[Design and Implementation of Adventure Game for Learning Mathematics and Science]

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Design and Implementation of Adventure Game for Learning Mathematics and Science

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This report is submitted in partial fulfillment of the requirements for the Bachelor of Computer Science (Software Development) with Honours.

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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DECLARATION

I hereby declare that this project report entitled

Design and Implementation of Adventure Game for Learning Mathematics and Science

is written by me and is my own effort and that no part has been plagiarized

without citations.

STUDENT : MUHAMMAD AMAR TAUFIQ BIN MOHD NAZRI Date : 27/5/2021
([NAME OF STUDENT])

I hereby declare that I have read this project report and found
this project report is sufficient in term of the scope and quality for the award of

Bachelor of [Computer Science (Software Development)] with Honours.

SUPERVISOR : DR.ULKA CHANDINI PENDIT Date : 27/5/2021
([NAME OF THE SUPERVISOR])

DEDICATION

This Final Year Project is dedicated to my beloved parents, who keep giving me support, inspiration, strength in doing the research as they provide moral, and financial support.

To my brothers, sisters, and friends that where they ideas and advice to help me finish this study.

I also dedicated this book to Almighty Allah S.W.T, thank you for your guidance, strength, power of the mind, protection, skills, and for my good healthy life.

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Thank you to my classmate for giving feedback and idea for my research and development of my FYP(Final Year Project).

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ABSTRACT

Nowadays, student is losing interest in learning sciences and mathematics due to uninteresting teaching method. Therefore, an interesting method for teaching sciences and mathematics is needed. The purpose of the project is to develop an edutainment adventure game based on subject mathematics and sciences. The game was developed using Unreal Engine 4 and Blender 3D. The result of the game will be measure through questionnaire that will be given for the target user, these questionnaires will ask question about the game and does it help them improve their understanding in sciences and mathematics. The result of evaluation from the questionnaire shows that participant agree that edutainment adventure game can help improve their understanding in sciences and mathematics. It is hoped that The Reporter can help student improve their understanding in sciences and mathematics.

ABSTRAK

Pada masa kini, pelajar sekolah menengah kurang minat untuk mempelajari subjek sains dan matematik kerana cara pembelajaran yang kurang menarik. Oleh itu, cara pembelajaran yang menarik untuk mengajar subjek sains dan matematik diperlukan. Tujuan projek ini adalah untuk mencipata sebuah edutainment adventure game berdasarkan sains dan matematik. Permainan video ini dihasilkan menguna Unreal Engine 4 dan Blender 3D.Hasil untuk projek ini akan dinilai berdasarkan soal selidik yang akan diedarkan kepada pengguna sasaran dimana soalan itu akan memberi soalan mengenai permainan dan kebolehan permainan tersebut untuk meningkatkan fahaman mereka dalam sains dan matematik. Berdasarkan hasil dari soal selidik tersebut, didapati bahawa pengguna sasaran bersetuju permainan edutainment adventure mampu meningkatkan fahaman mereka dalam sains dan matematik. Ia diharapkan bahawa '*The Reporter*' mampu meningkatkan permahaman pelajar dalam sains dan matematik.

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LIST OF ABBREVIATIONS

FYP - **Final Year Project**

UI - **User Interface**

HUD - **Heads Up Display**

GUI - **Graphical User Interface**

AI - **Artificial Intelligence**

MCO - **Movement Restriction Order**

LIST OF ATTACHMENTS

Chapter 1: INTRODUCTION

1.1 Project Background

The game title for this project is “The Reporter” is an edutainment adventure game where player plays as a journalist who goes to an abandoned house to investigate what happen to the house. Players need to solve puzzle in form of sciences and mathematics question. Player can find clue inside the house to help them solve the puzzle or purchase a power up capable of solving the puzzle. The purpose of this project is to help student understand sciences and mathematics through playing game in entertaining way since nowadays study of sciences and mathematics in traditional ways can be boring and troublesome for some student causing them to lose interest in gaining sciences and mathematics knowledge (Kumar, 2016). Teachers and parent can use this game to help their student and children understand about science and mathematics.

1.2 Problem Statement

Nowadays, secondary school students are losing interest in science and mathematics due to uninteresting methods of teaching (Kumar, 2016). This proves that the traditional method of teaching is boring for the student. To master one knowledge the student required to do a lot of practices, but non-interactive method can be not interesting for the student causing them to lose focus and unable to understand what they have learned.

Sciences and mathematics are important subject since we use it in our daily life without realizing it. Unable to understand the process inside sciences and mathematics can cause misconception for the student since all chapter inside sciences and mathematics are connected to each other. Most profession now a days required sciences and mathematics. In this digital era, student should be able to learn sciences and mathematics using games but the mobile game that based on sciences and mathematics are very limited.

Playing this game can help student to learn sciences and mathematics in more interactive way as student required to do puzzle inside the game that based on science and mathematics. Based on the problem, there is need of developing edutainment adventure game that based on sciences and mathematics to help improve student understanding.

1.3 Objective

- To study about how to implement adventure element in an edutainment game based on sciences and mathematics.
- To develop an edutainment adventure game for learning mathematics and sciences.
- To evaluate the implementation of adventure element in edutainment game based on user understanding in sciences and mathematics.

1.4 Goals and Genre

- Educational goal can be gained since player needs to solve puzzle based on mathematical equation or sciences task. Sometimes, player need to interact with object inside the house to solve the puzzle. So, player will be able to learn about sciences and mathematics when they try to solve the puzzle. There is also a tool such as solver, energy drink, navigator and seed inside the game that can help player to solve the puzzle which will show the answer for the puzzle.

- Entertainment goal can be gained through exploration inside the game. The game requires player to do some exploration to find clues and item for puzzle. While exploring, player can stumble upon an enemy which can capture player forcing them to restart the current level. Player can hide from the enemy by hiding inside the cabinet. Certain puzzle inside the game requires player to bring item around the house. Finishing the puzzle will give player a note about the story of the game. This adds interactive element inside the game rather than just solving puzzle and finding clues.

1.5 Game Features

- Target audience for this game is form 1 student to form 3 student, parent and teacher. Most puzzle inside the game are based on form 1 student until 3 student sciences and mathematics syllabus. Form 1 student to form 3 student can increase their understanding by playing this game since the game puzzles are based on their science and mathematics syllabus. Teachers and parent can use this game to help their student and children understand about sciences and mathematics.

- Rules of the game:

  i. Player can hide in a closet to avoid getting captured by the enemy.

  ii. Progress and Money that player obtain will not save if player get caught by the enemy.

  iii. Player can pick up certain object inside the game.

  iv. Certain room or area will be unlocked after player have complete the puzzle.

- Victory Condition is when player able to solve all the puzzle and uncover the mystery of the abandoned house.

- Losing Condition is when player get caught by the enemy, they will re-spawn back in the van and loss all the current progress.

1.6 Conclusion

This chapter covered about the problem statement of the project, objectives of the project, the game genre, and game features. The targeted output for this project is an edutainment adventure game where player can learn or understand more about sciences and mathematics. The target user for this game is form 1 student to form 3 student. The next chapter will cover comparison of proposed game and existing games, explanation of project methodology and genre.

CHAPTER 2: LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

The Reporter is a first-person puzzle game where the player needs to find information about the abandon mansion. Player needs to explore the house finding clues and puzzle inside the house. The main purpose of this game is teaching children mathematics, and sciences. The game is based on Hello Neighbor game developed by Dynamic Pixel but the difference is that, this game player able to buy equipment to unlock new area. The game also has 3 enemies that can catch player cause player to restart the level. The methodology for this project is scrum methodology which mean that the development phase will be divided into three sprints, Alpha-Sprint, Beta Sprint, and Completion Sprint.

2.1.1 Literature review

The Reporter was developed for mobile platform. Based on number of smartphone users worldwide from 2016 to 2026 statistic published by S.O'Dea (2017), the number of smartphone user increase every year.

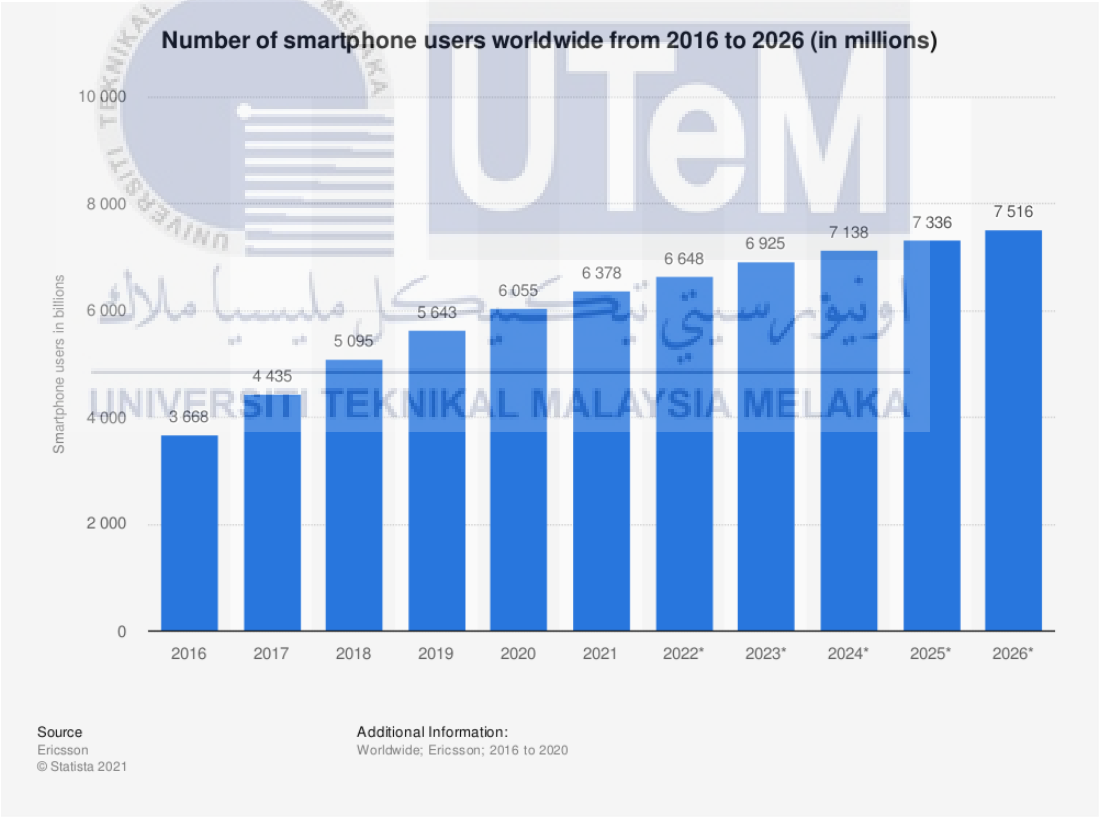


Figure 1: Statistic of Smartphone user from (Ericsson, 2021)

This show that creating game on mobile platform can be beneficial as more players can play the game. The Reporter has minimal requirement to be played as it do not

require extra gadget or accessory to be played. Player can also play the game anytime and anywhere they want since smartphone is portable and easy to carry.

After reading many journal, articles, and report about sciences and mathematics game, three (3) major findings were obtain:

i. **Learning mathematics using edutainment software is better than learning mathematics without using edutainment software (Setyaningrum, 2018)**

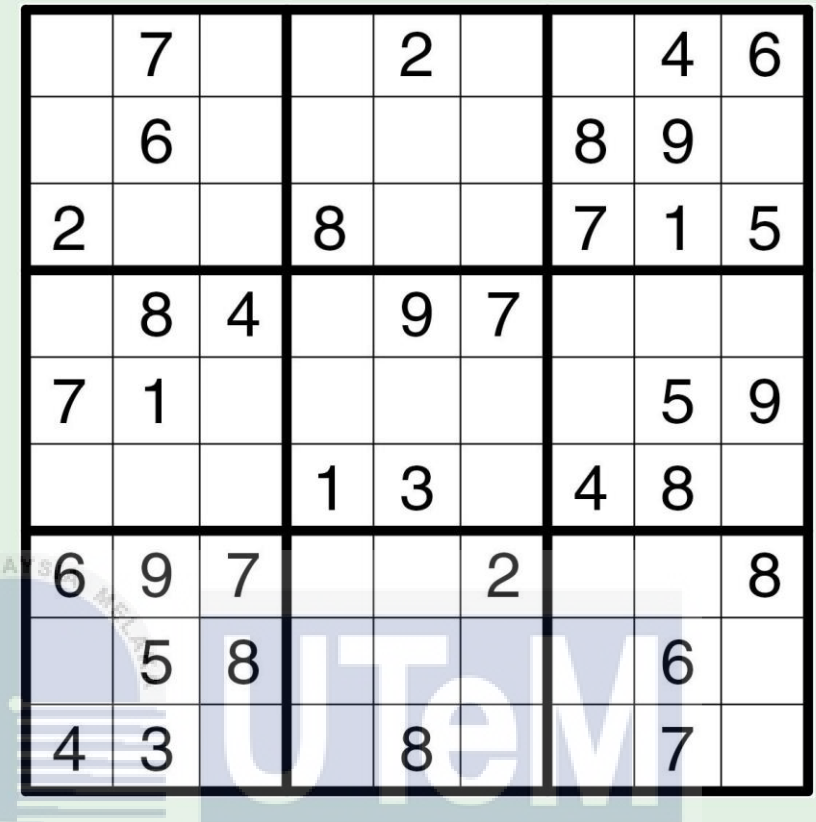
Mathematic is a subject that requires a lot of practices and understanding. Student needs to do a lot of homework, question, quiz, and exercise to master this subject. Sometimes this question can be troublesome and difficult to be solved causing the student to think that it is not worth it to solve the question. Student sometimes thinks that it not rewarding to solve the question if they do not understand how the equation is solve cause their motivation to study to decrease. The study of mathematics using edutainment games also affected by their interest, some students prefer to study in a traditional way where they are required to solve problem and do exercise.

With the use of edutainment game for teaching mathematics, student can improve their understanding through puzzle that based on mathematics question while try to solve the mystery that are available inside the game. This will give student sense of reward as they able to solve the puzzle and progress through the game. In this game, student can explore the area looking for clues and interesting item that can help them solving the puzzle. This allows them to

feel like playing game not doing homework where they will not get anything if they do not understand.

Using game also help show the student how to solve the equation. Clue inside the game can teach student by showing how to solve the problem. Mathematics puzzle inside the game is not always required student to do calculation and entering number but it will show the student the process of the calculation.

Games such as sudoku (Refer to figure 2) and 2048 (Refer to figure 3) are example of edutainment game based on mathematics. In Sudoku, player need to fill all the box with number from 1 to 9. Student can play the game learn how to calculate from 1 to 9 through sudoku.



	7			2			4	6
	6					8	9	
2			8			7	1	5
	8	4		9	7			
7	1						5	9
			1	3		4	8	
6	9	7			2			8
	5	8					6	
4	3			8			7	

Figure 2:Sudoku from (Cutolo, 2021)

Another game is, 2048 is a game that required player to add number until they able to obtain the biggest number before game over. This game helps student understanding mathematics addition process of equal number or power of 2

calculation.

Figure 3: 2048 from (elgoog.im, n,d)

Sudoku and 2048 help student learn about mathematics in more interactive ways as they can see the process occurs without, they student having to do any calculation.

ii. Students losing interest in science and mathematics (Kumar, 2016)

According to Kumar(2016), students losing interest in sciences and mathematics education. The problem cause by an uninteresting teaching

method which causing the student to become bored and stress about their studies if they unable to understand what they are studying. Mathematics and science subject are difficult as it requires lot of practices and understanding. Remembering knowledge from these subjects will not help as one thing that student learn from this subject will be used in the future for more complex calculation or formulas. Teacher will give student lot of exercise to improve their understanding, but it can affect the student morale to study in they unable to solve the question. Since the exercise do not have any clue or tutorial to help the student, they need to find external reference or refer to their previous exercise. With the help of technology, student lot more prefer to watch video from internet to help understand the question. Student loves to watch tutorial video because if they do not understand certain part, they can always rewind that part up to 1000 times while asking teacher to prove to be difficult since student have short duration to ask the question and cannot be repeat for 1000 times. Problem on watching tutorial videos is that student is not able to get instant answer if they do not understand the video. Student also cannot do experimental on the question and see if it is correct or wrong. That why using edutainment game to teach science and mathematics since the student can have interactive learning session in the game. They can try or do what they want to the puzzle inside the game and see if their answer is right or wrong. This give them more understanding as there is clue inside the game explaining the subject using pictures, text, or videos.

iii. Edutainment or Entertainment Education Possibilities of Didactic Games in Science Education (Trna, 2007)

Edutainment games can helps teaching sciences subject based on Edutainment possibilities for Science Education by Josef Trna. Science is a subject that requires student to understand the concept and formula. Student needs to read and understand information for the subject which can be difficult for student that do not enjoy reading or having difficulties in understanding through words. Student will feel stress if they must read and memorize the knowledge inside the book so they can pass their study. This stress can cause the student to feel demotivated to study science as they think that this subject requires only reading and memorization. Making student miss the concept of understanding the subject since what they learn now will be used in the future.

