

Morse Code Unlock: An Interactive Escape Room that Teaches Morse Code

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Abstract

Morse Code Unlock is an educational desktop game that uses an escape room format to teach Morse code. Learners are becoming less interested in Morse code due to its repetitive and outdated teaching methods, despite its importance in emergency response, aviation, and military communication. To address this, the game blends education and entertainment by allowing players to decode Morse code and solve increasingly complex puzzles. Developed using the Game Development Life Cycle methodology, it boosts engagement through features such as menus, hints, visual prompts, and sound effects. Morse Code Unlock is well suited for training programs, workshops, and educational institutions, and supports both formal and informal learning. Through user testing involving beginner users, the game achieved a good usability rating, with an average System Usability Scale score of 79.75, and the majority of participants reported improved recognition of basic Morse code signals after gameplay. These results indicate that the game successfully provides a positive and accessible first exposure to Morse code, while encouraging the development of communication and problem-solving skills and reinforcing the relevance of Morse code in real world contexts.

1. Introduction

In today's fast-paced digital era, traditional communication methods often fade into obscurity, yet their significance and potential applications remain invaluable. Morse code, historically a vital communication system using dots and dashes, still has practical applications in fields such as emergency communication and aviation [1]. However, its awareness and usage have diminished over time, being replaced by modern digital communication methods [2]. Interactive learning tools, such as escape rooms, offer engaging ways to teach skills like Morse code by encouraging critical thinking and problem-solving. Conventional teaching approaches, like textbooks and mobile apps, often rely on rote memorization, lacking interactivity and engagement [3]. This has led to a decline in motivation and long-term retention among learners. Furthermore, gamified tools that effectively teach Morse code are scarce, creating a gap in resources for making this skill approachable and enjoyable [4].

Morse Code Unlock aims to address these gaps by developing a gamified, interactive escape room experience to make. Its objectives include designing a user-friendly, visually appealing game; implementing interactive features that teach Morse code skills; and evaluating user acceptance through feedback and testing. Targeting young adults, the game is tailored for students and individuals who have never been exposed to Morse code. Built in Unity, it features two rooms, the "Abandoned Study Asylum" for stage 1 and the "Communication Hub" for stage 2 which progressively increases in difficulty. This design ensures accessibility for both novice and experienced

learners. The game includes 4 key modules: a User Interface for intuitive gameplay controls, a Morse code learning Module for skill refinement, and 2 stage Modules to test the player capabilities. Players will start with basic Morse code identification in the Abandoned Study Asylum and advance to decoding more challenging puzzles in the Communication Hub. The expected result is a desktop platform game where players solve Morse code-based puzzles through interactive challenges, supported by auditory and visual cues. Features like obtaining hints after each task will provide feedback and motivation, ensuring a fun learning experience.

Morse Code Unlock reinvigorates interest in Morse code by combining education with entertainment, making learning practical and enjoyable. This game addresses the shortcomings of traditional teaching methods by offering an adaptable, self-directed learning experience. By promoting mastery of Morse code in a life-like 3D game environment, the project highlights its relevance in modern communication fields such as emergency services and aviation. The game caters to diverse learners, encouraging skill retention and application, and ensures that Morse code remains a valuable communication tool in the digital age.

The rest of this report is structured as follows: Section 2 outlines the domain of study, the technologies used, and the results of the comparative analysis. Section 3 details the Game Development Life Cycle (GDLC) methodology applied throughout the project, along with the outcomes of the analysis and design phases. Section 4 presents the results, including user testing data, feedback, and discussion of the game's performance and educational impact. Lastly, Section 5 concludes the report by summarizing the overall achievements and potential future improvements.

2. Related Work

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

2.1 The Role of Gamification

Interactive games have gained prominence among individuals, particularly teenagers and young adults, by seamlessly blending enjoyment with education, acting as "hidden teachers" that instruct players subconsciously [5]. Research indicates that gamified learning environments enhance student motivation and engagement, making complex subjects more accessible and enjoyable [6]. Based on the literature reviewed, it highlights that gamification in education positively impacts student motivation and academic performance, with commonly used game elements including points, levels, badges, and leaderboards [7]. Additionally, studies suggest that gamified learning management systems can increase student engagement and improve learning outcomes [8]. By transforming traditional teaching methods into interactive experiences, gamification imparts essential skills and fosters a deeper understanding of significant subjects, demonstrating that educational games can be both entertaining and intellectually stimulating.

2.2 Morse Code

Since its development in the early 19th century, Morse code a system of encoding textual information through sequences of dots and dashes has been instrumental in long-distance and emergency communications, notably within military, naval, and aviation sectors [9]. Despite the advent of advanced communication technologies, Morse code retains its relevance in specialized areas such as amateur radio and emergency services, offering a universal method that transcends language barriers [10]. However, traditional instructional methods, including rote memorization and static online resources, often fail to engage contemporary learners, particularly younger individuals seeking interactive experiences [11]. While some digital platforms provide basic Morse code education, they frequently lack the immersive and dynamic environments necessary for effective learning [12]. Acquiring proficiency in Morse code not only preserves a historically significant skill but also equips individuals with a reliable communication tool applicable in scenarios where modern systems may fail [13].

2.3 Escape Room

Escape rooms have emerged as innovative educational tools that enhance learning by promoting engagement, critical thinking, and problem-solving skills [14]. By immersing students in interactive scenarios, these games encourage teamwork and the application of knowledge in real-world contexts, making learning both enjoyable and effective [15]. The integration of escape rooms into educational settings has been shown to increase student motivation and content retention, as they provide a dynamic alternative to traditional teaching methods. Furthermore, the adaptability of escape rooms allows educators to tailor challenges to specific learning objectives across various subjects, thereby accommodating diverse learning styles.

2.4 Comparative Analysis

Comparative analyses were conducted on three related applications to the proposed system. Morse Mania: Learn Morse Code [16], Morse Code Course Translator [17], and Morse: Code Training to CW Guru [18]. Table 1 summarizes the comparative.

The comparison is based on multiple features of the applications, including the developer, target audience, gameplay type, UI type, educational approach, game mechanics, language support, graphics, in-app purchases, advertisements, strengths, limitations, and platform. In comparison, Morse Code Unlock employs a 3D escape room approach with problem-solving challenges, offering immersive experience. Unlike the other three applications, which rely on 2D or text-based interfaces, Morse Code Unlock provides a first-person 3D environment that enhances user interaction. It is designed for desktop use and operates without in-app purchases or advertisements, ensuring a seamless learning experience. Furthermore, Morse Code Unlock targets users aged 10 and above, integrating gamified learning to make mastering Morse code enjoyable and effective, whereas the other applications cater to younger or niche audiences and focus on basic or specialized learning objectives like radio communication or translation tasks.

