GAMIFICATION LEARNING SYSTEM:

WORD ADVENTURE

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ABSTRAK

"Sistem Pembelajaran Gamifikasi: Pengembaraan Perkataan" ialah platform permainan pembelajaran dalam talian yang bertujuan untuk menyelesaikan cabaran penyertaan dan motivasi yang rendah dalam pembelajaran perbendaharaan kata tradisional. Dengan permintaan yang semakin meningkat untuk alat pendidikan yang inovatif, permainan ini menggabungkan elemen gamifikasi ke dalam pembelajaran bahasa, menyediakan pengguna cara yang interaktif dan menyeronokkan untuk meningkatkan perbendaharaan kata bahasa Inggeris mereka. Melalui ciri teras seperti mekanik ejaan perkataan dan cabaran halangan, pelajar boleh mengeja perkataan untuk mengatasi halangan dan terlibat dalam pertempuran bos. Mekanik ini bukan sahaja menjadikan pembelajaran perbendaharaan kata lebih menarik, tetapi ia juga memberikan maklum balas dan ganjaran segera untuk memastikan pemain bermotivasi. Di samping itu, permainan ini mengimbangi kandungan pendidikan dan hiburan, menggabungkan pembangunan kemahiran bahasa utama dengan keseronokan melengkapkan tahap dan menakluki cabaran permainan. Dengan menggabungkan elemen seperti mata ganjaran dan laluan pembelajaran yang diperibadikan, Word Adventure memastikan pelajar boleh menjejaki kemajuan mereka dan kekal terlibat. Dan projek itu menggunakan model pembangunan tambahan, secara beransur-ansur menggabungkan kandungan

pendidikan dan permainan baharu, sekali gus memecahkan kebosanan kaedah hafalan tradisional. Matlamat utamanya adalah untuk mencipta platform yang bukan sahaja meningkatkan ingatan perkataan, tetapi juga menggalakkan interaksi pemain dan pembelajaran berkesan jangka panjang.

Abstract

" Gamification Learning System: Word Adventure " is a 2D online learning game platform, the project aims to solve the challenge of low participation and motivation in traditional vocabulary learning. With the growing demand for innovative educational tools, this game incorporates gamification elements into language learning, providing users with an interactive and enjoyable way to improve their English vocabulary. With core features such as word spelling mechanics and obstacle challenges, learners can spell words to overcome obstacles and engage in boss battles. These mechanics not only make vocabulary learning more engaging but also provide immediate feedback and rewards to keep players motivated. In addition, the game balances educational content with entertainment, combining the development of key language skills with the excitement of completing levels and conquering game challenges. By combining elements such as points, rewards, and personalized learning paths, Word Adventure ensures that learners can track their progress and stay engaged. And the project adopts an incremental development model, gradually incorporating educational content and new gameplay, thus breaking the monotony of traditional memorization methods. The ultimate goal is to create a platform that both improves word memory and promotes player interaction and long-term efficient learning.

1.0 INTRODUCTION

With the advancement of time, the world has witnessed dramatic technological changes. This has also led to significant transformations in educational methods, particularly in the field of language learning. Numerous studies have shown that traditional vocabulary

memorization methods are often monotonous and tedious, resulting in learners lacking sustained motivation, which in turn affects learning outcomes. To address this issue, gamified learning systems have gained widespread attention and application in the education sector. By integrating game elements such as points, levels, and reward mechanisms into the learning process, gamified learning effectively enhances learner engagement and efficiency (Sailer & Homner 2020).

In 2022, a study published in the journal *Foreign Language Annals* demonstrated that participants who completed a gamified course achieved reading and listening proficiency levels comparable to university students after four semesters of study, suggesting that gamified platforms can be effective tools for language learning (*Foreign Language Annals* 2022). Therefore, this project proposes to design and implement a word crossing platform based on gamified learning systems to solve the inefficiency of current word learning. The name of the platform is Word adventure, which combines gamification elements with language learning by designing mechanisms such as word spelling selection and BOSS battle, so that learners can overcome difficulties by spelling words in the process of completing game tasks, thereby improving the effect of vocabulary memory. At the same time, the platform provides rewards and points system, allowing users to track their learning progress in real time and maintain the enthusiasm and fun of learning.

