Designing an Interactive Media Application for Tidung Ethnic Language Learning Through the ADDIE Model

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ABSTRACT

The integration of technology in the preservation and empowerment of the Tidung ethnic language represents an approach aligned with contemporary technology-based education. This study outlines the use of the ADDIE instructional design model in developing the interactive media application i-Tidung, designed to support the preservation and learning of the Tidung language in Sabah. The application was created following the five core phases of the ADDIE model, which are analysis, design, development, implementation, and evaluation. The study employed a 200-word Swadesh list as its primary dataset, with each transcribed entry annotated with its meaning for integration into the application. The i-Tidung application focuses on five key components of language learning: (i) oral communication, (ii) print awareness, (iii) phonemic and phonetic skills, (iv) narrative comprehension, and (v) basic writing skills. Additionally, knowledge-based quizzes were developed using the collected data. The application targets young Tidung speakers under the age of 18, aiming to strengthen their linguistic competence and cultural identity. Consequently, this interactive media application serves as both a resource and documentation for the Tidung ethnic language in Tawau, Sabah, while contributing to its sustainability and revitalisation

Keywords: Tidung ethnic language, ADDIE model, Swadesh list, language preservation, interactive media application

INTRODUCTION

In the rapidly evolving digital era, internet-based learning has become a necessity within technology-driven education. Technological advancement has introduced a paradigm shift in education, encompassing not only formal instruction but also informal learning practices. Consequently, numerous interactive media applications have been developed to achieve more comprehensive and relevant learning outcomes. The development of interactive media applications represents a crucial process in educational technology, enabling users to engage with various forms of multimedia content, including text, graphics, animation, video, and audio. Such applications are designed to enrich user experiences and transform learning into a more effective and engaging activity (Ahmad & Seandy, 2024).

The process of developing interactive media applications generally involves several phases, including user analysis, interface design, user experience design, technical development, implementation in authentic contexts, and effectiveness evaluation. Each phase plays a significant role in ensuring that the application not only meets learners' needs but also delivers meaningful impact. One of the most widely adopted frameworks guiding this process is the ADDIE instructional design model introduced by Rossett in 1987. The model comprising Analysis, Design, Development, Implementation, and Evaluation has been extensively applied in designing technology-based instructional materials (Molenda, 2003). By employing this systematic approach, applications can be developed with pedagogical rigour, suitable content, and efficient usability to foster interest and proficiency among learners (Lateh, Osman & Din, 2022).

When applied to the context of endangered languages, instructional media designed with ADDIE can function not only as a learning platform but also as a mechanism for preservation and revitalisation. By integrating

multimedia content such as audio recordings, vocabulary exercises, and cultural narratives, digital applications provide accessible and engaging resources that document and transmit minority languages to younger generations. This is particularly relevant for the Tidung ethnic language, spoken in parts of Tawau, Sandakan, and Lahad Datu, Sabah, which remains under-documented and underrepresented in digital learning resources. Saidatul Nornis (2019) emphasised the urgency of conducting research on the Tidung language and making it accessible to the Malaysian linguistic community.

The scarcity of available materials has limited younger generations' ability to recognise and engage with their heritage language, raising concerns of intergenerational language loss. Aini (2009) similarly warned that younger generations risk losing their mother tongue entirely if no preservation measures are taken. Current trends suggest that many Tidung youth are unfamiliar with, and uninterested in, learning their ancestral language, a situation exacerbated by the dominance of national and global languages. One potential solution lies in leveraging digital technology to increase interest and accessibility. Nazrul (2016) noted that technology can play a pivotal role in attracting learners to explore and acquire a language. For endangered languages such as Tidung, interactive digital applications not only enhance engagement but also serve as a crucial platform for documentation and preservation. This is particularly urgent given Ethnologue's classification of Tidung as a "shifting" language (status 7), where adult speakers still use the language. However, it is not being transmitted to children (Nettle & Romaine, 2000).

