Revolutionizing English Vocabulary Learning for Malaysian University Students through Gamified Mobile Learning

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Abstract—**Low vocabulary knowledge remains a significant challenge for Malaysian university students during their English learning journey. The traditional method of memorizing English vocabulary often feels tedious and lacks inspiration. However, the education landscape is evolving rapidly with technological advancements. Mobile learning (M-Learning) has emerged as a transformative approach, enabling students to engage with English language learning through mobile platforms, especially on smartphones. One innovative trend in education that holds great promise is the integration of gamification. This approach seeks to enhance students' motivation and active participation in the learning process. This study introduces a gamification approach to address the vocabulary challenge faced by Malaysian university students—the "*EasyLearn*" application. This Android-based solution leverages the power of gamification to assist Malaysian university students in acquiring English vocabulary. Employing an iterative development model, this study focuses on the gamification approach's implementation. Three iterations encompassing requirement and analysis, design, implementation, and testing were conducted. *EasyLearn* application was successfully deployed and aligning seamlessly with user requirements. By emphasizing gamification in English language learning, this pioneering mobile learning solution represents a significant step forward in fostering motivation and enthusiasm among Malaysian university students, ultimately transforming the way they approach vocabulary acquisition.**

Keywords—**Gamification, mobile application, English vocabulary learning, mobile learning, M-learning**

I. INTRODUCTION

In Malaysia, English is one of the most common languages spoken along with Malay. It is used widely not only in daily communication but also as the medium of education and government houses. Therefore, mastering English is essential for socializing and entertainment as well as work. English is also a compulsory subject and is taught in all Malaysian schools as a second language. However, most Malaysian students still have difficulty mastering the English language. Many Malaysian students are unable to master the English language after spending 11 to 12 years of English learning during their primary and secondary school [1]. Language proficiency becomes more important in tertiary education as the teaching methods and reading materials are mainly in English.

Undoubtedly, vocabulary is the most important component when learning a native language or any foreign language. This is because vocabulary is the building blocks that we can use to share information, express our ideas and thoughts, and understand the text's contents. Malaysian tertiary learners faced difficulty in understanding long sentences once the difficult words exist if they have limited vocabulary knowledge [2]. English as an Additional Language (EAL) learners typically take longer to master the high-frequency vocabulary essential for their academic success [3]. The lack of vocabulary knowledge has the potential to influence EAL learners' academic success in reading comprehension [4]. Moreover, most Malaysian undergraduates are only at 2000 words level and almost all of them do not achieve at University Word Level (UWL) [5]. Low vocabulary knowledge is one of the biggest challenges faced by Malaysian university students during the English learning process.

In addition, Malaysian university students may lack motivation for learning English as memorizing English

vocabulary is often considered tedious. The learning process among learners of English as a second language will be affected once they lack motivation and digital gaming technologies especially mobile games will be the best way to create enthusiasm for new language learning [6].

Besides, the rapid development in the past few decades has brought significant changes not only to human life aspects but also to the learning process. Mobile learning (M-Learning) has become a learning method where students can learn using mobile platforms or devices such as smartphones. Having a smartphone is like having a tiny computer in a pocket [7]. The statistic showed that the Internet accessed through the smartphone among Malaysians continues to be the most popular compared to other devices [8]. The dictionary app as one of the mobile applications will be downloaded and used by most students as an approach to refer to and check the word they did not understand [9].

Mobile applications not only can enhance the learning of vocabulary but also improve the confidence of the learner [10]. The gamification approach has become the new face of education in the information age, defined as the process of engaging users in games [11]. A gamification approach is a suitable method to achieve positive outcomes in education, it works by motivating students to adapt to new behaviors, allowing them to learn more or learn new things; it also aims to keep people motivated and promote attachment and certain behaviors [12]. Gamification is an integration of game elements and game thinking in activities that are not games [13]. The most widely adopted game elements for the gamification of learning are achievements, rewards, story, time, personalization, and micro-interactions [14]. The use of game elements in non-game contexts has shown a potential benefit to learning [15]. Thus, the mobile application using a gamification approach will be one of the best ways for Malaysian university students in learning English vocabulary.

The goal of this study is to investigate the challenges Malaysian university students face when learning English vocabulary using mobile game-based apps. This study aims to develop an interactive vocabulary learning app with a gamified approach specifically designed for Malaysian university students and evaluate its quality through software testing.

