

# Escape Room: Desktop 3d Game Application For Grammar Lesson Using First Person View Game Genre

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## Abstract

Traditional grammar teaching methods, such as lectures and repetitive drills, often less effective to engage high school students. With advanced technology, there are various types of existing interactive apps on english grammar were created such as existing apps like Duolingo and LearnEnglish Grammar. However, its only focus on repetitive tasks with limited interactivity and feedback, further decreasing interest. Escape Room: Desktop 3D Games Application for Grammar Lesson integrates grammar learning with a first person view game designed for students aged 16 to 17 and above. Developed using the Game Development Life Cycle (GDLC) methodology, the game features modules like grammar correction challenges and sentence matching tasks, offering feedback and hints. Using storytelling and interactive puzzles, the game promotes critical thinking and problem-solving skills. After comprehensive testing, the game achieved an average System Usability Scale (SUS) score of 81%, which falls under the category of an acceptable level of user satisfaction, with a grade of B and an adjective rating of Excellent. User feedback has been gathered and highlighting the game's advantages, such as its immersive learning experience and educational impact. Overall, Escape Room: Desktop 3D Game Application for Grammar Learning demonstrates its potential to be an engaging game with strong educational and entertainment value.

## 1. Introduction

English grammar is fundamental for developing writing and communication skills, essential for academic success and career opportunities [1][2]. However, traditional teaching methods, such as written exercises and quizzes, often fail to engage students effectively, resulting in decreased motivation and limited learning outcomes [3][4]. Grammar proficiency is crucial for clear and accurate communication, yet many students struggle due to the lack of dynamic and problem-solving learning approaches [5][6].

Existing grammar tools, such as Duolingo and Grammarly, primarily focus on repetitive drills or error correction but lack in delivering interactivity and meaningful feedback [7]. These limitations hinder students from fully understanding their mistakes or applying grammar effectively. High school students, particularly those aged 13 to 16, require innovative and engaging methods to improve their grammar skills while maintaining interest [10].

The Escape Room: Desktop 3D Games Application for Grammar Lessons aims to address these challenges by including grammar education with immersive gameplay. Using a first-person perspective, the game provides interactive puzzles, quizzes, and challenges designed to enhance grammar skills while offering detailed feedback in an engaging way. This project seeks to design a user-friendly interface, develop the game on a desktop platform, and evaluate its effectiveness, ultimately offering a more enjoyable and impactful learning experience [5][6].

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The objectives of this project are to design a user-friendly Escape Room: Desktop 3D Games Application for Grammar Lesson that is visually appealing and easy for students to navigate, to develop an interactive version of the application for the desktop platform, and to evaluate the usability of the application through testing with the target users. The scope of this project focuses on high school students aged 16 to 17, covering grammar topics such as pronouns, verb tense, adverbs, conjunctions, nouns, and subject-verb agreement. These topics will be integrated across five game stages. The game includes several modules: a story scene that delivers narrative through 2D illustrations and dialogues. A game module featuring quizzes and puzzles that increase in difficulty across five stages; a credits section displaying details about the development team, supervisor, and subject expert; and a settings module that allows players to customize audio preferences.

There will be 5 section for this report including introduction. In Section 2, the related work highlights the background of English as a core subject, focusing on grammar skills such as tenses, sentence structure, and subject-verb agreement, which are incorporated into the proposed game through interactive puzzles. Next, in Section 2.2, the first-person view (FPV) game concept is explained. Furthermore, in Section 2.3, a comparative analysis between existing applications like Duolingo, ABA English, and Grammarly. In Section 3, the methodology describes the use of the Game Development Life Cycle (GDLC), covering the phases of planning, pre-production, production, testing, post-production, and deployment. In Section 4, the results and discussion show positive feedback from beta testing. Lastly, in Section 5, the conclusion confirms the project successfully achieved its goal of providing an interactive grammar learning experience.

## 2. Related Work

This section discusses the background of the study, the technology used, and the result of the comparative Analysis.

### 2.1 English Subject

English, a core subject for secondary students, aims to enhance their reading, writing, communication, and listening skills while grammar involves rules for structuring words, phrases, and clauses into meaningful sentences. Key elements include tenses, sentence structure, subject-verb agreement, and word classes. Tenses are categorized into past, present, and future, each with forms like simple, continuous, and perfect to indicate the timing of actions. Sentence structure follows the Subject-Verb-Object (SVO) order, and subject-verb agreement ensures compatibility in number and person, like in "She plays" (singular) and "They play" (plural). The Escape Room: Desktop 3D Games Application for Grammar Lesson provides these grammar topics, offering an interactive learning experience that includes English grammar rules through puzzles and challenges in an immersive escape room environment.

### 2.2 First Person View Game

A first-person view (FPV) game allows players to experience the perspective of the character they control, with the camera acting as their eyes, simulating real-life movement and interaction within a 3D world. This genre provides a sense of presence and engagement, commonly seen in first-person shooters, simulation games, and exploration games [11]. For example, Call of Duty offers intense action from a first-person view, making it a highly popular genre. The camera movement reflects the player's actions, such as walking, running, or jumping, enhancing the game experience of the player. The Escape Room: Desktop 3D Games Application for Grammar Lessons uses the FPV to allow players to experience the game environment directly through the character's eyes. Players can focus on details, interact with objects, and navigate the environment, enhancing their engagement with the game.

### 2.3 Comparison between Reviewed Application and Proposed Application

This section highlighted the Application comparison with the existing application and game application proposed.

