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Educational Game Development for Middle School Students' English Vocabulary Learning

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ABSTRACT

Student interest and participation in learning will influence learning success. Because the higher the student's interest, the better their ability and understanding of the subjects being studied. English learning at the junior high school level still faces various obstacles, one of which is low vocabulary skills or vocabulary in English. Vocabulary serves as the basis for communication and contributes to language skills. The application of technology-based learning media such as educational games can be used to improve the quality of the teaching and learning process in schools. This study aims to develop an Android educational game as a medium for learning English vocabulary. The development of this educational game uses the Game Development Life Cycle (GDLC) method.The results of the Black Box test show that all the main functions of the application, starting from the process of opening the application, menu navigation, character and camera control, mission completion mechanism, game time management, to the function of repeating the game and exiting the application, have run according to the designed specifications.

1. Introduction

Student interest and participation in learning will influence learning success. The higher the student's interest, the better their ability and understanding of the subject matter. As educators, teachers play a role in creating an engaging, interactive, and enjoyable learning environment for students. This can foster their interest in learning. However, the teaching and learning process in schools is often conventional and monotonous.[1][2]Many students feel bored and therefore lack motivation to participate in lessons, especially English. According to a 2025 report from the educational institution Education First (EF),[3]Denpasar has an English proficiency index of 477, which is in the low proficiency category. Therefore, English skills need to be improved from an early age, given that Bali is a popular international tourist destination and English is an international language used to communicate with foreign tourists.

English language learning at the junior high school level still faces various obstacles. One of the obstacles students face in learning English is a low vocabulary. Vocabulary serves as the foundation for communication and contributes to language skills.[4]. Lack of interest and involvement of students in learning makes it difficult to remember and understand the new vocabulary taught.[5][6]. Furthermore, the learning methods used tend to be teacher-centered and lack active student involvement. Students often receive instruction and memorize without any activities that foster curiosity and enthusiasm for learning. This condition results in a less than optimal teaching and learning process. If left unchecked, the goal of English language learning, which is to increase vocabulary, will be difficult to achieve.

To address these various issues, learning innovations are needed that can increase student interest and engagement during the learning process. The use of technology-based media can be an effective means of engaging students, as they are already familiar with digital devices. One such innovation is the implementation of technology-based learning media, such as educational games, which can be used to improve the quality of the teaching and learning process in schools.[7]Educational games are interactive games, not only entertaining but also have educational value.[8] [9]Through educational games, students can learn in a more enjoyable, active, and challenging way. The gameplay elements in educational games encourage students to keep trying to complete the challenges presented.[10] [11]. So that without realizing it, students learn while playing. Previous research has developed more two-dimensional (2D) quiz-based educational games. Meanwhile, the research conducted on Android-based three-dimensional (3D) adventure educational games, with English vocabulary learning. Thus, the use of educational games is expected to increase student interest in learning, especially in English vocabulary in Junior High School (SMP) students. Based on these problems, this study aims to develop Android educational games as a medium for learning English vocabulary.

2. Method

This research uses the Game Development Life Cycle (GDLC) method to develop educational games.English vocabulary learningGDLC is a method widely used for game development, resulting in high-quality games. GDLC consists of six stages: Initiation, Pre-Production, Production, Testing, Beta, and Release.[12].

