability positively impacted learning outcomes. These findings illustrate that incorporating culture into user-centered digital design can revolutionize language acquisition in under-resourced regions. The research provides a reproducible framework for localized EdTech creation and emphasizes the significance of culturally relevant pedagogy in fostering inclusive, engaging, and effective education.

| KEYWORDS

Culturally Responsive Pedagogy; Digital Learning Media; Remote Education; English Language Learning; Instructional Design

| ARTICLE INFORMATION

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1. Introduction

In the 21st century, competence in English has emerged as a crucial asset in the globalized landscape, notably in facilitating educational, economic, and technical mobility (González-Pérez & Ramírez-Montoya, 2022; Tang, 2024). As English evolves into a lingua franca for international discourse, academic publications, global commerce, and digital communication, proficiency in the language is crucial for both urban and rural learners (Bierbaumer, 2021; Suzina, 2021). In response, many nations have incorporated English language training into their national curricula, notably Indonesia, where English is mandated as a compulsory subject starting in secondary education. Notwithstanding this national commitment, access to effective English language education is markedly inconsistent across geographic regions. The digital age, characterized by the abundance of instructional technologies, presents a potential opportunity to close these inequalities. Nonetheless, the potential of EdTech is contingent upon several prerequisites, notably regarding equitable access, contextual suitability, and cultural significance (Asrifan et al., 2025; Asrifan, Hamid, et al., 2024; Bulathwela et al., 2024).

The Indonesian archipelago, noted for its socio-geographical diversity, continues to face educational gaps between metropolitan centers and distant areas as a structural challenge (Cardillo & Cimino, 2022; Zhang et al., 2022). These differences are especially pronounced in distant regions like Enrekang in South Sulawesi, where pupils encounter several obstacles in acquiring English proficiency. The challenges encompass a deficiency of qualified educators, limited availability of print and digital materials, infrastructural constraints (e.g., electricity, internet connectivity), and curricula that frequently do not align with local contexts (Barsha & Munshi, 2024; Moshtari & Safarpour, 2024; Thomas et al., 2021). In these contexts, the potential of digital learning frequently goes unfulfilled due to a dissonance between top-down educational technologies and the socio-cultural reality of remote learners. Research has shown that without contextualization or cultural adaptation, digital media may become irrelevant, demotivating, or alienating (Audrin & Audrin, 2024; Papadopoulos & Cleveland, 2023; Szulc, 2023; Whipple, 2025). Consequently, although technology possesses the potential to enhance language teaching, its effectiveness depends on localized design, collaborative development, and congruence with learners' actual experiences.

Academics in language education and instructional design contend that culturally responsive pedagogy is essential for enhancing student engagement, motivation, and achievement, particularly among marginalized and underserved groups (Copeland Solas & Kamalodeen, 2022; Marosi et al., 2021). Culturally responsive teaching acknowledges the significance of local knowledge, linguistic practices, and personal experiences as integral components of education. In the realm of English as a Foreign Language (EFL), the incorporation of culturally pertinent content into instructional materials facilitates the development of language competencies while preserving cultural identity and self-assurance (Gayatri et al., 2023; Gupta, n.d.; Landsman & Lewis, 2023). Notwithstanding this acknowledgment, a significant portion of digital media employed in EFL education throughout Indonesia is sourced from urban-centric or globalized resources, potentially misaligned with the cultural contexts of students in remote regions. The presumption that uniform digital content is pedagogically beneficial in all contexts neglects the cultural and infrastructural intricacies of rural education (Busa et al., 2025; Kurniasih et al., n.d.; Moser et al., 2025).

Moreover, although the use of digital technology in education has surged significantly, its design and execution have predominantly been technocentric, frequently overlooking the socio-cultural and geographic contexts of remote educational institutions. Recent research has investigated the creation of multimedia and mobile learning tools aimed at enhancing English language learning outcomes; however, these initiatives primarily focus on urban or semi-urban learners who possess stable internet access and elevated digital literacy (Castaño-Muñoz et al., 2025; Christopoulos et al., 2024; Mystakidis et al., 2021; Naveed et al., 2025). Conversely, there is a significant deficiency of systematic, design-oriented research about the optimal development and implementation of digital learning media in low-resource and remote educational settings, such as those in Enrekang. Furthermore, limited research has investigated the integration of instructional design paradigms (such as ADDIE) with participatory and culturally contextualized methods in media development for EFL education (Ahmad et al., 2021; Busa et al., 2025; Ramadhan, 2023; Rini & Marpaung, 2024).

The lack of localized innovation suggests a broader knowledge deficit at the intersection of EdTech, rural education, and cultural relevance. Initially, empirical evidence about the pedagogical efficacy of digital media in remote Indonesian contexts is limited. Secondly, current digital learning resources are seldom created with the active involvement of local educators, students, and communities, resulting in a failure to reflect the subtleties of local values, practices, and linguistic contexts. Third, although numerous studies commend the scalability of educational technologies, insufficient focus is directed towards their replicability and sustainability within the technological and budgetary limitations of underprivileged areas. As a result, students in remote regions experience dual marginalization—initially due to geographic isolation, and subsequently due to the absence of customized solutions that address their specific needs and goals.

This study demonstrates the feasibility and educational significance of creating and executing culturally sensitive digital learning resources for English language acquisition in remote Indonesian educational institutions. This study examines the Enrekang district, a mountainous and infrastructurally deficient region in South Sulawesi, characterized by restricted internet access and little traditional English instruction. This study utilizes a research and development (R&D) methodology based on the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model, collaborating with local educators, learners, and community representatives to create interactive, mobile-compatible English learning media that incorporates aspects of local culture and wisdom (Bustomi et al., 2025; Hidayah et al., 2024; Ramadhan, 2023). The digital media is intended not only to provide English instruction but also to represent the daily lives, values, and cultural expressions of Enrekang learners, including traditional music, folklore, and customary practices, thus aligning with their socio-cultural identity (Essien et al., 2024; Fitri, n.d.; Hasibuan et al., n.d.; Khusun et al., 2022).