**Table 1: Application Comparison**

Features/ Applications	Duolingo[12]	ABA English [13]	Grammarly [14]	Escape Desktop  3D Games:	Room:

Technology used	Point and click	None	None	First Person View
Required OS	Android, iOS, web, browser	Android, iOS, web, browser	Android, iOS, web, browser	Windows
Educational Content	Vocabulary, grammar	Grammar feedback and writing style	Practical English usage	Grammar-focused puzzles
Strength	Gamified learning	Real-time grammar suggestion	Real-life context	video Highly interactive, story driven gameplay

### 3. Methodology

The Game Development Life Cycle (GDLC) has been chosen as the methodology to develop the game application. It consists of six key phases: Planning, Pre-Production, Production, Testing, Post-Production, and Deployment. Table 5 in Appendix A provides the summary of the output of the six phases of GDLC.

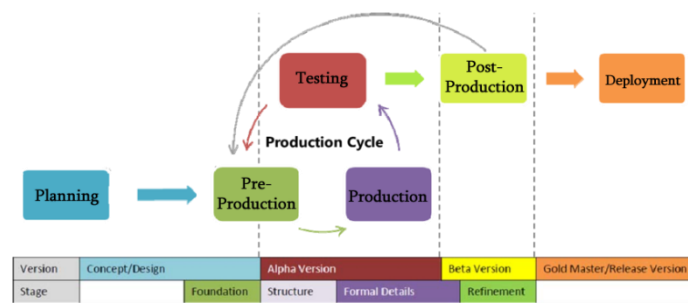


Fig. 1 Game Development Life Cycle (GDLC)

#### 3.1 Planning Phase

During the planning phase, the game’s objective is identified as creating an engaging educational tool to enhance grammar proficiency for secondary school students aged 16 to 17 years. A problem statement is determined to highlight the issues in existing applications for grammar learning. The scope is defined to outline the project’s boundaries, including its platform, gameplay mechanics, and expected outcomes. Subject matter expert Mr. Ruhaifi Bin Abu Bakar, an English teacher, is consulted to ensure the content aligns with educational standards.

Table 2 User Requirement Analysis

Category of Stakeholder	Role in the Product	Design Implications	Required Actions
Subject Matter Expert (SME) Mr. Ruhaifi Bin Abu Bakar	English Teacher	Ensure all grammar-related content is accurate and follows proper English language rules	Following the grammar rules provided by the SME.
		Ensure difficulty matches students’ knowledge.	Provide difficulty in the game application.

Table 2: (Continued)

Category of Stakeholder	Role in the Product	Design Implications	Required Actions
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Subject Matter Expert (SME) Mr. Ruhaifi Bin Abu Bakar	English Teacher	Ensure lessons, difficulty, feedback are coherent.	Provide the feedback with explanation after clearing stage.
		Ensure for easy navigation.	Provide consistency buttons to navigate user.

### 3.2 Pre-Production Phase

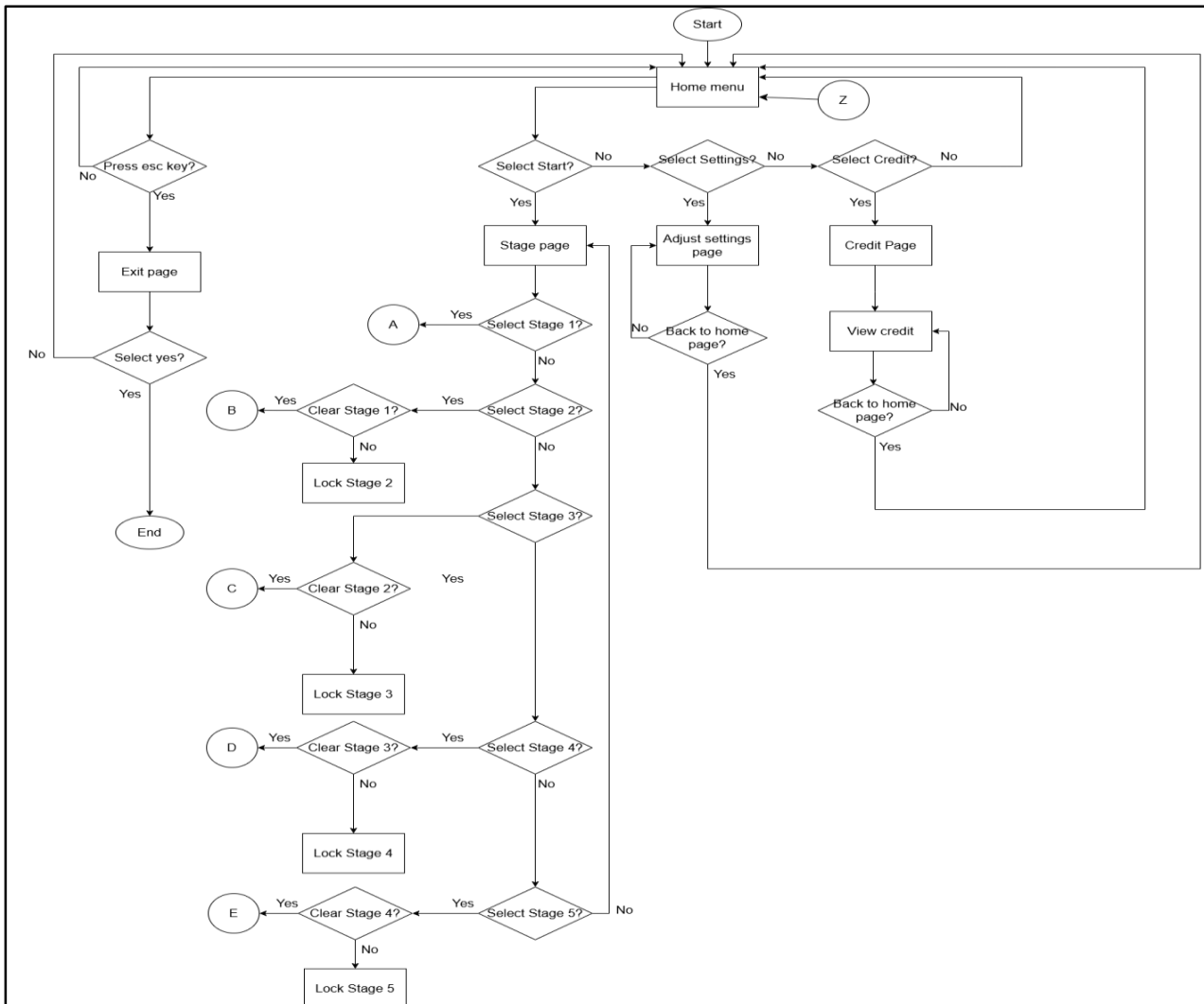
In the pre-production phase, a detailed game system design will be determined by illustrating game flowchart and navigation structure. The game's mechanics and levels are designed with progressive difficulty, balancing challenge and learning. Characters and environments are designed to create relatable and immersive gameplay. Besides that, the project requirements will also be analyzed in this phase. These requirements include both functional and non-functional requirements. Moreover, a comprehensive storyboard are developed to be the references during development. Table 3 presents the Functional Requirements, while Table 4 outlines the Non-Functional Requirements. Figure 2 illustrates the main flowchart of the game, followed by the flowcharts of each stage shown in Figure 3. Lastly, Figure 4 displays the navigational structure of the game.