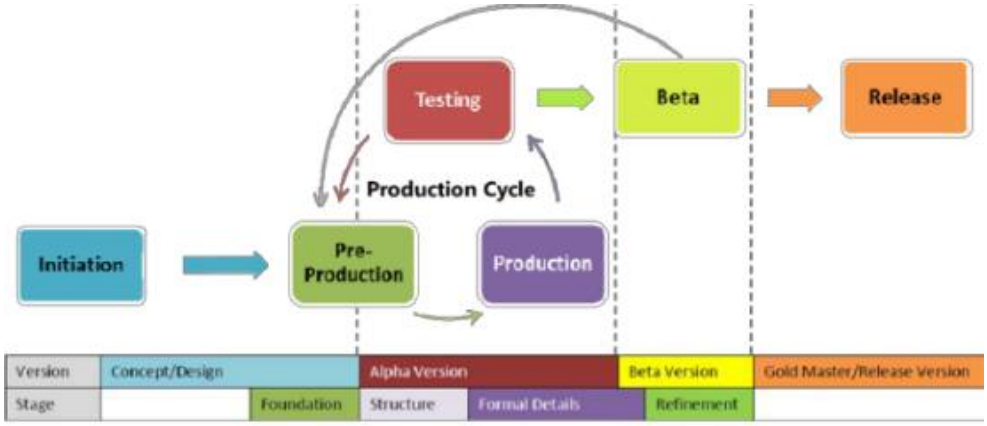

Figure 1. Game Development Life Cycle

The first stage, Initiation, is the initial stage for identifying problems, determining target users, and identifying needs in game development. This will ultimately result in a simple concept and description of the game to be developed. The next step, the pre-production stage, is the creation of the game design. This includes gameplay, storyline, levels, characters, and supporting assets. Prototype creation is also carried out at this stage. The production stage is one of the most crucial stages. This is where all elements used in the game are combined and the program code is created. Internal testing is then conducted to determine whether the game is playable or whether any bugs are still found. Beta testing is the external testing stage. The game will be tested directly with users. The Release stage is the final stage of the GDLC method and is the release of the game to the public.

3. Results and Discussions

Initiation

In the initial stage, interviews were conducted with class teachers and observations were also conducted during the teaching and learning process. The interviews and observations were conducted to identify existing problems. It was discovered that teachers were still using the lecture method, which quickly caused students to get bored and had difficulty memorizing vocabulary. This resulted in an initial concept and description of the game to be developed.

Pre-Production

In the pre-production stage, storylines, flowcharts, gameplay mechanics and supporting assets are created for the game.

1. StorylinePlayers will assume the role of Wayan Wijaya, a junior high school student. Players will explore their neighborhood, collecting objects found throughout the game. The collected items must align with the specified mission.
2. The flowchart explains that when the game is first launched, the first thing that appears is the Main Menu. Within the Main Menu, there are three menus: Play, Tutorial, and Exit. The Play menu is used to start playing the game. Players must

complete a mission to advance to the next mission. The Tutorial menu contains video tutorials on how to play the game. The Exit menu is used to exit the game.

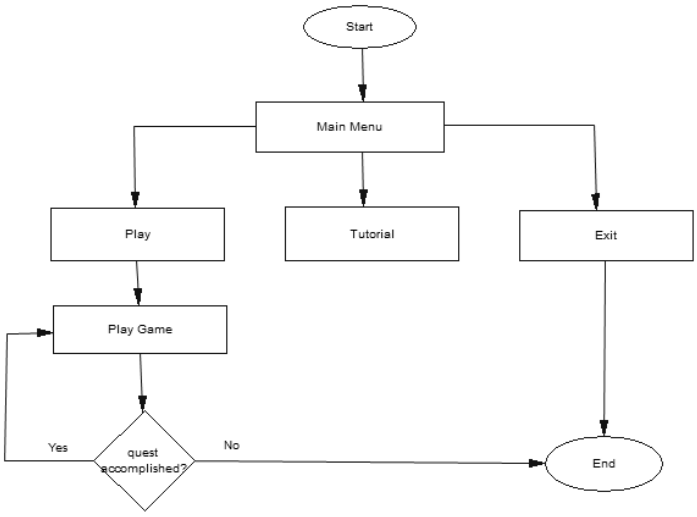

Figure 2. Game Flowchart

3. Gameplay Mechanicused to regulate interactions and game rules[13]The game begins in a house. Players are given a mission in English to find an object that matches the mission. If the player successfully finds the object, they are awarded the next mission. Educational games also have a time limit; exceeding the time limit results in a game over.The home environment was chosen because it is the most familiar environment for junior high school students, making it easier to associate real objects and English vocabulary.

Production

During the production phase, all game elements are combined and the program code is created. Work begins by gathering the assets created in pre-production.

1. Main Menu

   Main MenuThis is the initial display when users start the game. The main menu contains three menus: Play, Tutorial, and Exit. These three menus were chosen because they cover the basic functions users need to operate the game. The Play menu is used to start the game. The Tutorial menu provides instructions on how to play, making it easier to understand the gameplay. The Exit menu, on the other hand, exits the game. Using only three menus aims to create a simple, understandable interface that facilitates navigation. This allows users to access necessary features without confusion.