II. RELATED WORKS

There are several applications related to English vocabulary application. The *Word of the Day – Vocabulary Builder* application offers a wide range of vocabulary resources from trusted sources, including synonyms, antonyms, idioms, and more. However, it may be less user-friendly for beginners due to the fully English-based definitions. Additionally, the limited daily quiz and lack of interactive elements may lead to user boredom. In other hands, the *IELTS Vocabulary – Play Games To Learn* application offers categorized vocabulary learning and interactive games but has a poor user interface and lacks engagement features, feedback, and an extensive word database. Another work, the *Game To Learn English* application incorporates gamification elements, offering rewards and achievements to enhance user engagement.

However, it has a limited vocabulary database, lacks a revision feature, and does not allow users to revisit learned words.

TABLE I. COMPARISON OF EXISTING SYSTEMS

Features	Word of the Day – Vocabulary Builder	IELTS Vocabulary – Play Games To Learn	Game To Learn English	*EasyLearn*
Device Support	iOS and Android	Android	Android	Android
User Interface Design	Good	- Poor - Low attractive in terms of the arrangement	Good	Good
Vocabulary Category	No Category	By group /situation	By group /situation	By group/ situation
Learning Type	Text and audio	Picture, text, and audio.	Picture, text, and audio.	Text and audio
Game Interaction	No interaction	No interaction	-Animation -Audio -Typical gaming elements (time, rewards, and achievements)	Typical gaming elements (time, rewards, and achievements)
Vocabulary Size	Unlimited	Limited with almost 1000 words	Limited to less than 1500 words	Unlimited
Bookmark	Provided	Provided	Not Provided	Provided
Language Support in Game and Dictionary	Fully English-based	Fully English-based	Fully English-based	English to Both Malay and Chinese

Based on the information presented in Table I, it is evident that only *Word of the Day – Vocabulary Builder* and *EasyLearn* offer unlimited access to vocabulary from trusted sources. In contrast, *IELTS Vocabulary – Play Games To Learn* and *Game To Learn English* have limitations, with the former providing approximately 1000 words and the latter offering fewer than 1500 words. Notably, only *Game To Learn English* and *EasyLearn* incorporate typical gaming elements such as timing, rewards, and achievements into their gameplay. Additionally, it's worth mentioning that all the mentioned systems feature game and dictionary components that are exclusively English based, except for *EasyLearn*, which supports both Malay and Chinese languages in its game and dictionary functionalities.

III. METHODOLOGY

The iterative model was selected as the methodology that was implemented in the development of the *EasyLearn* application. In this model, each iteration was divided into a few phases: requirement analysis, design, implementation, and

testing. Iterative is a life cycle model which starts by implementing just part of the software rather than beginning with a full specification of requirements [16].

The iterative model was chosen as the project's methodology due to its advantages in simplifying product debugging, management, and testing by breaking down large development processes into smaller iterations. This approach allows for flexibility in adapting to changing requirements and makes it easier to identify design and functional flaws early on, as a working model is developed incrementally. Furthermore, a successful iteration serves as a solid foundation for subsequent development phases, making it a practical choice for the project's development process.

In Iteration 1 of the project, the primary focus is on establishing a clear scope and understanding of the system's objectives. This involves gathering requirements from stakeholders, particularly Malaysian university students, who are the target users. Requirements are collected through questionnaires, and existing English vocabulary learning applications are analyzed for insights. The design phase encompasses interface, architecture, and database design, with detailed diagrams and documentation. Deliverables at the end of this iteration include mock-up interfaces, Software Design Documents (SDD), System Requirements Specifications (SRS), and System Test Descriptions (STD), setting the groundwork for subsequent development and testing phases.

In Iteration 2 of the project, the primary objective is to build a functional system through coding, allowing for feedback collection and stakeholder requirement validation. This iteration revisits the requirement gathering and analysis phases to refine project requirements based on feedback received from the first iteration. It also reiterates the design phase to create a more detailed system design in line with the latest requirements and stakeholder feedback. Implementation involves coding the system components using Flutter and Android Studio for the mobile-based *EasyLearn* application, with Cloud Firebase used for real-time data storage. Subsequently, the testing phase focuses on identifying and documenting potential issues and bugs, using previously designed test cases to validate system performance and functionality. Any errors or defects discovered are documented for review in the next iteration.