**Table 3** *Functional Requirements*

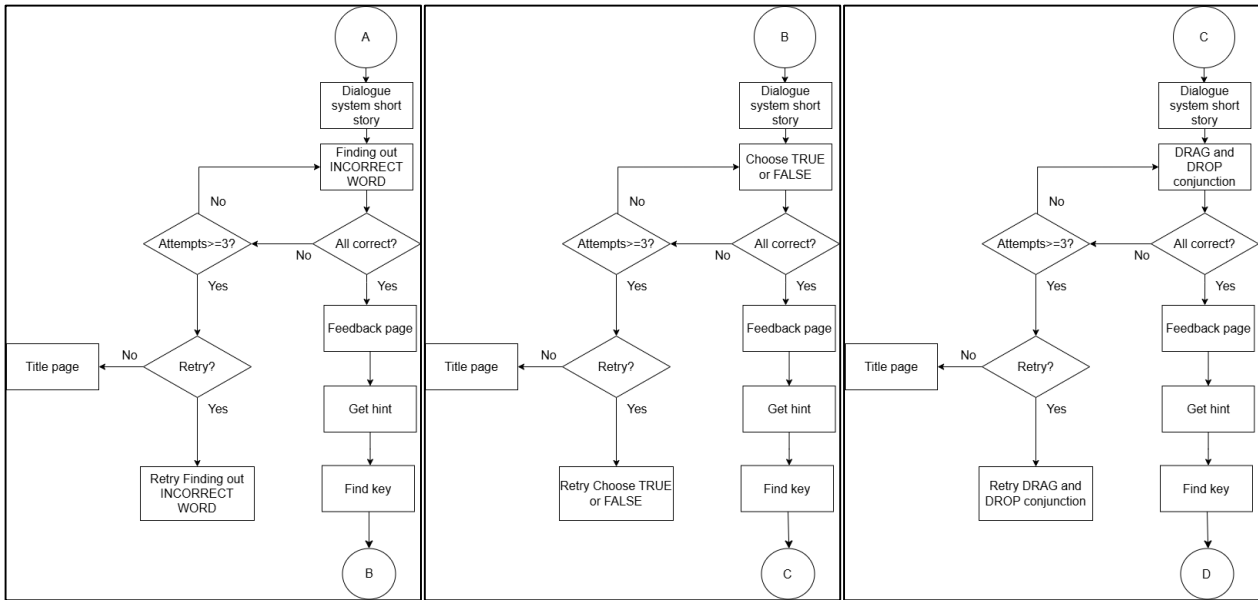
Functional Requirements	Module	Description
User Interaction	Home Interface	<ul style="list-style-type: none"> <li>Users should be able to interact with all of the options in the interface.</li> </ul>
	Stage selection	<ul style="list-style-type: none"> <li>Users should be able to choose the stage of the game.</li> <li>The interface should provide a back button to go back to the home page.</li> </ul>
	Story scene	<ul style="list-style-type: none"> <li>The system should allow users to skip the story scene or proceed to the next part of the dialogue system.</li> </ul>
	In Game	<ul style="list-style-type: none"> <li>Users should be able to interact with some objects by pressing keys such as in Stage 1 matching color puzzle, Stage 2 matching numbers while Stage 3 matching patterns.</li> </ul>
Autonomous system activities	Home Interface	<ul style="list-style-type: none"> <li>Users should be able to interact with all of the options in the interface.</li> </ul>
	Stage selection	<ul style="list-style-type: none"> <li>Users should be able to choose the stage of the game.</li> <li>The interface should provide a back button to go back to the home page.</li> </ul>
	Story Scene	<ul style="list-style-type: none"> <li>The system should allow users to skip the story scene or proceed to the next part of the dialogue system.</li> </ul>
	In Game	<ul style="list-style-type: none"> <li>Users should be able to interact with some objects by pressing keys.</li> </ul>
	Game Over Menu	<ul style="list-style-type: none"> <li>Users should be able to go back to the quiz section.</li> </ul>
	Level Complete menu	<ul style="list-style-type: none"> <li>Users should be able to proceed to the next stage.</li> <li>Users can go back to the Home interface.</li> </ul>