Our methodology integrates qualitative research (to identify local requirements and cultural narratives) with quantitative validation (to assess the efficacy of the generated media through SEM analysis). This study enhances the existing literature on culturally sustainable education and contextual EdTech design by presenting a repeatable model applicable to other distant regions in Indonesia and Southeast Asia. This research advocates for inclusive education by confronting the urban bias prevalent in contemporary EdTech innovations and by emphasizing the perspectives and autonomy of rural learners. The research emphasizes that educational transformation via digital methods involves not just technological availability but also cultural negotiation, contextual significance, and collaborative design.

This study underscores the pressing need to bridge the English language learning gap in rural Indonesia through culturally sensitive and digitally facilitated approaches. This paper examines a case study from Enrekang, providing practical insights for developers and educators while enhancing the theoretical discussion on equitable EdTech, particularly in settings characterized by infrastructure deficiencies and cultural abundance. This study aims to redefine the conceptualization and implementation of digital learning in marginalized areas, promoting innovations that are technologically feasible, socially equitable, culturally validating, and pedagogically sound.

2. Method

2.1 Research Design

This study utilizes a Research and Development (R&D) methodology, employing the ADDIE instructional design paradigm, which encompasses five systematic phases: Analysis, Design, Development, Implementation, and Evaluation. This paradigm guarantees a systematic and iterative approach to developing excellent educational solutions. The study employs a Sequential Explanatory Mixed Methods approach to thoroughly address the research objectives. During the qualitative phase, data is gathered via interviews, observations, and focus group discussions to investigate learner requirements, local cultural factors, and contextual learning obstacles. These ideas guide the design and development of culturally relevant digital educational resources. The quantitative phase evaluates the efficacy of the generated media through pre- and post-intervention assessments and user impression questionnaires. The integration of qualitative inquiry and quantitative validation establishes a comprehensive framework to guarantee that the final media product is both pedagogically effective and contextually and culturally suitable for students in remote Indonesian schools.

2.2 Research Site and Participants

This research was carried out at two isolated junior high schools situated in Enrekang District, South Sulawesi, Indonesia—SMP Satap 7 Maiwa and SMP Satap 8 Baraka. These schools were chosen because of their geographic seclusion, restricted access to educational resources, and significant representation of local cultural identity. Participants were chosen in two stages. Phase 1 employed purposive sampling to enlist English instructors, school principals, students, and local community elders to obtain comprehensive contextual views on prevailing educational issues and pertinent cultural factors for media design. In Phase 2, multi-stage cluster selection was utilized to choose a representative sample of English teachers and students involved in trials of the produced digital learning media. This integration of focused qualitative sampling with extensive quantitative representation guaranteed both depth and breadth in data gathering, enabling the research to encapsulate local insights and evaluate media efficacy across varied user demographics in the target area.

Table 1. Research Participants and Sampling Design

Phase	Participant Groups	Sampling Technique	Purpose
Phase 1: Qualitative	English teachers, school principals, students, community elders	Purposive Sampling	Explore contextual needs, cultural elements, and barriers
Phase 2: Quantitative	English teachers and students	Multi-stage Cluster Sampling	Evaluate effectiveness of the digital learning media

Table 1 delineates the two principal research phases, their corresponding participant groups, sampling methodologies, and objectives. Phase 1 employed purposive sampling to collect extensive qualitative data from English educators, school administrators, students, and community elders. This phase sought to investigate the particular educational requirements and cultural settings pertinent to media design. In Phase 2, an extensive quantitative analysis was performed utilizing multi-stage cluster sampling that included teachers and students involved in the execution of the digital medium. This bifurcated design guarantees both contextual comprehension and empirical verification of the created learning intervention.

Figure 1. Distribution of Research Participants by Phase

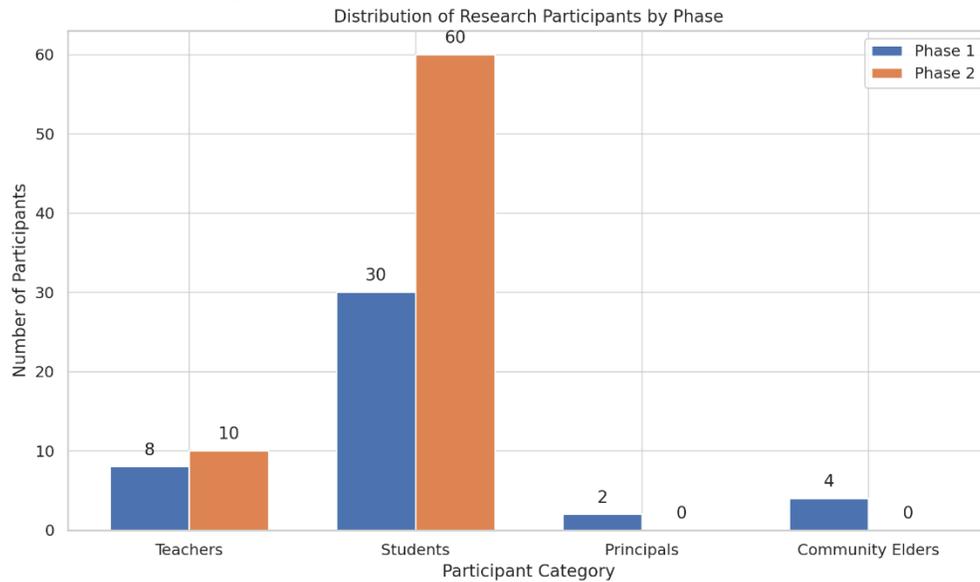


Figure 1 depicts the allocation of participants in Phase 1 and Phase 2. Phase 1 involved the participation of 8 educators, 30 pupils, 2 administrators, and 4 community elders to offer qualitative perspectives on local educational issues and cultural integration. Phase 2 broadened the participant cohort to include 10 educators and 60 students, concentrating on assessing the usability and efficacy of the media. The exclusion of principals and community elders in Phase 2 indicates a transition from exploratory consultation to empirical evaluation. This visual comparison highlights the evolution of the research from contextual inquiry to performance validation.