Within this context, the present study proposes the development of i-Tidung, an interactive media application based on the ADDIE model, focusing on the lexical and phonological features of the Tidung Inderasabah and Apas dialects. This initiative aims to both empower young Tidung learners under the age of 18 and provide a sustainable medium for documenting and revitalising the language. Accordingly, the objectives of this study are to explain the application of the ADDIE model in developing an interactive media application for the Tidung ethnic language and to describe the content features of the interactive media application designed for Tidung ethnic language learning.

LITERATURE REVIEW

Efforts to preserve endangered languages such as Tidung increasingly leverage digital tools, particularly mobile applications, guided by systematic instructional design frameworks like the ADDIE model. Recent literature highlights the growing use of mobile apps, online dictionaries, and social media platforms to document, teach, and sustain endangered languages in Indonesia and beyond (Sihite & Sibarani, 2024). These tools, including Android-based dictionaries and interactive resources, have been practical in engaging communities, increasing accessibility, and fostering cultural preservation. Their success is closely tied to community involvement, integration into educational frameworks, and support from local stakeholders. However, challenges remain in ensuring sustainability, addressing socio-cultural and technical barriers, and maintaining long-term engagement (Ali, Bashir & Hussain, 2025).

Mobile-Assisted Language Learning (MALL) applications have shown promise in supporting language acquisition, especially among younger generations. Research from regions such as Gilgit-Baltistan underscores the importance of tailoring app content to the linguistic and cultural context of the target community (Ali, Bashir & Hussain, 2025). Effective MALL initiatives often emphasise community participation, authentic learning environments, and the use of multimedia content to enhance engagement and learning outcomes (Shadiev, Liu & Hwang, 2020). Studies highlight the importance of designing mobile-assisted language learning (MALL) apps tailored to the linguistic and cultural needs of endangered language communities. Community involvement in app development is crucial for relevance and adoption, as seen in projects for languages in Gilgit-Baltistan, Pakistan; Manarrayi, Australia; and Kamchatka, Russia (Ali, Bashir & Hussain, 2025; Richards et al., 2024; Fayzrakhmanova, 2024).

Several Malaysian studies have highlighted the use of interactive applications designed using the ADDIE instructional model. Nazrul Muhaimin and Fadzllah (2016) developed an interactive media application based on "Perambahan Brunei", employing ADDIE to structure content, explain cultural values, and integrate knowledge-testing features. Similarly, the effectiveness of the interactive game Objek Tersembunyi in teaching Malay grammar to Year Four students was found, with learners showing strong engagement and enthusiasm

(Hui & Norazah, 2021). In early childhood education, Nur Ainul Husna et al. (2022) evaluated the Mahir Nama mobile application, designed for preschool teachers, which was also developed using the ADDIE model, and found that it successfully supported children in learning to write their own names.

In secondary and higher education, numerous applications have been developed to support diverse subjects. Rafidah and Mimi (2019) created interactive multimedia software for sewing skills in the Living Skills curriculum, while Sa'adiah et al. (2020) designed the "Measurement Fun and Easy" application to facilitate online learning with interactive notes and quizzes. Both studies applied ADDIE to ensure alignment between instructional goals and application features. Similarly, an interactive multimedia software, namely MiFiPK, for teaching Fardhu Ain to students with learning disabilities, found that text and audio integration improved accessibility and comprehension (Nor Adawiyah, 2019). Other examples include 3D Math, an Android-based application for geometry learning (Fauziah & Shaharudin, 2020), and Modul Karangan E-BMKU, designed to enhance essay writing skills among Tamil school students through interactive animation (Logambigai et al., 2022). These studies collectively affirm the versatility and effectiveness of the ADDIE model in designing interactive learning tools across disciplines.

While the use of ADDIE in mainstream education is well documented, its application in the preservation of minority and indigenous languages is still limited in Malaysia. However, international research provides examples of how digital applications can play a pivotal role in language revitalisation. For instance, the Hawaiian language revitalisation movement has leveraged mobile apps and digital dictionaries to reintroduce the language to younger generations (Galla, 2018). Māori in New Zealand have also benefited from gamified learning applications and mobile platforms that combine vocabulary drills with cultural storytelling (Keegan et al., 2011; Lemon, 2017). Closer to Malaysia, initiatives to preserve Bidayuh and Mah Meri have explored the use of digital dictionaries, although such projects are still in their early stages (Coluzzi, 2016).

