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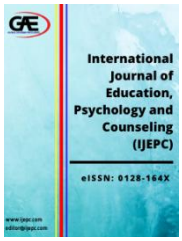

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USABILITY AND ACCEPTANCE OF MALAYLEARNING: A GAME-BASED MOBILE APPLICATION FOR SECOND LANGUAGE VOCABULARY ACQUISITION

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Abstract:

This developmental study addresses common difficulties faced by Universiti Utara Malaysia (UUM) foreign students in learning Malay, specifically grammar, vocabulary, and motivation, by focusing on the development and evaluation of MalayLearning, a game-based mobile application. The methodology adhered to the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation), incorporating Mayer's Multimedia Principles to refine instructional alignment. Evaluation involved a Formative Review by content and multimedia experts to verify usability, followed by a Summative User Testing phase with five UUM foreign students to assess acceptance and user experience. While results from both evaluations consistently confirmed the application's high usability and clarity, the findings are presented as a qualitative proof-of-concept given the small sample size. The study concludes that MalayLearning serves as a validated pedagogical intervention for beginning Malay language acquisition, possessing significant potential to enhance autonomous learning outcomes through a blend of instructional design and motivational architecture.

Keywords:

Malay Language; Mobile Application; Mobile Learning; ADDIE Model; Usability Evaluation.

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Introduction

Mobile technology, encompassing smartphones and tablets, has revolutionized teaching and learning, giving rise to mobile learning (m-learning). While not replacing formal education, m-learning significantly enhances student motivation and engagement by providing innovative, flexible access to educational content anytime and anywhere (Demir & Akpinar, 2018). The potential of m-learning is best realized through interactive mobile applications that offer engaging learning experiences (Demir & Akpinar, 2018).

In Malaysia, the Malay language holds a vital national position and is the compulsory intermediate language for foreign students studying at Malaysian universities (Abdul Rahman et al., 2023). This study addresses the specific challenges faced by Universiti Utara Malaysia (UUM) foreign students in their Malay language learning journey. Key challenges include difficulty understanding grammar and sentence structure, limited vocabulary expansion, pronunciation issues, low motivation, and difficulties mastering listening skills. Research by Hashim and Yahya (2019) confirms that these difficulties, particularly related to grammatical structure and pronunciation, are common obstacles for international students learning Malay.

To mitigate these issues, this project developed MalayLearning, a mobile learning application that utilizes multimedia learning principles. The study employed the ADDIE model as a structured methodology for development and conducted both formative and summative evaluations. The goal is to provide a solid, validated solution to help UUM foreign students overcome their learning challenges and improve their Malay language outcomes.

The objectives of this developmental research are:

- To determine the requirements for the mobile learning application.
- To design and develop the mobile learning application.
- To verify the application through expert review (Formative Evaluation).
- To validate the application through user testing (Summative Evaluation).

Literature Review

Previous Works on Mobile Language Learning

Previous research consistently supports the effectiveness of mobile applications in enhancing second language acquisition. Poláková (2022) found that integrating a mobile vocabulary learning application into a blended learning environment significantly improved vocabulary retention, precise usage, and overall understanding among students, attributing the success to the mobile application's portability, immediacy, and novelty. Similarly, studies by Habbash (2015) and Basal (2016) also documented improved vocabulary retention and positive student attitudes through mobile app usage. Furthermore, Phuc and Nghi (2023) demonstrated that mobile applications integrated with gamification and interactive features lead to higher engagement, better language retention, and flexibility. Gamification elements (e.g., progress tracking, rewards) specifically boosted learner motivation, and the inclusion of multimedia (audio, video, visuals) improved comprehension and language skills. These findings collectively establish mobile applications as effective tools for enhancing language proficiency and motivating learners. Furthermore, Lai and Lai (2021) established a strong correlation between mobile application usage and increased learning performance and satisfaction, suggesting that the delivery platform itself contributes positively to the overall learning outcome and user acceptance.