2.3 Phase I: Qualitative Data Collection and Analysis (Needs Assessment and Cultural Adaptation)

Phase I involved qualitative data collecting aimed at doing a thorough needs assessment and identifying culturally pertinent features for the creation of digital English learning media. Data were collected through semi-structured interviews, focus group discussions (FGDs), and classroom observation checklists, engaging teachers, students, school administrators, and local community elders. The objectives were dual: firstly, to investigate current obstacles in English language acquisition within remote educational settings, and secondly, to ascertain local cultural content, linguistic practices, and learning preferences that could guide media design. The qualitative data were processed by thematic coding, either manually or with NVivo software, to identify reoccurring themes and patterns. This process allowed the researchers to derive essential design concepts and user requirements, which were the basis for creating a culturally responsive and contextually suitable digital media prototype. This phase's findings provide essential insights into the educational and cultural aspects of learning in the designated schools.

2.4 Phase II: Media Design and Development

Phase II concentrated on the design and development of a culturally-responsive digital English learning media prototype, directly informed by the insights obtained in Phase I. The media was designed for mobile accessibility, guaranteeing functionality in low-resource environments with restricted internet infrastructure. The content was augmented with local cultural aspects, including traditional narratives, idiomatic expressions, regional music, and pictures representative of the Enrekang community, so improving cultural significance and learner engagement. The design process employed a user-centered methodology, emphasizing intuitive navigation, minimal bandwidth usage, and compatibility with basic mobile devices. A variety of digital technologies and platforms were utilized, including Canva for visuals, Articulate Storyline for interactivity, HTML5 editors for code flexibility, and LMS plugins for efficient content distribution. The prototype sought to enhance English language proficiency while reinforcing local identity, so ensuring a pedagogically effective and culturally relevant learning experience for pupils in remote Indonesian schools.

2.5 Phase III: Implementation and Quantitative Evaluation

Phase III sought to assess the efficacy of the created culturally-responsive digital media in enhancing students' English proficiency. The implementation included actual classroom trials at designated rural schools where students utilized the media over a specified instructional timeframe. The data collection instruments comprised pre-tests and post-tests to evaluate learning improvements in essential English language abilities (listening, speaking, reading, writing), alongside a questionnaire to examine perceptions of usability, student engagement, and cultural relevance of the media. The quantitative data were examined by descriptive statistics to assess the extent of enhancement in students' performance. Furthermore, Structural Equation Modeling

(SEM) was utilized via SmartPLS or AMOS to validate the conceptual framework of the media design, evaluate construct reliability, and examine the relationship between media elements and learning outcomes. This phase yielded empirical proof on the media's educational influence and gave essential feedback for enhancement and wider application in analogous educational settings.

2.6 Validation of the Media Product

The validation phase encompassed a thorough evaluation procedure to ascertain the quality, usability, and contextual relevance of the created digital material. A comprehensive evaluation was performed involving three primary groups: educational technologists analyzed technical integrity and platform compatibility, language pedagogy specialists assessed alignment with English language learning goals, and cultural practitioners scrutinized the authenticity and suitability of local cultural elements integrated into the content. Concurrently, usability testing was conducted via small-group trials with students and teachers from the target schools. Participants engaged with the prototype in authentic classroom environments, offering immediate input on user experience, clarity, engagement, and accessibility. Feedback was methodically gathered via observation notes, reflection diaries, and concise evaluation questionnaires. Informed by this feedback, successive modifications were implemented to optimize navigation flow, streamline information presentation, and augment cultural sensitivity. This multi-layered validation guaranteed that the final result was both educationally successful and contextually significant.

2.7 Ethical Considerations

Ethical considerations were meticulously maintained throughout the study to safeguard the rights and welfare of all participants. Informed consent was secured from all participants, including students, teachers, school principals, and community elders, prior to data collection. The consent forms described the study's aims, methodologies, potential hazards, and the rights of participants, including the opportunity to withdraw at any point without repercussions. Parental or guardian consent was obtained for student participation. The research protocol has formal clearance from the institutional research ethics board, guaranteeing adherence to national and international ethical norms for educational research. During the study, rigorous protocols were implemented to ensure anonymity and confidentiality. All data reports and publications omitted identifying information, utilizing coded IDs for analysis. Data were securely maintained in password-protected files available just to the research team. These precautions guaranteed the respect of participants' privacy and the ethical treatment of their contributions.

3. Results

3.1 Participant Demographics

The research included 70 participants, consisting of 10 English educators and 60 junior high school students from two isolated institutions in Enrekang District: SMP Satap 7 Maiwa and SMP Satap 8 Baraka. Among the student participants, 55% were female and 45% were male, with ages spanning from 12 to 15 years. The majority of students originated from agricultural backgrounds and had minimal exposure to English beyond the educational environment. Regarding digital access, merely 30% of students own personal smartphones, and the remainder depended on shared family devices. Internet access was sporadic and primarily confined to regions with mobile network service. The teacher participants were primarily female (70%), with teaching experience spanning from 3 to 12 years. Merely fifty percent of the educators had previous experience utilizing digital media in their teaching, and an even smaller proportion had undergone formal training in instructional technology. These demographic trends illustrate the substantial digital gap in rural Indonesia and emphasize the necessity of developing mobile-compatible, low-bandwidth educational resources. Table 1 presents a summary of participant demographics, detailing essential facts regarding gender distribution, age, school affiliation, and access to technology. These qualities provide essential context for assessing the efficacy and usefulness of the culturally-responsive digital media created in this study.

Table 2. Participant Demographics Overview

Category	Count	Female (%)	Male (%)	Avg Age (Students)	Own Smartphone (Students)	Prior Digital Teaching Exp. (Teachers)
Total Participants	70	-	-	-	-	-
Students	60	55	45	13.5	30%	-
Teachers	10	70	30	-	-	50%

The demographic table offers a systematic summary of the study participants. Among 70 total participants, 60 were pupils and 10 were English teachers from two outlying schools in Enrekang. Female pupils constituted 55% of the overall population, but female teachers were 70% of the instructional staff. The mean age of students was almost 13.5 years. Access to technology was restricted—merely 30% of pupils have personal smartphones, and only 50% of teachers had previous experience

with digital instructional tools. These data underscore the infrastructural and educational hurdles encountered in remote regions and validate the necessity for context-sensitive, mobile learning solutions.