Research demonstrates that mobile applications can enhance language acquisition, particularly among younger generations, by offering accessible, engaging, and interactive learning environments. Features such as audio, text, and gamification enhance motivation and learning outcomes (Burova et al., 2021; Fayzrakhmanova, 2024). Apps and digital platforms are utilised for documenting endangered languages, creating speech corpora, and supporting the learning of pronunciation and grammar (Parimi, Guliani, & Chen, 2024). AI-powered tools and cloud-based systems further streamline documentation and teaching processes (Kareem & Rahman, 2025). Systematic reviews and case studies from Pakistan, Russia, and Australia show that successful implementation depends on community engagement, integration into education, and addressing technical barriers like internet access and device availability (Ali, Bashir & Hussain, 2025; Richards et al., 2024; Fayzrakhmanova, 2024; Burova et al., 2021). These global examples demonstrate that interactive media can successfully document, teach, and sustain minority languages while engaging younger and tech-savvy audiences.

The literature reviewed confirms that the ADDIE model is a reliable framework for developing instructional media across various educational contexts, ensuring systematic design and pedagogical rigour. However, applications specifically targeting the learning of ethnic and indigenous languages remain underexplored in Malaysia. This gap justifies the present study, which aims to develop an interactive media application for the Tidung ethnic language, thereby extending the application of ADDIE to the domain of endangered language preservation.

METHODOLOGY

The methodology of this study outlines the systematic process used to collect, organise, and analyse data to achieve the research objectives. A qualitative approach was adopted, as it enables in-depth exploration of the linguistic and cultural elements that underpin the Tidung ethnic language. Fieldwork methods, including observation, interviews, voice recordings, and photographic documentation, were employed to ensure that the data collected accurately represented the natural use of the language within the community.

Reserch Design

This study employed a qualitative, fieldwork-based research design, focusing on two Tidung-speaking communities in Sabah: Kampung Inderasabah and Kampung Apas, both located in Tawau. These sites were

selected because they remain active settlements of the Tidung ethnic group. A total of ten informants, aged between 55 and 80, were interviewed. All participants were permanent residents of the selected villages, in good health, and possessed normal speech abilities, ensuring accuracy in pronunciation and data representation.

The informants were provided with a 200-word Swadesh list consisting of basic vocabulary items commonly used in everyday communication. While an extended list of 443 additional lexical items adapted for the Malay world context exists (Mohammad Khairulanwar Abdul Ghani et al., 2024), only the 200 core Swadesh items were employed during fieldwork. Voice recordings were made as informants responded to questions and engaged in storytelling on assigned topics. This strategy ensured the collection of natural and spontaneous pronunciation patterns. The recordings were later transcribed phonetically to facilitate lexical categorisation and analysis.

Upon completion of the i-Tidung application development, an external evaluation was conducted to assess content validity and pedagogical appropriateness. Expert reviewers and practitioners in the field were engaged to provide feedback on the accuracy, usability, and effectiveness of the application. Based on this feedback, revisions and improvements were incorporated to strengthen the final version of the application. This process ensured that the i-Tidung application not only met linguistic and instructional requirements but was also reliable for wider use among Tidung speakers.

ADDIE Model as Instructional Design Framework

The ADDIE instructional design model (Rossett, 1987; Molenda, 2003) was adopted as the framework for developing the i-Tidung interactive media application. The model consists of five phases (see Figure 1). In the revised model, the evaluation phase is central and implemented at each stage of the process.