**Table 4** Nonfunctional Requirements

Nonfunctional Requirements	Description
Performance	<ul style="list-style-type: none"> <li>Interaction between the system and user should not exceed two seconds.</li> <li>The time to load the screen should not exceed two seconds.</li> </ul>
Operational	<ul style="list-style-type: none"> <li>The system should be able to run without the internet.</li> <li>The system should be able to operate on any Windows 10 and above.</li> </ul>
Cultural	<ul style="list-style-type: none"> <li>The application should be in English.</li> </ul>
Legal	<ul style="list-style-type: none"> <li>Users should not be able to copy or modify the content and information displayed in the system.</li> </ul>
Usability	<ul style="list-style-type: none"> <li>The system should be easy to use and user friendly.</li> </ul>



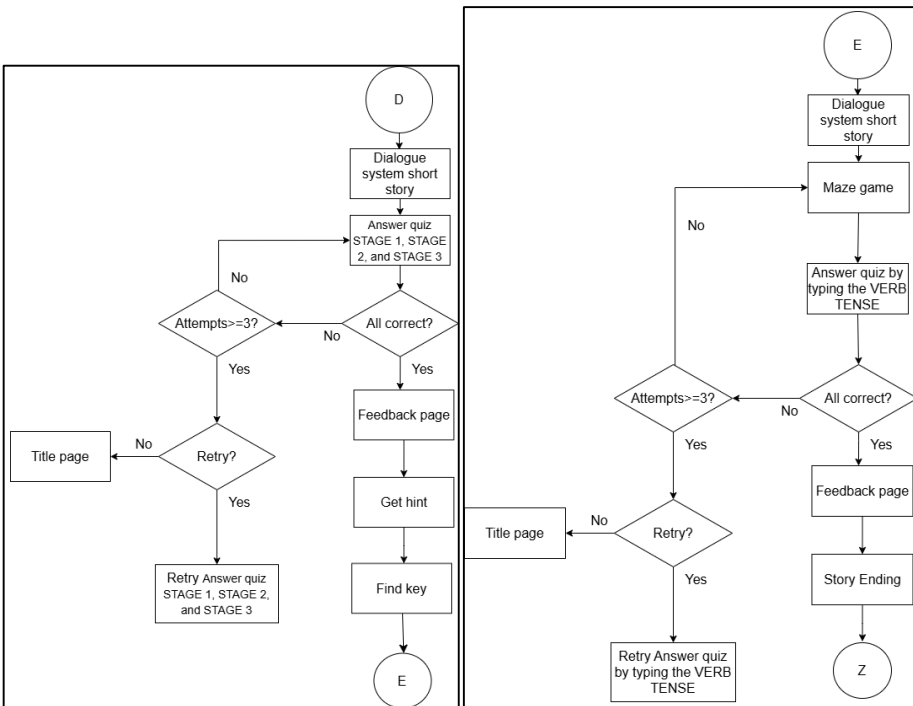
**Fig. 2** Game Flowchart



(a)

(b)

(c)



(d)

(e)

**Fig. 3** Flowcharts (a) Stage 1; (b) Stage 2; (c) Stage 3; (d) Stage 4; (e) Stage 5

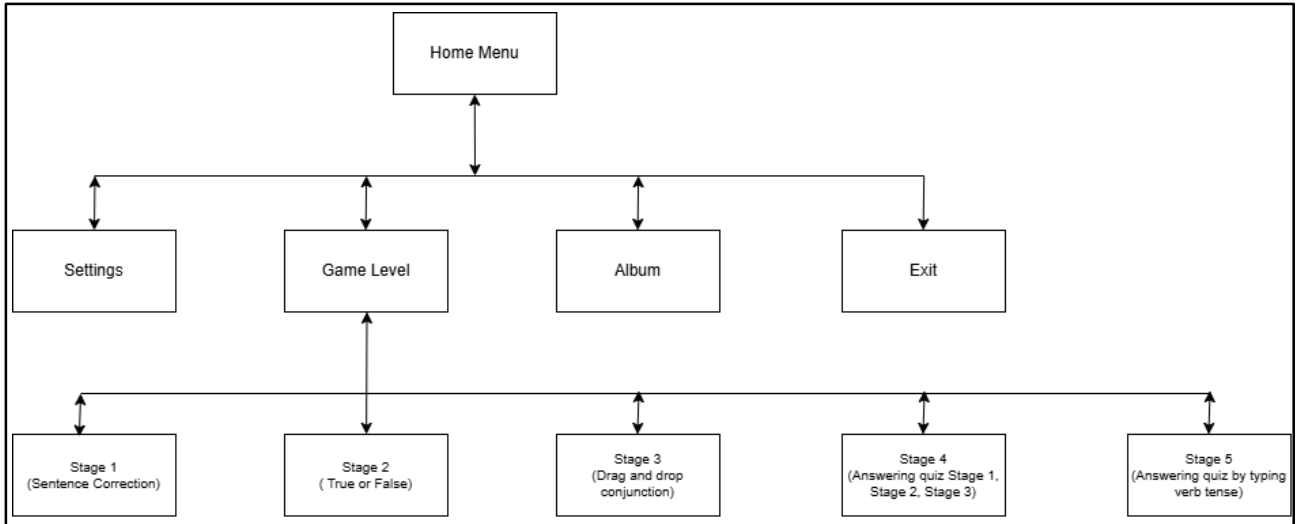







Fig. 4 Navigational Structure

### 3.3 Production Phase

The production phase focuses on bringing the conceptual elements of the game to life by developing the tangible components. Various tools and technologies are utilized to achieve this effectively. Clip Studio Paint is used to design characters and buttons, ensuring a visually appealing artistic style for the game. Canva is employed for coordinating button layouts and designing the user interface for each page, optimizing the design process for consistency and usability. This section also lists the core components implemented to ensure good performance. It will include some components from Unity. The button creation can be referred at Table .The game scripts, such as Player Movement, Interaction, and Puzzle Manager, will be detailed in Table 6 while Table 7 shows the 2D and 3D Model.