The game system generates letter blocks that form correct words based on player movement, enabling progress through each level. This not only enhances spelling skills but also increases learner interest. A time-limited BOSS battle mode is included, where players earn points by quickly matching or identifying English words. Reaching the required score results in victory, adding a sense of urgency and pressure that further reinforces learning. The platform also features a real-time points and reward system, allowing users to track their progress and remain motivated.

Therefore, this project is designed to achieve the following objectives:

1. To explore the characteristics of engaging and fun learning games.
2. To develop a gamified system for vocabulary learning.
3. To evaluate the effectiveness of the gamification system in promoting vocabulary retention.

The scope of this project is limited to vocabulary learning within a 2D online game environment. The game includes level design, vocabulary spelling tasks, points, and reward mechanisms to motivate learners. Emphasis is placed on spelling and understanding of words; grammar, listening, and speaking components are excluded. The platform uses 2D graphics for simplicity and accessibility.

2.0 LITERATURE REVIEW

Gamified learning has become an increasingly popular method in modern education, particularly in language learning where vocabulary acquisition plays a central role. Traditional vocabulary learning methods often rely on mechanical memorization, lacking interaction and engagement. In contrast, gamification integrates game elements such as rewards, level progression, and real-time feedback, which can effectively enhance learner motivation, participation, and knowledge retention (Sailer & Homner, 2020). Research shows that gamified learning satisfies learners' psychological needs for autonomy, competence, and relatedness (Liu Yufeng, Hew & Du, 2023), while also promoting sustained attention and learning interest when applied properly (Su & Cheng, 2015). However, the effectiveness of gamified systems depends on context and duration, as short-term interventions often show stronger effects than long-term ones (Kim & Castelli, 2021), and challenges like learner anxiety or reduced intrinsic motivation may emerge when extrinsic rewards dominate (Bai, Hew & Huang, 2020).

Despite the increasing popularity of gamified vocabulary learning platforms such as Duolingo, Memrise, and Wordscapes, current systems still face limitations in

personalization, interactivity, and feedback. Duolingo offers curriculum-based progression and reward systems but lacks individualized learning paths (Ajisoko, 2020). Memrise and Wordscapes provide engaging visual and puzzle-based mechanics yet fall short in real-time feedback and targeted vocabulary correction (Li, Hew & Du, 2023). Addressing these gaps, the proposed "Word Adventure" platform incorporates boss battle challenges, instant feedback loops, and dynamic level progression to enhance vocabulary mastery. For example, players receive immediate responses to correct or incorrect answers during gameplay, encouraging reflection and adaptive learning. Compared to other platforms, Word Adventure focuses specifically on vocabulary efficiency through interactive mechanics, offering a fun, goal-oriented experience tailored to individual learners. While existing research confirms the motivational benefits of gamification, it also emphasizes the need for educational alignment, adaptive challenge design, and sustained novelty (Carina & Vicente, 2020). The Word Adventure platform aims to fulfill these needs and contribute an innovative, learner-centered approach to gamified vocabulary learning.

3.0 METHODOLOGY

This chapter outlines the comprehensive methodology used to develop the Word Adventure platform, addressing the problems identified in existing vocabulary learning tools. The process encompasses user needs analysis, conceptual model design, system architecture, implementation, and testing. Through an iterative approach, the study integrates pedagogical insights with gamification principles to ensure that the resulting platform is engaging, pedagogically sound, and technically robust.