Iteration 3 of the project aims to deliver a fully functional system to end-users by updating requirements, refining system design, addressing defects identified in previous testing phases, and conducting comprehensive testing. The requirement gathering and analysis phase reviews stakeholder feedback from previous iterations, refining processes, and requirements if necessary. The design phase ensures a detailed design aligns with the latest requirements, avoiding redundancy and ensuring consistency. The implementation phase focuses on debugging and correcting defects identified in the prior testing phase. In the testing phase, black box testing is repeated to ensure the system meets SRS requirements and operates without errors. User Acceptance Testing (UAT) and system testing are also conducted to assess the system's readiness for end-users and its alignment with user requirements. As a result, a total of 3 iterations have consisted in this project development as shown in Fig. 1.
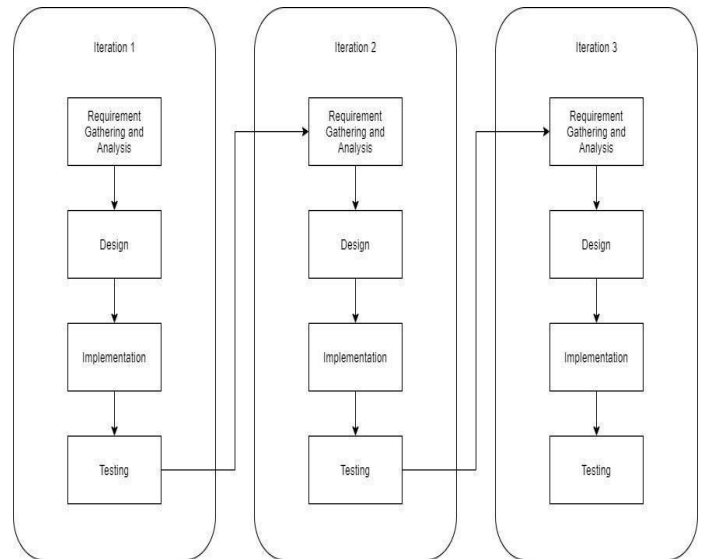

Fig 1. Iterative model

IV. SYSTEM ARCHITECTURE AND DESIGN

A. MVC Architecture

The model-view-controller (MVC) design pattern was selected as the architectural style for the *EasyLearn* application. The main reason for selecting MVC as the architectural design pattern is because it can define the logic structure (including business logic, user interface logic, and input logic) in the *EasyLearn* application by separating them into three main logical components which are Model, View, and Controller. The business logic is handled by the Model component which is mainly related to the data retrieval and data updating in the database. The View Component is responsible for the user interface logic which is mainly related to the information and data presentation. The input logic is in charge of the Controller component which is related to user input responding and performing interactions on the data model. Hence, the separation between each component helped in reducing the coupling between the components as they will not affect each other.

B. Use Cases

There are a total of 16 use cases and two actors in the *EasyLearn* application. Those use cases are register account, log in, update profile, play word game, view bookmarked word, bookmark a word, unbookmark a word, search a word, manage a word, manage the game, manage question stage, manage question category, manage question, manage question option, view performance, and view overall users performance. While the User (Malaysian university student) and Admin are the two main actors in this application. Fig. 2 shows the use case diagram of the *EasyLearn* application.
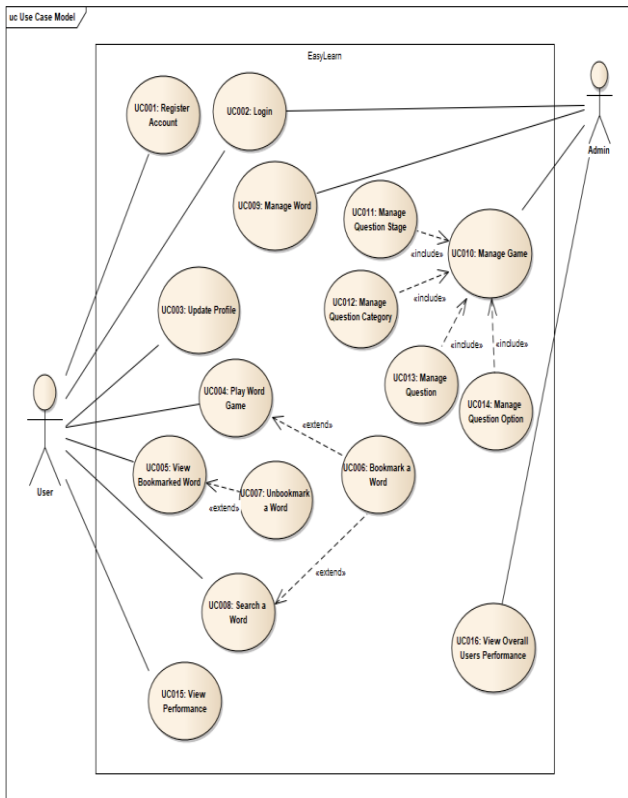
Fig 2. Use Case

V. RESULT AND SYSTEM TESTING

A. Result

All the functions in the system could be tested through the real or emulator Android devices as the *EasyLearn* application was designed fully mobile based. In the *EasyLearn* application, there will be two major actors which are the user (Malaysian university student) and the admin. Since *EasyLearn* application aims to help Malaysian university students to learn English vocabulary.