Table 5 Button Creation

Button	Description
	<ul style="list-style-type: none"> <li>This button appears when the user selects any option and activates when hovering.</li> </ul>
	<ul style="list-style-type: none"> <li>The Back button takes the user to the previous interface or content.</li> </ul>
	<ul style="list-style-type: none"> <li>The Next button takes the user to the next interface or content.</li> </ul>
	<ul style="list-style-type: none"> <li>The Skip button allows the user to skip the dialogue system or story scene.</li> </ul>
	<ul style="list-style-type: none"> <li>The slider bar button is available in the settings interface, where the user can adjust the BGM and SFX sound.</li> </ul>

**Table 6 C# Script for the Game**

Function	Source Code	Description
Player Movement	<pre>using UnityEngine;  // Calculate movement direction relative to the player's orientation Vector3 forward = transform.forward * moveForward; Vector3 right = transform.right * moveSide; Vector3 horizontalMove = (forward + right).normalized * speed;  void Update() {     Input.GetAxis("Horizontal");      AudioSource.PlayOneShot(footstepSound); } }</pre>	This source code details the logic for player movement and camera control. Players can move using the W, S, A, and D keys.
Player Interaction	<pre>public class SwitchCamera : MonoBehaviour {     public Camera playerCamera;     public Camera targetCamera;     public Collider interactionZone;     public Image fadeImage;      [Tooltip("Duration of the fade transition (in seconds).")]     public float fadeDuration = 1f;      private bool isUsingPlayerCamera = true;     private bool isInInteractionZone = false;      void Update()     {         if (isInInteractionZone &amp;&amp; Input.GetKeyDown(KeyCode.E))         {             Debug.Log("E Key Pressed. Switching Cameras.");             StartCoroutine(SwitchCameraWithFade());         }     }      private void OnTriggerEnter(Collider other)     {         if (other.CompareTag("Players"))         {             isInInteractionZone = true;             Debug.Log("Player entered the interaction zone.");         }     }      private void OnTriggerExit(Collider other)     {         if (other.CompareTag("Players"))         {             isInInteractionZone = false;             Debug.Log("Player exited the interaction zone.");         }     } }</pre>	This source code manages player interaction, allowing players with the "Player" tag to interact with collidable objects. When a player enters a collision zone, they can interact with the object by pressing the 'E' key.
Puzzle Manager	<pre>public class PuzzleManagerLib2 : MonoBehaviour {     public RectTransform[] imageObjects; // Assign Image1,     Image2, Image3     public Button[] controlButtons; // Assign Button1,     Button2, Button3     public Vector2 topPos;</pre>	Source code for Puzzle Manager. This code allow to create a puzzle to unlock a chest box in a stage.

**Table 7** 3D surroundings and 2D characters

Characters/ Props	Model name	Description
	John	Main character of the game named John
	Mr Han	English teacher named Mr. Han
	Maxwell	Side character named Maxwell
	Classroom	Environment props for Stage 1.
	School Hall	Environment props for Stage 2.
	Library	Environment props for Stage 3.
	John's Room	Environment props for Stage 4.
	Classroom	Environment props for Stage 1.
	School Rooftop	Environment props for Stage 5.

### 3.4 Testing Phase (Alpha Testing)

In the testing phase, the game is evaluated for functionality and user experience. Alpha testing identifies and resolves technical issues, followed by functional testing to verify the performance of specific features, such as buttons functionality and UI responsiveness. The game provided 2D and 3D models, which played a crucial role in making the game more immersive. Bugs and errors are fixed to ensure a smooth and engaging user experience. This phase ensures the game meets both technical and educational standards before being tested externally. Table 6 presents all the elements of the 3D surroundings and 2D characters, while Table 7 provides the list of alpha testing details.

**Table 8** Alpha Testing details

Bil	Test	Expected Result	Actual Result
1	Start button	Navigate to stage selection scene.	Works well as expected.
2	Settings button	Navigate to setting BGM and SFX slider panel.	Works well as expected.
3	Credit button	Navigate to credit panel.	Works well as expected.
4	Back button for all	Navigate to previous scene/ panel.	Works well as expected.
5	Stage 1 button	Navigate to Stage 1 scene.	Works well as expected.
6	Stage 2 button	Navigate to Stage 2 scene.	Works well as expected.
7	Stage 3 button	Navigate to Stage 3 scene.	Works well as expected.
8	Stage 4 button	Navigate to Stage 4 scene.	Works well as expected.
9	Stage 5 button	Navigate to Stage 5 scene.	Works well as expected.
10	Next dialogue button	Navigate to next dialogue.	Works well as expected.
11	Skip dialogue button	Fast forward the dialogue.	The skip function did not auto lead to a new scene.
12	No button in the quiz panel	Navigate to current scene.	Works well as expected.
13	Yes button in the quiz panel	Navigate to quiz section	Works well as expected.
14	No button in the continue panel	Navigate to title screen.	Works well as expected.
15	Yes button in the continue panel	Navigate to the next stage.	Works well as expected.
16	Retry button	Restry current quiz.	Works well as expected.
17	Chest button (Stage 1)	Able to change color button.	Works well as expected.

### 3.5 Post-Production phase (Beta Testing)

The mobile application Escape Room: Desktop 3D Game Application for Grammar Lesson is tested by 20 target users, aged 16, from SMK Seri Gading. These users provided feedback on the gameplay experience, remaining issues, and overall user reactions, which have been collected at the end of the Beta Testing phase. This feedback allow to inform product improvements or determine if the application is ready to move forward to the release phase. This marks the final checkpoint before the official launch, ensuring a refined and well-received product.