3.1 Needs Analysis

The needs analysis phase involved understanding the pain points of traditional word learning and identifying user expectations. Most learners find rote memorization tedious and ineffective. To address this, a prototype of the game platform was sketched

and presented to language learners and educators for feedback. Interviews with experienced educators revealed the need for structured quizzes, engaging visuals, and adaptive difficulty levels. Based on this input, key gameplay features such as boss battles, progress tracking, and real-time feedback were prioritized. Comparative analysis with applications like Duolingo and Memrise further informed requirements related to personalized pathways and competitive mechanics.

3.2 Conceptual Design and Architecture

According to Figure 1， the Word Adventure system is designed using the Model-View-Controller (MVC) architecture, promoting modularity and scalability. The model manages user data, vocabulary, and game progress, while the view handles user interfaces like the level selector, battle screens, and progress dashboards. The controller manages user inputs and system logic, such as updating scores and verifying answers.

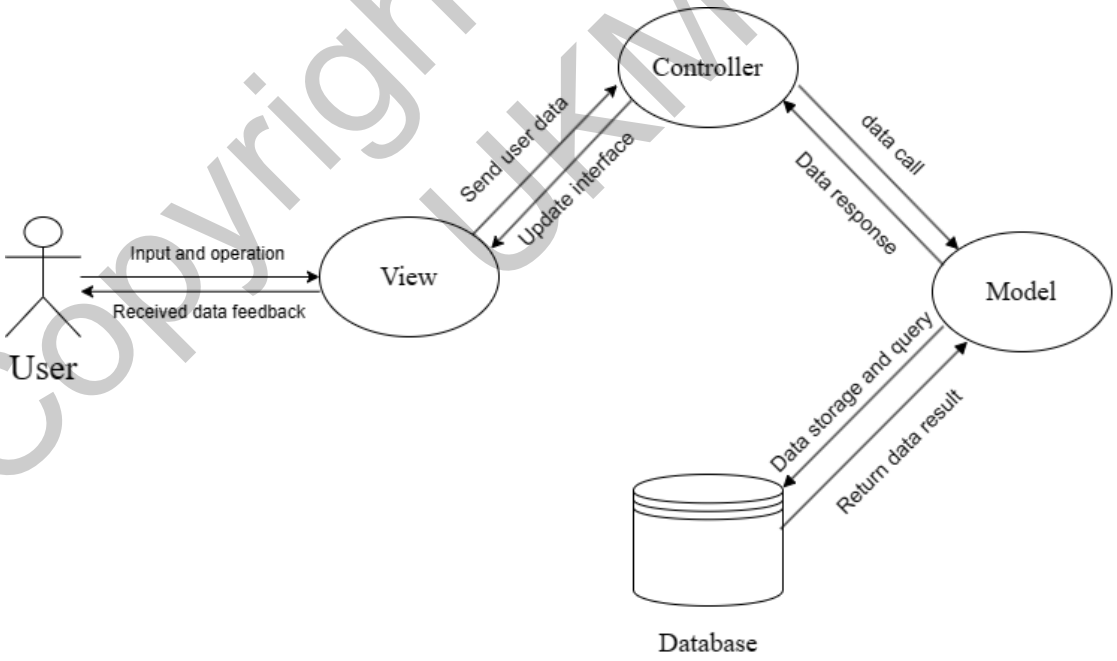

Figure 1: Word Adventure gamification learning platform system Model-View-Controller (MVC)

3.3 Requirement Specification

Functional requirements include user registration, gameplay in boss and challenge modes, dictionary lookup, multiplayer features, and progress tracking. Non-functional requirements focus on reliability, usability, and security. The platform employs Firebase for real-time data and authentication, with offline support to enable gameplay without internet access.