Experiment in sciences is difficult to be done and sometimes it will take time to get the result. Using edutainment, student can see how to process of photosynthesis work, and they need to setup up so the process can occur. Clue inside the game will explain process inside the subject through text, pictures, or videos. This help player to see and understand how process in the subject works as they able to read or watch clue videos inside the game multiple times. Using edutainment game, it can helps shorten the time taken to get the result and shows the result quickly to the student.

2.2 Genre

The genre for this game is adventure game(Refer to figure 4). Adventure game focus on puzzle solving while exploring the area of the game. This genre allows the

player to explore the game world and increase their creativity by creating their own lore from the surrounding. The game do not required high skill to master since inside the game since there is no fast movement for player to complete in

Figure 4: Example of adventure game(Portal from Valve, 2007)

the level. This genre is perfect for the project since the game requires player to explore the area finding clues and solving puzzle while avoiding enemy in the area. Story telling in the game will keep player interested as they able to solve the mystery of the game. Environment story telling will have a huge impact inside the game as it will give uniqueness and make the area different from normal area. The Reporter is a game that heavily depends on puzzle and exploration which suitable with this genre. Solving the mystery of the game will be the reward for the player once they able to finish the game.

This game also has sub-genre which is thriller sub-genre(Refer to figure 5) which give player intense moment to keep the game interesting.

Figure 5: Example of thriller element in game (Silent Hill from Konami, 1999)

The sub-genre also affects the setting and level design of the game. This game theme is more into mad scientist experiment. The specimen from their experiment escape and roaming inside the house which increase the thrilling element inside the game. The enemy will chase player around the map preventing them from completing the puzzle. As player progress through the game, the environment inside the house will change and different enemy will spawn inside the map showing more thrilling element. Players need to avoid these monsters, so it keeps the game interactive for the player other than just finding clues and solving puzzle. Since the game involve science and mathematics question, it can be stressful for the player so the thrilling feeling can increase player fun factor. Player also can find coins inside the game that will allow player to purchase equipment and items. These items will help player bypass the puzzle or move around the house faster.

2.3 Existing Game

The next sub-sections provide existing games of adventure FPS game, which are Hello Neighbor, and Granny.

2.3.1 Hello Neighbor

Hello Neighbor is a survival horror stealth game developed by Russian video game studio Dynamic Pixels and published by TinyBuild. The player takes the role of Nicky Roth, who investigates his mysterious neighbor named Mr. Peterson. The player's task is to break into the neighbor's home and solve a series of puzzles in order to gather the items needed to unlock and access his basement. As the player explores the neighbor's house, they must not be spotted by the mysterious neighbor, or they will be chased down(Refer to figure 6), and if the player is not quick enough to hide or escape, they will be captured. The player can stun the neighbor by throwing objects at him for an easier escape.

Figure 6: Neighbor Chasing the Player from (GameUP24, 2018)

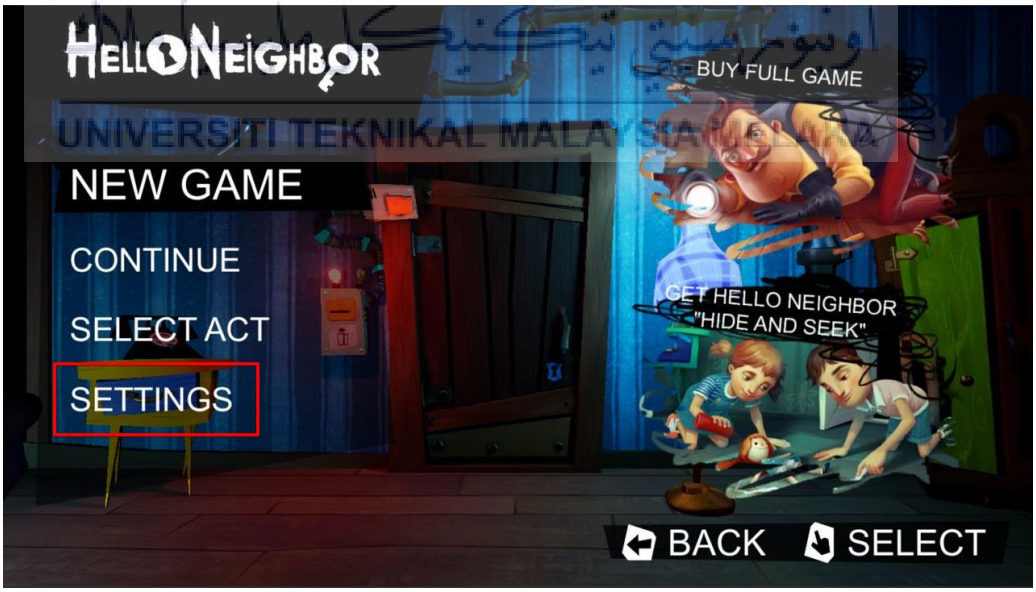


Figure 7: Hello Neighbor Menu from (Hello Neighbor)

2.3.2 Granny

Granny is a survival stealth horror game developed by DVloper. The player finds themselves waking up in a bed in a room they don't recognize. They have been locked up in an old, decrepit house by Granny, a crazy old woman (or demon) who hunts her prey with a bloody baseball bat. Player must explore and find items and tools to help them open the various locks Granny keeps on her front door, all while outrunning her pursuit and hiding in the beds, coffins, and wardrobes found in the various rooms of the house. In their mission to unlock the front door, they will also stumble upon a garage at the bottom of the house which holds a functional, albeit disassembled car. Should they so choose, they could abandon their original objective and instead focus on using the parts that they find to repair and fuel the car, which can then be used as an alternate escape method. Along the way, they will also run into the many other secrets that Granny keeps hidden behind locked doors. Her pet spider makes an appearance as a secondary antagonist, holed up in a cage at the very top of the house. Additionally, a particularly investigative player might find remnants of a broken family, or worse, the remains of Granny's last victim. They will come across her second big pet, the Crow kept in a secret room connected to the Meat Room and the Cellar Swamp.

Figure 8: Granny 1 menu screen from (Granny wiki fandom)

Figure 9: Granny 2 menu screen from (Thnuknoodles, 2019)

Figure 10: Granny player perspective from (Nick Fernandez, 2018)

2.3.3 Comparison of Existing Games

This section provides comparison of Hello Neighbor and Granny (refer to Table 2.3),

Table 1: Comparison of Existing Game

	Hello Neighbor,	Granny
Gameplay	The player's task is to break into the neighbor's home and solve a series	Player get capture by a granny. Player will start waking up in a bed

	of puzzles in order to gather the items needed to unlock and access his basement. The puzzle are in form of finding keys, and flipping switch to open gate. Player also need to avoid from getting captured by the neighbor.	and they need to find item to help them escape from the granny. There is multiple of ways for player to escape from the granny. Player can hide from granny to avoid getting captured. Player can retry 5 times if they get caught.
Storyline	The player takes the role of Nicky Roth, who investigates his mysterious neighbor named Mr. Peterson. Player hears screams coming from his neighbor's, Mr. Peterson, house. Nicky goes to investigate and witnesses Mr. Peterson apparently locking someone in his basement. Nicky sneaks into the house, finds the key to the basement, and enters. He finds that Mr. Peterson has converted his basement into a makeshift underground dungeon but finds no sign of any prisoner. As player progress deeper into the game, they will discover more of the neighbor secret.	The player finds themselves waking up in a bed in a room they don't recognize. They have been locked up in an old, decrepit house by Granny, a crazy old woman (or demon) who hunts her prey with a bloody baseball bat. As player progress through the game, they'll also run into the many other secrets that Granny keeps hidden behind locked doors. Her pet spider makes an appearance as a secondary antagonist, holed up in a cage at the very top of the house.

Game Mechanic	Include picking up object inside the maps and putting them into player's inventory. Player also can sprint, and jump. Certain item in the game have their own uses such as magnet that able to attract metal toward the player.	Include picking up one object at a time. Player can hide from granny by interacting with the hiding spot. Certain item in the game have their own uses such as stun gun that able to stun granny for short duration of time.
Platform	Windows, android, IOS, PlayStation 4, Nintendo Switch and Xbox One	Windows, android, IOS
Duration	Average of 80 minutes	Average of 40 minutes

Based on the comparison, it is found that The Reporter have some similar game mechanics with Hello Neighbor and Granny. The concept of exploration and mystery from both Hello Neighbor and Granny game are implemented inside The Reporter. Clues will help the player to get the idea to solve the puzzle. Solving the puzzle will give player coins that they can use to purchase item from a shop. Hiding mechanics from Granny also implemented in this game, allowing player to hide from the enemy. Player also can carry one item same with Granny game if player want to carry another item, they need to drop the item that they are carrying. Like in Hello Neighbor when player is spotted by the enemy, a music cue will be played to alert the player. The Reporter have a shop system which allow player to purchase item that can help them to complete the game which are not available from both Hello Neighbor and Granny.

2.4 Project methodology

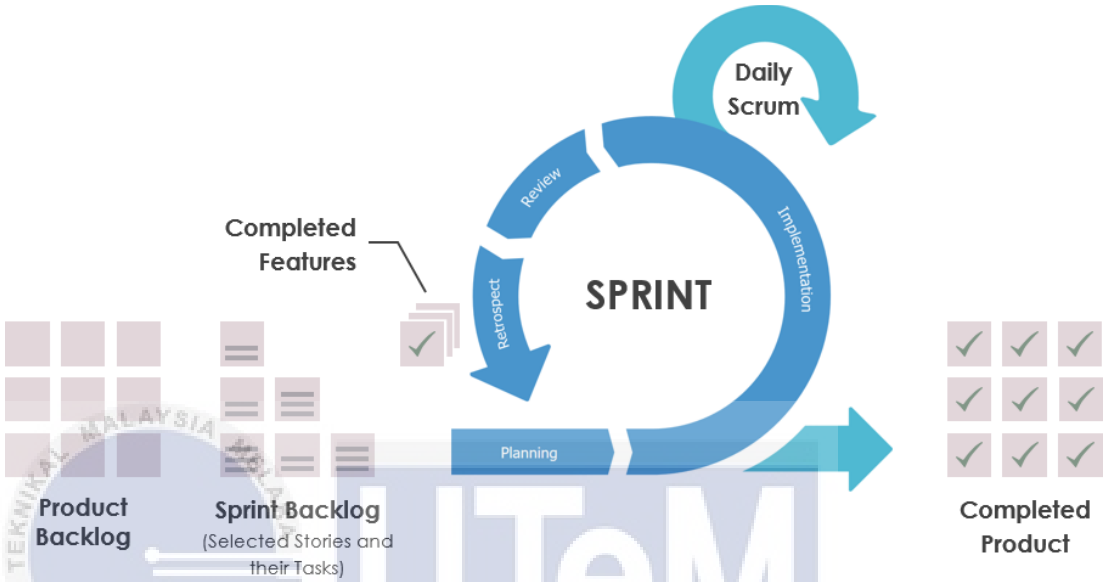


Figure 11: Scrum methodology from (visual-paraigm.com)

Scrum methodology method was used to ensure that the game development process goes smoothly without any problem. Using this method, the project task can be divided and done in duration given. Scrum methodology allow for proper planning and keep the task complete at duration with the help of sprint backlog.

- **Planning**

  In planning phase, a list of product backlog was created and assigned on the respective sprint. All random idea and subject that can be related with the game. What is the problem statement, how to solve it, how the

game should look and what cost in term of time and resources needed to execute. The genre, concept, gameplay, and visual were discussed in this phase.

- **Implementation**

  Implementation phase was the actual sprint in the scrum where the developer will try to complete the sprint backlog. Working on the programming to set up the game mechanics and physics in the game. For every two weeks, the developer had a meeting with his/her supervisor about the progress of his/her project.

- **Review**

  This game was reviewed seeing if the puzzle in the game were working properly, the user interface was suitable and working, mechanics of the game were working and enemy able to roam and chase the player. Any error during the review was noted and fixed. The game and a questionnaire were distributed to target user to obtained feedback for the game. The questionnaire had to be distributed online due to MCO.

- **Retrospect**

  This is the phase where the game was tested for improvement based on the feedback. Any bugs or error that occur during this phase was noted to be fix in the future. Alpha testing was to test whether the puzzle in the game was working properly, can the puzzle be solved and can

player interact with the clue. The beta testing test the movement of the enemy, player win and losing condition, and player progression. Based on the feedback, certain element of the game such as the UI, AI mechanics, and game mechanics need to be changed for the Gold Version of the game.

2.5 Conclusion

As a conclusion, this chapter explains why Hello Neighbor and Granny were reference The Reporter and why it is suitable to be implemented in the game. The comparison of The Reporter game and other game that have same type of game genre that available in the market are discussed. The methodology used in the project development was Scrum Methodology.

For the next chapter, analysis of the project is being discuss. Item such as Project Requirement, technical Requirement, software requirement, hardware requirement and project schedule will be explained.

CHAPTER 3: ANALYSIS

3.1 Requirement Analysis

The next sub-sections explain about project requirement, technical requirement, technical requirement, software requirement, hardware requirement, and project schedule and milestone.

3.1.1 Project Requirement

The Reporter is based on Stealth Horror Game called Hello Neighbor by Dynamic Pixel. The idea for gameplay is taken from that game with few adjustments toward its mechanics and design. A comparison was made for Hello Neighbor and Granny to help see their differences and find out the features from the existing games that can be applied for The Reporter (Refer to Table 2).

Table 2: Game Comparison

	Hello Neighbor	Granny

Player Roles	Player will play as a person that just move into the neighborhood.	Player plays as a character that get captured by Granny. Player needs to find item that can help them escape before granny kill them.
Gameplay	Hello Neighbor required player to search for item or keys inside the neighbor house and try to unlock the mystery. Player can use the objects that are scattered around the house to solve a puzzle or hit the neighbor. To progress through the game, player need to solve the puzzle in form of flipping switches and platforming.	Player needs to find item that can help them escape before granny kill them. There are plenty of items that player can find by exploring the house while hiding from the granny. Players need to solve certain puzzle inside the area to obtain item that allow them to escape.
Victory Condition	The victory condition for Hello Neighbor occurs once player have solved all of it puzzle and gone through all of the level.	There is multiple ways for player to escape from granny. Once player able to escape they will win the game.
Core Mechanic	Hello Neighbor has an inventory system where player can store up to 4 item that they had pick up	Granny has a hiding mechanic that allow player to hide from the granny. If player hide in

	from the house and use it later. Players can run, jump and crouch. Once player get caught by the neighbor, player will respawn at their own house and still have item that they store inside their inventory. Certain objects inside the neighbor house have a special effect such as magnet can be used to attract all metal component, while glue can be used to slow down the neighbor.	front of granny, there is probability that granny will still capture them. If player get captured by the granny, they will respawn and their progress will be kept. Player can respawn for 5 times only and if they get captured again it game over. Player can only carry 1 item at a time, so they need to swap item after they use it.
Level Progression	Level progression in Hello Neighbor occur when player able to open the lock door by finding keys. Going through the door will transport player into another level where player will have to solve a new puzzle. The design of the map changes when player proceed to the next level giving player a new look.	In Granny there is only 1 level, player will have to explore the level finding item that will unlock certain area. Player can finish the game in respawn session.