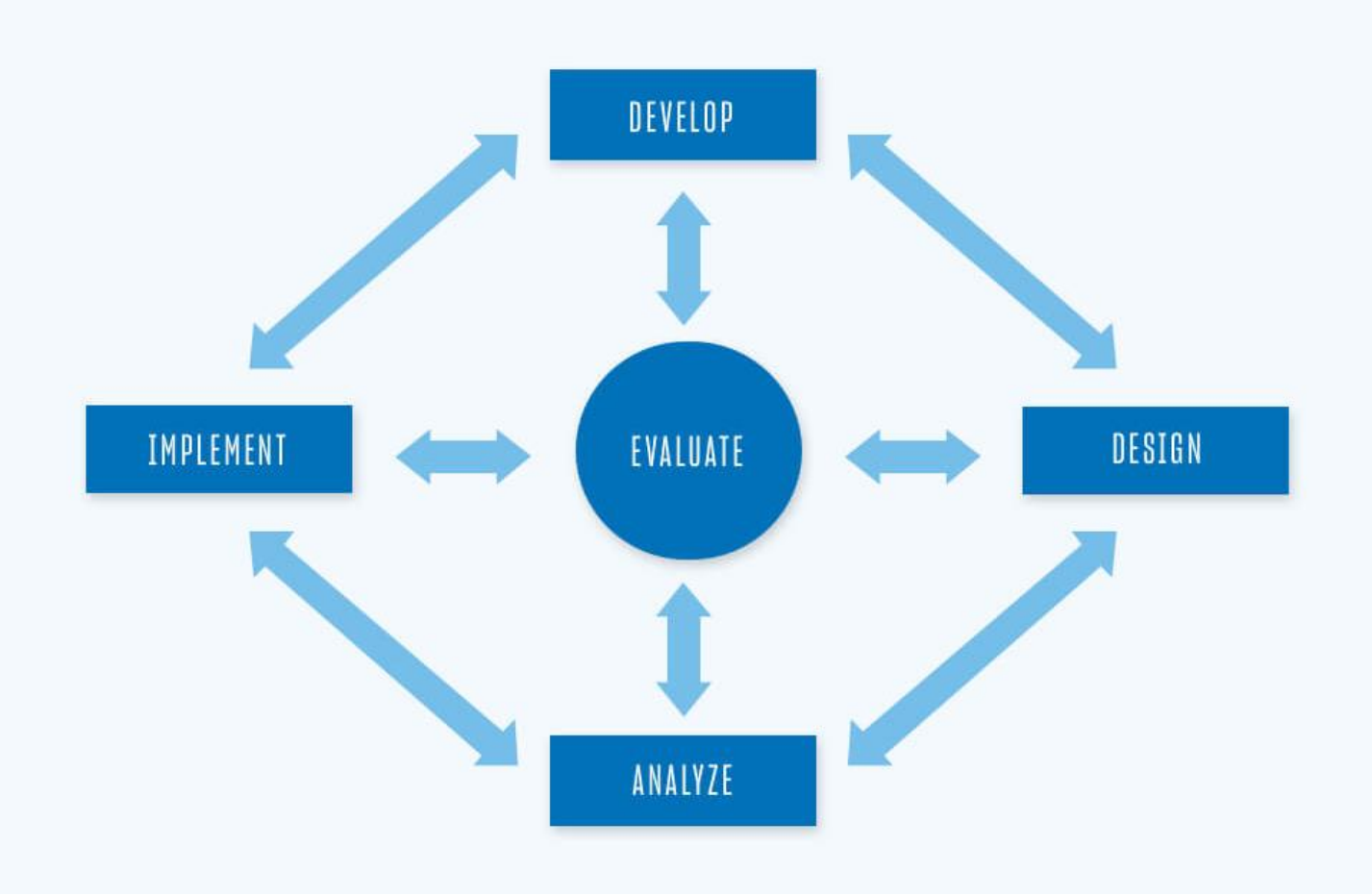

Figure 1 ADDIE Model (Evans, 2022)

Each of the five phases was systematically implemented to ensure that the application was pedagogically sound, linguistically accurate, and technologically effective.

Table 1 Application of ADDIE Model in *i-Tidung* Interactive Media Application

ADDIE Phase	Application in *i-Tidung*
Analysis	Fieldwork was conducted in Kampung Inderasabah and Kampung Apas, with data collected from 10 informants (55-80 years old). A 200-word Swadesh list was collected and transcribed
Design	Design based on five components: oral communication, print awareness, phonemic/phonetic skills, narrative comprehension, basic writing, including a culturally illustrated interface and quizzes designed
Development	Integrated transcribed Swadesh list, embedded native speaker audio, developed graphics and multimedia; built app prototype.
Implementation	Piloted studies with Tidung youth and community; gathered user feedback on usability, clarity, and engagement.
Evaluation	Formative evaluation with experts (linguistics, instructional design, cultural studies), summative evaluation for usability and effectiveness, and improvements made.