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Instructional Design and Multimedia Learning Principles

Building on the ADDIE-driven design decisions, the application of Mayer's multimedia principles further strengthened the instructional alignment of the MalayLearning application. While ADDIE structured the macro-level developmental workflow, Mayer's principles guided the micro-level design decisions to ensure cognitive efficiency.

The ADDIE Model

The ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) is widely recognized as a flexible and effective framework for instructional design and development in various educational settings (Adeoye et al., 2024; Branch, 2009; Morrison et al., 2019). Alimi and Adegoke (2020) further demonstrated the effectiveness of the ADDIE model specifically in the design and development of e-learning courseware, highlighting its structured approach in producing efficient and effective learning experiences, which aligns with the methodology chosen for the MalayLearning application.

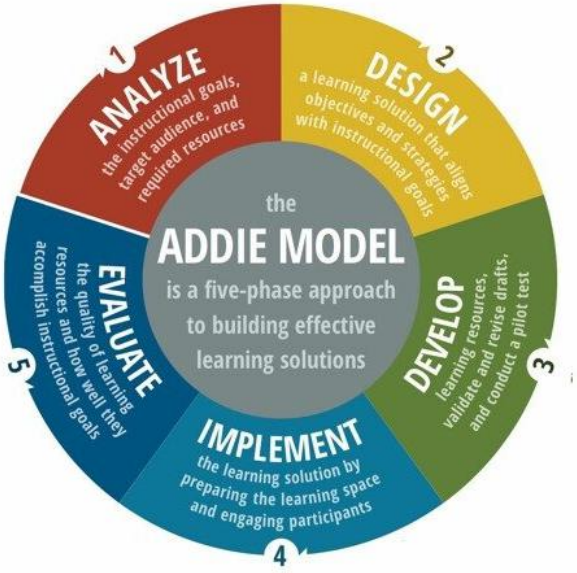

Figure 1: ADDIE model (Morrison et al., 2019)

Mayer's Principles of Multimedia Learning

The design of MalayLearning was guided by Richard E. Mayer's 12 Principles of Multimedia Learning, which aim to maximize learning outcomes by managing cognitive load (Mayer, 2001). Recent reviews, such as Wong and Lim (2022), reinforce the importance of these principles, especially Coherence, Multimedia, and Contiguity, in developing effective mobile learning environments for language acquisition. This project primarily applied three core principles:

- Multimedia Principle: This principle dictates that people learn better from images and words than from words alone.
- Coherence Principle: The Coherence Principle suggests that learning is deeper when extraneous information is excluded from multimedia messages.
- Temporal Contiguity Principle: This principle states that people learn better when corresponding words and pictures are presented simultaneously rather than successively. In the context of the MalayLearning application's listening quiz, adhering

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to this principle was crucial to ensure the auditory question and the options/interface for response were presented immediately together, optimizing cognitive processing and minimizing confusion, as discussed in the evaluation section.

Game-Based Learning and Vocabulary Acquisition

While instructional frameworks provided the structure, GBL theory informed the motivational architecture of the application. The adoption of game-based learning (GBL) is an intentional pedagogical choice, supported by evidence showing that digital serious games yield positive cognitive, motivational, and emotional effects (Granic et al., 2014; Demmel et al., 2011). GBL provides an active and engaging alternative to traditional instruction (Gee, 2003; Hsieh et al., 2015). Specifically, the word puzzle format, utilized in MalayLearning, is recognized as a potent method for vocabulary development, enhancing learner interest and motivation (Wiwat, 2013; Latha et al., 2015). Recent work, specifically focused on the target language, such as Zaini and Yaacob (2023), further supports the viability of using gamification within mobile apps for improving Malay vocabulary acquisition among non-native speakers.