### 3.6 Deployment Phase

The deployment phase marks the project's completion. Final bug are fixed to ensure a polished and stable game. The game is released on its designated platform (STEAM) making it accessible to the intended audience. Identifying the feedbacks to address any remaining issues and gather insights for future updates. This phase ensures a successful launch of the game.

## 4. Result and Discussion

Beta Testing was conducted to ensure that the final product was accessible to the target users, a high school student aged 16 to 17 and above. The purpose of this testing was to gather feedback from testers at SMK Seri Gading based on their user experience with the Escape Room: 3D Desktop Game Application for Grammar Lesson.

A printed questionnaire was distributed to students to simplify the process, rather than using an online form such as Google Forms. The questionnaire consisted of 10 questions focused on the usability of the game application, using the System Usability Scale (SUS) format to determine the level of user acceptance.

Based on the Figure 6, All respondents (R1–R20) provided scores of 3 and above for the odd-numbered questions. This indicates a positive perception of the game application's usability. A few users gave a score of 3 on one or two items, reflecting a neutral stance rather than disagreement. No scores were below 3, which confirms that none of the respondents disagreed with the positive usability statements. Figure 6 illustrates the analysis of the odd-numbered (positive) questions.

In conclusion, The average score obtained was 81%, which falls under the "Excellent" category, indicating that the game application is user-friendly and has an acceptable level of usability.

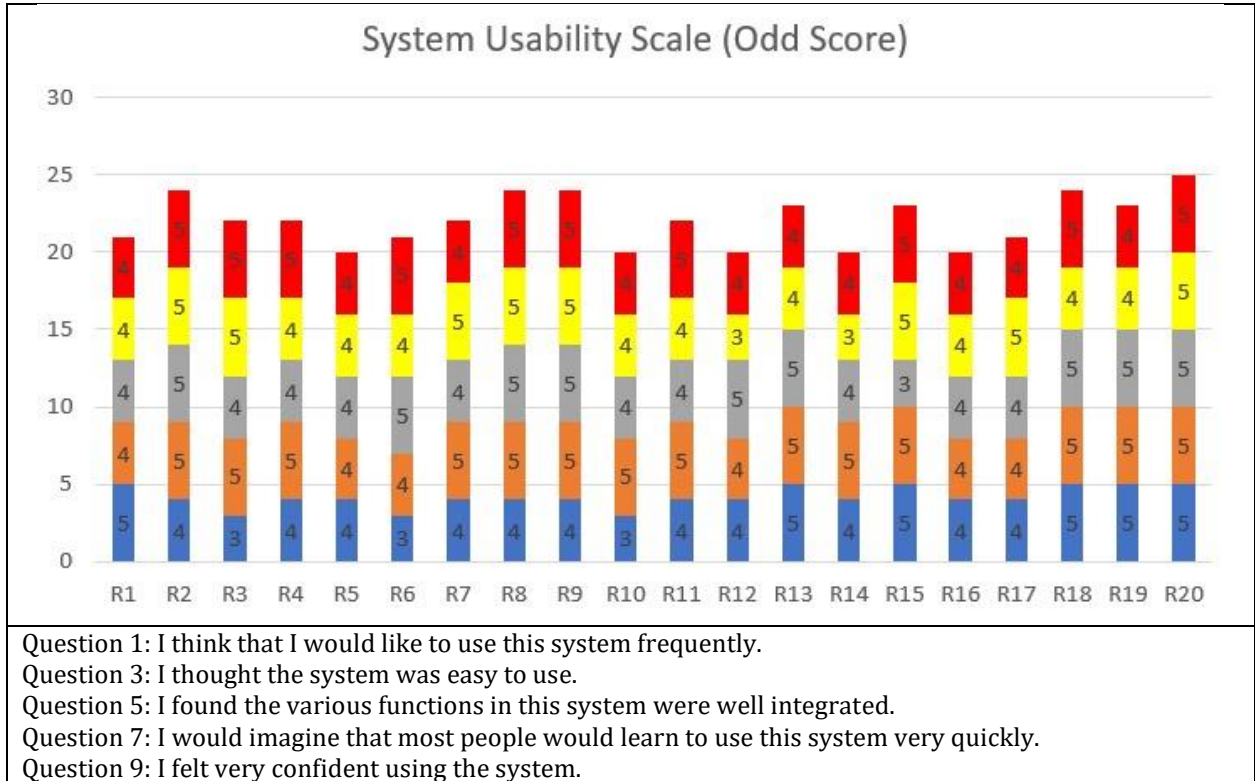


Fig. 6 Analysis of the odd-numbered (positive)

Figure 7 illustrates the analysis of the even-numbered scores, which reflect the negative usability statements. Most respondents gave scores of 3 and below, indicating that users did not find the game application complex or difficult to use. Some respondents gave a score of 3, representing a neutral stance. Although a small number of users gave scores slightly above 3, this indicates only a minor agreement with certain negative aspects.