Table 1 illustrates the application of the ADDIE instructional design model in developing the i-Tidung interactive media application. Each phase, which is Analysis, Design, Development, Implementation, and Evaluation, was systematically linked to specific outputs, beginning with fieldwork and data collection from native speakers, followed by the planning of instructional content and interface design, technical development of multimedia components, pilot testing with the target community, and iterative evaluation through expert review and user feedback. This mapping highlights how the ADDIE framework ensured a structured, learner-focused, and culturally grounded approach to the development of i-Tidung.

FINDINGS AND DISCUSSION

This section presents the findings from the development and pilot testing of the i-Tidung interactive media application, framed through the five core components of language learning: oral communication, print awareness, phonemic and phonetic skills, narrative comprehension, and basic writing skills. Each component was systematically designed and implemented following the ADDIE instructional design model to ensure that the application not only addressed the linguistic needs of the Tidung community but also aligned with established principles of educational technology.

Oral Communication

During the analysis and design phase (see Figure 2) of i-Tidung's development, field data revealed that young Tidung speakers under 18 rarely use the language orally in their daily communication. Based on this, the oral communication module was designed to expose learners to natural Tidung pronunciation through audio recordings of 200 Swadesh words and conversational phrases. Clear learning objectives (ABCD model) emphasised the recognition and reproduction of oral forms, the development phase integrated native-speaker audio into i-Tidung, featuring replay functions. Pilot implementation showed learners gained confidence in repeating words. Formative evaluation indicated that the audio clarity was effective, and experts confirmed that this module addressed the critical oral deficit identified in the analysis.