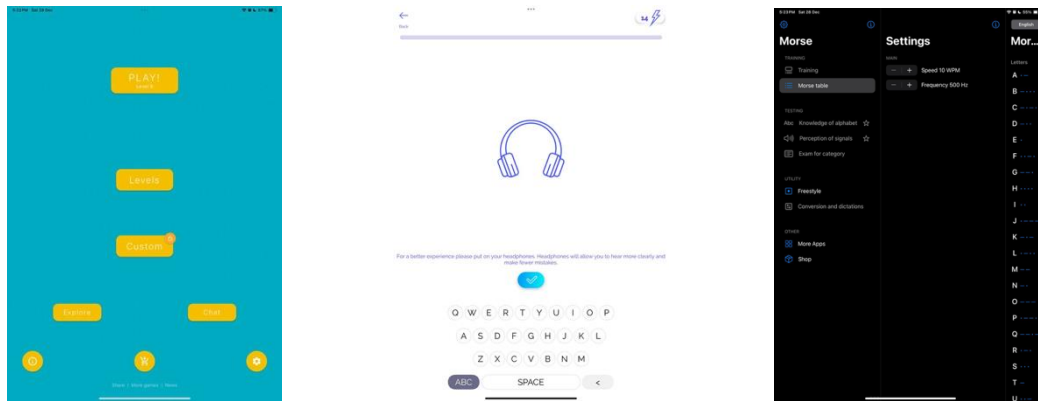


Fig. 1 (a) *Morse Mania* [16] (b) *Morse Code Course Translator* [17] (c) *Morse Code Training to CW Guru* [18]

Table 1 *Application Comparison*

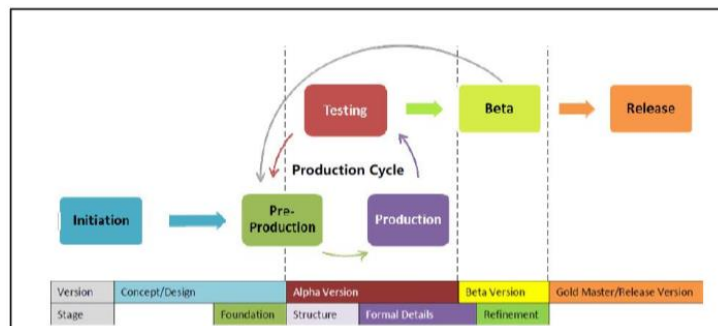
Features/ Application	Morse Mania: Learn Morse Code	Morse Code Course – Translator	Morse: Code Training to CW Guru	Morse Code Unlock
Target Audience	Age 4+	Age 4+	Age 4+	Age 15+
Gameplay Type	Puzzle based, symbol recognition	Text-based translation	Text-based translation	3D escape room, puzzle solving
UI Type	2D, puzzle	text-based	Text and training based	First person 3D
Educational Approach	Speed, accuracy in recognition	Translation of Morse code	Learning Morse code for radio use	Problem solving through Morse code puzzles
Game Mechanics	Puzzle solving, speed- based	Translation of words to Morse code	Repetitive Training	Escape room, Challenges, Morse code puzzles
Language Support	English	English	English	English
Graphics	Basic 2D	2D text	Basic 2D	3D FPV
In-App Purchases	Yes	Yes	Yes	No
Advertisement	None	Yes	Yes	None

Table 1: *Application Comparison (continued)*

Features/ Application	Morse Mania: Learn Morse Code	Morse Code Course – Translator	Morse: Code Training to CW Guru	Morse Code Unlock
Strength	Simple and accessible for beginners	Focus on practical translation learning	Detailed training for advanced users	Simple and accessible for beginners
Limitations	Limited interactivity, lacks immersive features	Less interactive, basic educational content	Niche target audience (radio operators)	May require higher end devices for full experience
Platform	Mobile	Mobile	Mobile	Desktop

3. Methodology

The Game Development Life Cycle (GDLC) methodology was utilized to develop Morse Code Unlock, progressing through six distinct phases. The Initiation Phase established the project's concept, objectives, and scope while analyzing similar applications and outlining resources and timelines [19]. In the Pre-production Phase, key game elements such as the storyline, mechanics, target audience, and initial prototypes were defined. The Production Phase involved creating 3D assets, user interface elements, and integrating them into Unity for gameplay functionality. During the Testing Phase, alpha testing ensured the game's mechanics, usability, and features met expectations, addressing bugs and deficiencies. Beta Phase introduced third-party testing to refine usability and user experience based on feedback. The Release Phase marked the completion of development and documentation. However, Morse Code Unlock was not published on any public distribution platform, and the release phase was therefore limited to internal deployment and reporting. Figure 2 shows the general flow of the game development life cycle.

**Fig. 2** Game Development Life Cycle (GDLC) model

3.1 Initiation Phase

In the first phase of developing the Morse Code Unlock desktop game, the initial requirements were identified. This phase included reviewing existing Morse code learning applications, consulting Subject Matter Experts (SMEs), and gathering feedback from the target audience, which consists of individuals aged 15+ and young adults interested in gamified educational. An interview was conducted with SME Encik Sufian Bin Johar, a navy seal with over 20 years of experience in Morse code training and application.

3.2 Pre-Production Phase

In the Pre-Production Phase, key aspects of the game were identified and structured to ensure alignment with the project goals. This phase included defining the core elements such as the storyline and gameplay mechanics, with a focus on creating an educational yet fun experience for users. Additionally, functional requirements like the game progression and non-functional requirements such as the cultural aspect of the game were prioritized. The creation of the game design and its prototype is included in this phase. The game pitch requirements are defined in the game design, such as game title, game dialog system, game lore, gameplay style, intended audience, concept art, flowchart, and storyboard. Two flowcharts were created to explain the application's main flow and the subprocesses in the application. It can be referred to in Appendix A. Button design, software and hardware for developer are also provided in Appendix B to outline the essential and supporting features for development. Figure 3 displays the main mechanic for the Morse code input in the game.



Fig. 3 Main Game Mechanic to Input Morse Code

3.3 Production Phase

The production phase of Morse Code Unlock focuses on creating and integrating the necessary game assets to bring the project to life. In this stage, 3D models and environments are designed using Blender. Narrative elements, including cutscenes and dialog boxes, are created using Procreate and Canva to assist storytelling. Unity serves as the game engine for integrating assets and developing the 3D environment, gameplay mechanics, and user interactions. This phase ensures that the components of the game are seamlessly combined, requiring significant effort and time to achieve a high-quality result. Detailed script snippets of game mechanics are provided in Appendix C. Figures 4, 5 and 6 show some of the processes.