Usability Heuristics in Mobile Learning Design

Jakob Nielsen's ten usability heuristics are fundamental guidelines for designing effective and acceptable user interfaces (Nielsen, 1994). For mobile learning applications, adherence to principles such as *Visibility of System Status*, *Consistency and Standards*, and *Error Prevention* is vital for ensuring a smooth and efficient learning experience (Zhang & Adipat, 2005). The systematic application of these heuristics in the design phase and their use as a framework for expert reviews (Formative Evaluation) ensures that the application is intuitive, minimizes cognitive load, and reduces user frustration, which are all prerequisites for sustained engagement in a self-directed learning environment (Tractinsky et al., 2000).

The Role of Motivation in Mobile Assisted Language Learning (MALL)

Motivation is widely recognized as a crucial affective filter in successful second language acquisition (Gardner, 1985). Mobile Assisted Language Learning (MALL) environments, like the one developed in this study, are highly effective in increasing intrinsic motivation due to their portability, immediacy, and capability for personalized, low-stakes feedback (Godwin-Jones, 2011). Gamification elements, which are core to the design of MalayLearning, further exploit this motivational advantage by providing clear objectives, immediate rewards, and progress tracking mechanisms. This approach successfully transforms the otherwise tedious process of rote memorization into a more enjoyable and self-directed activity (Deterding et al., 2011), directly addressing the challenge of low motivation identified among UUM's foreign students.

Methodology

The ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) was utilized as the structured instructional design methodology to guide the project from inception to final evaluation (Adeoye et al., 2024).

Analysis

This phase focused on defining the functional and non-functional requirements and addressing Project Objective 1. A needs analysis, conducted via interviews with a Malay language instructor and surveys with foreign students, was essential to identify the specific challenges

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(grammar, vocabulary, pronunciation, motivation) and inform the application's design to meet user needs.

Design

This phase involved creating the blueprint (Project Objective 2). Figma was used to develop a low-fidelity prototype, establishing the application's navigation flow and structure. Content was designed specifically to cover key features for beginners, including lessons on grammar, vocabulary, listening tests, and pronunciation guides.

Development

In this phase, the high-fidelity prototype, named MalayLearning, was constructed (Project Objective 2). Unity was used to develop the interactive prototype, ensuring a functional user interface and realistic user experience demonstration. The development involved collaboration to ensure alignment with client and pedagogical expectations. The selection of the Unity game engine aligns with established practices for creating complex, interactive, and immersive learning applications, leveraging its cross-platform capability and robust support for multimedia integration (Wu et al., 2013).

Implementation (Formative Evaluation)

This phase served as the verification step (Project Objective 3). The high-fidelity prototype was tested with experts to gather initial feedback, identify usability problems, and receive recommendations for improvement. The results from this phase were critical for refining the prototype before end-user deployment.

Evaluation

The final phase involved both formative and summative evaluations.

Formative Evaluation (Expert Review)

- Method: Expert review was conducted through prototype walk-throughs and semi-structured interviews.
- Participants: Four UUM academics: three Multimedia Experts (lecturers from SMMTC) and one Content Expert (Malay language instructor from SLCP).
- Instrument: Interview questions were adapted from Nielsen Norman Group guidelines (Harley, 2018), focusing on Usability Strengths, Usability Problems, and Recommendations.

Summative Evaluation (User Testing)

- Method: Surveys using open-ended questions were administered via Google Forms to collect qualitative feedback.
- Participants: Five target users (UUM foreign students learning the Malay language). Although the sample size ($N=5$) limits strong generalizability, it is appropriate for this initial developmental stage focused on qualitative proof-of-concept validation (Nielsen, 2012).
- Instrument: Questionnaire questions were adapted from Razak et al. (2024), focusing on engagement, usefulness, confusion/difficulty, future suggestions, and recommendation likelihood.

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Results

Formative Evaluation Findings and Improvements

The expert review yielded valuable insights, confirming the application's Usability Strengths (user-friendly, clear interfaces, suitable content for beginners) while identifying several critical Usability Problems. The recommended changes and their subsequent implementation are summarized in Table 1.