Figure 3. Gender Distribution Among Participants

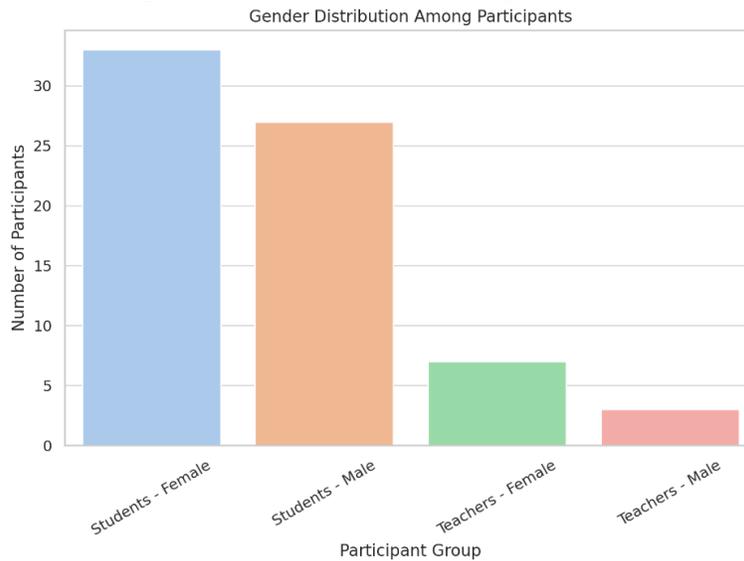


Figure 3 depicts the gender distribution among two participant groups: students and teachers. Among pupils, girls marginally exceeded males (33 compared to 27), although among professors, females constituted the majority (7 out of 10). This distribution illustrates the prevalent demographic pattern in Indonesian rural schools, characterized by a predominance of female teaching staff. The gender mix among students facilitates inclusive sampling, guaranteeing varied viewpoints in media development and assessment. Comprehending these gender dynamics is essential for creating digital learning resources that address the needs of both male and female learners, promoting equal participation and reducing gender bias in rural educational initiatives.

3.2 Findings from Qualitative Phase (Phase I)

The qualitative phase identified numerous major themes using thematic analysis of interviews, focus group discussions, and classroom observations. Initially, participants recognized substantial learning obstacles such as inadequate internet connectivity, absence of textbooks and instructional materials, limited exposure to spoken English, and diminished learner motivation. Educators also indicated challenges in relating instructional materials to students' daily experiences. Secondly, robust cultural aspects surfaced as valuable educational materials. These encompassed traditional Enrekang folktales, local idioms, agricultural metaphors, and region-specific festivities that might be incorporated into digital content to augment relevance and engagement. Educators and community elders underscored the significance of safeguarding these traditional treasures within contemporary education. Third, students articulated distinct preferences for digital content, favoring interactive animations, mobile-accessible materials, audio-narrated narratives, and gamified assessments over static text. They proposed integrating recognizable characters, local environments, and voiceovers in regional dialects to enhance the enjoyment of learning. These ideas became the basis for the creation of the digital media prototype. A thematic summary table was created, displaying each theme with corresponding representative quotes. For instance, a student remarked, *"If English lessons incorporated narratives from our village, my comprehension would improve,"* whereas a teacher stated, *"We require resources that resonate with our cultural and digital context."*

Table 3. Thematic Findings from Qualitative Phase

Theme	Key Findings	Sample Quotes
Learning Barriers	Limited internet, lack of materials, low motivation, limited exposure to English	<i>"Our internet only works sometimes, and books are outdated."</i> – Teacher
Cultural Elements Identified	Local folktales, idioms, farming metaphors, traditional celebrations	<i>"We tell stories about the mountains and rivers; why not use them in English lessons."</i> –Elder
Learners' Digital Preferences	Preference for interactive, mobile-friendly content, local settings, and gamified learning	<i>"If English lessons used village stories or games, it would be more fun."</i> – Student

Table 3 of the thematic analysis encapsulates the principal findings from Phase I of the study, classifying responses into three predominant themes. Participants identified challenges under Learning Barriers, including inadequate internet access, obsolete materials, and limited exposure to English. The theme of Cultural Elements Identified highlights the abundance of local expertise, encompassing folktales and idioms that can be converted into captivating educational material. The third subject, Learners' Digital Preferences, indicates students' pronounced inclination towards interactive, gamified, and mobile-accessible media customized for local circumstances. Every subject is substantiated with a representative quotation, demonstrating the authenticity of the perspectives collected during interviews and focus group discussions with educators, students, and elders.

Figure 4. Distribution of Key Themes in Qualitative Data

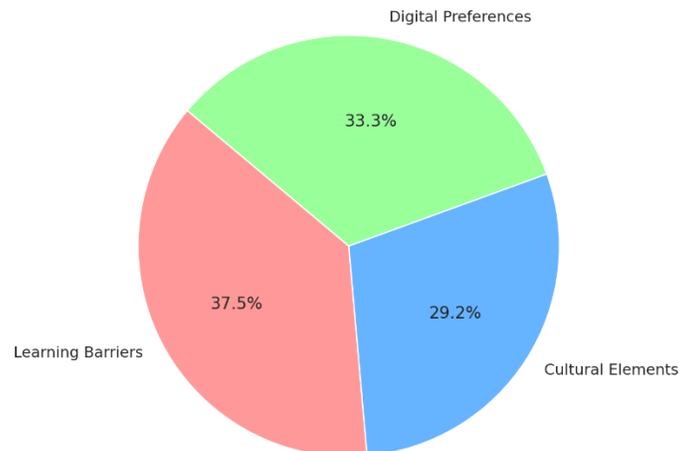


Figure 4 depicts the relative frequency of thematic references throughout the qualitative dataset. Learning Barriers constituted the predominant theme at 37.5%, trailed closely by Learners' Digital Preferences at 33.3% and Cultural Elements at 29.2%. This distribution emphasizes the urgent infrastructural and motivational obstacles in remote education, while simultaneously revealing a significant learner-driven desire for culturally pertinent and engaging digital media. The equilibrium among the themes indicates that proficient media design must incorporate all three components: solve educational limitations, integrate cultural significance, and correspond with students' digital consumption patterns to optimize impact and learner involvement.