Figure 3. Main Menu

2. Tutorial Menu

   The Tutorial menu contains videos showing how to play educational games. The tutorial menu aims to make it easier for new users to understand the game's mechanics and reduce errors during gameplay.

Figure 4. Game Tutorial

3. Play Menu

   To play the game, players must first select the Play menu. When the game starts, four buttons will appear. The button on the bottom left is a virtual joystick, used to move the player character. The button on the bottom right, with an eye icon, is used to move the camera left or right, and up or down. The button below, with a hand icon, is used to interact with objects, such as picking up items that are part of the game's missions. The button on the top right, with an X icon, is used to end the game or exit.

Figure 5. Starting the Game

Figure 6 shows a player successfully completing the first mission. When the answer is correct, the system displays a "Correct" message and then automatically generates

a new mission. Additionally, the system plays English audio that pronounces the name of the completed mission. This audio provides immediate feedback to the player while also helping improve their listening and pronunciation skills.

Figure 6. Players Execute Missions Correctly

When a player gives an incorrect answer, the system will display a "Try Again" message. After that, the game will end and the system will redirect the player to the Game Over page.

Figure 7. Players Perform Missions Wrongly

The same situation occurs if a player fails to complete a mission within the specified time limit, causing the system to automatically display a Game Over screen. The time limit aims to increase the game's challenge. It encourages players to think faster and stay focused to complete each mission. This makes the game more engaging, increases player motivation, and creates a sense of challenge to complete all missions correctly before time runs out.

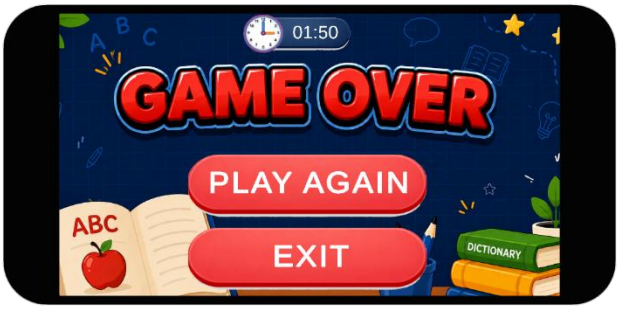

Figure 8. Game Over

Testing

Testing uses the black box method. Black box testing is conducted to determine whether the educational game's functionality is working properly. Black box testing only requires knowledge of the required input and output, without requiring knowledge of the program's internal structure.

Table 1. Black Box Testing

Test Name	Test Form	Expected results	Results
Main menu testing	Open the application	Displaying the main menu	Succeed
Testing starting the game	Press the Play button	Enter the game	Succeed
Character movement testing	Pressing the virtual joystick movement	the character goes to the location directed on the virtual joystick	Succeed
Camera movement testing	Pressing the virtual camera joystick	The camera will rotate left, right, up and down	Succeed
Testing to execute the mission correctly	Direct the object character and press the mission button	The message "correct" appears and a new mission appears.	Succeed
Testing runs the wrong mission	Direct the object character and press the mission button	The message "try again" appears and the Game over page appears.	Succeed
Player testing exceeds the time limit	Letting the game go over the time limit	Displaying the Game over page	Succeed
Play Again Testing	Press the Play Again button	Enter the game	Succeed
Game Exit Testing	Press the Exit button	Exit the game	Succeed

Based on the Black Box testing results in Table 1, it can be seen that all the main features of the game application have functioned according to the designed functional requirements. Black Box testing is conducted by examining each function without looking at the program code structure, but rather focusing on the match between the given input and the resulting output. The Black Box testing results show that all the main functions of the application, from the application opening process, menu navigation, character and camera control, mission completion mechanisms, game time management, to the function of replaying the game and exiting the application, have run according to the designed specifications. No functional failures were found in all test scenarios conducted. Thus, the application is declared suitable for use in terms of functionality because it is able to provide output that meets user expectations and meets the established system requirements.

4. Conclusion

Based on research conducted in the development of educational games using the Game Development Life Cycle (GDLC) method, it can be concluded that this study successfully developed an educational game for learning English vocabulary. The developed educational game can be used as an interactive learning medium for junior high school (SMP) students. Black box testing showed that all functions in the educational game functioned well and were in accordance with the design. Therefore, this educational game is suitable and can be played by users.

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