Therefore, the main functions of the system is for searching for an English word and playing the word game that was designed for the user. Fig. 3 shows the interface when the user searches for a valid English word. On top of the interface is the search bar where the user can insert and search for an English word. The below container represents the result of the searched word. The user allows to listen to the pronunciation of the word by clicking the "Volume" button and bookmarked an English word by clicking the "Bookmark" button. The small cards inside the container represent the word meanings of the searched word with the lexical category, definition, and example sentences in English, Chinese and Malay if available.
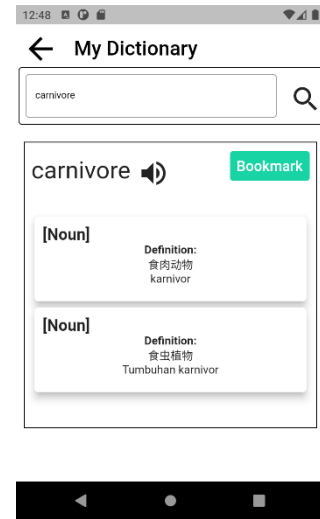

Fig 3. Word Searching Page for User to Search an English Word

Fig. 4 displays the menu interface, presenting all the available game stages within the system. Each small card in the interface represents a distinct game stage, featuring its corresponding level and title. Unlocked game stages showcase the highest number of stars earned by the user on that stage, while locked stages are marked with a "lock" icon at the top right corner of the card. Users can select a game stage by simply clicking on it through this interface.
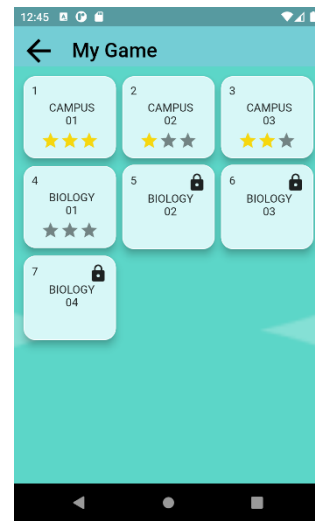

Fig 4. Game Menu Page for User to Select a Game Stage

Fig. 5 presents the interface that appears when a user selects an unlocked game stage from the menu. At the top of the interface, the selected stage's level is displayed. Furthermore, the interface provides information such as the stage's title, the user's highest star rating achieved on that stage, the total number of questions earned and answered, and the allocated time for answering questions within the selected

game stage. To commence playing the game stage, the user can simply click on the "Play Now" button.
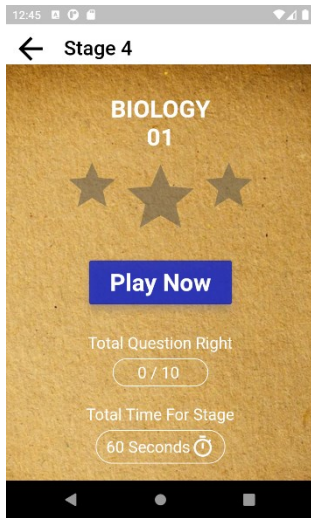

Fig 5. Game Stage Page for User to View and Play a Game Stage.

Fig. 6 illustrates the interface during active gameplay of a game stage. At the top of the screen, the current question number is displayed, accompanied by a countdown clock indicating the remaining time for answering questions. Users have the option to bookmark a question word by clicking the "Bookmark" button. Just below this button, users can see the question word and its lexical category. Additionally, there are four answer options presented, labeled as A, B, C, and D, each accompanied by a combination of Chinese and Malay definitions.

Fig 6. Game Question Page for User to Answer a Word Question.

Fig. 7 depicts the interface that appears when a user completes a game stage or when the allotted time expires. This interface presents the user's performance results in terms of question answers for the game stage. The displayed information includes the stage's level, title, the total number of correct answers, and the number of stars earned by the user during the stage. Additionally, at the bottom of the interface, a comment and the corresponding number of stars earned are provided to offer feedback and recognition for the user's accomplishments.
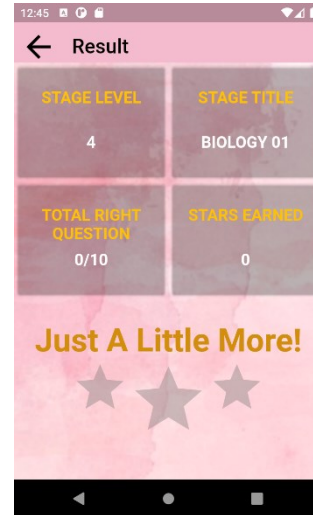

Fig 7. Game Question Page for User to Answer a Word Question.