User Interface/Interaction models	In Hello Neighbor there is a HUD that can shows player inventory and controls for the game.	In granny, there is HUD that will show it the item is interactable and player status
Camera Models	the camera models are first-person perspective.	the camera models are first-person perspective.
Storyline	Player finds themselves moving into a new house across the street from a mysterious neighbor who is behaving in a paranoid manner and seems to be keeping a secret in his basement. Inside the neighbor house, there is lot of switch that control a gate inside the house and a lock door for the basement. Once player able to enter the basement they will finds that the neighbor has converted his basement into a makeshift underground dungeon, but finds no sign of any prisoner. The player then get caught by the neighbor and put	The player finds themselves waking up in a bed in a room they don't recognize. They have been locked up in an old, decrepit house by Granny, a crazy old woman (or demon) who hunts her prey with a bloody baseball bat. They must explore and find items and tools to help them open the various locks Granny keeps on her front door, all while outrunning her pursuit and hiding in the beds, coffins, and wardrobes found in the various rooms of the house. Along the way, they'll also run into the many other secrets that

	inside the dungeon. Player need to escape and uncover more mystery about the neighbor.	Granny keeps hidden behind locked doors. Her pet spider makes an appearance as a secondary antagonist, holed up in a cage at the very top of the house.

Puzzle in the game was based on form 1 to form 3 mathematics and science syllabus. This is an important element in the game since player spend most of their time exploring and solving puzzle. Player can find clues inside the game that give information about mathematics and science subject based on form 1 to form 3 syllabus.

3.1.2 Technical Requirement

- **Smartphones**

The game is developed for Android mobile platform. With the rapid growth of technology, there is more smartphone that can play games. Developing this game in mobile platform allows a lot of users to player the game since they do not need extra accessory to play the game.

- **Unreal Engine 4**

Unreal Engine 4 is a popular game engine that currently used by many game developers from indie developers to AAA company. The beautiful and comfortable user interface inside Unreal Engine 4 making it easier to develop games using it. The usage of blueprint makes it easy for developers to spot the mistake that they have made during development. Unreal Engine 4 also provide a lot of features that can help developers such as AI(Artificial Intelligence), movement controls, UI design and level design.

3.1.3 Software requirement :

- Blender
- Unreal Engine 4
- Audacity
- MediBang Paint Pro

3.1.4 Hardware requirement :

- Microsoft Windows 10
- Mouse
- Keyboard
- Smartphones

- Headphone

3.2 Project Schedule and Milestone

Task/Week	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14
Writing Proposal														
Creating the level outlay														
Creating the asset														
Developing the game														
Game testing and debugging														
Interview primary school children and distributing the game														
Collecting the data from the primary school about the effectiveness of the game														
Polishing the game and writing a report														

Figure 12: Project Gantt Chart

- **Writing Proposal**

Research subject matter information through article, research paper and write it down inside a proposal.

- **Creating the level outlay**

Setting up the level design for the game.

- **Creating the Asset**

Modelling the asset for the game using Blender such as enemy brother bob and cousin wade, scale, and boxes.

- **Developing the game**

Setting up the game mechanics and physics in the game.

- **UI design and puzzle design**

Designing the user interface and puzzle that will implemented inside the game.

- **Setting up the sound effect**

Set up the sound effect for action inside the game to give feedback for the player.

- **Game Testing**

Play test the game to see in there is bug inside the game and error that cause the game to crash. Balancing the game based on the difficulty of the enemy, and puzzles.

- **Polishing the game**

Fixing the bugs and adding the leftover details to the game.

The next table is project milestone for the project (refer to table 3).

Table 3: Project Milestone

Task	Start Date	End Date
Writing Proposal	1/3/2021	8/3/2021
Creating the level outlay	14/3/2021	28/3/2021
Creating the asset	29/3/2021	11/4/2021
Developing the game	21/3/2021	115/2021
Setting up the sound effect of the game	11/5/2021	18/5/2021
UI design and puzzle design	24/5/2021	14/6/2021
Game Testing	21/6/2021	28/6/2021
Polishing the game	1/7/2021	15/7/2021

3.3 Conclusion

In this chapter, the differences between the similar game that are related to the proposed project are analyzed and technical requirement, software requirement, and hardware requirement are identified. The project schedules and milestones also being portrayed in this chapter.

For the next chapter, the design of the project will be explained.

CHAPTER 4: DESIGN

4.1 Introduction

In this chapter, the game architecture, game design, and game art. The design for this game was inspired from a game called Hello Neighbor created by Dynamic Pixels and published by TinyBuild. The game involve player to solve puzzle and uncover the mystery of the neighbor. The Reporter is an adventure edutainment game where player went into an abandoned house and try to solve the mystery and puzzle that based on mathematics and science question. Player can find item, clues and coin inside the game that can help them progress through the game.

4.2 Game Architecture

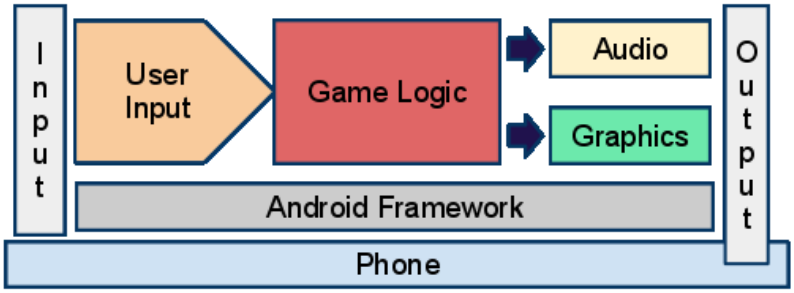


Figure 13: Game Architecture Model from (obviam.net)

The figure 13 is the game architecture model for The Reporter. The game was being developed for smartphone. User gives touch input into the game based on the button and key that they click. Movement control for the character is located at the bottom left of the screen while the movement control for camera is located at the bottom right of the screen. There also button interaction button that player can click, if player click while overlapping with a door, they will open it. Interacting with the puzzle will allow player to solve it. Once player able to solve the puzzle or open the door, an output will be given out in form of audio or graphics. For example, when player finish the BODMAS puzzle, the box will be opened giving out a graphic output and a chest opening sound will played giving out audio output for the player.

4.3 Game Design

The next sub-sections below provide explanation about gameplay, core mechanics, flowboard, storyline, and user interface

4.3.1 Gameplay

The Reporter is an adventure first-person game where player will play as Ariff who work as a reporter that want to investigate an abandon house. Ariff want to solve the mystery about the house since there is a rumor about the house where people who visit the house never return. Players need to search for information inside the house. This information can be gain by exploring and solving puzzle inside the house. Players need to complete the puzzle inside the game to progress through it (Refer to Figure 14). Player can solve the puzzle based on the clue they find in the game. These clues are scattered around the house and player need to find it. The clue will explain how to solve puzzle that are present inside the game. After they see the clue, player can try to solve the puzzle based on the clues. If player unable to solve the puzzle based on the clues, they can collect coins inside the game.

The collected coin can be used to purchase solver, an item that will give player answer for the puzzle and bypass it. Player still need to key in the answer such as enter the number on the safe or bring food based on the animal diet since the solver will only show player the answer. Using solver will not give any penalty towards the player but the price to buy the solver is expensive and required player to grind for coins to obtain it. One puzzle would consume 1 solver if it used. If player want to test their knowledge, player can straight do the puzzle inside the game without searching for clues inside the game. Player can see if their understanding of the subject is high or not.

There are enemies inside the house that capable of capturing player. If player get captured, they will spawn back at the store and lost all their current progress during the gameplay. Player can hide from the enemy and this will prevent them from getting captured. Player can use certain item to outrun the enemy if they get corner. Player will archive victories once they collect information about the house. The game have multiple ending based on how much information player able to collect from the house.

The game will have 3 difficulties. Player unable to select the difficulty and it will rise as the game progress on. The difficulty will affect number of enemies inside the game, and the hardness of the puzzle. When player reach level 2 and 3, the puzzle will involve more complex item and question that required more understanding. Player can use solver to solve the puzzle but the price of the solver will increase for higher difficulty.

Hierarchy Of Challenges

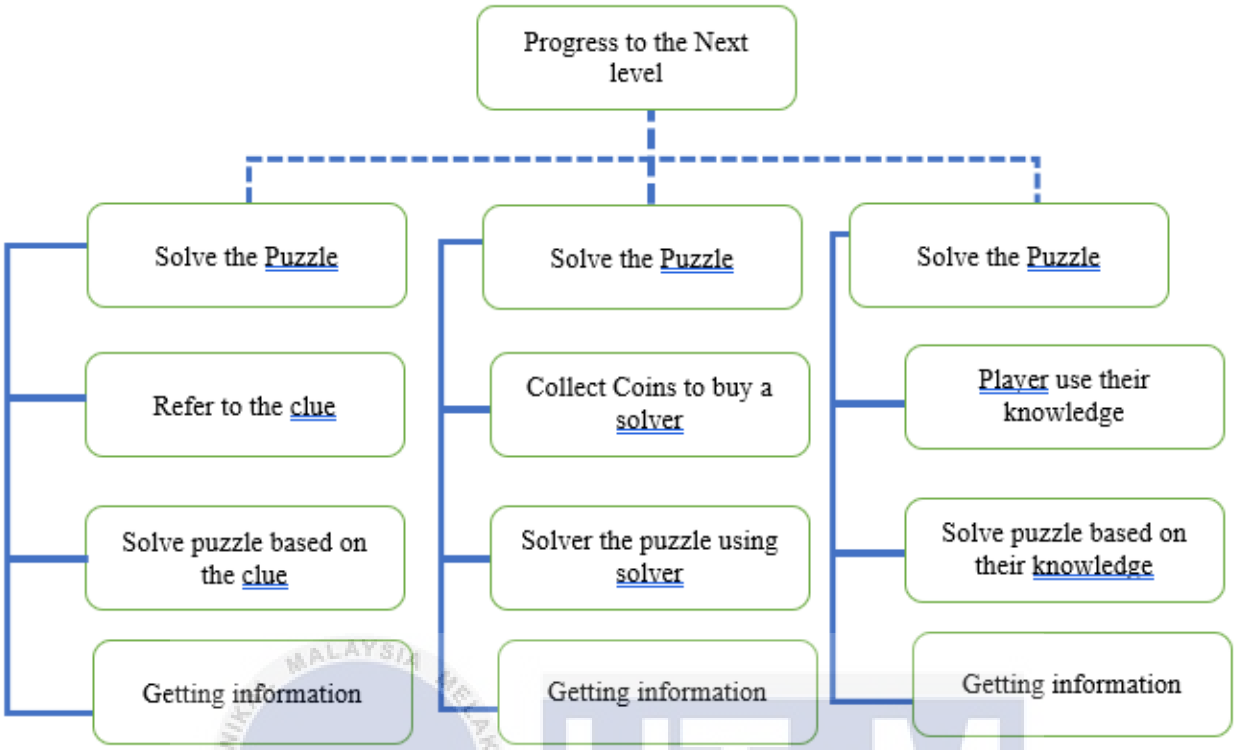


Figure 14: Hierarchy of Challenges for The Reporter game

4.3.2 Core mechanics

- Player able to walk
- Player able to run with help of an item
- Player able to crouch
- Player able to pick up item

Player will enter the house and if they able to get out of the house safely, their progress will be saved (Refer to figure 15).If player get captured by the enemy, the current progress for the current level of player will be lost (Refer to figure 16).

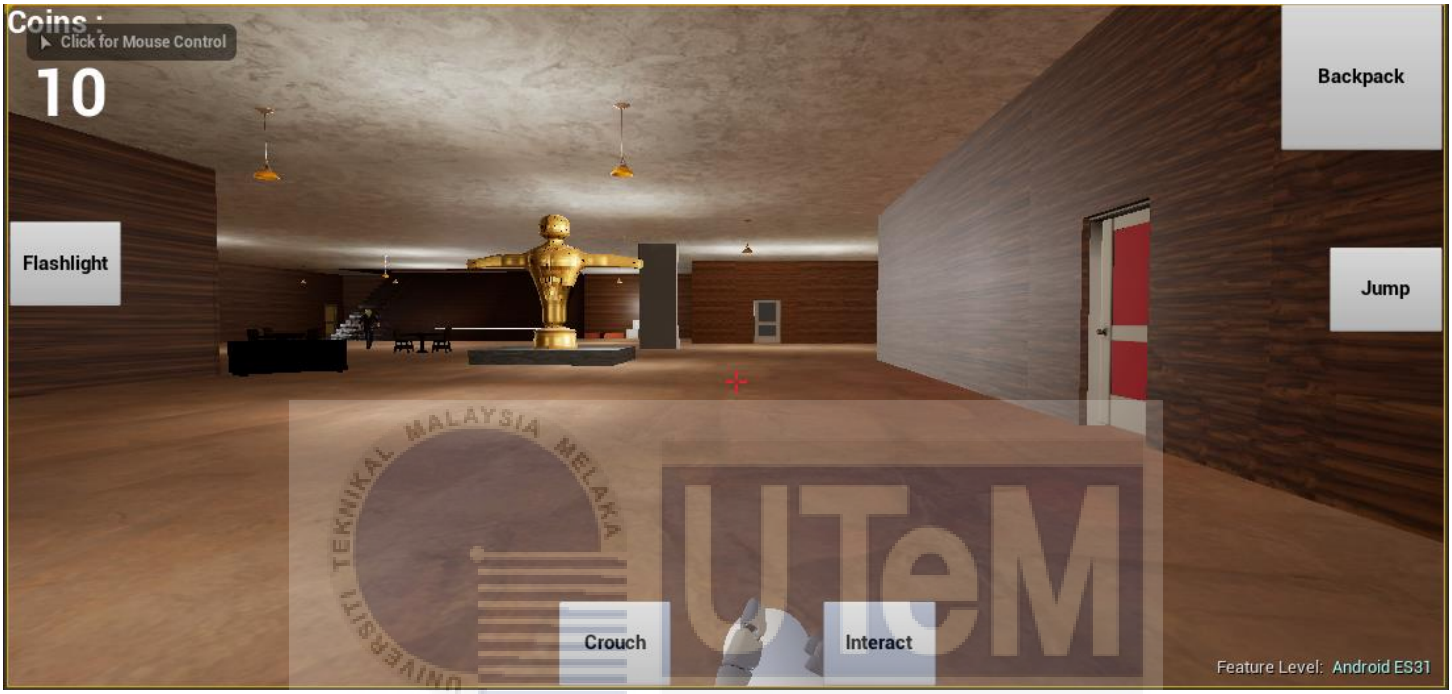


Figure 15: Progress before getting captured

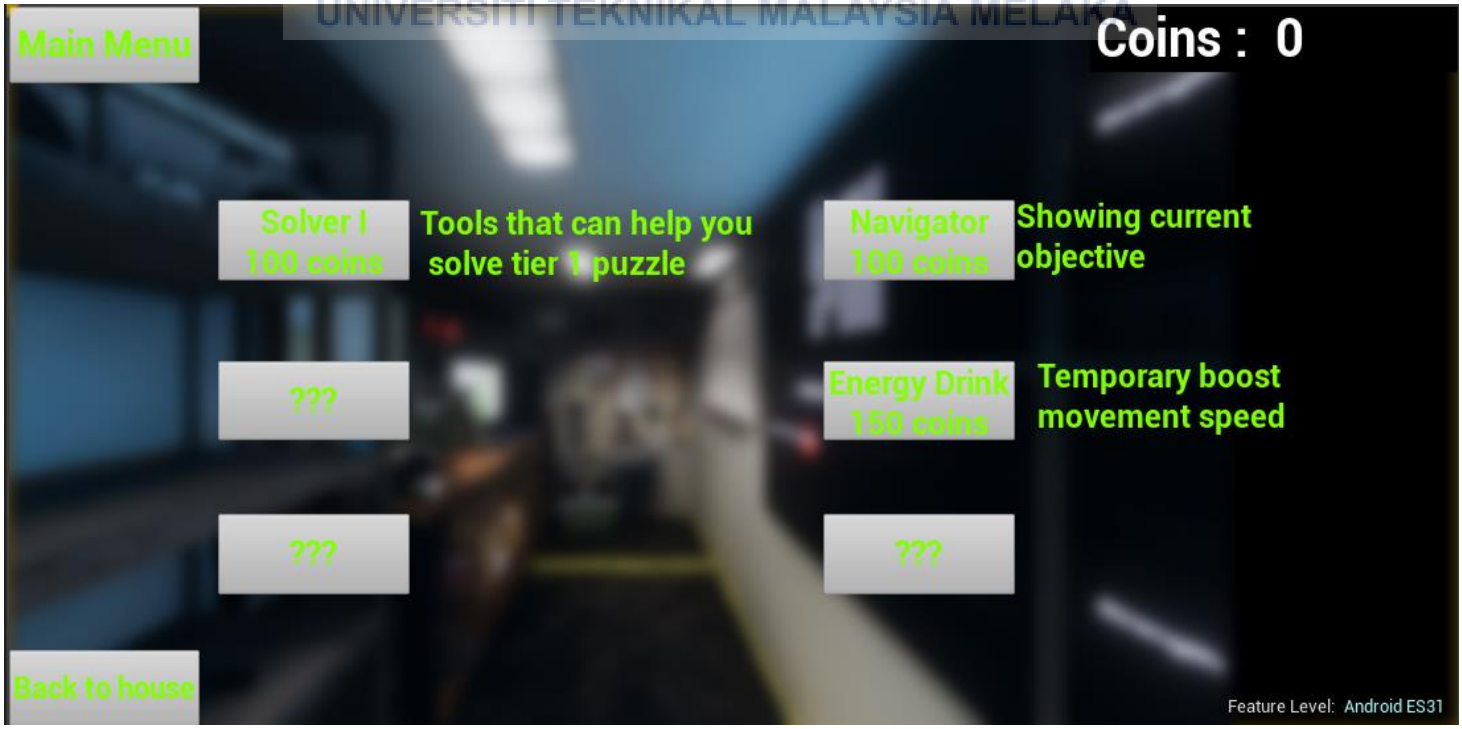


Figure 16: Progress After getting captured

Player can hide from the enemy by hiding in a closet(Refer to figure 17 & 18).