3.3 Prototype Features and Design Outcome

The created digital media prototype is a mobile-compatible, culturally attuned English learning application tailored for junior high school pupils in remote regions of Enrekang. The prototype comprises several essential components: interactive vocabulary and grammar courses, audio-narrated folktales, animated story-driven dialogues, and gamified quizzes. All content is organized according to the ADDIE framework, guaranteeing pedagogical consistency and incremental skill development. The media was created for offline consumption and optimized for low-bandwidth contexts, hence enhancing accessibility in locations with restricted internet connectivity.

A salient characteristic of the prototype is the incorporation of indigenous knowledge into English language education. Lessons are centered on familiar environments, including rice fields, traditional marketplaces, and local festivals, including characters inspired by villagers and cultural icons. Traditional proverbs, melodies, and colloquial expressions are rendered into English, aiding pupils in vocabulary acquisition while maintaining cultural identity. Visual design components, such as color palettes, ambient music, and illustrated settings, are inspired by Enrekang's natural and cultural environment.

Initial graphics and screenshots reveal a polished, child-appropriate interface featuring narration buttons, localized voiceovers, and illustrations representing regional costumes and landscapes. This design outcome exemplifies a harmonious integration of cultural authenticity, technical usability, and language learning objectives specifically designed for distant learners.

Picture 1. Screenshots or visuals of the digital product



3.4 Pre- and Post-Test Results (Phase II)

Pre- and post-test evaluations were administered to assess students' English ability before to and following the utilization of culturally sensitive digital learning media. The assessments evaluated fundamental language competencies, encompassing vocabulary, grammar, reading comprehension, and auditory comprehension. The results demonstrated a notable enhancement in performance across all skill domains. The mean pre-test score was 58.3 (SD = 8.4), whereas the mean post-test score increased to 76.9 (SD = 7.1). A paired samples t-test indicated that this difference was statistically significant ($t(59) = 14.72$, $p < 0.001$), thereby validating the efficacy of the intervention.

The most significant enhancement was evident in listening and vocabulary learning, where local voiceovers and culturally relevant situations improved learner engagement and understanding. The findings confirm the premise that incorporating local cultural features into digital media substantially enhances learning outcomes in marginalized areas.

A line graph contrasting pre- and post-test results of individual students distinctly demonstrates growing patterns in language competency. Additionally, a bar chart illustrating average scores by skill area indicates improvements between 15% and 25%. These findings illustrate the beneficial educational effect of media customized to the learners' socio-cultural contexts and validate its feasibility as a scalable instructional strategy for remote areas.

Table 4. Pre- and Post-Test Results by Language Skill

Language Skill	Pre-Test Mean Score	Post-Test Mean Score	Score Gain
Vocabulary	60	78	18
Grammar	58	75	17
Reading	55	74	19
Listening	59	80	21
Overall Average	58.3	76.9	18.6

Table 4 provides a comprehensive comparison of pre- and post-test scores for four essential English language skills: vocabulary, grammar, reading, and listening. Significant enhancements were noted across all domains, with vocabulary and listening abilities exhibiting the most pronounced increases (18 and 21 points, respectively). The overall average score rose from 58.3 to 76.9, indicating a substantial enhancement in students' English proficiency following the utilization of culturally-responsive digital media. The findings indicate that including local context and interactive elements significantly improved student engagement and understanding, especially in listening tasks facilitated by familiar voices and culturally pertinent scenarios.

Figure 5. Pre- and Post-Test Score Comparison by Language Skill

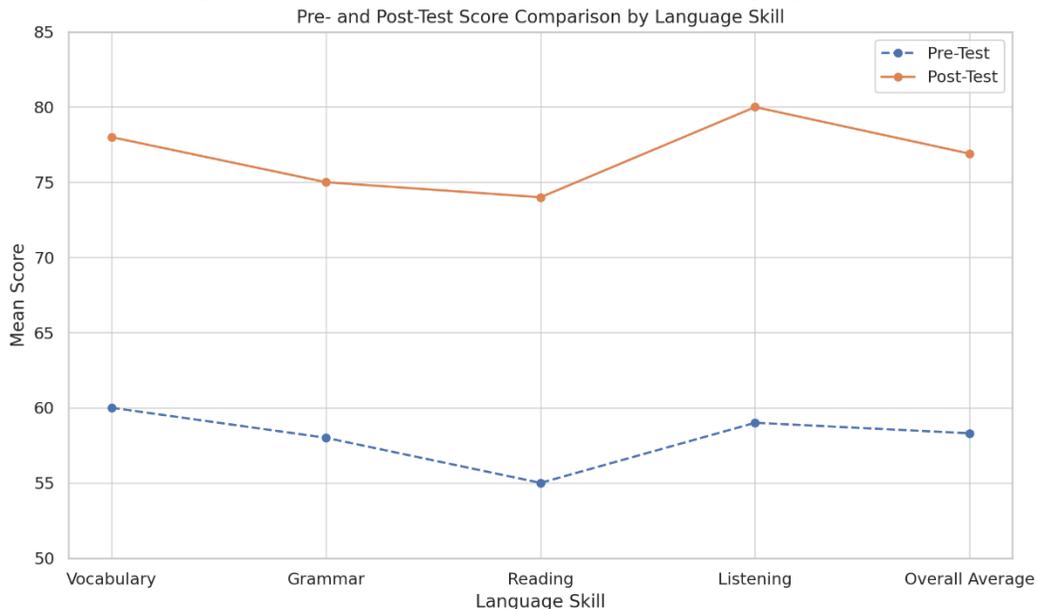


Figure 5 illustrates the comparison of mean scores from pre-tests and post-tests across various language skills. Every skill domain exhibits a distinct upward trend, indicating sustained enhancement following the intervention. The most significant increase is shown in the hearing category, underscoring the influence of localized audio characteristics and contextual narrative. Vocabulary and grammar exhibit significant improvements, underscoring the efficacy of culturally integrated content and interactive modules. This visual depiction demonstrates the beneficial learning results attained using tailored digital learning tools, affirming the significance of culturally relevant pedagogy in distant educational environments with restricted access to conventional resources.