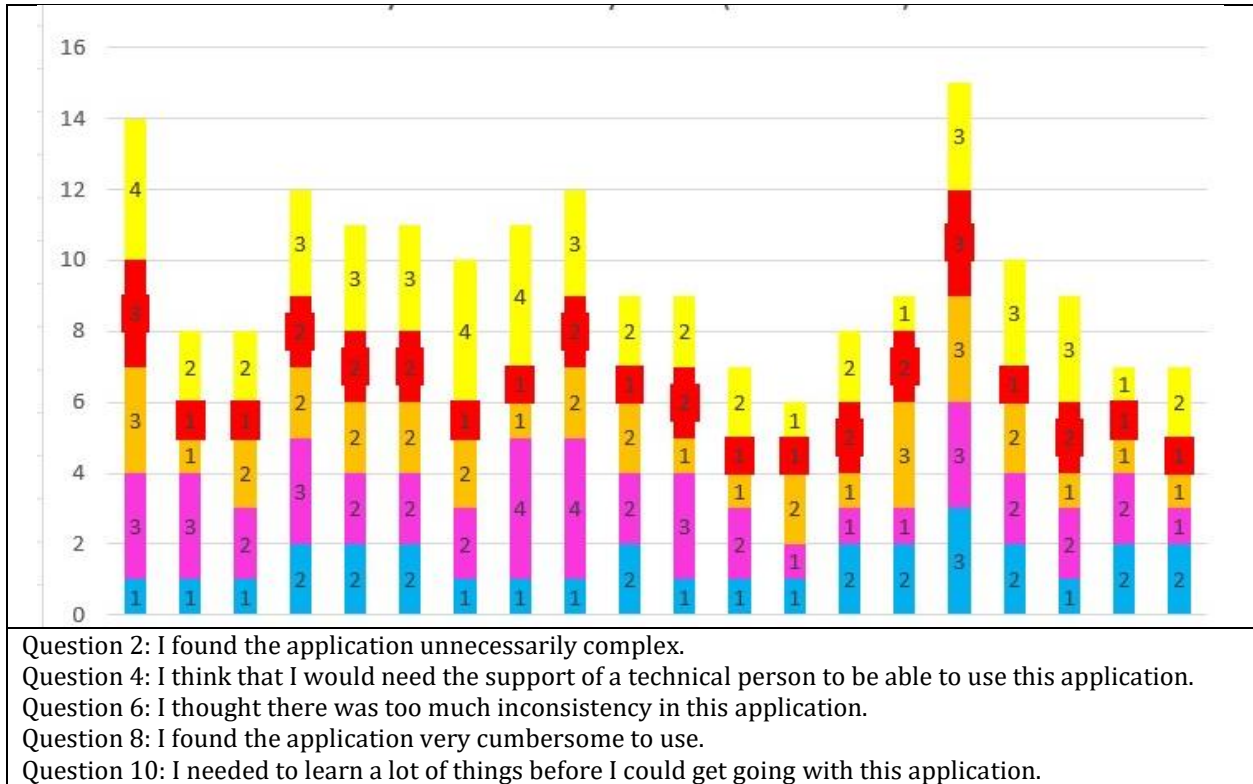


Fig. 7 Analysis of the even-numbered (negative)

The overall result of SUS questions shows that over half of respondents do not have much problem using the Escape Room: Desktop 3D Game Application for Grammar Lesson. The total scores for each question from the user tests are shown in Table 10 in detail, followed by calculating the average score by using the SUS formula.

Table 10 Respondent's Score

Respondent	Item Score										Odd Score	Even Score	Total Score
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10			
R01	5	1	4	3	4	3	4	3	4	4	16	11	67.5
R02	4	1	5	3	5	1	5	1	5	2	19	17	90
R03	3	1	5	2	4	2	5	1	5	2	17	17	85
R04	4	2	5	3	4	2	4	2	5	3	17	13	75
R05	4	2	4	2	4	2	4	2	4	3	15	14	72.5
R06	3	2	4	2	5	2	4	2	5	3	16	14	75
R07	4	1	5	2	4	2	5	1	4	4	17	15	80
R08	4	1	5	4	5	1	5	1	5	4	19	14	82.5
R09	4	1	5	4	5	2	5	2	5	3	19	13	80
R10	3	2	5	2	4	2	4	1	4	2	15	16	77.5
R11	4	1	5	3	4	1	4	2	5	2	17	16	82.5
R12	4	1	4	2	5	1	3	1	4	2	15	18	82.5
R13	5	1	5	1	5	2	4	1	4	1	18	19	92.5
R14	4	2	5	1	4	1	3	2	4	2	15	17	80
R15	5	2	5	1	3	3	5	2	5	1	18	16	85
R16	4	3	4	3	4	3	4	3	4	3	15	10	62.5
R17	4	2	4	2	4	2	5	1	4	3	16	15	77.5
R18	5	1	5	2	5	1	4	2	5	3	19	16	87.5
R19	5	2	5	2	5	1	4	1	4	1	18	18	90
R20	5	2	5	1	5	1	5	1	5	2	20	18	95
<b>Average Score</b>											<b>81.00</b>		

$$\text{Total Score} = (\text{Odd Item} + \text{Even Item})$$

$$\text{Average SUS Score} = \text{Total SUS Score} / \text{Total Number of Respondents}$$

Where:

$$\text{Odd Item (Q1,Q3,Q5,Q7,Q9)} = \text{contribution} - 1$$

$$\text{Even Item (Q2,Q4,Q6,Q8,Q10)} = 5 - \text{contribution}$$

The level of usability can be outlined using the System Usability Scale (SUS) score, as shown in Figure 8. The average score obtained was 81%, which falls under the "Excellent" category, indicating that the game application is user-friendly and has an acceptable level of usability.