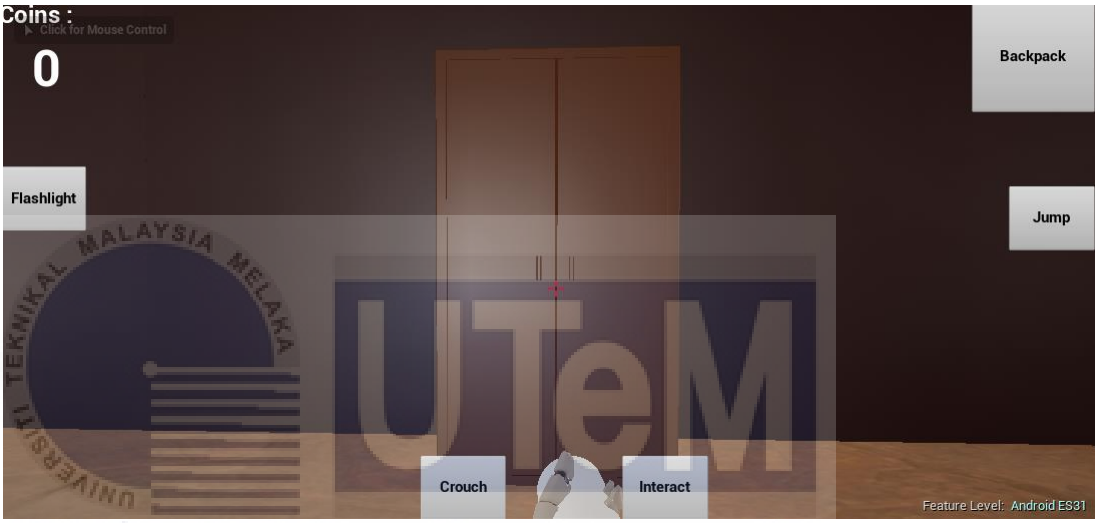


Figure 17: Player interacting with the cabinet

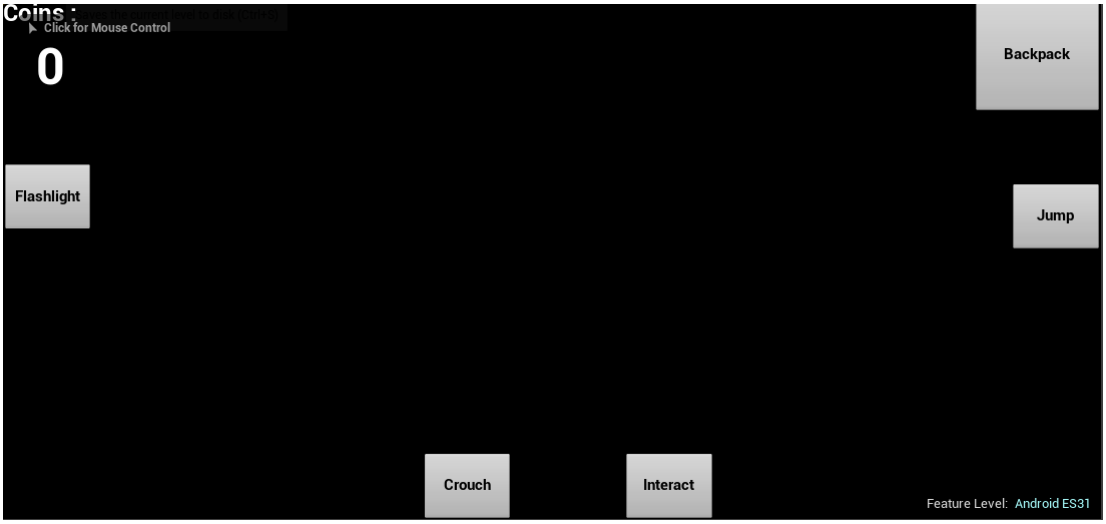


Figure 18: Player hiding in the cabinet

Each time player leaves the house, their progress will be saved (Refer to figure 19 & 20).

Figure 19: Progress before leaving the house

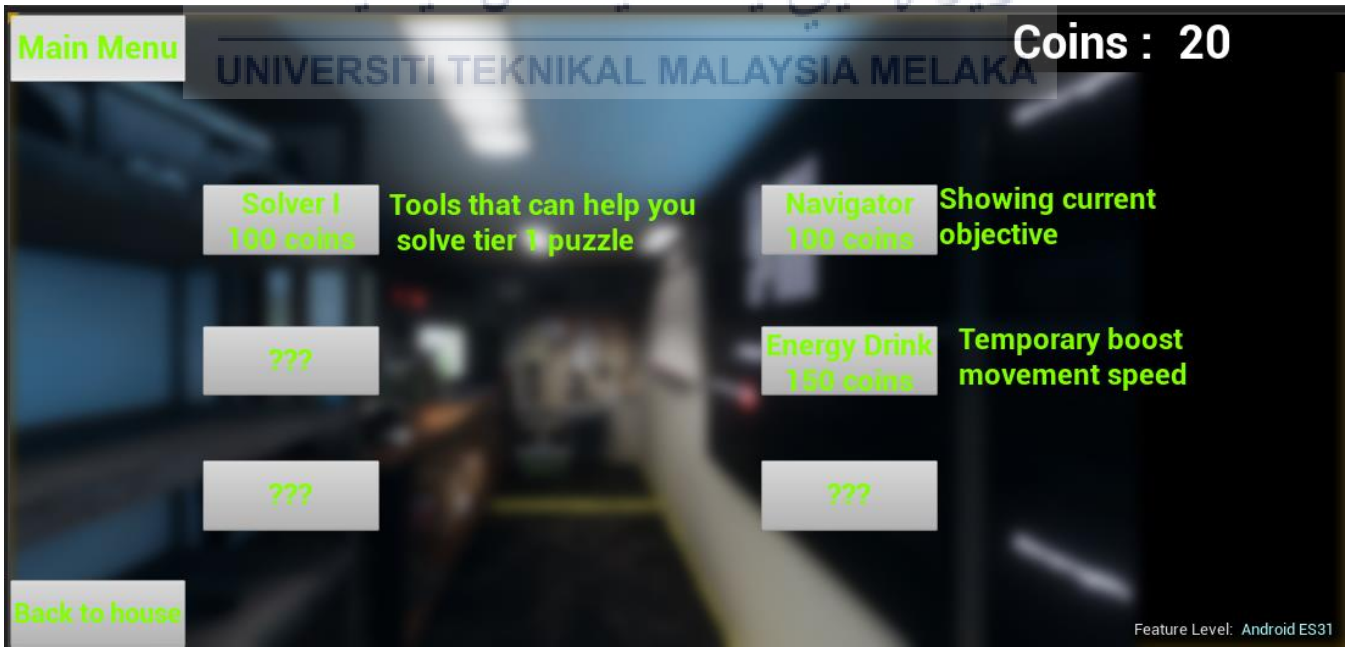


Figure 20: Progress after leaving the house

Backpack inside the game will show information about how much puzzle have player solve, amount of solver that player currently have (refer to figure 21), the document that they have (refer to figure 22) and equipment that they have (refer to figure 23). One puzzle can only use one solver and different difficulty puzzle use different type of solver. Player can collect coins by exploring the house, solving puzzle, and doing task inside the game.

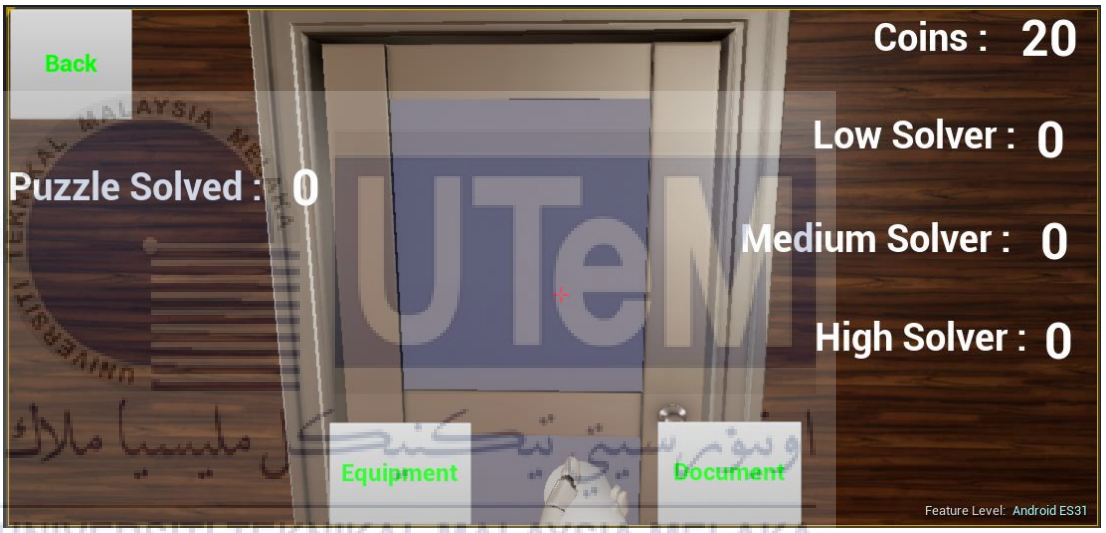


Figure 21: Backpack

Figure 22: Documents collected

Figure 23: Inventory

4.3.3 Flowboard

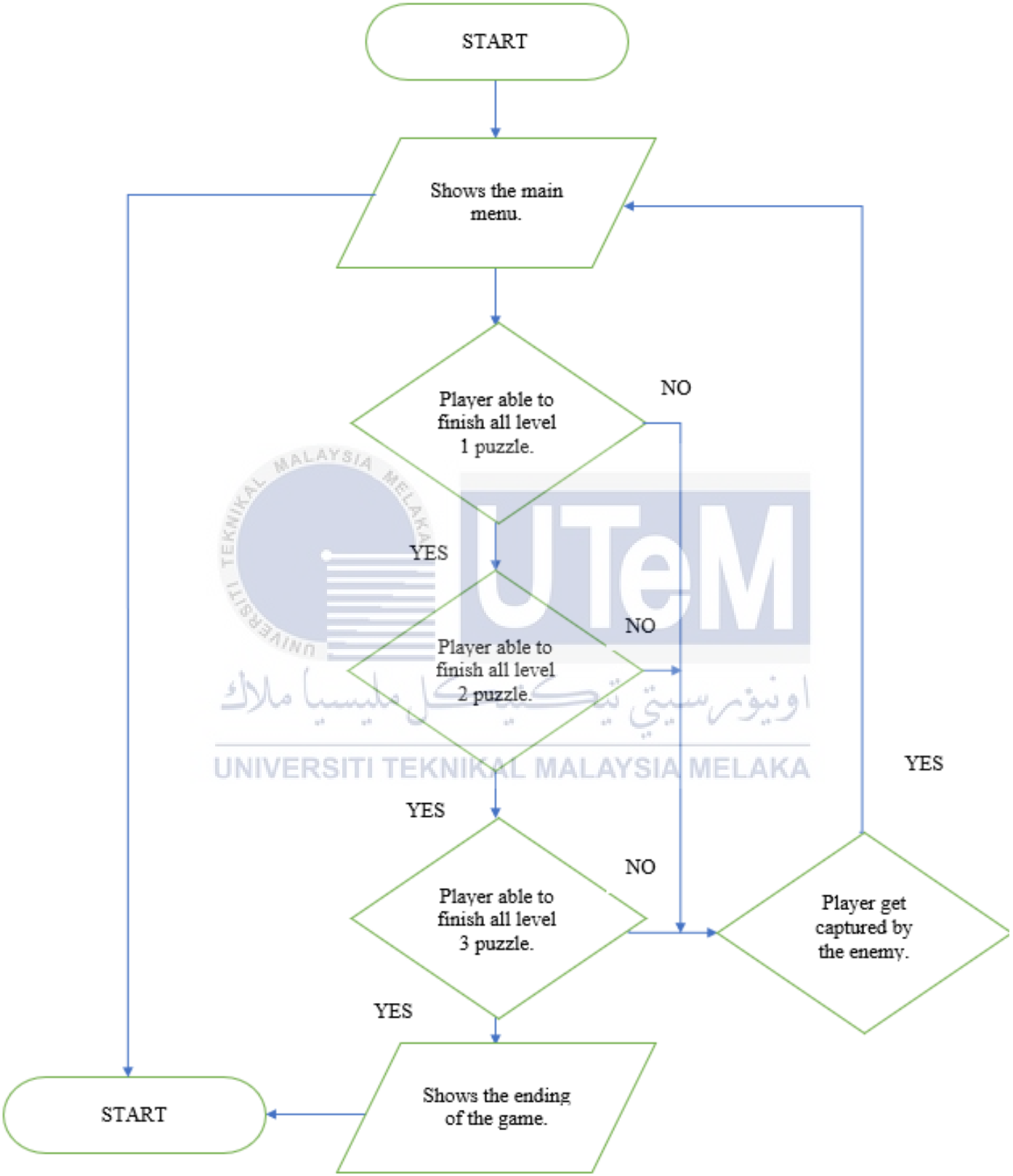


Figure 24: Flowboard

Level Progression

- In The Reporter, there are 3 level before player able to achieve victory. Player need to solve puzzle on each level and gather necessary item such as data or tape in order to progress to the next level.

- The first level will involve simple puzzle that player need to solve. For the first 2 puzzle, the enemy will spawn inside the world yet. So player can roam the place freely. The coins will also not spawn around the world for the first 2 puzzle. Once the enemy has spawn, 6 more puzzles are available for the player to solve it. Solving these puzzles will give player coins and document about the house. Player can read it to gain information and lore of the game. The example of question that will be ask for the first level are Round Off for mathematics and Diet for sciences. After solving all of the puzzle, player will able to progress to the next level.

- Level 2 will spawn 1 more enemy inside the game. The enemy will roam second level hallway. Player will have solved puzzle that more difficult compared to level 1 puzzle. Player can buy a medium level solver that capable of solving level 2 puzzle. The item is more expensive compared to solver for level 1. The question that will be inside the puzzle for level 2 are Division for mathematics and Animal Life Cycle for science puzzle. Before entering level 3, player will have to solve one of puzzles in level 3 puzzle. Players are not allowed to leave the house or save the game before solving the puzzle.

- Level 3 is the final level of the game. Player will need to solve high level puzzle and it requires certain item from the store that player need to purchase. The enemy will move even faster and have a high chance to outrun the player. The puzzle for this level will be BODMAS for mathematic and Plant Life Cycle for science puzzle. Finishing all the puzzles will let player to continue uncover the mystery of the house or finish the game.