3.4 System Modeling

Use case diagrams were developed to visualize interactions between users, administrators, and the system. Sequence diagrams show the chronological flow from login to gameplay and progress tracking. Activity diagrams illustrate user pathways, highlighting decision points such as mode selection and dictionary use. Figure 2 will clearly show the main functions of users and administrators and the relationship between them

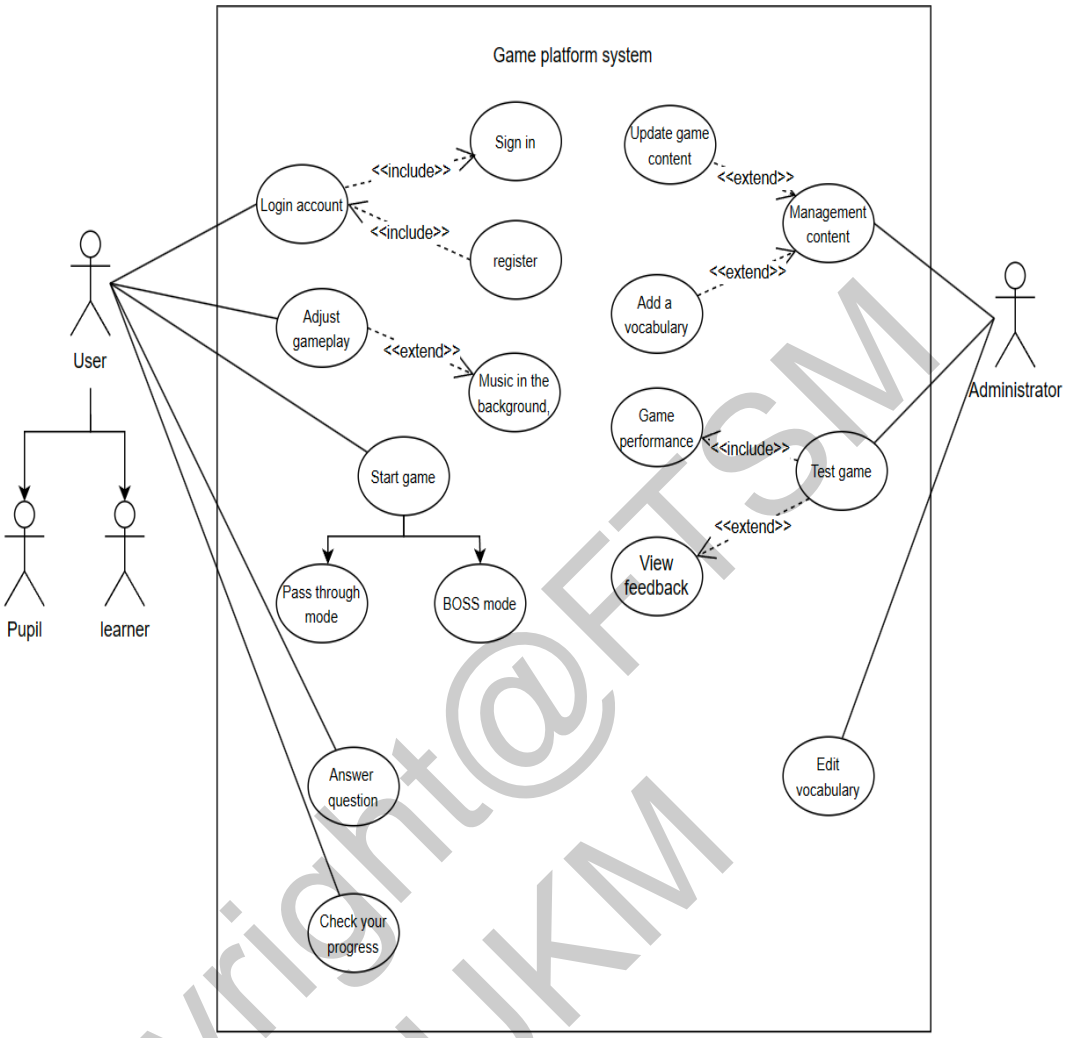

Figure 2 : Use case diagram

3.5 Implementation Tools

The platform was developed using Unity and C# in Visual Studio. Firebase handles cloud storage and user authentication. Minimum development requirements include an Intel i3 processor and 8GB RAM, with user-side operation requiring a dual-core processor and at least 6GB RAM.