Table 1: Formative Evaluation Findings and Corrective Implementation

Component	Usability Problem	Design Principle Affected	Recommendation & Implementation
Navigation	Redundant "Next" buttons appeared when no further progression was possible.	Coherence Principle (extraneous information).	Redundant buttons were removed.
Visual Design	Sentences in lessons were center-aligned and difficult to read; examples lacked labels.	Aesthetic and Usability Heuristics.	Text alignment was changed to left-aligned; labels were added to examples.
Feedback	In the listening quiz, the answer feedback from the previous question overlapped with the automatic play of the next question's audio.	Temporal Contiguity Principle.	Audio play was changed to user-controlled (manual button click) to separate feedback from question initiation, resolving confusion.
Features	Lack of personalization features (scores) and inconsistent use of language (too much English).	User Control and Freedom.	A score recording section was added, and more Malay words were used in the interface to enhance learning.

Summative Evaluation Findings (User Testing)

The Summative Evaluation provided strong evidence of the application's acceptance and effectiveness among the target user group (Project Objective 4). The qualitative feedback was synthesized across three dimensions: Usability, User Experience, and Feedback for Improvements, as detailed in Table 2.

Table 2: Summative Evaluation Key Findings

Dimensions	Findings
Usability	The app is smooth enough to use. Easy to understand and learn the basic stuff about Malay. The app is easy, simple, and the design is clear and straight to the point.
User Experience	The quizzes can help boost confidence in Malay. Able to concentrate while learning. The app is interesting and user-friendly. All the features are useful.

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	No confusion when using the app. Intend to recommend to others (100% agreement).
Feedback for Improvements	Integrating more multimedia elements, such as videos, graphics, and animations. Provide a translation function.

Usability, Clarity, and Confidence

Participants consistently praised the application's design for being "smooth," "easy," and "straight to the point," confirming its high level of usability for a beginner audience. Crucially, the corrective actions taken after the Formative Evaluation were validated, as all participants explicitly stated that they did not find any part of the application confusing or difficult to use. Users reported heightened confidence, suggesting that the interactive nature of the app improved affective engagement with the language material. This outcome confirms the application's efficacy in adhering to fundamental usability heuristics.

User Experience and Recommendation

The qualitative data strongly indicates a positive User Experience (UX), demonstrating the application's engagement potential. Users reported being "able to concentrate while learning" and finding the application "interesting and user-friendly." The inclusion of quizzes was specifically mentioned as a feature that "can help boost confidence in Malay." Most notably, 100% of participants confirmed their willingness to recommend the application to other foreign students, suggesting a high perceived value and successful motivational impact.

Pedagogical Significance of User-Controlled Audio

The modification of the listening quiz to user-controlled playback was particularly significant. By allowing users to trigger audio at their own pace, the application effectively reduced extraneous cognitive load, ensuring that auditory input did not compete with visual feedback, thereby supporting deeper comprehension.

Recommendations for Future Development

Two primary avenues for improvement were suggested by the users. First, there was a unanimous call for richer multimedia integration, specifically the use of videos, graphics, and animations, to further enhance the learning content. Second, users recommended the inclusion of a utility function, such as a dedicated translation capability, to improve real-time support during self-study.

Discussion and Implications

The successful adherence to the ADDIE model, supported by research such as Alimi and Adegoke (2020) and Branch (2009), and Morrison et al. (2019) on its effectiveness in instructional design, was foundational to the positive outcomes of this study. The application of Mayer's multimedia principles, consistent with the review by Wong and Lim (2022) on mobile language learning, was essential for achieving high usability.

The successful adherence to the ADDIE model was foundational to this study (Morrison et al., 2019). Differentiating the theoretical roles reveals that while ADDIE structured the developmental workflow, Mayer's principles guided micro-level design decisions, and GBL theory informed the motivational architecture.