4.3.4 Storyline

Ariff is a journalist who investigate an abandoned house that located inside a jungle. Rumors said that people who visit the house will never come out of the house but there were not evidences proving those rumors. Three years before, the owner of the house went missing and the house left abandoned. The rumors making people think that the house was haunted causing them to avoid the house. Ariff enter the house to see if the rumors were true. Once he enter the house he see things that he cannot believe exists in this real world. Will he be able to uncover the mystery of the house or will he unable to return like everyone else that entered the house?

4.3.5 User Interface/Interaction Model

Store menus contain item that player can purchase, these items will help and sometimes are crucial for the game (Refer to figure 25).

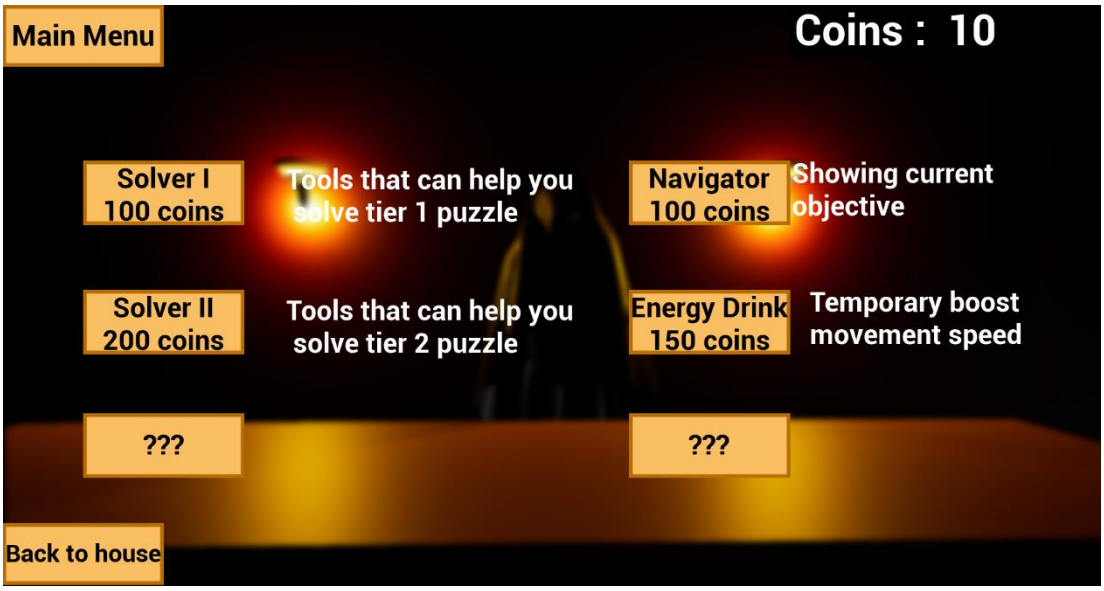


Figure 25: UI for store

When player open a puzzle, there is option to activate solver. The solver will help player getting the answer for the puzzle (Refer to figure 26 & 27).

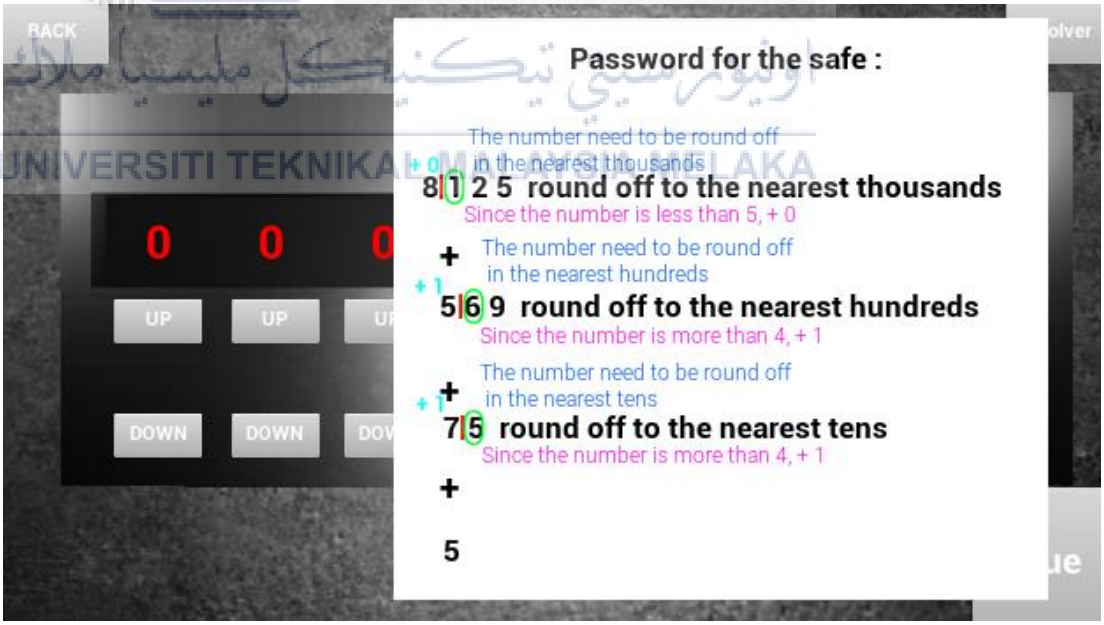


Figure 26: UI for round off mathematic puzzle

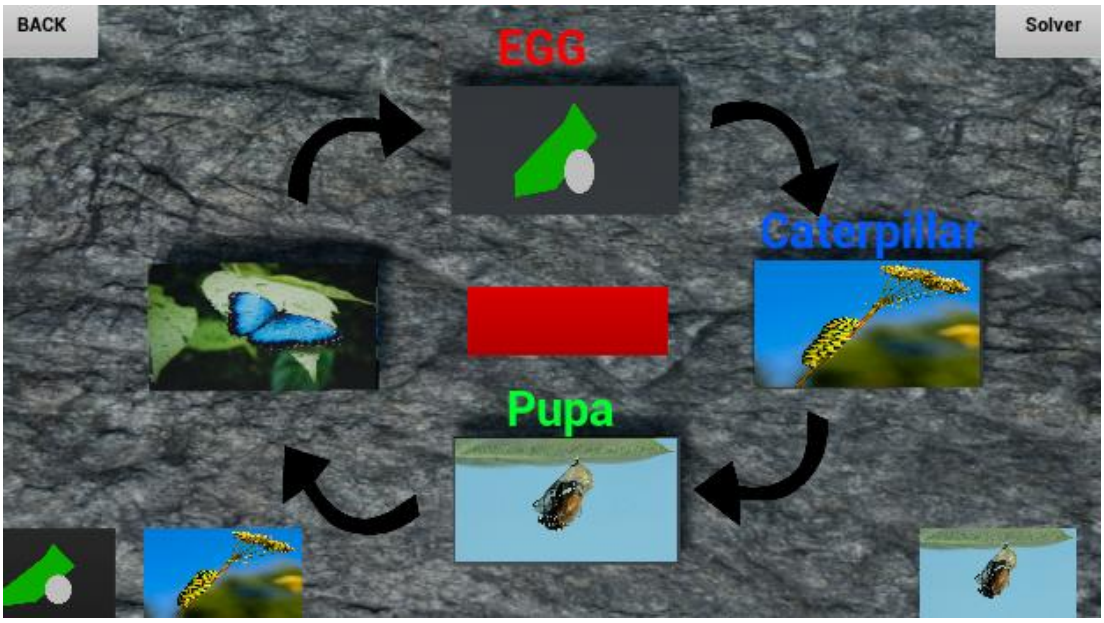


Figure 27: UI for Animal life Cycle science puzzle

The HUD(Heads-Up Display) contains buttons that allow player to move and do action inside the game. Coins on the top left of the screen shows how much coin player has (Refer to figure 28).

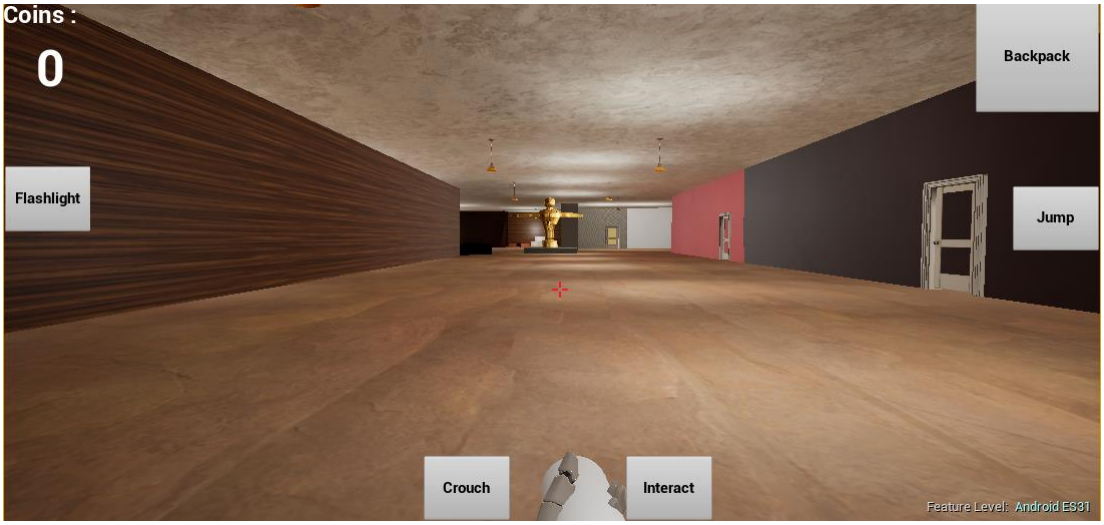


Figure 28: HUD for the game

The design of HUD is based on the sketch, where it will show the coins that player has and button for action inside the game (Refer to figure 29). The HUD is created inside the Unreal Engine 4, where the character movement will control player movement inside the game while the camera movement will control the camera control inside the game. Flashlight button will allow player to turn on and off the flashlight. Backpack button will open another UI that shows the number of solver player have, puzzle that they solved, and document that they have. Interact button will allow player to interact and pick up item inside the game. Jump button will allow player to jump inside the game. A crouch button is added into the interface where player able to crouch when it is pressed.

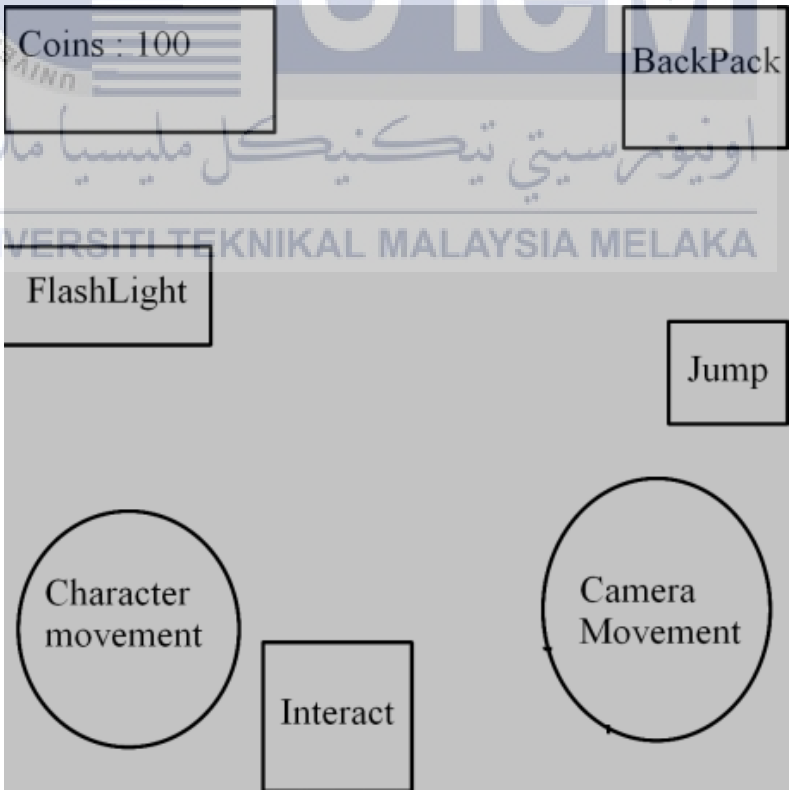


Figure 29: Sketch of HUD

4.4 Game art

The next sub-section explains about game world, character design, camera model, and audio/sound effects.

4.4.1 Game World

The level design is based on the sketch. Each room inside the house have a color coding to help player memories the room. It also gives player sense of weirdness of the house. Green room on the second floor are accessible after level 1. Player will obtain the key for the green room after finishing all puzzle on level 1. Blue and purple room can be access after finishing all the puzzle on level 2. The first-floor map consists of study room, hallway, library, leisure room, dining room, kitchen, and security room (Refer to figure 30). Second floor map consists of kid bedroom, guest bedroom, green room, and Master Bedroom (Refer to figure 31). Each room are color coded where the study room is colored yellow. Hallway, library, and leisure room are color light brown. Security room colored dark brown. Dining room colored red. Kids Bedroom color light blue. Guest bedroom colored purple. Green room colored green and master bedroom colored blue. Player can see the color coded on the door before they enter the room.