3.6 Database and Algorithm Design

Figure 3 A class diagram outlines entities such as User, Vocabulary, and Game, showing attributes and key functions like tracking progress and generating questions. The data dictionary defines attributes for each class. Flowcharts describe game logic for login, settings, mode selection, and boss battles, ensuring structured gameplay and responsive feedback.

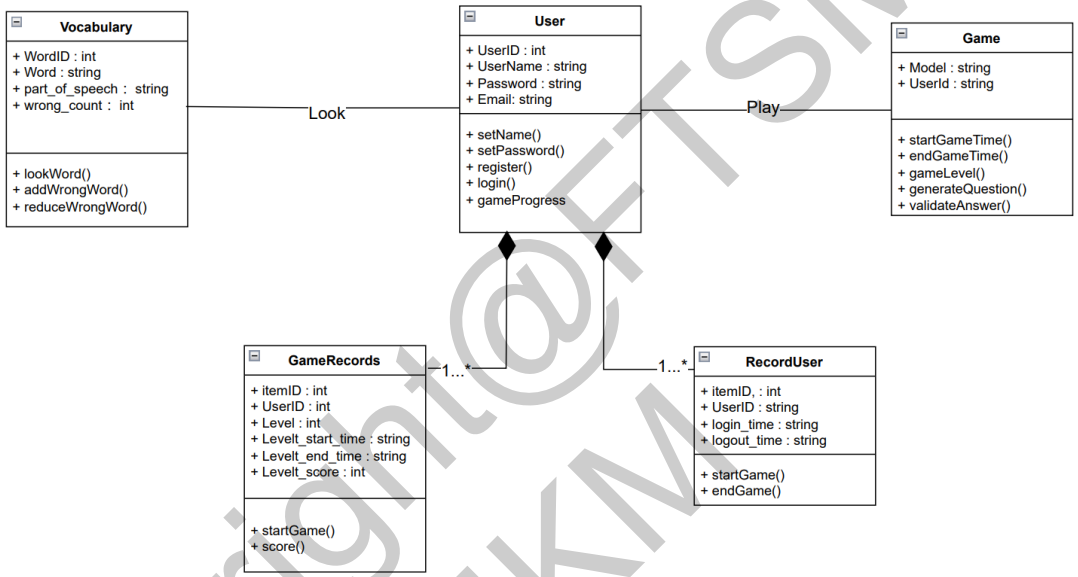

Figure 3 : Class Chart design of the Word Adventure gamification learning platform

3.7 Interface Design

The UI design emphasizes user-friendliness and motivation, with clearly labeled options for gameplay, settings, and guidance. Each interface element—from registration to boss fights—is tailored to guide learners intuitively through the vocabulary acquisition process. Use interface design to illustrate the learner's learning journey through the platform, detailing each interaction from accessing the game to completing a vocabulary challenge. By identifying and addressing potential problems early in development, this visual model enhances the overall user experience.

4.0 RESULTS

4.1 Application Development

The development of the “Word Adventure” platform was carried out using the Unity engine with C# as the core programming language. The system was designed as a 2D educational game based on gamification principles to improve English vocabulary acquisition and learner engagement. The development adopted the Model-View-Controller (MVC) architectural pattern to facilitate modular design and smooth interaction between logic, data, and user interface layers.

During the design phase, the game’s interface was created with Unity's built-in UI tools. Game scenes such as the Login Interface, Game Start Page, Wordbook UI, Boss Battle Mode, and Obstacle Challenge Mode were all carefully designed to provide intuitive navigation and engaging interaction.