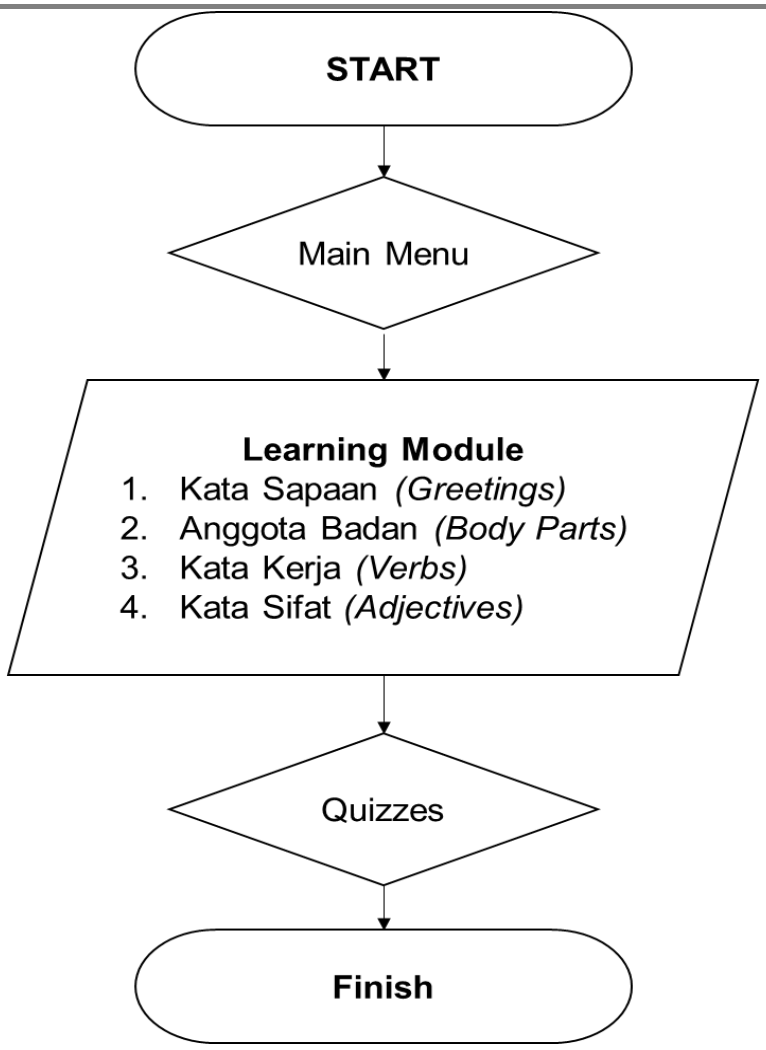

Figure 2 Flowchart of learning module in i-Tidung

The oral communication component enabled learners to hear native speaker pronunciations of each lexical item in the Swadesh list. Audio recordings from informants were integrated into each vocabulary module, allowing learners to replay, slow down, or compare their own recordings with the model. During pilot testing, many users reported improvements in their confidence to pronounce words aloud, citing the availability of repeatable, native-speaker speech as particularly helpful. This mirrors findings in the Gilgit-Baltistan MALL project, where repeated listening and pronunciation features enhanced learner phonological awareness and led to more accurate spoken output.

From a theoretical perspective, embedding oral communication tools within i-Tidung supports the communicative competence framework: learners are not merely exposed to vocabulary, but encouraged to produce it actively. This active use helps internalise pronunciation patterns and prosody. In endangered-language contexts, such as the Gilgit Baltistan app, scholars observed that providing immediate feedback (or at least model comparisons) fosters learner engagement and reduces fossilisation of mispronunciations. By allowing learners to practice speaking interactively, i-Tidung builds a bridge between passive exposure and active performance in oral Tidung communication.

Print Awareness

Observation highlighted a lack of familiarity among youth with the Tidung writing system. Thus, a print awareness module was designed to pair text with audio to reinforce sound–symbol mapping. Learning objectives emphasised recognising written forms alongside phonetic transcription. During development, each word was presented with a script, phonemic transcription, and its meaning. Implementation tests showed learners could better retain vocabulary when both text and audio were available. Evaluation confirmed that pairing print and sound improved recognition, aligning with findings from similar heritage languages. In the i-

Tidung modules, print awareness was nurtured by pairing each lexical item with its written form, phonetic transcription, and semantic annotation. Learners are guided to link the spoken form with text, recognising word boundaries and orthographic conventions. During usability testing, users indicated that seeing the written word alongside the audio helped them better retain vocabulary and cross-modal mapping (sound → text). In the Gilgit-Baltistan MALL app, a similar dual presentation of audio + orthography was found to strengthen the mapping between phonology and script, improving recognition and recall.

Conceptually, print awareness is foundational for literacy development: it fosters understanding that spoken words have graphic counterparts. Especially for a minority language like Tidung, where standardised orthographies may be less familiar, designing for print awareness trains users to read (or begin reading) their heritage language. In the context of revitalisation, combining audio with text, as i-Tidung does, ensures that learners do not treat the language solely as a phonetic curiosity, but as one that exists in written form, thus supporting the preservation of both spoken and written traditions.

Phonemic and Phonetic Skills

Analysis identified specific phonemic contrasts in Tidung that differ from Malay, posing challenges for younger learners. Objectives were designed using minimal pairs and phoneme drills. Development involved embedding a phonetic symbol (see Figure 3). During implementation, learners practised listening and repeating minimal pairs. Evaluations revealed an improved awareness of subtle sound contrasts, with experts attributing the module's contribution to enhanced accurate pronunciation and phonological competence.

Figure 3 Example of phonemic orthography included in *i-Tidung*

The phonemic and phonetic component in i-Tidung provides fine-grained feedback by breaking down each lexical item into constituent phonemes, showing minimal pairs, and enabling playback at slower speeds. Users can isolate, compare, and manipulate phonemes to discern subtle contrasts. Preliminary feedback indicated that

learners, especially younger ones, benefited from listening to minimal pairs (e.g., Tidung phonemes that differ by vowel or consonant), which helped them sharpen phonemic distinctions. In the comparative MALL study, phonological drill features and segmentation tools played a crucial role in enhancing phonemic awareness and reducing misperceptions among learners.