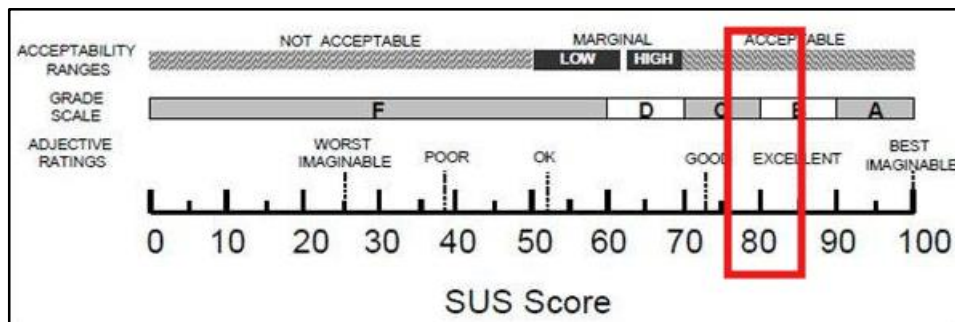


Fig. 8 System Usability Scale (SUS) score

## 5. Conclusion

In conclusion, the results of the project confirm that the Escape Room: Desktop 3D Game Application for Grammar Lesson successfully achieved its main goal by providing an interactive, first-person learning experience with a user-friendly interface, varied quizzes, and short storytelling elements. The strengths of the game were supported by user feedback, highlighting features such as interactive learning, engaging graphics and music, quiz variety, offline functionality, and high-quality 3D models. However, despite these advantages, some limitations were identified, including the absence of a save feature, limited character options, and a heavy reliance on reading. While the project achieved high user satisfaction, there are still areas for future improvement. Recommendations for further development include implementing a save system, adding more characters, and enhancing gameplay through visual storytelling and dynamic stage design. The recommendation aims to widen the game's education and entertainment value by improving the user engagement and make it more accessible to the audience.

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## Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

## Author Contribution

This journal requires that all authors take public responsibility for the content of the work submitted for review. The contributions of all authors must be described in the following manner:

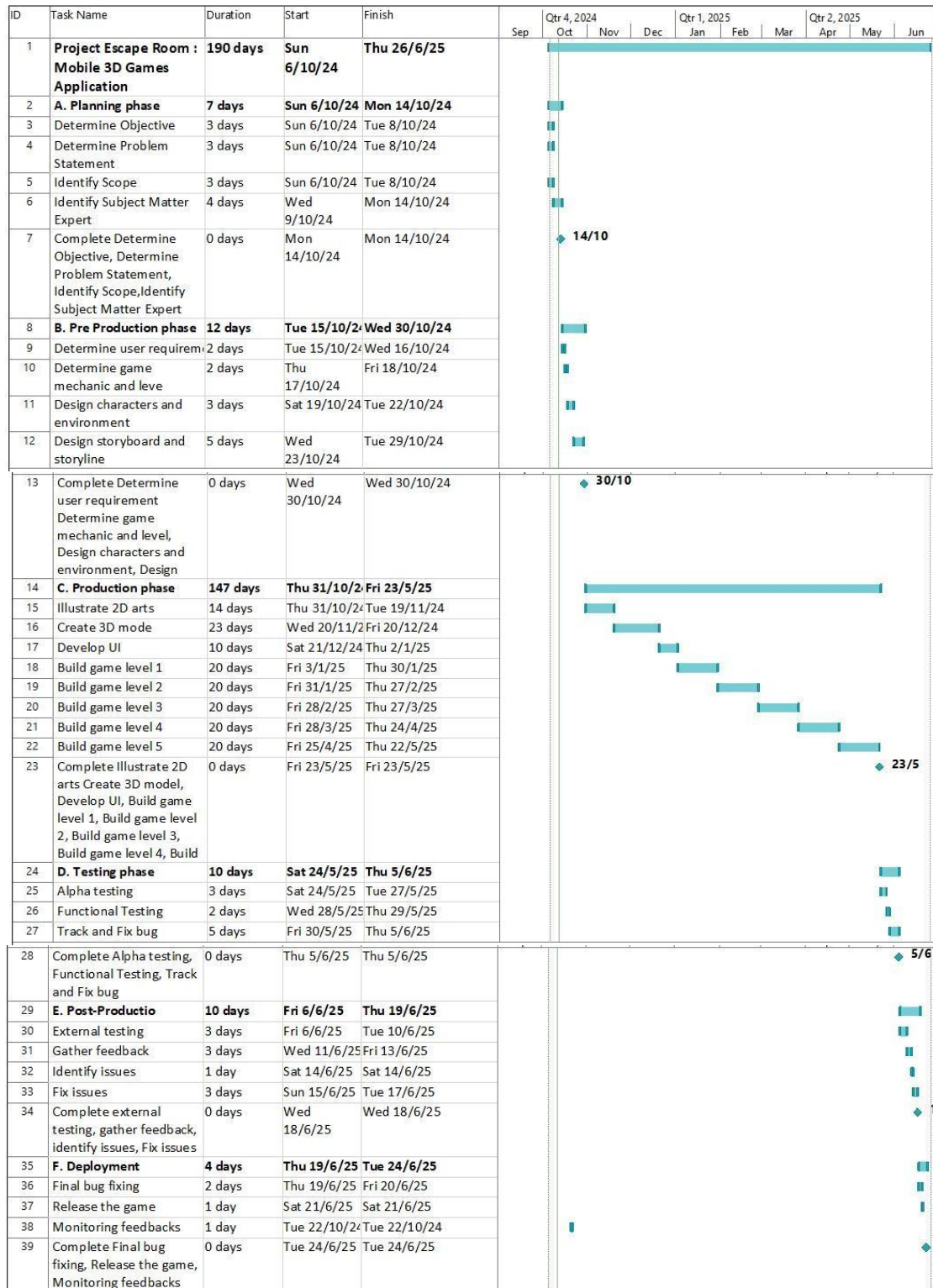
The authors confirm contribution to the paper as follows: **study conception and design:** Najmi Lim Bin Anas Lim, Norhalina binti Senan; **data collection:** Najmi Lim Bin Anas Lim, Norhalina binti Senan; **analysis and interpretation of results:** Najmi Lim Bin Anas Lim, Norhalina binti Senan; **draft manuscript preparation:** Najmi Lim Bin Anas Lim, Norhalina binti Senan. All authors reviewed the results and approved the final version of the manuscript.

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### Appendix A:

Figure 9 shows the Gantt Chart for the development of Escape Room: Desktop 3D Game Application for Grammar Lesson



## Appendix B:

### Evidence of User Acceptance