The data layer stores core information such as vocabulary lists, user scores, and error logs using local data structures and arrays, simulating real backend interactions. The game control logic (movement, battle mechanics, damage handling, etc.) was scripted using Visual Studio, while animations and player interactions were handled via Unity’s event system.

4.2 Key Modules

Several core modules were developed and integrated to complete the system:

- Login and Registration System: Enables users to create and access accounts. Simulated locally with clear feedback for error handling (e.g., duplicate account, password restrictions).
- Game Start & Guide Interface: Offers game navigation, tutorial content, and game mode selection (Adventure and Boss Battle).
- Wordbook System: Allows players to preview vocabulary, and automatically stores wrong answers in a separate “Wrong List” for future review.

- Boss Battle Mode: Timed vocabulary challenges where correct answers damage the boss, incorrect answers trigger penalties. Players level up upon reaching the score threshold.
- Obstacle Challenge Mode: A side-scrolling puzzle where players must spell words correctly to overcome obstacles, with embedded traps and logic-based movement scripts.

4.3 Issues Encountered and Solutions

As shown in Table 1, during the development process, some technical and design issues were encountered

Table 1 Issues and Solutions

Issue	Description	Solution
Resource mismatch	Difficulty finding visually consistent and educationally appropriate assets	Combined open-source resources with custom-designed elements
User interface hierarchy	Button malfunction due to layer overlaps	Reorganized Canvas hierarchy and improved layout layering
Feature overload	Initial scope exceeded available development time	Focused on core features (login, wordbook, boss battle, etc.) to ensure delivery

4.4 Application Testing

To ensure the stability and effectiveness of the “Word Adventure” platform, a comprehensive testing strategy was employed. Two primary testing techniques were adopted:

- Black-box Testing: This method was used to verify whether each module performs according to the expected input-output behavior without delving into

internal code structure. This includes UI interaction, registration logic, and scene transitions.

- User Acceptance Testing (UAT): Performed from the end-user perspective to ensure the application satisfies user requirements, provides smooth gameplay, and supports intended educational goals.

Testing efforts were focused on three main aspects:

- Functional Testing: Includes login and registration validation, player movement controls, quiz logic, animation triggers, and wordbook functionality.
- Integration Testing: Verifies seamless coordination between different components, such as UI behavior during gameplay, character state transitions when panels are open, and return-button scene handling.
- Non-functional Testing: Focused on usability, responsiveness, button feedback, input restrictions, and clarity of error messages.

4.5 Test Results

Table 2 below shows that all 14 test cases have been successfully executed, and the actual results are consistent with expectations. No serious functional errors were found during the testing process. All functional modules of the system operate smoothly and meet the project requirements.

Table 2 summarizes the testing outcomes by module

Test Area	Number of Cases	All Passed
Registration & Login	5	Yes
Player Controls	3	Yes
Scene Switching & Integration	3	Yes
UI Panel Interaction	3	Yes

Each module underwent robust scenario simulation, such as repeated registration attempts, movement combined with UI toggles, and mid-battle transitions. Minor bugs were identified and resolved during testing.

5.0 CONCLUSION

Although this system has successfully achieved its main functions, there is still room for further improvement in terms of user experience, content expansion, and personalization. The current vocabulary list is relatively basic. In the future, a more extensive collection of words can be introduced, classified by topic, difficulty level or usage scenarios, to meet the needs of learners at different levels and enhance the long-term usability value of the system. Optimizing the interface and visual design Although the current UI design is simple and practical, if higher-quality game art resources, animations and background styles are added, it will further enhance the immersion and increase the fun of learning, making it particularly suitable for young users. Supporting user-defined words enables the development of a function allowing teachers or students to upload vocabulary independently, which can be used in various scenarios such as classroom teaching and exam review, thereby enhancing the flexibility and practicality of the platform. By integrating with the times and through the development of AI or rule-based methods, the difficulty of questions can be dynamically adjusted according to the user's answering performance, providing learners with a more personalized learning path and enhancing learning efficiency.

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