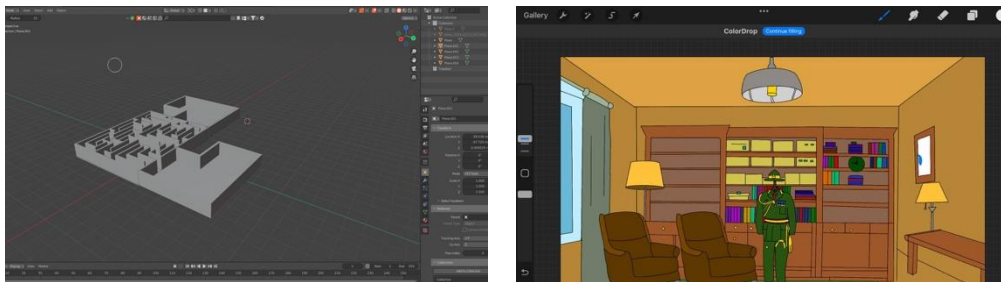


Fig. 4 Modelling and Narrative Cutscene Background Creation in Blender and Procreate

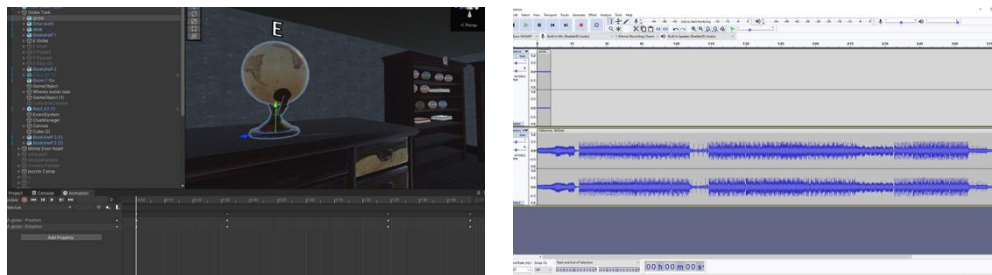


Fig. 5 Animation and Sound Mixing in Unity and Audacity

```

using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using UnityEngine.UI;
using UnityEngine.Events;
using TMPro;

public class MorseCodeInputUI : MonoBehaviour
{
    [Header("UI Elements")]
    public Button submitButton;
    public TextMeshProUGUI feedbackText;
    public TextMeshProUGUI debugText;
    public TextMeshProUGUI morseText;

    [Header("Morse Settings")]
    public string targetMorseCode = "...";
    public float dotThreshold = 0.4f;

    [Header("Audio")]
    public AudioSource morseAudioSource;
    public AudioSource feedbackAudioSource;
    public AudioClip correctInputClip;
    public AudioClip incorrectInputClip;
}

```

Fig. 6 Script snippets of Morse Code Input System

The user interface of Morse Code Unlock is carefully designed to support smooth and intuitive player interaction throughout the game. Key UI components such as the main menu, settings, hint buttons, and level transitions are arranged to ensure clarity and ease of use. These elements are built using Unity's UI tools and styled to match the visual identity of the game. The layout also accommodates the educational aspect by

minimizing distractions and focusing on guiding the player through each puzzle. Table 2 presents the layout and structure of the game's user interface.

Table 2 *User Interface*

Scene	User Interface
Home: The splash screen with the game title and a start button leading to the main menu	
Main Menu: Allows players to choose between Story Mode for narrative gameplay or Practice Mode for free puzzle solving.	
Game: The main interactive space where players solve puzzles, input Morse code, and progress through escape room challenges.	
Note and Morse Code Table: In-game panel showing collected notes and a Morse code table to help players decode messages.	

Table 2 *User Interface (continued)*

Scene	User Interface
Final Task of Stage 2: One example of how players would solve a task in the game.	

3.4 Testing Phase

Alpha testing is conducted during the late stage of Morse Code Unlock's development to identify bugs and ensure all core features function as expected. One of the main focuses during alpha testing is the overall system functionality, including gameplay mechanics, interaction feedback, and progression logic. The testing results show that most features, such as player movement, puzzle interactions, and the Morse code input system, work as intended. However, a few issues were discovered, such as sensitivity in the Morse code input and inconsistent behavior of interaction indicators. These issues were addressed through targeted fixes. Table 3 summarizes the results of the system functionality testing conducted during the alpha phase.

Table 3 *System Functionality Testing*

Test	Expected Result	Actual Result	Action Taken	Outcome
Start Button	Game starts and brings users to main menu	Works well as expected	None	Functionality confirmed
Puzzle Interaction	Players can interact with puzzles and input Morse code	Some delays in response	Optimize interaction handling	Delays reduced
Hint System	Displays hint when requested	Works well as expected	None	Hint system work as intended
Audio Feedback	Correct or incorrect answers give sound feedback	Works well as expected	None	Audio feedback matches input
Visual Cues	Flashing lights show Morse input on lamp task	Works well as expected	None	Visual cues clearly communicate Morse signals
Level Progression	Unlocks next stage only after all task is solved	Works well as expected	None	Level progression logic validated
UI Navigation	Users can smoothly navigate between notes and Morse table	Minor lag on notes	Revise button linking in Unity	Navigation smoother with reduced lag
Floating Interaction Indicator	Disappears after interaction and goes to next task	Sometimes progresses without task being completed	Add condition to ensure task is completed before advancing	Indicator now advances only after task completion
Tutorial Hint	Hint appears and stays until task is solved	Disappears after one press for entire level	Double check hint linkage and add persistent display logic	Tutorial hints remain visible until task completion
Morse Input System Sensitivity	Inputs should register accurately based on timing	Some input errors due to sensitivity	Adjust timing thresholds for dots and dashes	Input accuracy improved

3.5 Beta Phase

In this phase, the beta testing was conducted after Morse Code Unlock is fully developed. Hence, Morse Code Unlock was tested by the target users, young adults from the age of 15 until 30 years old. Beta testing was conducted to evaluate the final build of Morse Code Unlock, focusing on its effectiveness in delivering educational content and overall gameplay experience. A total of 30 participants, aged between 15 and 30, took part in the test. All were students or peers from University Tun Hussein Onn Malaysia (UTHM) with no prior exposure to Morse code. The game was tested using two approaches: by playing it on the developer's desktop or by installing the Unity-built executable file on the participants' personal computers. After completing the game, participants responded to a structured Google Forms questionnaire that included the System Usability Scale (SUS) and open-ended feedback. Further details about the result of testing are discussed in section 4.

4.0 Result and Discussion

This section presents the findings gathered from user testing and feedback conducted during the beta phase of Morse Code Unlock. Data was collected through structured questionnaires and observational notes to evaluate the game's educational effectiveness, usability, and overall player experience. The responses revealed that Morse Code Unlock successfully introduced users to basic Morse code principles. Many participants reported learning meaningful signals such as the universal distress signal "SOS," and expressed interest in exploring Morse code further. In addition to the educational value, users highlighted the game's engaging narration and immersive sound design as standout elements that enhanced their overall experience. This feedback demonstrates that the game not only met its instructional objectives but also created a memorable first interaction with Morse code for new learners.

Component 1, Demographic, shows that 3 (11.1%) respondents are between the ages of 13–18, 17 (63%) respondents are between the ages of 19–24, and the remaining 7 (25.9%) respondents are between the ages of 25–30. A total of 27 responses were collected. This numbers are shown in figure 7 below.