B. Functional Testing

Black box testing is a testing method that evaluates the functionality of an application without requiring knowledge of its internal code or implementation. In essence, it concentrates on examining the application's inputs and outputs, encompassing both functional and non-functional aspects, and comparing the actual output with the expected output. The success or failure of a test case is determined by the accuracy of the actual output during execution. In the context of this application, testing is conducted based on test cases derived from the use cases.

C. User Acceptance Ttesting (UAT)

For the software testing, the User Acceptance Testing (UAT) was carried out with a total of 10 participants involved. To avoid bias and ensure the fairness of the testing result. The participants are selected randomly inside the campus. The UAT is the final stage of the software testing process. The main purpose of user acceptance testing (UAT) is to verify that the implemented solutions and functions are suitable for users. By using UAT, it is also possible to understand the ability of an application to meet the user's needs by providing the user with instructions to perform the desired task. For testing, user feedback can also be used to improve the application. The main

objective of this application is to help Malaysian university students to learn English vocabulary. Thus, only the tasks and functionalities that are designed for the User were tested in UAT.

Likert scales were used to measure the testers' satisfaction with the highest score of 5 and the lowest score of 1. And the higher the score means the more satisfied the tester is with the application. Fig. 8 shows the satisfaction with the application across all testers.
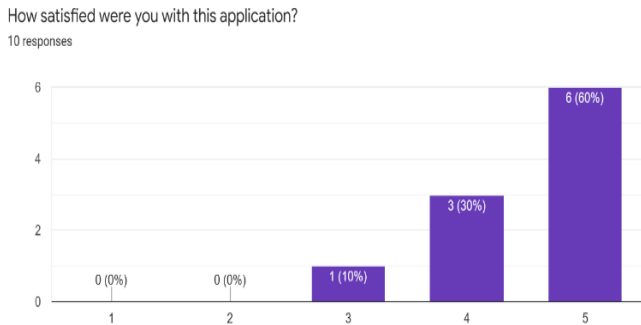

Fig 8. Testers' Satisfaction with the Application

The overall feedback from all participants indicates a high level of satisfaction with the application. Additionally, the majority of users noted that the app boasts a user-friendly and intuitive interface, making it convenient for them to complete their tasks. This positive response is encouraging, as a simple and user-friendly design tends to attract a larger user base for task outsourcing.

VI. DISCUSSION AND CONCLUSION

The developed application caters to users of all English proficiency levels. It is well-suited for beginners who wish to learn English vocabulary by allowing them to search for and bookmark unfamiliar words for revision. Users with average and high English proficiency levels can benefit from this application by expanding their vocabulary through quiz games and the dictionary feature. The application incorporates gamification elements such as achievements, rewards, and time constraints. For instance, a countdown clock is included in the quiz game, adding a sense of urgency to the questions. Users earn stars as rewards based on their performance in each level. The achievement element is introduced through a leveling system, where users unlock new stages as they complete the previous ones. These gamification elements are designed to engage learners and motivate them to continue their English vocabulary learning journey. Additionally, the application records users' question-answering accuracy, stage progression, and the total number of words learned. It offers a comprehensive learning experience that caters to most Malaysian university students, supporting both English to Chinese and Malay language translations in its games and dictionary features.

For future enhancements, several suggestions have been proposed for this application. These include implementing badges based on user performance in the quiz game, expanding the application's availability to iOS devices to reach a broader audience of Malaysian university students, incorporating the Tamil language into both the dictionary and quiz game, offering additional language translation options like Chinese-English, Malay-English, and Tamil-English, and introducing a discussion forum to facilitate user interaction and discussions within the application's community. These improvements aim to enhance the overall user experience and functionality of the application.

In conclusion, this study holds significant importance in offering a well-designed platform for Malaysian university students to enhance their English vocabulary. The application's core objective is to boost motivation among Malaysian university students by employing gamification principles within the quiz game, effectively turning learning into an engaging and enjoyable experience. Furthermore, this application's wide reach is notable, as it caters to most Malaysian university students by offering English content in both Chinese and Malay languages through its game and dictionary features. By addressing these crucial aspects, this study contributes to improving English language learning outcomes among Malaysian university students and provides a valuable resource for their educational journey.

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