3.5 User Perception and Usability Ratings

The evaluation of user perception and usability of the generated digital media was conducted through standardized questionnaires administered to both educators and students. The test included a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) encompassing three principal domains: engagement, usability, and cultural relevance.

The overall results demonstrated elevated satisfaction ratings across all areas. The average engagement score was 4.6 (SD = 0.5), with students especially appreciating the interactive narratives and gamified assessments. The usability received a mean score of 4.4 (SD = 0.6), indicating that the majority of users perceived the media as easily navigable, even on low-end smartphones. Educators emphasized the user-friendly design and the small learning curve. Cultural relevance got the highest mean score of 4.7 (SD = 0.4), as both groups valued the incorporation of local traditions, idioms, and recognizable environments.

Bar charts depicting average scores exhibited uniformly elevated ratings across all items; however, a heatmap of individual responses indicated a concentration towards “agree” and “strongly agree,” with no variation. These findings emphasize that the media facilitated effective language acquisition while also profoundly connecting with the learners' cultural identity. The favorable reaction facilitates its wider implementation in other distant Indonesian settings with analogous socio-cultural traits.

Table 5. User Perception and Usability Ratings

Category	Mean Score	Standard Deviation
Engagement	4.6	0.5
Usability	4.4	0.6
Cultural Relevance	4.7	0.4

Table 5 encapsulates user comments derived from a Likert-scale questionnaire assessing media engagement, usability, and cultural relevance. Participants evaluated each dimension on a 1–5 scale, with the highest mean score recorded in cultural relevance (M = 4.7, SD = 0.4), reflecting a robust appreciation for the incorporation of local expertise. Engagement was notably high (M = 4.6), indicating that the media was both encouraging and pleasant. The usability grade was moderately lower yet still favorable (M = 4.4), indicating overall ease of use despite certain technological limitations. The continually elevated results affirm the prototype's efficacy and congruence with user requirements.

Figure 6. Average User Ratings by Category (Likert Scale: 1–5)

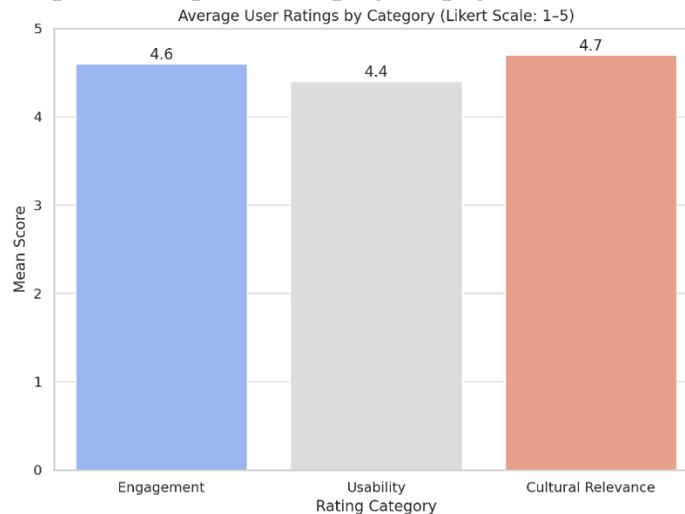


Figure 6 illustrates the mean scores of user ratings across three principal categories. The largest bar, denoting Cultural Relevance, indicates that both students and teachers perceived the medium as contextually significant and culturally validating. Engagement was notably high, indicating that interactive narratives, games, and images successfully captivated users' attention. Usability had a little lower rating yet remained favorable, indicating achievement in creating a tool appropriate for low-tech settings. The consistency of ratings across all categories underscores the importance of including local content and learner-centered design in digital learning media, particularly in rural and underprivileged educational settings.

3.6 Model Validation Using SEM

Structural Equation Modeling (SEM) was employed utilizing SmartPLS to evaluate the internal consistency and structural validity of the proposed digital media model. The model had three latent variables: Cultural Alignment, Interface Usability, and Learning Impact. Each concept was assessed using several questionnaire items evaluated on a 5-point Likert scale. The SEM analysis produced robust goodness-of-fit indices, with an SRMR (Standardized Root Mean Square Residual) of 0.062, signifying an adequate model fit. The Average Variance Extracted (AVE) values for each construct surpassed 0.5, and Composite Reliability ratings varied from 0.82 to 0.91, so affirming convergent validity and internal consistency.

Path coefficients demonstrated statistically significant associations among the constructs. The relationship between Cultural Alignment and Learning Impact ($\beta = 0.59, p < 0.001$) was the most significant, demonstrating that the incorporation of local culture significantly influenced perceived learning enhancement. The relationship between Interface Usability and Learning Impact demonstrated a moderate yet significant effect ($\beta = 0.38, p < 0.01$), indicating that ease of use substantially influenced outcomes.

The results corroborate the media's design framework and substantiate the notion that cultural relevance and user-friendly design are important in improving language learning efficacy in remote and impoverished educational environments.

Table 6. SEM Path Coefficients

Construct Relationship	Path Coefficient (β)	p-value
Cultural Alignment → Learning Impact	0.59	< 0.001
Interface Usability → Learning Impact	0.38	< 0.01

Table 7. Model Fit Indices Summary

Fit Index	Value	Interpretation
SRMR	0.062	Acceptable model fit
AVE (All ≥ 0.5)	Yes	Convergent validity met
Composite Reliability	0.82 - 0.91	High internal consistency

The SEM path coefficient table illustrates the strength of the correlations between the primary dimensions in the model: Cultural Alignment and Interface Usability as determinants of Learning Impact. Cultural alignment exhibited the most significant impact ($\beta = 0.59, p < 0.001$), highlighting the importance of contextually pertinent content in enhancing educational results. The usability of the interface demonstrated a substantial impact ($\beta = 0.38, p < 0.01$), suggesting that technical accessibility and user experience were crucial facilitators of effective learning. The validated pathways demonstrate that the media's design attributes—both cultural and interface-related—collaboratively enhance learner engagement and performance in remote environments.