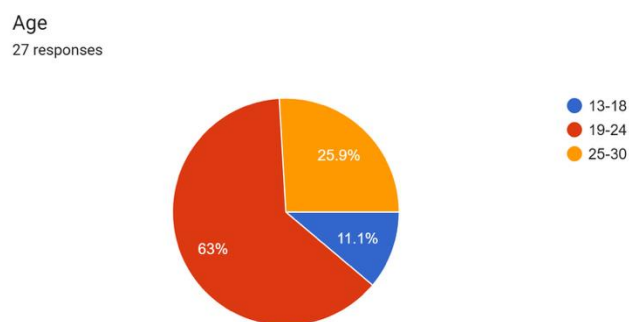


Fig. 7 Component 1, Demographic

To quantify the usability experience, the 20 most relevant SUS responses were extracted from Google Forms data and analyzed in Microsoft Excel. Each participant's answers to the 10 SUS items were scored using the standard method, where responses to positively worded items (odd-numbered) and negatively worded items (even-numbered) were adjusted accordingly, then summed and multiplied by 2.5 to generate a final score out of 100. These values were recorded and processed in a structured spreadsheet to ensure consistency. The average SUS score across the 20 participants was 79.75, placing it within the "Good" usability range according to SUS interpretation benchmarks. This score indicates that users found Morse Code Unlock generally easy to use and intuitively designed, reinforcing the positive qualitative feedback received and validating the game's overall user interface effectiveness. The questions that were asked to complete the SUS survey are listed in Appendix D. The final score of SUS is shown in table 4 below.

Table 4 SUS Evaluation Table with Score of 79.75

Respondent	Item Score										Odd Score	Even Score	Total Score
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10			
R01	4	2	4	2	4	2	4	2	4	2	15	15	75
R02	4	2	5	2	2	3	3	2	5	4	14	12	65
R03	4	3	3	4	3	2	5	2	4	1	14	13	67.5
R04	5	4	5	2	4	1	5	1	4	2	18	15	82.5
R05	5	5	5	2	5	1	5	2	5	1	20	14	85
R06	2	1	5	1	4	2	5	1	5	2	16	18	85
R07	1	5	3	1	5	2	5	1	5	1	14	15	72.5
R08	5	2	5	1	5	2	5	2	5	1	20	17	92.5
R09	1	4	5	1	5	1	5	1	5	1	16	17	82.5
R10	5	1	4	4	4	2	4	2	4	1	16	15	77.5
R11	1	5	5	2	5	4	5	1	5	5	16	8	60
R12	5	2	5	1	5	2	2	2	5	1	17	17	85
R13	1	2	5	1	5	1	5	2	5	2	16	17	82.5
R14	5	5	5	2	5	2	5	1	5	1	20	14	85
R15	2	4	5	5	2	2	2	2	5	1	11	11	55
R16	1	1	5	2	5	1	5	1	5	2	16	18	85
R17	4	1	5	1	2	2	2	1	5	1	13	19	80
R18	5	1	4	1	5	1	5	1	5	2	19	19	95
R19	5	2	5	1	5	2	5	2	5	1	20	17	92.5
R20	5	2	5	1	5	2	4	1	5	2	19	17	90
Average Score													79.75

Additionally, detailed feedback collected through supplementary questions reinforced the SUS findings. A large majority of participants (74.1%) reported feeling very confident in recognizing the Morse code for “SOS” after playing, and 40.7% strongly agreed that the game helped them understand Morse code as a form of communication, with an additional 51.9% agreeing. When asked about distinguishing dots and dashes, 77.8% felt the game taught this very effectively. In terms of instructional design, 55.6% of participants highlighted that the puzzles and gameplay mechanics contributed most to their understanding, followed by 33.3% who valued the visual cues and UI design. Lastly, the real-world applicability of the learning was reflected as 48.1% responded “Yes, definitely” and another 48.1% “Maybe” when asked if they could apply the knowledge in emergency contexts. These findings suggest that Morse Code Unlock served as a helpful introduction to Morse code for many players, offering a first exposure that was both engaging and memorable. Charts referring to this data can be found in Appendix E.

5.0 Conclusion

In conclusion, Morse Code Unlock is an educational escape room game tailored for young adults aged 15 to 30, especially students, to promote learning of Morse code through escape room style gameplay. The game integrates gamification to make the learning process more interactive. One of the main strengths of Morse Code Unlock is its effectiveness in introducing Morse code concepts to first-time learners. Many users reported learning key signals such as “SOS” during their gameplay experience. The game also features narration, sound design, and puzzle mechanics that help aid the learning experience. It successfully delivers the solution it set out to provide making Morse code education more engaging and approachable for new learners. Despite its success, some limitations were identified through user feedback. For instance, while the game includes two unique rooms with different Morse code challenges, some players suggested that additional rooms or varied challenge levels would further enhance replayability. Furthermore, some users expressed that clearer guidance or tutorial at the beginning of the game could support players who are entirely new to Morse code. Additionally, improvements in interface responsiveness especially while inputting Morse code can help polish the user experience. Based on the feedback and observations, there are several opportunities for improvement. Future versions of Morse Code Unlock could

include more levels with increasing difficulty, additional gameplay features such as a time challenge mode and more tasks in each stage. Improving the visual storytelling and expanding on the narrative elements may also attract a wider audience and deepen player engagement. To summarize, Morse Code Unlock is a successful game developed using a structured Game Development Life Cycle. It achieved its core objectives of raising awareness and knowledge of Morse code through an entertaining and interactive experience. With further enhancements, the game has strong potential to be expanded and adopted in broader educational settings or even as a training tool for emergency communication basics.

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Conflict of Interest

The author declares that there is no conflict of interest regarding the publication of the paper.

Author Contribution

*The authors confirm contribution to the paper as follows: **study conception and design:** Akmal Azhad Mustaza, Rahayu A Hamid; **data collection:** Akmal Azhad Mustaza; **analysis and interpretation of results:** Akmal Azhad Mustaza, Rahayu A Hamid; **draft manuscript preparation:** Akmal Azhad Mustaza, Rahayu A Hamid. All authors reviewed the results and approved the final version of the manuscript.*

