

Research Article

QuadraLingo Quest: A Gamified Platform for Multilingual Learning and Indigenous Language Sustainability

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Abstract: Conventional multilingual instruction often struggles to keep learners engaged, while the indigenous languages continues to experience insufficient digital learning provision. Hence, QuadraLingo Quest is developed to overcome the challenges of disengagement and inaccessibility. This mobile, game-based learning platform features Malay, English, Mandarin, and Kadazan, an eroding indigenous language in Sabah. Based on the Theory of Multimedia Learning, Mobile-Assisted Language Learning, and gamification principles, QuadraLingo Quest integrates text, images, and sounds, to assist proficiency in these four languages. This multilingual interactive educational tool contributes to increased motivation and multilingual proficiency while preserving the indigenous language.



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1. INTRODUCTION

In today's interconnected world, multilingual competence is a vital skill particularly in a country that consists of multilingual society like Malaysia. Languages such as Malay, English, Mandarin, and indigenous are used simultaneously across educational, professional, and social contexts (Cenoz & Gorter, 2022). Despite Malaysian citizens are multilingual, indigenous languages such as Kadazan are experiencing declining use among the natives particularly the younger

generations. This scenario is due to vast urbanisation, language shift on more prominent ones, and the lack of digital learning resources (Meighan, 2021).

Technologies that support language-learning have indeed advanced considerably, yet these educational platforms mainly focus on international languages and provide little support for the preservation of indigenous languages. In Sabah, although the Kadazan language holds a significant cultural value, its presence in digital language-learning platforms remains limited. Thus, QuadraLingo Quest was developed as a multilingual language learning platform to address this issue. It is an extension of TriLinguaQuest and it integrates Malay, English, Mandarin, and Kadazan within a single gamified learning platform.

This innovative multilingual learning tool features mobile accessibility, multimedia resources, and gamification to ensure that learner's engagement and motivation is sustained. Studies indicate that mobile language learning is able to support flexible language practice (Kukulska-Hulme, 2009), while gamification is able to increase learner's participation and persistence (Sailer & Homner, 2020). The incorporation of Kadazan as an equal component with major languages like English and Mandarin in QuadraLingo Quest is able to promote multilingual competence and address the issue on the preservation of indigenous linguistic and cultural heritage in Sabah.

2. LITERATURE REVIEW

2.1 Multilingual Competence in Contemporary Society

In today's contemporary society, multilingualism provides benefits that extend beyond enhancing employment opportunities. Evidence shows that it enhances cognitive flexibility and social belonging (Cenoz & Gorter, 2022). Hence, multilingual language teaching should prepare people to communicate across cultures, rather than exclusively focusing on grammatical correctness (Byram, 2021). Another factor that leads to successful multilingual teaching is recognising learners' prior language experiences and building upon this foundation instead of disregarding it (Garcia & Wei, 2014).

2.2 Mobile-Assisted Language Learning (MALL)

The existence of Mobile-Assisted Language Learning (MALL) opens the opportunities for the integration of mobile technologies into language-learning activities that provide learners with convenient and accessible learning beyond formal educational setting (Isa & Banu, 2023). This learning approach allows learners to study at their own pace and time. In fact, this flexibility helps learners build vocabulary, stay motivated, and work more autonomously as learning opportunities are not restricted to class time (Kukulska-Hulme, 2009). For rural communities in Sabah who lack easy access to formal Kadazan classes, a mobile learning technologies can provide flexible and accessible learning opportunities.

2.3 Gamified Language Learning

One of the hindrances of language learning development is the lack of motivation. To address this issue, game-based elements such as badges, levels, and challenges have been shown to positively enhance participation and achievement (Sailer & Homner, 2020; Dehghanzadeh et al., 2021). It is also evident that gamified learning is effective for vocabulary development (Dindar et al., 2021). Additionally, prompt feedback and visible progress tracking positively enhance learner engagement and learning attainment (Dehghanzadeh et al., 2021).

2.4 Cultural Sustainability and Indigenous Language Preservation

In today's globalised world, younger generations are more inclined to learn and communicate in English and Mandarin, leading to the attrition of indigenous languages. This is not solely a linguistic issue since it erodes oral histories, cultural knowledge, and the community's identity. In response to this rising risk, digital technologies have become a promising tool for cultural preservation and indigenous language revitalisation. They can function beyond repositories of linguistics information, facilitating both language use and instruction (Galla, 2016). A similar stance is presented by Meghan (2021) who posits that digital technologies used for linguistic records varies distinctly from those that facilitate language use. Thus, QuadraLingo Quest integrates the Kadazan language learning into meaningful tasks that combines multimedia resources and game features.