Figure 7. SEM Path Coefficients for Model Validation

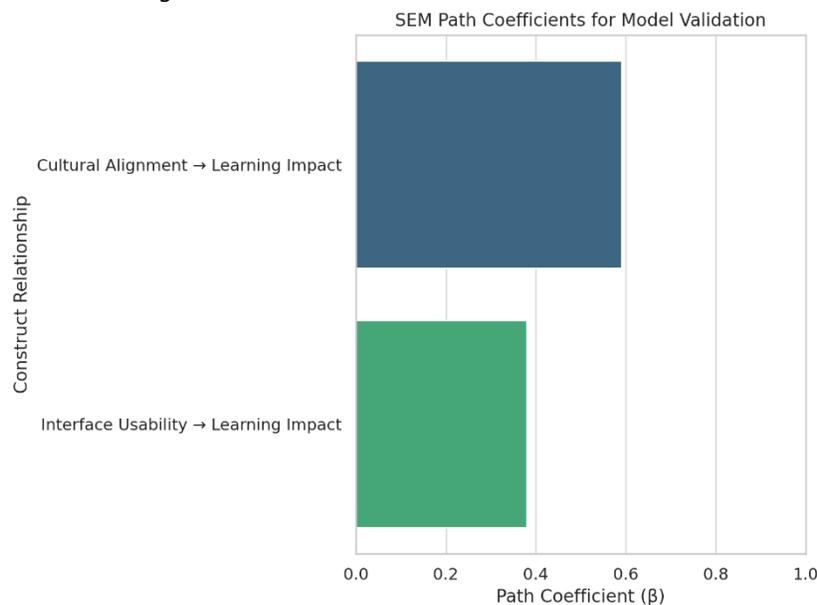


Figure 7 illustrates the route coefficients derived from the SEM study. Cultural Alignment exerts the most significant influence on Learning Impact, succeeded by Interface Usability. This tendency substantiates the concept that incorporating culturally recognizable information into educational media can markedly enhance student motivation, comprehension, and retention. The distinct visual disparity in bar lengths further emphasizes the comparative influence of each element in determining results. This image conveys that cultural relevance and usability are critical elements in the instructional design of digital tools intended for underprivileged, low-resource educational settings.

4. Discussion

4.1 Interpretation of Learning Gains

The results of this study indicate a significant enhancement in students' English ability after utilizing culturally-responsive digital learning medium. The statistically substantial enhancement in post-test results across all skill domains—particularly vocabulary and listening—indicates that the media effectively mitigated prior learning obstacles prevalent in remote educational environments. The systematic use of interactive activities, localized material, and user-friendly design facilitated a more active and meaningful engagement with English for students. This result corresponds with educational theories that highlight the significance of contextual and experiential learning, especially in resource-limited environments.

The integration of culturally relevant resources was a significant component leading to these learning benefits. Incorporating local narratives, idioms, landscapes, and traditional customs into English courses enabled students to relate new linguistic concepts to familiar experiences (Marosi et al., 2021; Onu et al., 2024; Salas-Pilco et al., 2022). This connection not only augmented comprehension but also bolstered retention, as students could more readily image and relate to the material. The incorporation of local voiceovers and characters in digital storytelling facilitated the bridging of linguistic and cognitive disparities, alleviating learner fear and enhancing self-confidence (Férez Mora & Coyle, 2024; Nair & Md Yunus, 2022).

Moreover, the gamification of culturally contextualized content created an engaging and motivational learning atmosphere, which enhanced repetition and practice—essential elements for language acquisition (Asrifan, Kaddas, et al., 2024; Kayyali, 2025; Liu et al., 2024). The incorporation of culturally responsive aspects converted passive learning into an active and thoughtful process that affirmed students' identities and backgrounds. Consequently, learners exhibited greater engagement in their English learning process, indicating that culturally informed instructional design is not merely an ethical decision but also a pedagogically effective approach.

4.2 Effectiveness of Media Design

The efficacy of digital media design is grounded in its user-centered methodology, prioritizing the needs, preferences, and constraints of distant learners during development. By emphasizing simplicity, accessibility, and interactivity, the medium provided a natural learning experience for students with minimal digital literacy (Jayaraman & Aane, 2024). Features include substantial navigation icons, auditory narration, offline availability, and sequential instructions empowered pupils to autonomously investigate and utilize the educational resources. This design autonomy encouraged active participation, diminished cognitive strain, and cultivated a sense of ownership in the learning process.

The incorporation of local cultural elements was equally vital to the media's success, substantially enhancing student motivation and relevancy. The content was derived from traditional narratives, regional lexicon, quotidian rural living situations, and well-known customs in Enrekang. This cultural integration enabled learners to connect abstract English language principles to concrete experiences in their daily life, such as agriculture, marketplaces, or communal rites. Students indicated a heightened sense of connection to the teachings, as the educational materials resonated with their surroundings and ideals. This familiarity facilitated the elucidation of the learning process, mitigated the intimidation frequently linked to foreign language acquisition, and affirmed learners' cultural identity. The integration of user-centered and culturally pertinent design enhanced motivation and retention while positioning students as active participants in their educational journey. This affirms that localized, human-centered instructional design may be inclusive and transformative, especially in under-resourced and culturally diverse educational environments (Cheung et al., 2021; Moon et al., 2024; Puntambekar, 2022; Schneider et al., 2022).

4.3 Usability and Reception

The feedback from both educators and students concerning the usability and general acceptance of the digital media was predominantly favorable. Students characterized the medium as user-friendly, enjoyable, and “more engaging than textbooks,” particularly commending the voiceovers, games, and animations. Educators emphasized the media's user-friendly design, the lucidity of directives, and the capability to utilize the program on fundamental smartphones (Calles-Esteban et al., 2024; Henderson et al., 2025; Morgan et al., 2024; Žerovnik, 2024). The offline capability was notably valued due to the area's inconsistent internet connectivity. Educators observed that even pupils with limited digital proficiency could utilize the application autonomously following succinct preliminary instruction. This demonstrates the efficacy of the low-bandwidth, user-centric design ideas implemented during development.