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Appendix A: Game Flowchart

Table 5 Flowchart 1

Overall Game Flowchart

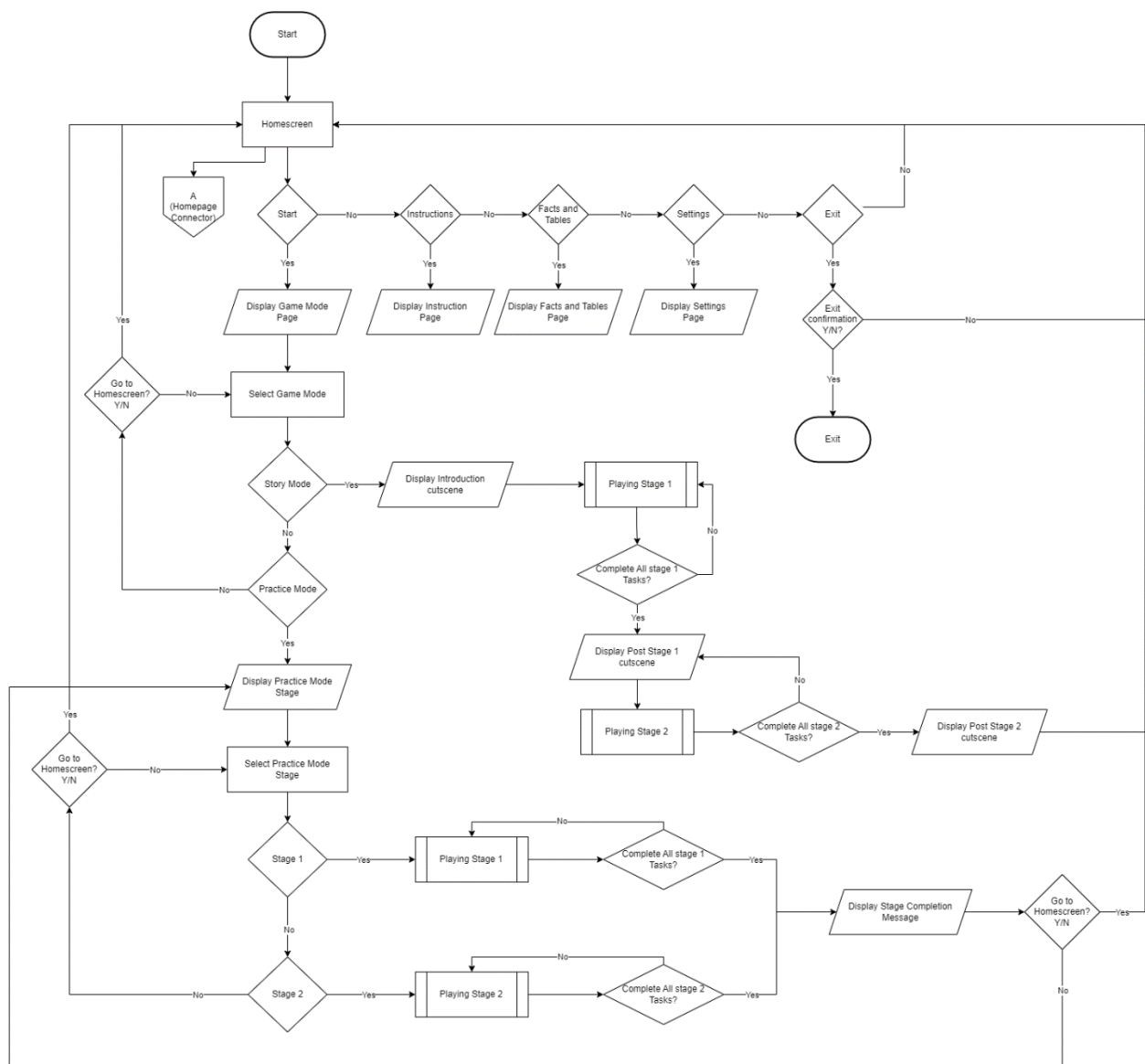
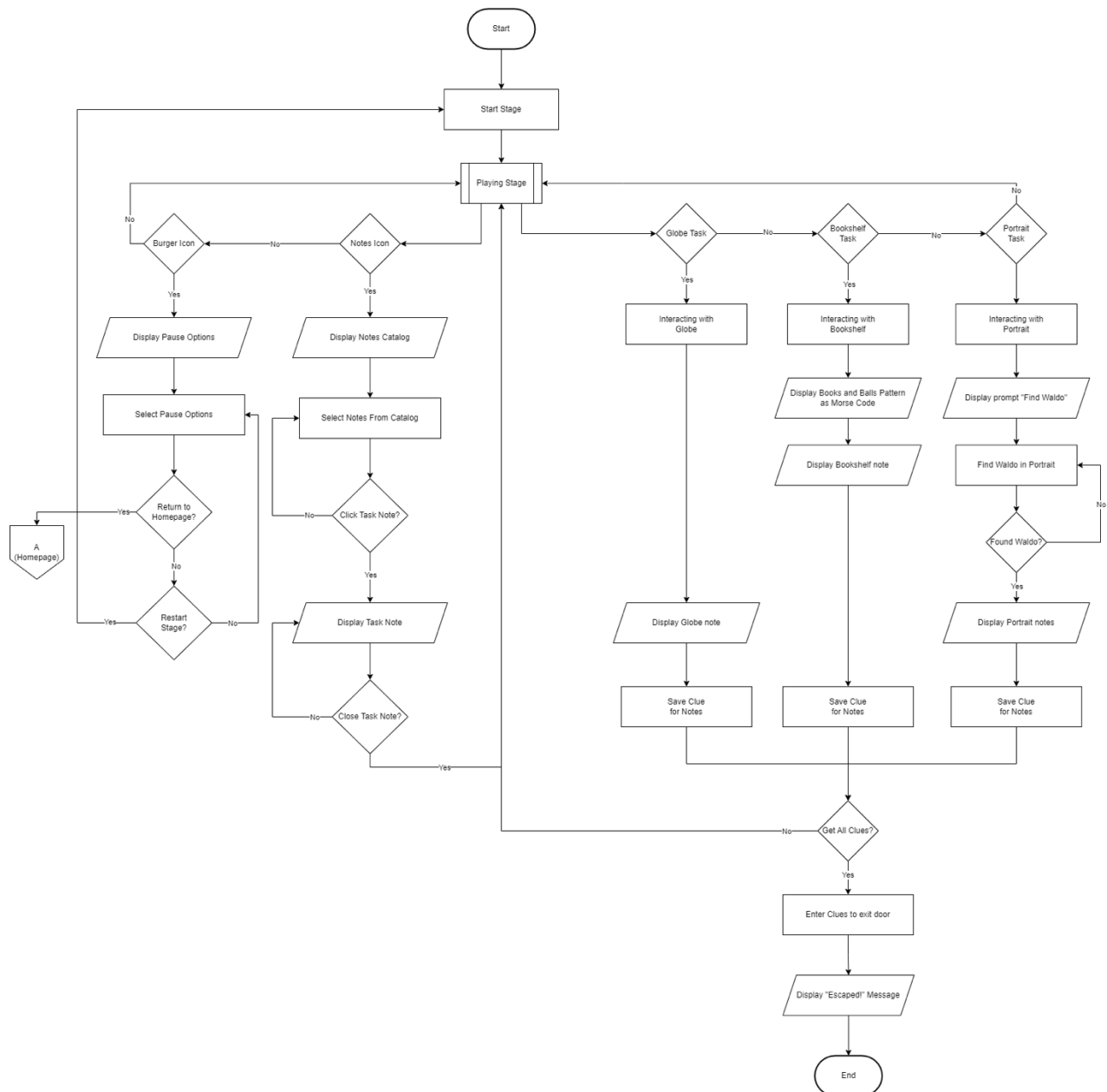


Table 6 *Flowchart 2*

Sub-level Flowchart



Appendix B: Button Design, Software and Hardware for Developer

Table 7 *Button Design*

Button	Description
	- This is the Start button. - It prompts users to enter story mode or practice mode to enter gameplay after being pressed
	- This is the Instructions button. - It guides the player for the basic movement and how to progress in the game after being pressed
	- This is the Facts button. - It shows Morse Code related facts and tips after being pressed
	This is the pause button (burger icon). It is used in stage 1 and 2 to access the pause page.
	This is a Notes button. It is used in stage 1 and 2 to view collected notes after tasks are completed.
	This is the Morse code table icon. It allows users to view the Morse code reference table at any time during the game or learning stages.