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The Formative Evaluation was critical for identifying and correcting design flaws. For instance, the modification of the listening quiz from auto-play to user-controlled playback successfully aligned with the Temporal Contiguity Principle, which advises placing corresponding auditory and visual elements close in time or, as necessary here, allowing the user control to prevent temporal overlap and confusion. Similarly, removing redundant navigation supported the Coherence Principle by eliminating extraneous information.

The Summative Evaluation results strongly support the application's validation. The unanimous positive feedback regarding usability and the absence of reported confusion confirm that the application is well-suited for its target audience, UUM foreign students who are beginners in Malay, addressing the challenges identified by Hashim and Yahya (2019). The positive user satisfaction aligns with the findings of Lai and Lai (2021) regarding the positive effect of mobile application delivery on learning performance and user acceptance. Furthermore, the high ratings for usability and usefulness strongly predict long-term adoption, consistent with the Technology Acceptance Model (TAM), which posits that Perceived Ease of Use and Perceived Usefulness are the primary drivers of user intention to use a new system (Liaw & Huang, 2013). Furthermore, the 100% recommendation rate among the initial participants, while limited by the sample size, indicates a successful translation of GBL theory into practice.

Connecting GBL to Motivational Outcomes. A key implication of the 100% user recommendation rate is the successful translation of Game-Based Learning (GBL) theory into practice. The initial analysis identified low motivation as a primary challenge for foreign students. The findings, users finding the app "interesting," "user-friendly," and heightened confidence directly indicate that the gamified, mobile approach acted as a successful motivational intervention, aligning with GBL research by Granic et al. (2014) and Phuc and Nghi (2023). This positive outcome, particularly for Malay vocabulary acquisition, is reinforced by the specific developmental work of Zaini and Yaacob (2023). This demonstrates that the mobile application not only delivered content effectively but also created a conducive environment for autonomous and self-directed learning.

However, the study notes two key limitations: the small sample size ($N=5$) for the summative evaluation, which limits generalizability to the entire UUM foreign student population, and the lack of assessment on long-term learning outcomes, which suggests an avenue for future quantitative research. The user suggestions, particularly the integration of videos, graphics, animations, and a translation function, also provide a clear roadmap for future feature development to enhance pedagogical depth.

The findings suggest significant implications for UUM's language support policies. Integrating digital tools like MalayLearning into the formal curriculum could enhance the socio-linguistic integration of international students. For curriculum designers, this study demonstrates a scalable strategy for using MALL to address learner motivation and autonomous vocabulary acquisition.

The study acknowledges methodological limitations, primarily the small sample size ($N=5$), which restricts broad generalizability. Additionally, the current scope focuses on initial acceptance rather than long-term retention. Technical recommendations, such as the need for translation functions and richer multimedia, provide a clear roadmap for version 2.0.

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Conclusion

This study successfully developed MalayLearning, bridging the gap between instructional theory and mobile language practice. By integrating micro-level design (Mayer) and motivational architecture (GBL) within a macro-workflow (ADDIE), the study demonstrates a robust approach to educational app development. While initial user testing confirmed high usability and acceptance, future research should transition toward experimental designs and mixed-method longitudinal tracking to measure long-term pedagogical effectiveness. This research serves as a foundation for enhancing the digital learning ecosystem for international students in Malaysia.

This study successfully developed and evaluated MalayLearning, a game-based mobile application designed to aid UUM foreign students in acquiring the Malay language, guided by the ADDIE model and Mayer's multimedia principles. The rigorous two-stage evaluation process, from formative expert review followed by summative user testing, provided valuable insights, confirming the application's high usability, engaging user experience, and overall effectiveness. The MalayLearning application is confirmed as a useful, interesting, and user-friendly solution to address common challenges in beginning Malay language acquisition, successfully addressing the key issue of learner motivation. Future development efforts will focus on implementing advanced functionalities, such as user login, a daily communication section, a dedicated translation function, and richer multimedia integration to provide a more effective and comprehensive learning tool.

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