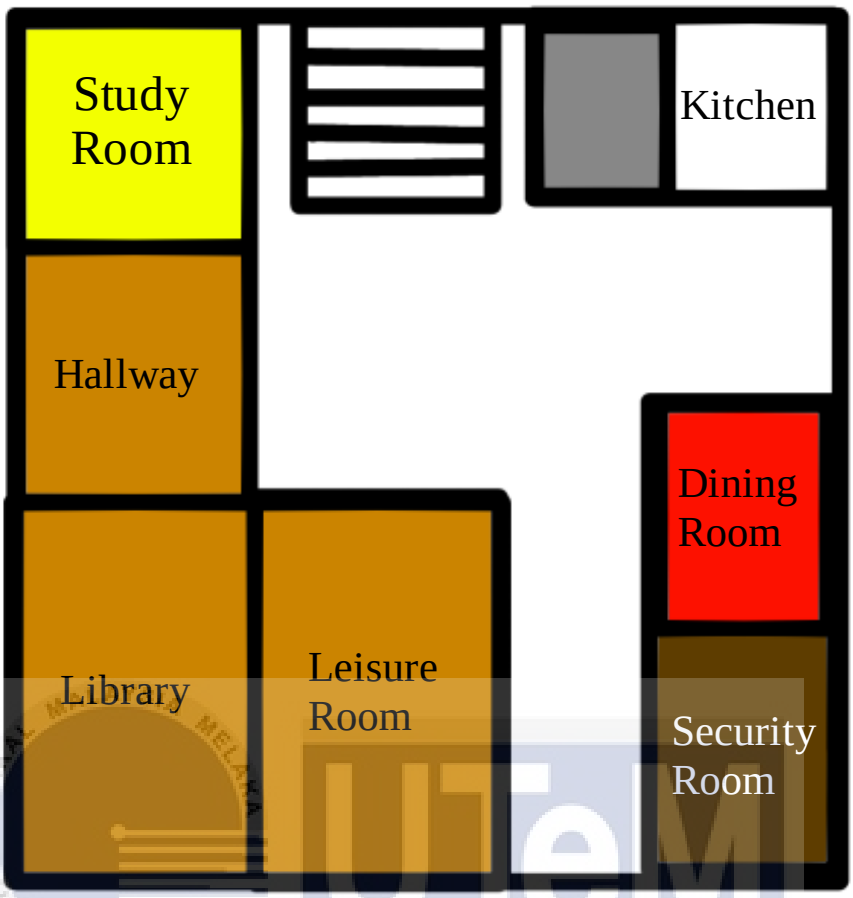


Figure 30: Sketch for the first floor of the game

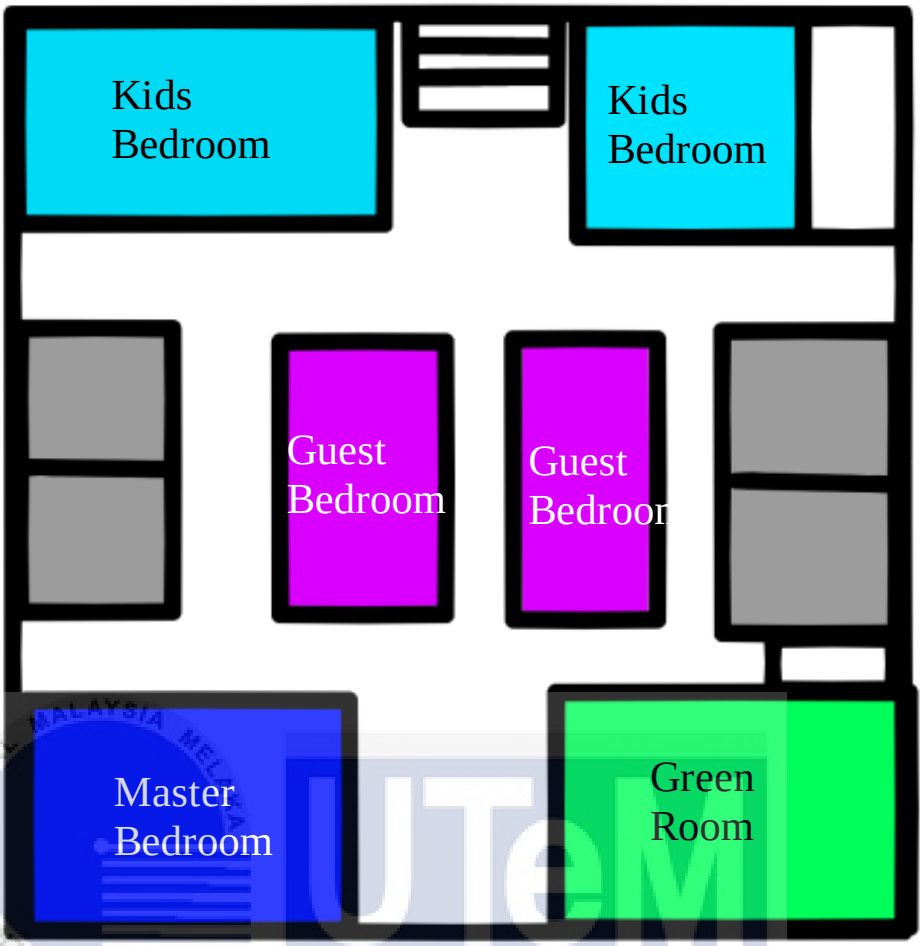


Figure 31: Sketch for the second floor of the game

The light of the game is bright to help player see item inside the house. Certain area inside the house is dark and require player to use the flashlight to see (Refer to figure 32). The setting of the game will be in an abandoned house since player is investigating an abandon house. The house has two floor which is first floor and second floor. In the second floor there are couple of lock room that player can access after obtaining the key for that room (Refer to figure 33).

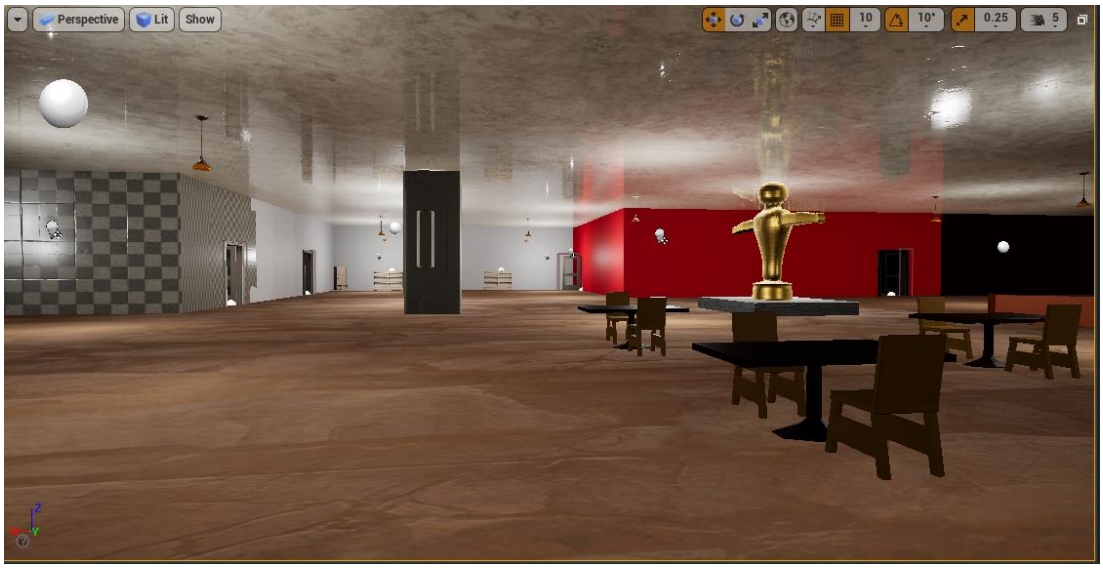


Figure 32: Level design for the first floor

Figure 33: Level design for the second floor

4.4.2 Character Design

The character design for the enemy is based on character in game Killing Floor (Refer to figure 34).

Figure 31: Mr Foster from Killing Floor from (DeviantArt)

The character is design using Blender 3D (Refer to figure 35, 36 & 37). The enemy is one of the specimens that escape from the it containment room and roam inside the house. The enemy want to do an experiment on player if they able to catch them. The enemy name is Brother Bob. He is one of the specimen that being experimented by the house owner which is Samad Rafdi. Brother Bob is calm person that love to do surgery on other people to see the internal organ and how they work. Before Brother Bob was kept in a containment room, he was a surgent but most of his patience unable to survive his surgery. After many failures, he was arrested by the police. Escaping custody, Brother Bob a few times and escape into the woods. Samad found him pass out on the ground after a few days the incidents and see that Brother Bob is completely fine. Samad bring him home and take care of him until he able to trick Brother Bob into entering the containment room.

Figure 35: The Front view of the Brother Bob

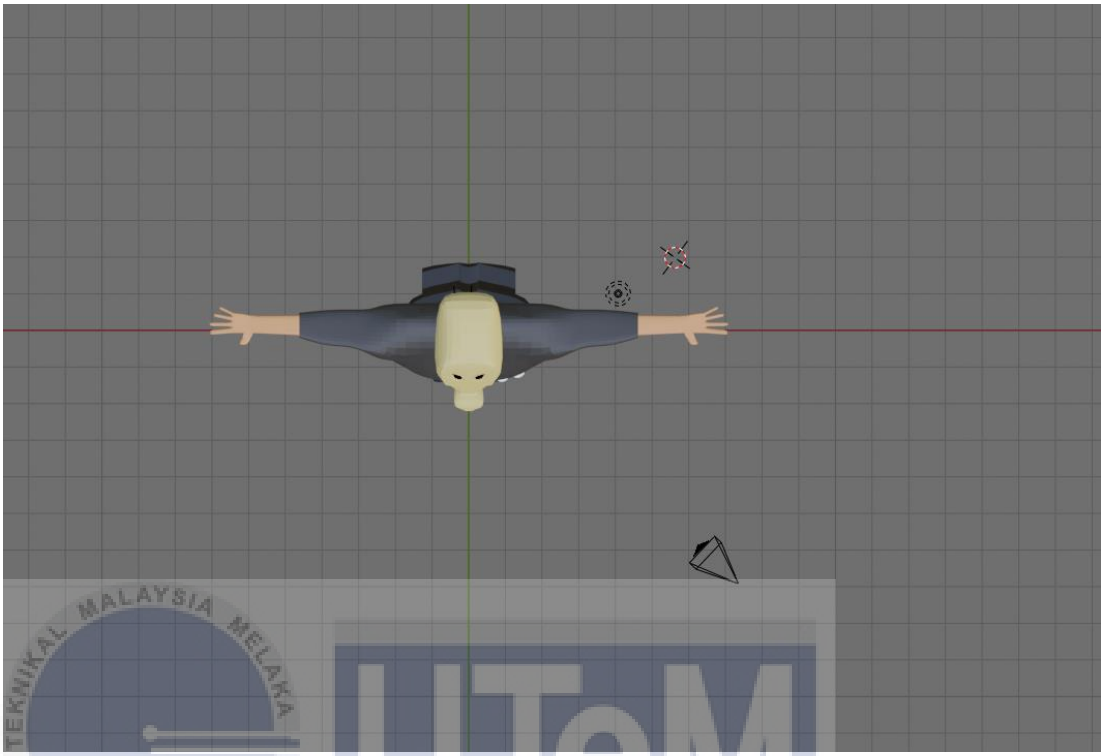


Figure 36: The top view of the Brother Bob

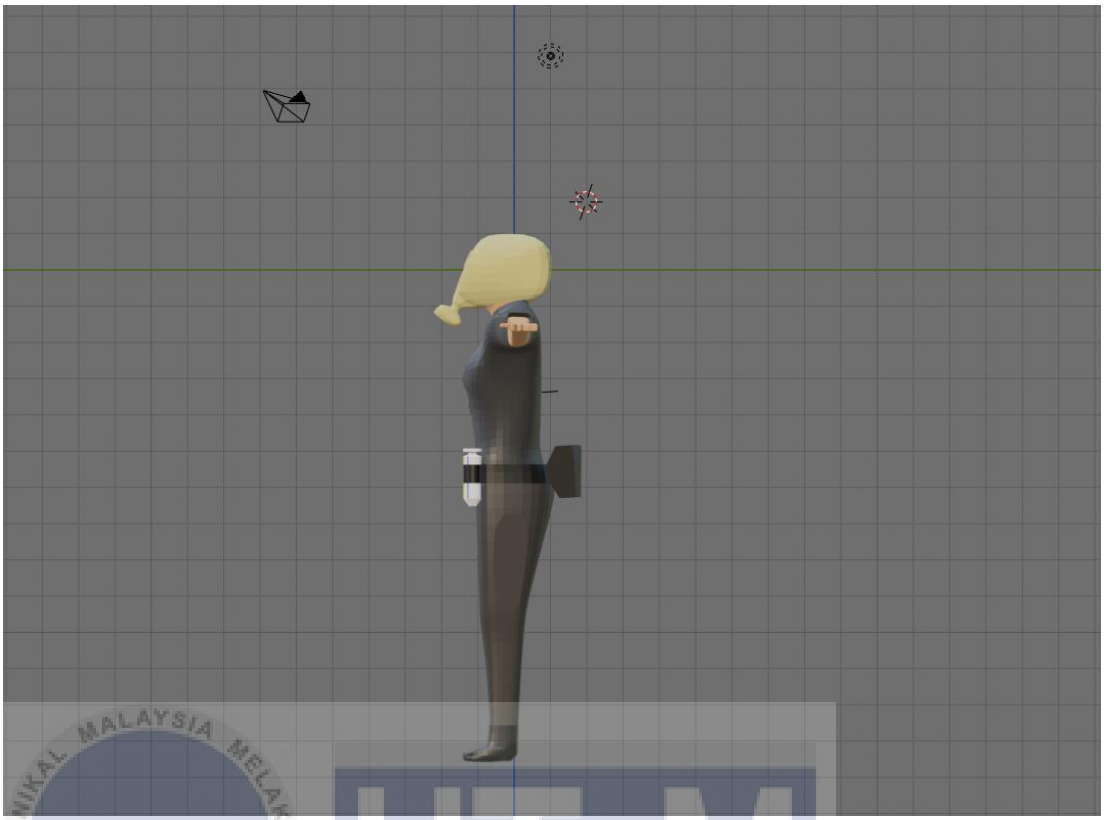


Figure 37: The side view of the Brother Bob

Cousin Wade is the second enemy available in The Reporter(Refer to figure 38). Cousin Wade is an aggressive subject. The subject was found in the forest during Alpha Team expedision. The subject appear to walking around the forest trying to find food. The subject eat it's prey raw and alive. The subject move slowly but have a super strength. The subject were captured by the Alpha Team and was sent to the house for research. Cousin Wade will spawn on the second level. The enemy will roam around the second floor. Cousin Wade have slow movement speed but high range of attack. Player also will not receive any alert when being chase by Cousin Wade making it difficult to detect it's presence.

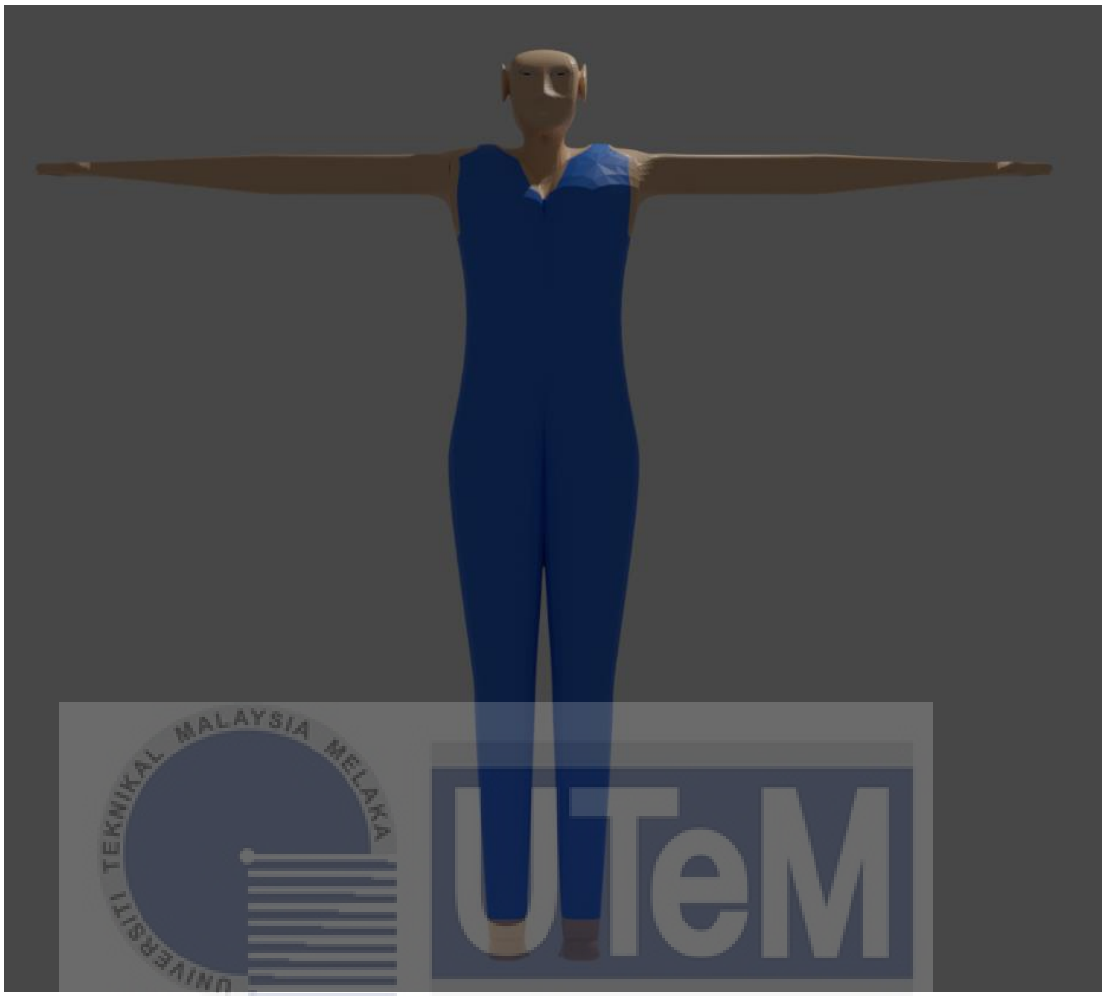


Figure 38: The design of Cousin Wade

Vulkan is the final boss in the game (Refer to figure 39). This subject was found in the old, abandoned factory. After the factory was abandoned, the factory was used as illegal human organ harvesting. Alpha Team was sent into the factory to search and destroy, but when they got there all the staff have been eaten. Alpha Team keep searching the factory for hours trying to find the source. When they found the subject, the subject moves very quick causing problem for the Alpha Team to contain it. After lot of sacrifice, the Alpha Team able to contain the subject and sent it to the house for research. Vulkan have high movement speed, and unpredictable moves. It can wait for

player for minimum of 2 second or maximum of 8 seconds. Vulkan will increase it movement speed when it has spotted the player.