Table 8 *Software and Hardware Requirements for Developer*

Requirement	Item	Description
Software	Operating System	Windows 10
	Unity	Game engine used to integrate assets and build the game.
	Blender	3D computer graphics used to model 3D objects for the game.
	Procreate	Raster graphics editor application used to create and design the game buttons, cutscenes graphic, and the 2D backgrounds for the application.
	Davinci Resolve	Video editing application utilized to combine the static cutscenes graphic into animation and create the tutorial video.
Hardware	Audacity	Mixing and editing audio files
	Laptop	- Processor - RAM - Graphic Card
	Ipad Air 4	- Intel® Core™ i5-10500H 16 GB - RTX 3060 Max Q Mobile
	Input Output device	- For Procreate application - Mouse - Keyboard - Speaker
	Ipad	Apple Pencil Gen 2

Appendix C: Script Snippets

Table 9 *Unity Script Snippets*

Script Name	Script Snippet
Dialog Narration: Responsible for all the narrative aspects. Background image, sound effects, background music and dialog can be inserted in the Unity inspector via this script.	<pre> public class Dialogue : MonoBehaviour { [Header("UI Elements")] public TextMeshProUGUI textComponent; public Image backgroundImage; [Header("Dialogue Content")] public string[] lines; public float textSpeed = 0.05f; [Header("Backgrounds and Audio")] public Sprite[] backgroundImages; public AudioClip[] backgroundAudios; public AudioSource audioSource; [Header("Scene Transition")] public int nextSceneIndex; private bool dialogueEnded = false; [Header("Typing Sound Effect")] public AudioClip typingSFX; [Range(0f, 1f)] public float typingSFXVolume = 0.5f; public float typingSFXCooldown = 0.01f; private float lastTypingSFXTime = 0f; </pre>
Interact On Keypress: Handles in-game interactions based on player input. When the player is within range and presses the assigned key, linked actions such as clues or object triggers are executed. Interaction key and range are configurable in the Unity inspector.	<pre> void Update() { if (isPlayerInRange && Input.GetKeyDown(interactKey)) { onInteract.Invoke(); // Fire the UnityEvent } } void OnTriggerEnter(Collider other) { if (other.CompareTag("Player")) { isPlayerInRange = true; } } void OnTriggerExit(Collider other) { if (other.CompareTag("Player")) { isPlayerInRange = false; } } </pre>
Morse Code Mechanic: Manages Morse code input through the spacebar. Pressing space generates dots or dashes based on press duration, updates indicator text in real-time, and displays a horizontal visual bar that grows to reflect signal length.	<pre> void Update() { if (Input.GetKeyDown(KeyCode.Space)) { isHolding = true; holdStartTime = Time.time; if (morseAudioSource != null && !morseAudioSource.isPlaying) morseAudioSource.Play(); } if (isHolding) { float currentHoldTime = Time.time - holdStartTime; float normalizedHold = Mathf.Clamp01(currentHoldTime / maxHoldTime); float newScaleX = normalizedHold * maxScaleX; if (holdIndicatorImage != null) { Vector3 scale = holdIndicatorImage.localScale; scale.x = newScaleX; holdIndicatorImage.localScale = scale; } } if (isHolding && Input.GetKeyUp(KeyCode.Space)) { isHolding = false; } } </pre>

Teleport on Collision:

Used in the maze task to detect collisions with tagged obstacles. When triggered, it displays a prompt and teleports the player back to the starting point. All settings are adjustable in the Unity inspector.

```
public class TeleportOnCollisionWithUI : MonoBehaviour
{
    [Tooltip("Where the player will be teleported to")]
    public Transform teleportTarget;

    [Tooltip("UI Panel with a teleport button")]
    public GameObject teleportPopupUI;

    [Tooltip("Tag of the object that triggers the teleport popup")]
    public string triggerTag = "Obstacle";

    private CharacterController controller;
    private bool canShowPopup = false;

    void Start()
    {
        controller = GetComponent<CharacterController>();

        if (teleportPopupUI != null)
        {
            teleportPopupUI.SetActive(false);
        }
        else
        {