From a pedagogical standpoint, phonemic awareness sits at the heart of accurate pronunciation and listening comprehension. Particularly for endangered languages with phonemic contrasts unfamiliar to learners' dominant languages, this component enables scaffolding from coarse listening to fine discriminations. By embedding phoneme-level interactivity, i-Tidung supports learners in acquiring the "ear" for Tidung phonology. In similar digital heritage language projects, phoneme drills reduced error rates in listening tasks and pronunciation accuracy, supporting the viability of i-Tidung's design choice.

Narrative Comprehension

The analysis revealed that without contextual use, youth struggled to grasp meaning beyond isolated words. Objectives were established to enhance comprehension through the use of short stories and cultural narratives. Development integrated recorded folk tales with comprehension questions. Pilot users reported higher motivation when engaging with stories rather than vocabulary alone. Evaluation confirmed the module's success in connecting linguistic content with cultural heritage, thus preserving both language and tradition.

To build narrative comprehension, i-Tidung includes short culturally contextualised stories, dialogues, and folk tales recorded with native speakers. Learners listen, view transcripts, answer comprehension questions, and replay segments. During pilot usage, many users reported increased interest in the culture and improved understanding when hearing stories in context rather than isolated words. In the Gilgit-Baltistan app, storytelling modules were found to be effective for vocabulary retention and situating language in meaningful contexts, thereby facilitating deeper memory and engagement.

In a revitalisation framework, narrative comprehension connects language learning with cultural meaning. Learners move from word-level memorisation to following discourse in context, thereby internalising syntax, cohesion, and pragmatics. For i-Tidung, this component helps anchor vocabulary and structures in Tidung cultural narratives, increasing learner motivation and reinforcing the language's living function. Such narrative integration has been demonstrated in related endangered-language apps to strengthen learners' connection to heritage meaning and resist the abstraction or decontextualisation of elements.

Basic Writing Skills

Analysis showed that many Tidung youth had never practised writing their heritage language. Objectives targeted basic orthographic competence, matching, filling in blanks, and constructing simple words. Development involved interactive writing tasks (using a worksheet) such as tracing and matching graphemes to phonemes. Implementation feedback highlighted increased retention and recognition of the script. Evaluation confirmed the writing module helped standardise orthographic knowledge and closed the learning cycle from oral to written language.

The Basic Writing Skills module in i-Tidung enables learners to type or trace Tidung words, fill in missing letters, reconstruct sentences, and match phonetic transcriptions to graphemes. After learners have listened and read, they attempt to produce written forms, which are then compared to correct forms. Pilot testers noted that the writing exercises reinforced memory of both orthography and pronunciation, especially when errors triggered hints or corrective feedback. While the Gilgit-Baltistan MALL study focused more on comprehension and spoken interaction, its framework supports that writing exercises in similar apps help internalise language structure and orthographic norms.

From a theoretical perspective, integrating writing tasks completes the full language skill cycle (listening → reading → writing). For endangered languages with limited literacy exposure, offering writing practice, backed by scaffolded guidance and supports orthographic standardisation and retention. In i-Tidung, this module helps learners cement their knowledge of the Tidung script (if standardised) and provides another channel for active

language use. In heritage-language technology projects, writing components often face greater design challenges but yield significant gains in learner retention and generative capacity.

CONCLUSION

The development of the i-Tidung interactive media application, guided by the ADDIE instructional design model, demonstrates how technology can serve as both a pedagogical tool and a medium for cultural preservation. By systematically integrating components of oral communication, print awareness, phonemic and phonetic skills, narrative comprehension, and basic writing, the application addresses the linguistic needs of younger Tidung learners while reinforcing their cultural identity. The pilot findings highlight that interactive, multimodal features not only enhance learner engagement but also provide a sustainable avenue for documenting and revitalising an endangered language. Ultimately, i-Tidung contributes to the broader discourse on digital language preservation, affirming that instructional design and educational technology can play a transformative role in safeguarding minority languages for future generations.

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