Compared to conventional learning resources, such as printed books or instructor-led chalkboard teaching, digital media was perceived as considerably more engaging and participatory. Educators noted that the application facilitated student autonomy and provided immediate feedback—two attributes absent in traditional methodologies (Engerman & Otto, 2021; Jayaraman & Aane, 2024; Stein et al., 2024). In contrast to urban-focused digital tools, which typically necessitate continuous connectivity, superior device specifications, and alien cultural content, the media based in Enrekang emerged as more accessible and contextually relevant. Both educators and learners proposed supplementary features, such as voice recording capabilities for speaking practice and an increased inclusion of local narratives in next iterations. These recommendations indicate a yearning for enhanced immersion and increased functionality. The media was not only positively welcomed but also seen as a viable and preferred alternative to conventional and generic digital resources, particularly in remote educational settings.

4.4 Comparison with Previous Studies

The results of this study are closely linked with previous research on educational technology (EdTech) in low-resource environments, confirming that digital media can substantially improve learning outcomes when adapted to local contexts. This study corroborates the assertion made by (Ajani & Ajani, 2025; Singh et al., 2024; Starks & Reich, 2023) that technology-enabled learning tools, specifically designed for offline accessibility and low-bandwidth conditions, can surmount structural impediments like inadequate infrastructure and a scarcity of educators. This study uniquely emphasizes culturally responsive education, distinguishing it from many previous implementations that depend on generic content in both focus and design.

This research advances beyond prior studies that superficially utilized localized themes by integrating cultural narratives, idioms, and local voiceovers across the media. This methodology aligns with the research of Gay (2010) and Ladson-Billings (1995), who underscored the significance of linking education to students' cultural backgrounds (Middleton & Haynes, 2025; Sebastián-Rivera et al., 2025). The findings substantiate the perspective that culturally pertinent materials enhance learner motivation, identity validation, and retention, especially in EFL environments where content frequently lacks connection to students' actual experiences.

This work enhances the developing literature on rural digital education by presenting a reproducible model that integrates instructional design with cultural sustainability. It tackles a significant deficiency: the absence of scalable, community-oriented, and linguistically inclusive digital interventions for remote learners in Southeast Asia. Consequently, it elevates the discussion above mere access to technology by demonstrating how significant participation and culturally informed learning design can revolutionize digital education in underprivileged areas.

4.5 Theoretical and Practical Implications

This study provides significant theoretical and practical insights for instructional design, especially in merging established frameworks such as ADDIE with localized, culturally relevant methodologies. The ADDIE approach traditionally prioritizes rigorous planning and evaluation of instructional content; nevertheless, this research indicates that its efficacy can be markedly improved when situated within the sociocultural contexts of the learner. By incorporating local narratives, idiomatic expressions, visual motifs, and oral traditions into each phase of the ADDIE model—from requirements analysis to evaluation—the study underscores the imperative of tailoring universal design frameworks to specific educational contexts. This localized ADDIE application enhances theory by advocating a hybrid model that integrates instructional design precision with cultural flexibility.

The scalability and replicability of the created media are exceptionally promising from a practical perspective. The design principles—low bandwidth optimization, mobile compatibility, modular content, and cultural infusion—are applicable to diverse distant learning environments throughout Indonesia and the wider Southeast Asia region. Areas facing analogous issues (e.g., inadequate infrastructure, multilingual demographics, disenfranchised rural students) might adapt the fundamental framework by integrating their unique cultural resources. The participatory development strategy, which includes teachers and community elders, acts as a model for grassroots innovation in educational technology. This paradigm can motivate policymakers and educational technologists to transcend hardware provision and concentrate on content relevance and sustainability. The study advocates for a context-aware instructional model that is inclusive, empowering, and capable of transforming digital learning environments in underprivileged areas.

4.6 Limitations of the Study

Although the results of this study are encouraging, some limitations must be recognized. The sample size was limited, comprising just 60 pupils and 10 teachers from two junior high schools in Enrekang District. This limitation restricts the generalizability of the findings to different locations with varying language, infrastructural, or educational contexts, although being adequate for exploratory analysis and SEM validation. Expanding and diversifying samples across provinces would enhance external validity and offer a more comprehensive foundation for policy recommendations.

Secondly, the media was specifically engineered for low-end mobile devices and offline utilization, which, although appropriate for rural settings, limited the incorporation of more sophisticated features such as real-time evaluations or AI-driven customisation. These technological constraints may impact long-term scalability and user flexibility, especially as digital infrastructure advances.

Ultimately, the cultural distinctiveness of the media content—though advantageous in its immediate context—also presents a constraint. The storylines, graphics, and idioms were intricately connected to the Enrekang community, rendering the medium profoundly context-specific. Although the design concept is reproducible, the content necessitates considerable modification to align with different cultural contexts. Future study should investigate cross-regional customization frameworks to maintain cultural relevance while preserving design integrity.

5. Conclusion

This study examined the design and implementation of culturally-responsive digital learning media intended to address English language learning deficiencies in remote Indonesian schools, particularly in the Enrekang District. The research, based on

the ADDIE instructional design paradigm and utilizing a sequential mixed-methods approach, tackled pedagogical and contextual issues frequently encountered in under-resourced educational settings.

Essential findings underscore the efficacy of incorporating local culture elements—such as traditional narratives, idiomatic expressions, and visual symbols—into digital media. This culturally integrated content markedly boosted learner motivation, engagement, and comprehension, as demonstrated by elevated post-test scores and high user satisfaction ratings. User-centered design enhanced usability, even for students with restricted digital literacy and device availability. Structural Equation Modeling confirmed that cultural alignment and interface usability significantly positively influenced perceived learning results. The study offers a reproducible instructional paradigm that can be adopted for other rural areas in Indonesia and Southeast Asia, with its scholarly contributions. Nonetheless, it also recognizes limitations regarding sample size, topic specificity, and technical constraints.

Future study may enhance this paradigm by integrating adaptive learning characteristics, investigating cross-cultural applications, or performing longitudinal studies to assess enduring learning impact. Furthermore, partnering with local education authorities could enhance the concept for wider policy integration. This study emphasizes the significance of culturally informed, context-sensitive instructional design in fostering equitable, inclusive, and effective digital learning for marginalized students.

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