```

Appendix D: SUS Questions

1. I think that I would like to use this Desktop application frequently
30 responses

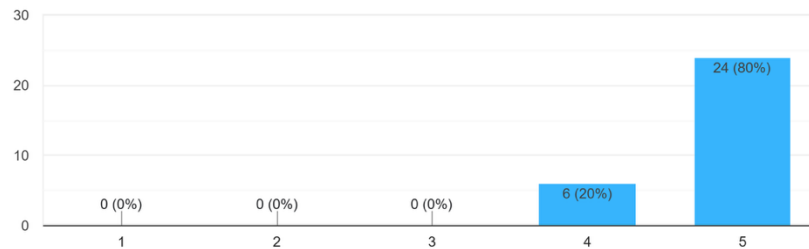


Fig. 8 SUS Question 1

2. I found the application unnecessarily complex
30 responses

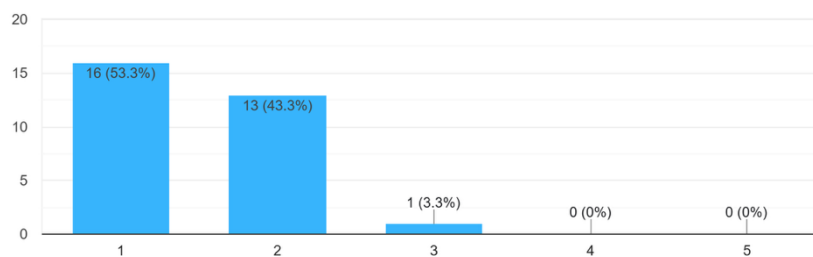


Fig. 9 SUS Question 2

3. I thought the application was easy to use
30 responses

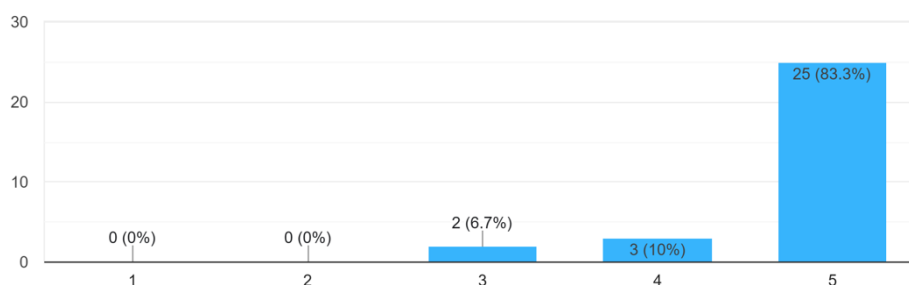


Fig. 10 SUS Question 3

4. I think that I would need the support of a technical person to be able to use this application
30 responses

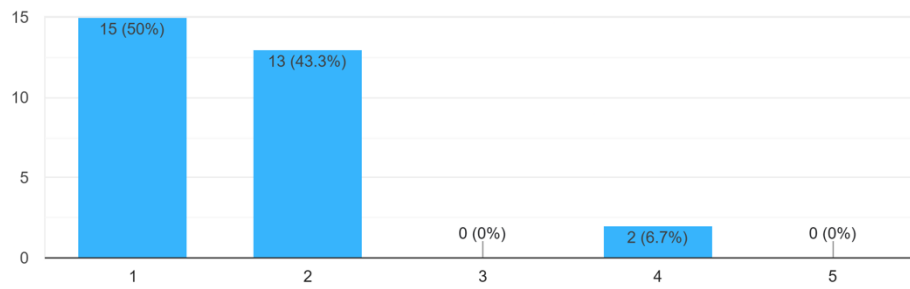


Fig. 11 SUS Question 4

5. I found the various functions in this application were well integrated
30 responses

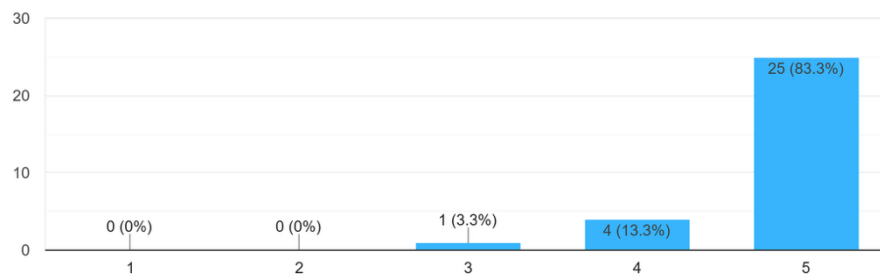


Fig. 12 SUS Question 5

6. I thought there was too much inconsistency in this application
30 responses

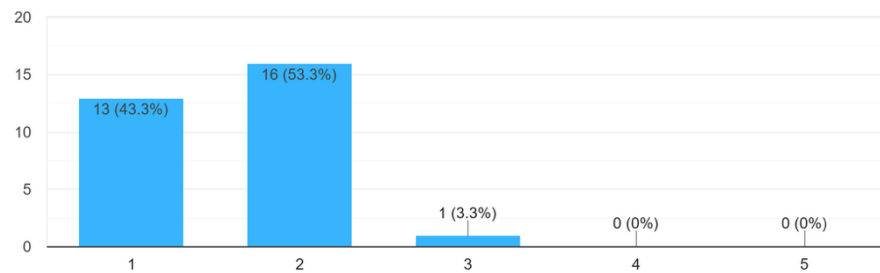


Fig. 13 SUS Question 6

7. I would imagine that most people would learn to use this application very quickly
30 responses

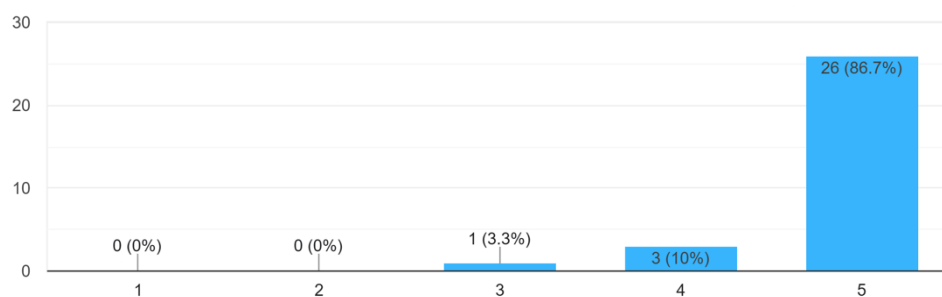


Fig. 14 SUS Question 7

8. I found the application very cumbersome to use

30 responses

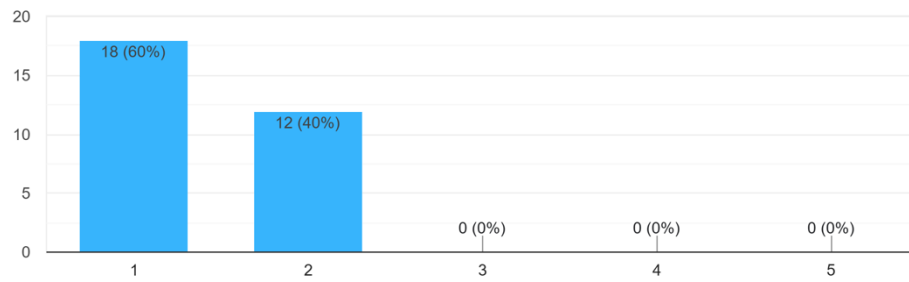


Fig. 15 SUS Question 8

9. I felt very confident using the application

30 responses

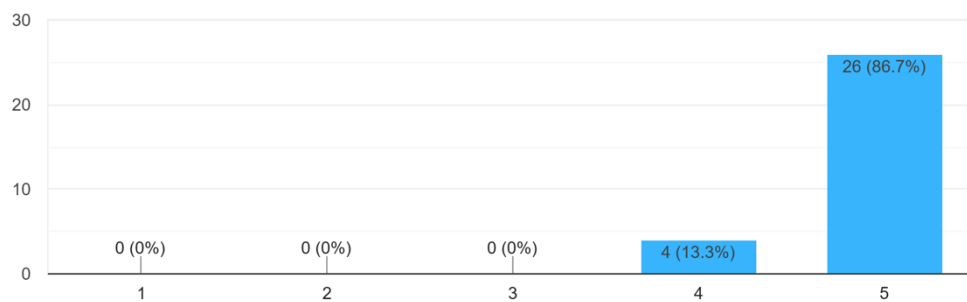


Fig. 16 SUS Question 9

10. I needed to learn a lot of things before I could get going with this application

30 responses

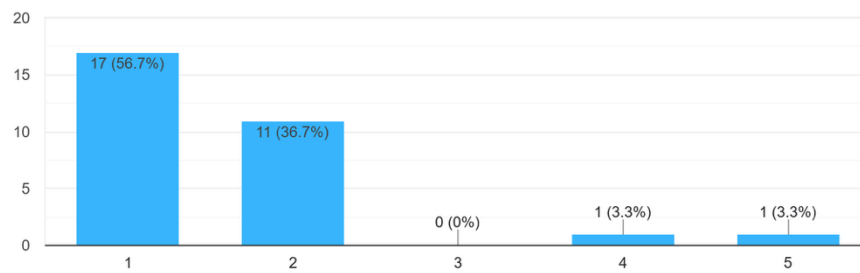


Fig. 17 SUS Question 10

Appendix E: Chart and Analysis of User Testing

After playing the game, how confident are you in recognizing the Morse code for "SOS"?