2.5 Mayer's Multimedia Learning Theory

According to the Multimedia Learning Theory, learning is enhanced when learners can receive information through multiple elements like text, visuals and audio simultaneously (Mayer, 2021). The combination of these elements helps learners to form cognitive connections. Hence, grounded on Mayer's Theory, QuadraLingo Quest is developed by integrating multilingual text, relevant images and audio. These multimedia features aid novice learners of Mandarin and Kadazan to overcome the challenge of associating the written words with their pronunciation. In particular, the integration of audio elements supports pronunciation accuracy and enhance mental connection between spoken and written forms.

3. METHODOLOGY

3.1 Development Process

QuadraLingo Quest was developed through a systematic four-stage process that include needs analysis, content development, platform design, and usability testing. Table 1 summarises the platform's development process.

Table 1. QuadraLingo Quest: Development Process

Stage	Development Process	Description
Stage 1	Needs Analysis	Through a systematic analysis of current language-learning apps which can be found in Google Playstore and Apple Store, it was found that there is a lack of apps that support multiple languages. Multilingual learning application that incorporates the Kadazan language is nonexistent. This gap justified the development of a cohesive multilingual platform for Kadazan, Malay, English, and Mandarin.
Stage 2	Content Development	The content focuses on functional language use with themes such as greetings, food, travel, daily life, and common daily exchanges. The accuracy of the Kadazan content was maintained using relevant references: - Belajar Bercakap Bahasa Kadazan (Miller & Miller, 1989) - Kadazan Dictionary: Kadazan-English, English-Kadazan, Bahasa Malaysia-Kadazan (Binjua, 2011) - Proficient speakers of Kadazan

Stage 3	Platform Design	The design framework was grounded upon: - Multimedia Learning Theory (Mayer, 2021) - Mobile-Assisted Language Learning (Kukulska-Hulme, 2009) - Gamification principles (Sailer & Homner, 2020) Each learning item in the platform integrates text, images, and audio, with interactive game features including quizzes, badges, achievement levels, and progress tracking.
Stage 4	Usability Testing	A small-scale usability evaluation was conducted with eight university students enrolled in a Mandarin elective course at UiTM Sabah branch to assess the key platform features: - navigation - content clarity - audio quality - user engagement Feedback from two trials guided further development of the prototype's design and functionality: - Trial 1: focus on platform refinement - Trial 2: focus on learning effectiveness

3.2 Learning Content and Materials

QuadraLingo Quest is categorised according to themes that cover practical vocabulary related to daily routines, family, food, animals, colours, numbers, travel, and social interactions. Since the platform aims to promote multilingual competence, the vocabulary is presented in Malay, English, Mandarin, and Kadazan within a single interface which allows learners to compare languages and identify their similarities and differences. To ensure language acquisition, the platform presents Mandarin entries in both Chinese characters and pinyin, and Kadazan pronunciation with audio recordings by proficient native speakers. Written texts, audio recordings, visual supports and game features are also integrated in all four languages equally. The key design feature is that the platform presents Kadazan language alongside the three other languages ensuring that the platform fosters multilingual competence while supporting Kadazan language preservation and sustainability.

3.3 Platform Features

Table 2 summarises the platform's main features and the educational function each serves.

Table 2. QuadraLingo Quest: Key Platform Features and Educational Contributions.

Key Feature	Description
QuadraLingo Interface	Vocabulary items appear in all four languages at once, with text, (including pinyin for Mandarin), images, and audio.
Interactive Quest Missions	Structured quest missions introduce language in real-life scenarios, from daily scenarios to travel and cultural exchanges.
Gamification Elements	Badges, points, level challenges, and progress tracking keep learners motivated and give them a sense of achievement.

Multimedia Audio-Visual Support	Native-speaker audio and visual illustrations support pronunciation and comprehension across all four languages.
Self-Assessment Quizzes	Guess-and-reveal quizzes test recall across all four languages and provide instant feedback.
Thematic Content Categories	Content is organised into practical themes: greetings, family, food, travel, daily activities, and common conversations.
Kadazan Heritage Module	Kadazan content is treated as equal to the other three languages, covering the same themes with full audio support.
Adaptive Difficulty Levels	Beginner to intermediate content lets learners progress at their own pace across all four languages.

3.4 Platform's Functionality

Learners are provided with an interactive, seamless learning experience supporting the acquisition of four languages. Upon selecting a language module, vocabulary is presented across four languages, reinforced through a combination of text, images and audio elements. The learning activities are structured as interactive quests to reinforce vocabulary through game-based challenges in increasingly demanding contexts. The real-time feedback and progress tracking allow learners to continuously evaluate their achievement and improvement. These features make QuadraLingo Quest a flexible platform that can be used as a standalone learning tool, or it can be used within classroom environment or community language programmes.

4. FINDINGS

Table 3 provides a direct design comparison between TriLinguaQuest and QuadraLingo Quest.