Figure 39: The design of the Vulkan

4.4.3 Camera Model

The camera model for the game is first-person perspective (Refer to figure 40). This camera model can give player immersive experience as they are playing the game. Player able to see size of object inside the game.

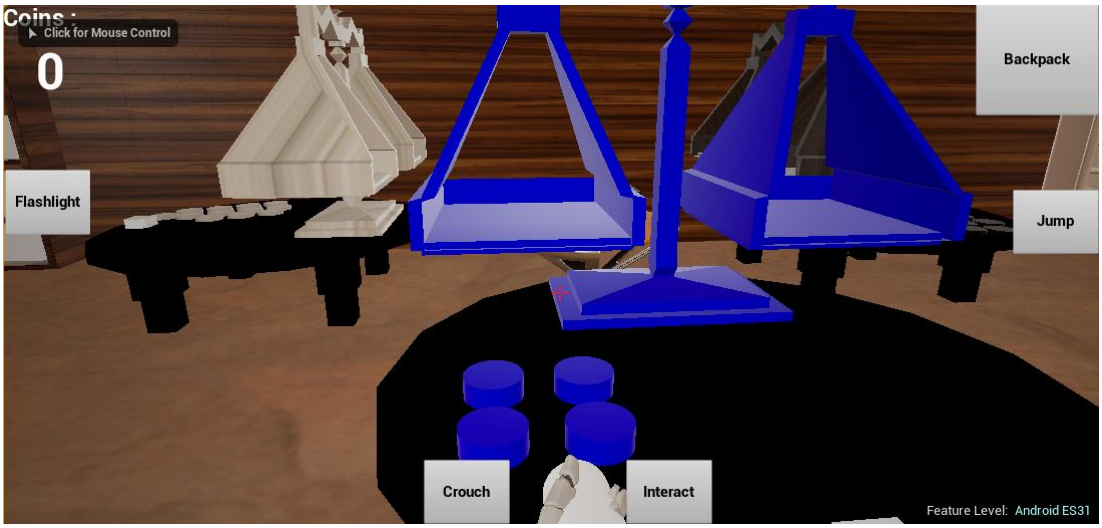


Figure 40: First person Perspective

4.4.4 Audio/Sound Effect

- Thrilling sound are implemented in the game.

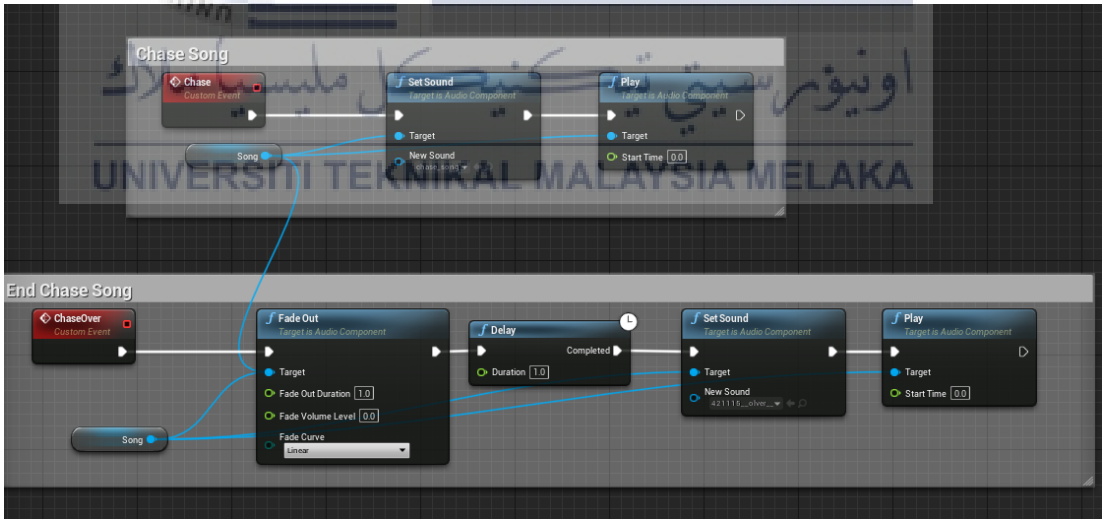


Figure 41: Chase song trigger

- When player spot the enemy, a loud sound will alert the player (Refer to figure 41).

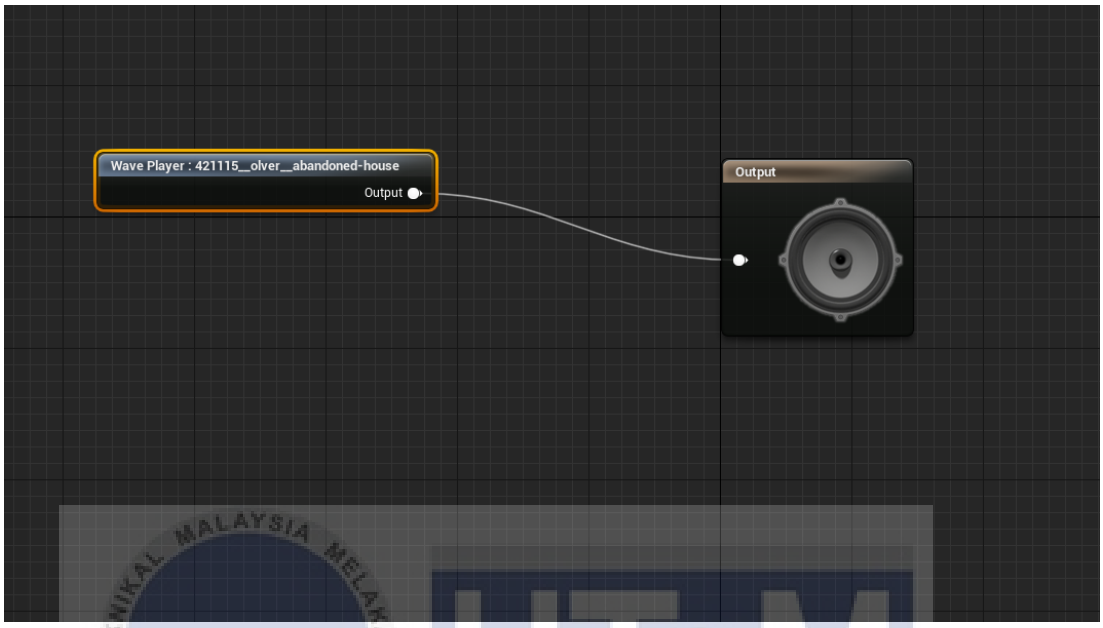


Figure 42: Background music

- A soft background song will be played for the entire game to give more thrilling experience for the player (Refer to figure 42).

- List of sound effect can be refer on appendix b.

4.5 Conclusion

In conclusion, this chapter covers how the game is being design such as character models, UI design, camera mode and sound effect inside the game. The next chapter discuss how to implement the project to get the required result and data.

CHAPTER 5: IMPLEMENTATION

5.1 Introduction

In this chapter, the implementation of The Reporter is explained. This chapter will provide information of the implementation from a developer perspective during the production of graphics, production of audio, production of video and production of animation. The integration for features core mechanics in game, configuration management and status are explained in this chapter.

5.2 Creation of Game Art

5.2.1 Production of Graphics

The character models were created using Blender 3D. The modelling, and texturing were created using Blender 3D. The animation and rigging for the model were created using Maximo. Once the model had been completed with rigging and animation, it will imported into Unreal Engine 4. The game world was created using architecture model and texture that are prepared inside Unreal Engine 4.

- The architecture model in Unreal Engine 4 (Refer to figure 43)

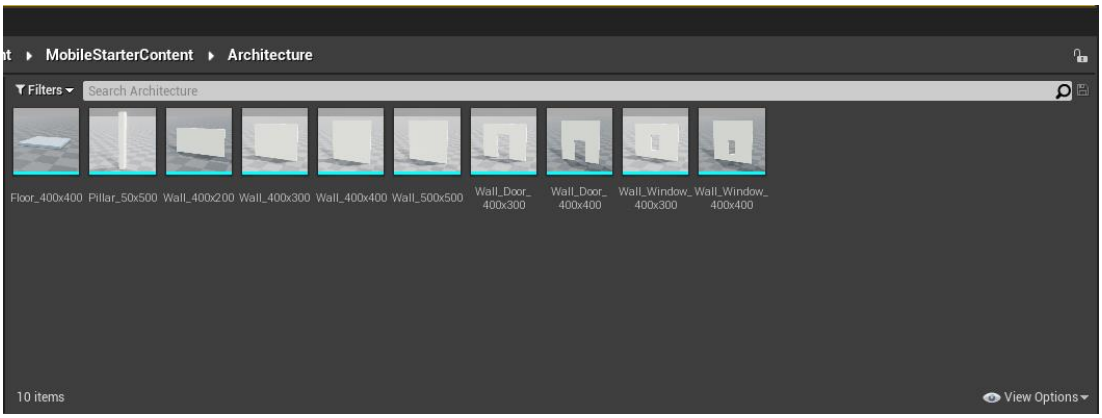


Figure 43: Architecture model

- Material use for the model and asset in game (Refer to figure 44). Material are texture that can be used on object or actor inside the game.

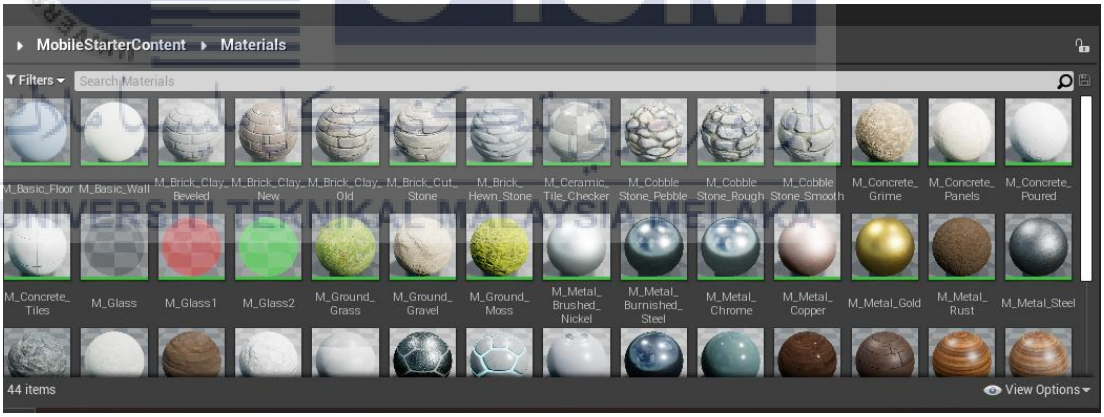


Figure 44: Materials in Unreal Engine 4

- Character Model Brother Bob (Refer to figure 45)

Figure 45: Brother Bob Model

- Character Model Cousin Wade (Refer to figure 46)

Figure 46: Cousin Wade Model

5.2.2 Production of Audio

There were couple of audios that implement inside the game which be refer from table 4. All of these audios are obtain from https://freesound.org.

Table 4: Type of audio

Sound	Description
Footstep sound	The enemy that roams around the house will produce a footstep sound so player can guess their location.
Background music	The background music will be played as player playing through the game. The background music will change based on player location.
Chase music	The music will be played once player getting chase by the enemy. This will give player alert that they have been spotted by the enemy.
Coin sound	When player interact with coin a sound will be played indicating that player have successfully pick up the coin.

Puzzle complete sound	Once player able to solve a puzzle, a sound cue will be played indicating that player have successfully solve the puzzle.
Note sound	When player obtain or read a note, a sound cue will be played indicating that player have obtain a note.

- All sounds were imported into Unreal Engine 4 where it can be configured to change it volume, pitch, and loop (Refer to figure 47).

Figure 47: Audio Configuration

- The audio then being implemented into the asset and character inside the game (Refer to figure 48).

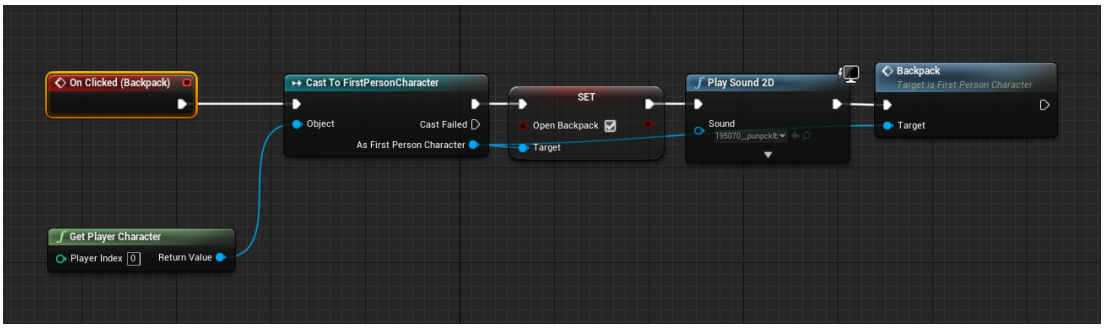


Figure 48: Audio Implementation on character

5.2.3 Production of Video

Cutscene were use to give player clue on where they need to go. There are 4 cutscene available inside the game. The detail of the cutscene can be refer from table 5.

Table 5: Game Cutscene

Cutscene Green Room	Cutscene will trigger when player enter the green room where the camera will focus on the computer that player need to interact with.
Cutscene Blue Room	Cutscene will trigger when player enter the blue room. The camera will focus on the computer that player need to interact with.
Cutscene First Ending	The cutscene will trigger when player reach the front door of the house. The

	cutscene will trigger showing the ending of the game.
Cutscene Second Ending	The cutscene will trigger if player have fulfilled the requirement for it. The cutscene will start when player try to go down the stairs.

- The cutscenes were created using cinematics tools in Unreal Engine 4 (Refer to figure 49).

Figure 49: Cinematic setup in Unreal Engine 4

- A sequencer is used to trigger the cutscene (Refer to figure 50).

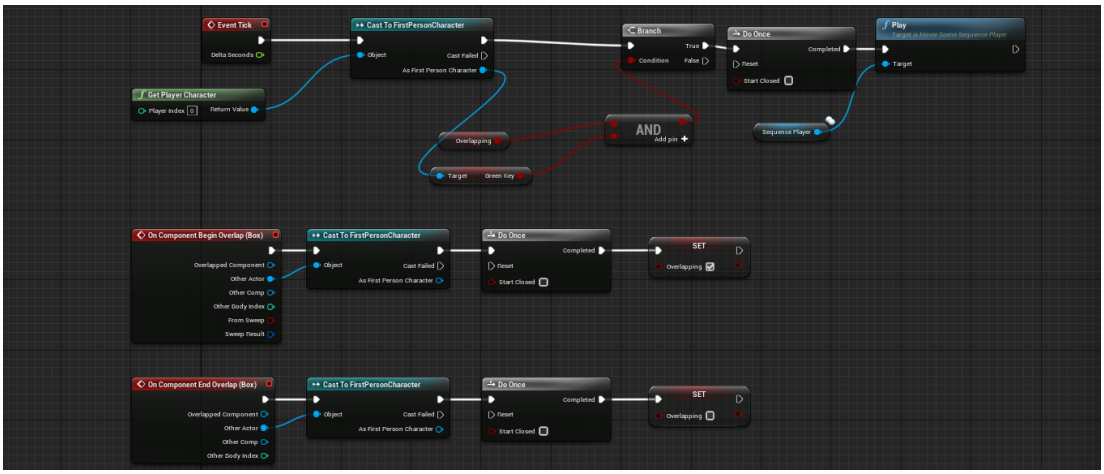


Figure 50: Implementation of cutscene

5.2.4 Production of Animation

- Setting up the Animation Blend Space

The animation blend space will allow the animation to be mapped based on the speed and direction (Refer to figure 51). The animation will be determined by the speed of the character. If the character speed is 0, it will do the idle animation. If the character speed is more or equal to 400, a walking animation will be played on the character.