27 responses

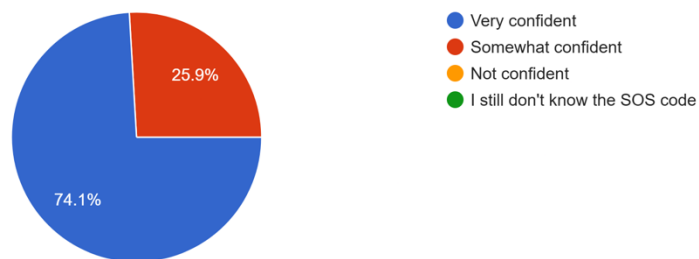


Fig. 18 Supplementary Question 1 Chart

Do you feel that the game helped you understand how Morse code can be used for communication?

27 responses

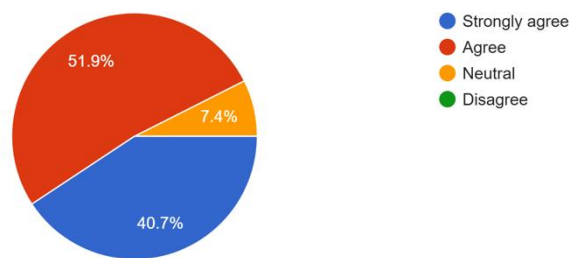


Fig. 19 Supplementary Question 2 Chart

How effectively did the game help you differentiate between dots (·) and dashes (–) in Morse code?

27 responses

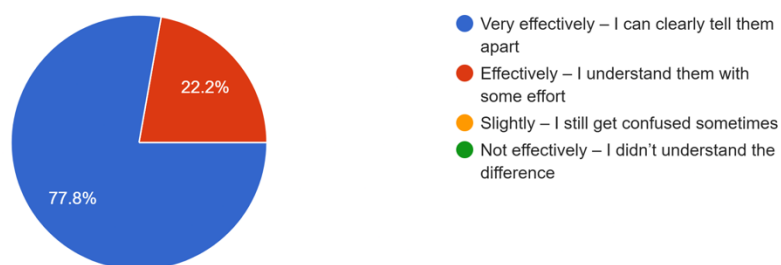


Fig. 20 Supplementary Question 3 Chart

Which part of the game contributed most to your understanding of Morse code?

27 responses

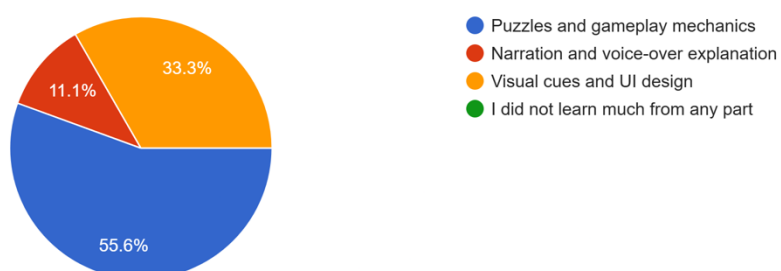
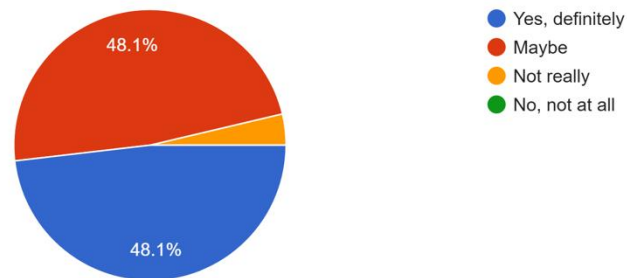


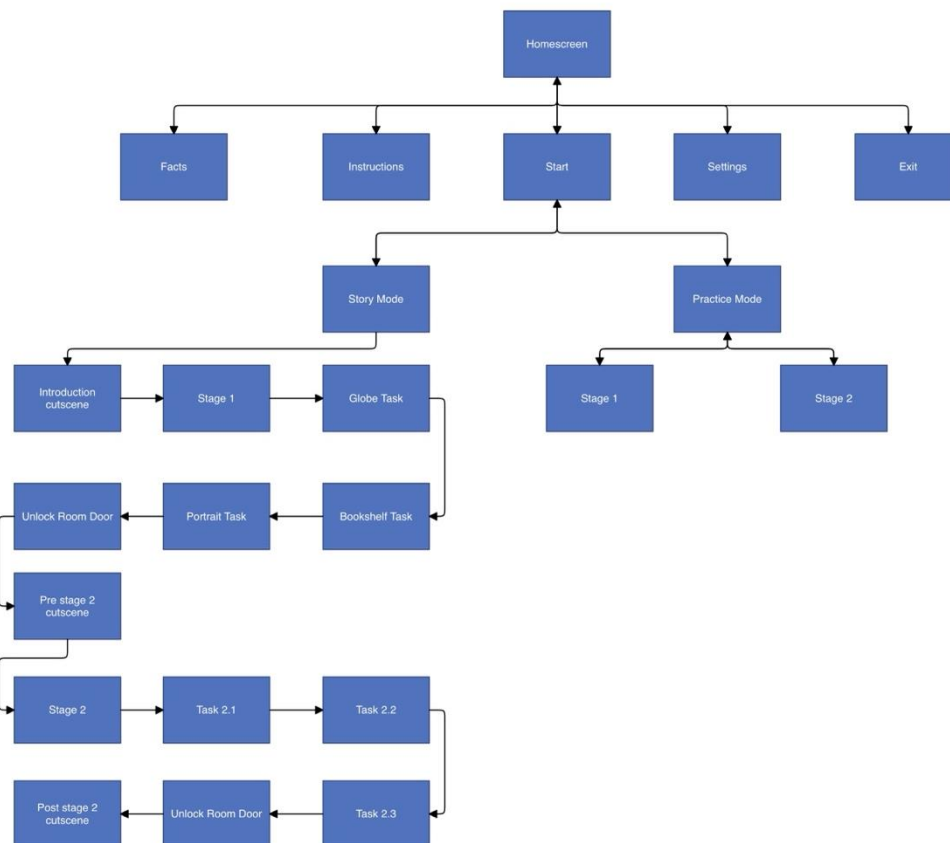
Fig. 21 Supplementary Question 4 Chart

Do you think you could apply what you learned about Morse code in a real-world context (e.g., emergency signaling)?

27 responses

**Fig. 22** Supplementary Question 5 Chart

Appendix F: Navigational Structure

**Fig. 23** *Navigational Structure*

Appendix G: Application Module

Table 10 *Morse Code Unlock Modules*

Modules	Description
User Interface Module	Provides players with easy access to gameplay controls, hints, and task tracking features to support their learning journey
Morse Learning Module	Allow players to refine Morse code skills at their own pace, reinforcing their understanding.
Stage I Abandoned Study Asylum	Players start with Morse code basics, focusing on dots and dashes for letters and numbers.
Stage II Communication Hub	A more difficult setting where players decode harder puzzles that connect partial words