Table 3. Design Comparison: TriLinguaQuest and QuadraLingo Quest.

Dimension	TriLinguaQuest (2024)	QuadraLingo Quest (2026)
Languages Covered	Mandarin, Malay, English (3 languages)	Malay, English, Mandarin, Kadazan (4 languages)
Gamification Depth	Clickable quiz buttons only	Quests, badges, progress tracking, level challenges
Cultural Heritage Focus	Cultural references in 3 languages	Dedicated Kadazan heritage module; indigenous language preservation
Theoretical Grounding	Mayer's Multimedia Learning Theory (1997)	Mayer's Multimedia Learning Theory (2021); MALL (2021); Gamification theory; Cultural sustainability
Audio Support	Audio for 3 languages	Native-speaker audio for all 4 languages
Target Audience	Mandarin elective students	Schools, learning centres, community programmes; all ages

Table 4 gives an overview of the key features of QuadraLingo Quest and their potential contributions to multilingual competence, indigenous language revitalisation, learner motivation and engagement, as well as inclusive language learning.

Table 4. Potential Contribution of QuadraLingo Quest

Feature	Description	Potential Contribution
QuadraLingo Learning Environment	Integrates Malay, English, Mandarin and Kadazan within a single learning platform, with Kadazan positioned as an equal language component.	Promotes multilingual competence while supporting indigenous language sustainability.
Gamified Learning	Incorporates quests, badges, rewards, levels, immediate feedback and progress tracking.	Enhance learner motivation, engagement and persistence in language learning.
Multimedia-Supported Learning	Combines text, images, and audio across all four languages, supported by more than 200 multimedia resources.	Improves vocabulary acquisition, pronunciation accuracy, and contextual understanding.
Indigenous Language Preservation	Integrates Kadazan into everyday learning activities and communicative tasks.	Encourages active language use and contributes to the preservation of the Kadazan language.
Accessibility and Inclusivity	Provides a user-friendly, flexible, and self-paced learning environment suitable for diverse learners.	Expands access to multilingual education across formal and informal setting.
Commercialisation Potential	Combines widely taught languages with an indigenous language, creating a unique educational product.	Creates opportunities for adoption by schools, language centres, community organisations, and cultural institutions.

5. DISCUSSION

Three key concepts underpin the design of the platform. The first principle suggests that gamification within mobile learning platforms can provide a more engaging and motivating learning experience than traditional forms of instruction. Features including feedback mechanisms, achievement tracking, and goal-oriented tasks have been linked to long-term participation in language-learning (Sailer & Homner, 2020; Dindar et al., 2021). The second principle emphasises the continued vitality of indigenous languages on practical usage rather than symbolic recognition of their cultural value. Languages remain sustainable when they are actively used in daily life (Meighan, 2021; Galla, 2016), hence Kadazan is incorporated into the platform on an equal footing with other languages. The third principle focuses on the integration of multilingual education and cultural preservation within one digital learning platform. Future user studies are needed for the validation of the effectiveness and educational value of this integrated approach.

The current work is subject to two key limitations that warrant consideration. First, the pilot study involved only eight participants who undertook two learning modules under supervisions. The insights from the pilot offer information on its usability but it lacks sufficient information to examine

learning gain and longitudinal engagement. Empirical investigation that employs pre-and post-intervention testing and a control group is needed to verify the educational impact. Second, although the Kadazan Language content was developed using established learning resources and reviewed by proficient speakers, formal validation by experts from the Kadazan Dusun Language Foundation (KLF) and the Kadazan Dusun Cultural Association (KDCA) is crucial. Consulting the experts prior to a broader implementation can involve community which is a fundamental step to strengthen the legitimacy of indigenous language content (Hermes et al., 2012).

6. CONCLUSION

The development of QuadraLingo Quest was motivated by the insufficiency of multilingual educational platforms that includes indigenous language in particular the Kadazan language. By presenting Malay, English, Mandarin and Kadazan in one single gamified learning application, the platform encourages multilingual development and indigenous language preservation. Based on established learning theories namely Multimedia Learning Theory, Mobile Assisted Language Learning and gamification principles, the platform exemplify how digital technologies can promote multilingual acquisition and sustain indigenous language. To strengthen the platform, future development should prioritise the evaluation of learning effectiveness, experts verification of Kadazan materials and the expansion of instructional content to cater to advance learners. The potential to adapt the platform to include other indigenous languages in Sabah and Sarawak suggests its importance in the preservation of Borneo's linguistic heritage. Therefore, by promoting inclusive multilingual learning and indigenous language sustainability, QuadraLingo Quest promotes Quality Education (SDG4), Reduced Inequalities (SDG10), and Sustainable Cities and Communities (SDG11).

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