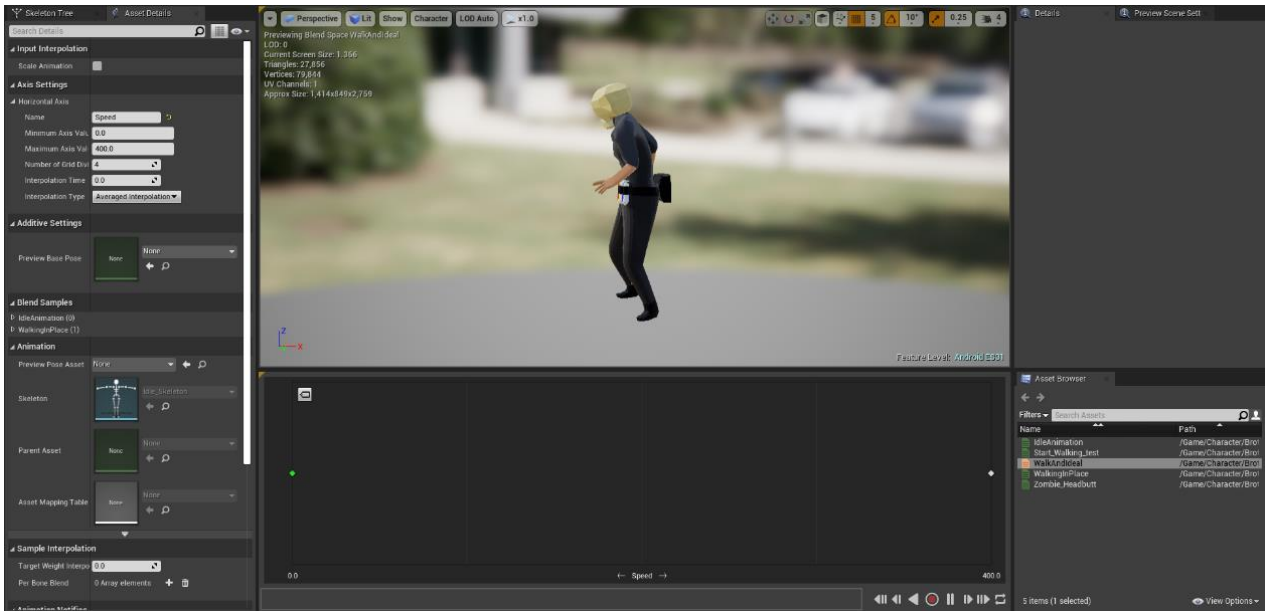


Figure 51: Blend Space for animation

- Animation Blueprint

In animation blueprint, the speed of the character is updated constantly. This allows the system to know the character movement speed and determined it animation (Refer to figure 52).

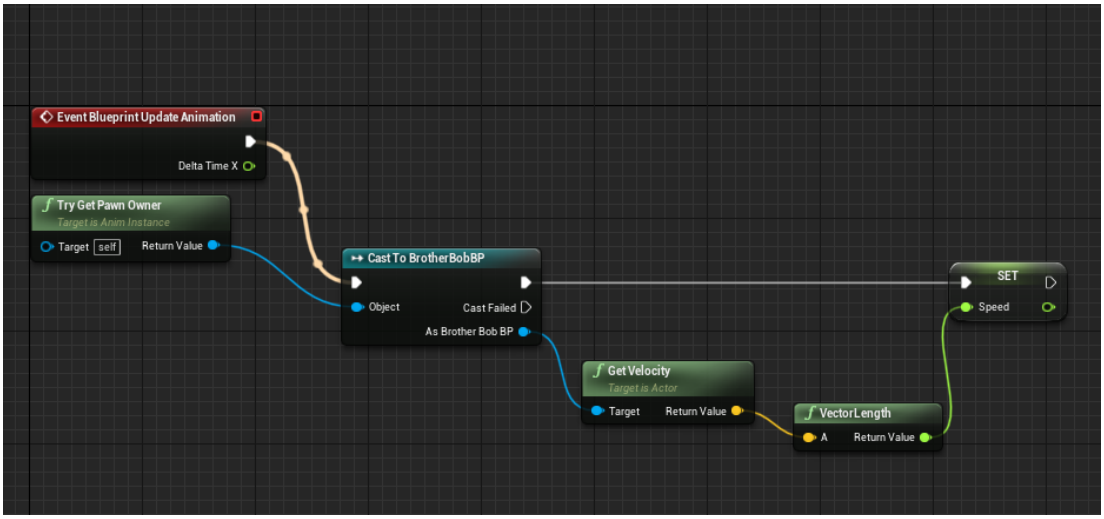


Figure 52: Animation Blueprint

- Applying animation blueprint to the character

The animation blueprint then be applied to the character skeletal mesh to be use in game (Refer to figure 53).

Figure 53: Applying the animation blueprint in character

5.3 Integration of Game Components

Player mechanics system

All character mechanics such as movement, interaction, GUI controller, UI controller and other features are implemented inside the character blueprint (Refer to figure 54).

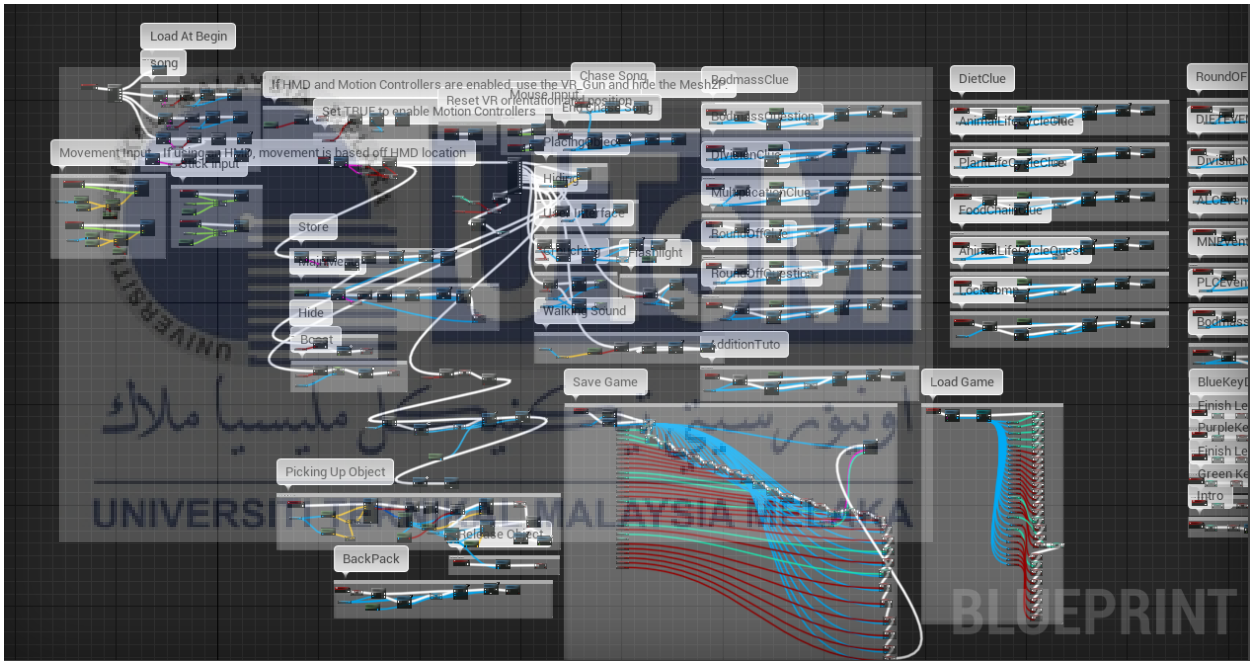


Figure 54: Blueprint implementation in character

Enemy mechanics system

The movement, attack, and AI are all implemented inside the enemy blueprint (Refer to figure 55).

Figure 55: Enemy AI blueprint

Note mechanics system

The note is implemented with action that allow the user to interact with it (Refer to figure 56).

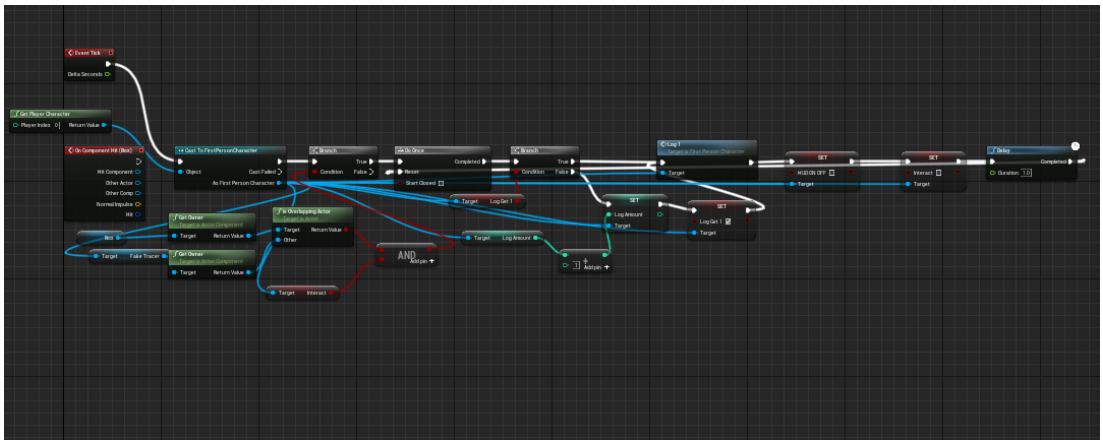


Figure 56: Note interaction mechanics

Puzzle mechanics system

The puzzle is implemented with mechanics such as opening the chest once puzzle is solve, button system, collision with correct item, and etc (Refer to figure 57).

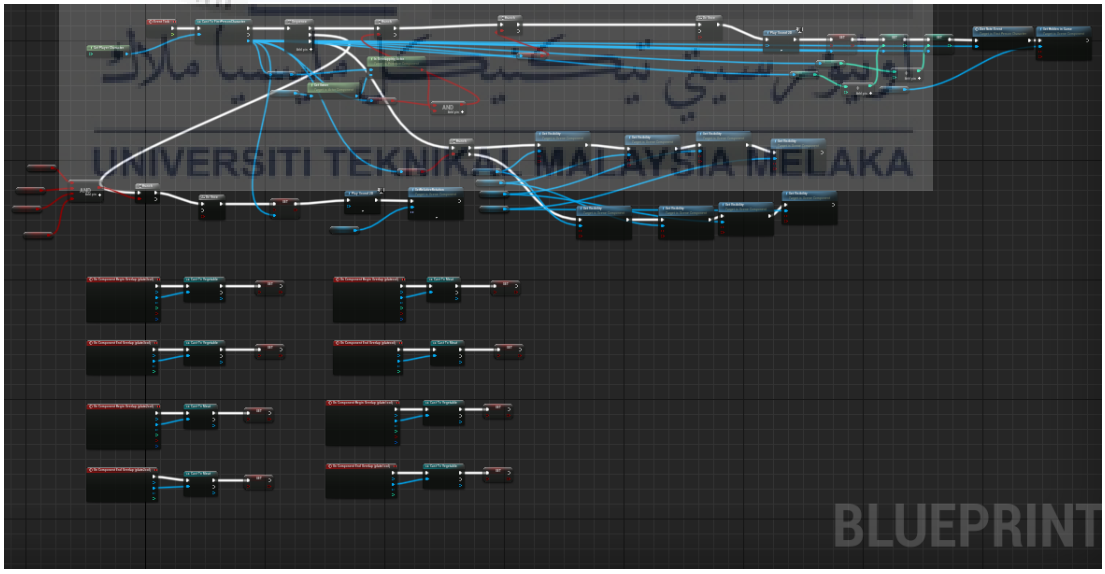


Figure 57: Puzzle mechanic blueprint

5.4 Game Configuration Management

The game can be played through two option which is player can download the apk and install the game into their phone or they get the project file and connect their phone with the PC and play on their phone.

5.4.1 Configuration Setup

This project was developed using Unreal Engine 4.26 for Android. Before distributing the game, a few configuration inside the project settings need to be done such as building the lighting inside the game, set the order of maps for the games and building the navigation for AI.

5.4.2 Version Control Procedure

There were multiple versions of the game produce to see problem, bugs, and improvement that can be improve into the game. The description of each version can be refer from table 6.

Table 6: Testing Phases

Testing Phase	Game Description
The Reporter Version 1 (Alpha Phase)	The game is in prototype version where it can be played. This phase

	focus on the mechanics of the game and localize content.
The Reporter Version 2 (Beta Phase)	This phase being developed after evaluation of Final Year Project 1 presentation. The comments and advice from the supervisor and evaluator are taken into note. The game will be improved to reach it objective. The game in this phase will be release for the tester and focus group on Final year Project 2. Feedback will be taken to polish the game for the Golden Version.
The Reporter Final Version (Golden Version)	After the evaluation in Final Year Project 2, the game will be improved before it can be finally release.

5.5 Implementation Status

The implementation process of this project is divided into certain component with duration for it to be completed (Refer to Table 7).

Table 7: Implementation process

Component	**Description**	**Completion Duration**	**Completed Duration**	**Status**
Character and Model Creation	Model the enemy, texturing it and animating it using Maximo	2 Weeks	2 Weeks	On Time
Environment Creation	Setting up the furniture's inside the house, applying materials for asset in game	1 Week	1 Week	On Time
Creating User interface and implementing it	Designing the HUD, main menu, store UI.	1 Week	1 Week	On Time

Programmed the puzzle mechanics	Implementing all puzzle mechanics that player need to solve to progress through the game. The puzzle based on sciences and mathematics question.	5 Weeks	6 Weeks	Delay
Implement the game mechanics	Setting up the movement and controls for the player, player interaction with game world, enemy attack.	3 Week	4 Week	Delay
Enemy AI	Creating the AI for enemy to allow them roaming the house and chase player on sight.	1 Week	1 Week	On time
Polishing the game	Polishing the game by adding small content into the game that can help player understand the lore of the game.	1 Week	1 Week	On time

5.6 Conclusion

In conclusion, the implementation phase was one of the important parts in this project. It allows the game mechanics of this game to work properly and making it playable. Addition of sound, animation, graphics, and video makes the game more interesting since it will make the game feel more alive. Using Unreal Engine 4 making it simple to implement these elements into the game. In the next chapter, game evaluation was conducted to obtain feedback for the game.

CHAPTER 6: TESTING AND EVALUATION

6.1 Introduction

In this chapter, the test plan, test strategy, test implementation, test result and analysis will be discussed. The objective of this project was to develop an edutainment adventure game that based on sciences and mathematics question. The questionnaire will focus on the successfulness of the edutainment game toward the target user.

6.2 Test Plan

The testing was done using Game User Experience Satisfaction Scale (GUESS) questionnaire which were proposed by Keebler, Phan, and Chaparro (2016). GUESS was chosen because it helps uncover the important factor that increase the satisfaction of The Reporter. The questionnaire was distributed along with the game during the Beta phase of the game. The elements being tested were Playtesting, User Interface, User Experience, Gameplay, Visual Aesthetics, and Understanding and Acknowledgment. Linkert scale with range of 5 was used for this testing because it helps target user to make easier decision when answering the questionnaire since they need to put the number of their agreement with the statements from strongly disagree 1 to strongly agree 5.

6.2.1 Test User

There were 17 target users around age 13 until 15 years old were involve for this game testing. Due to Movement Control Order(MCO) because of Covid-19, the tester were given link to download the game through Whatapps. After the tester have played the game, they need to answer a set of questionnaires to give feedback about the game.

6.2.2 Test Method

The focus of this testing is to evaluate multiple element which are Playtesting, User interface, User Experience, Gameplay, Visual Aesthetics, and Understanding and Acknowledgment. For playtesting, target user will enter data about how well the controls, how clear game user interface, the difficulty of the game, and main character ability. This data can help balance the game and to see if the game is way too easy or impossible to win. User interface question will ask about the main menu design if it is suitable to theme of the game, did player understand the objective of the game through user interface, did player know their task for each level, and does the user interface help player in game. This part is important since user interface is a crucial part in game and this data can help recorrect the size, placement, and the style of the interface. Third part is the User Experience where user will enter the environment setup for the game, the difficulty of the enemy, can player hear enemy footstep, player's equipment, puzzle difficulty, and sound design. The user experience can help improve the game to make it more interesting and fun. The gameplay

part will ask the user if they enjoy playing the game, can they play the game the way they want, will they recommend the game to other people, and is the game unique. This data can help improve the game features and mechanics. The visual aesthetics required user to enter the game's graphics, does the graphics fit the style of the game, do player understand the GUI easily, and level design. Final part is understanding and acknowledgment where user enter if the game improves their understanding in sciences and mathematics, and does this game provide an interesting way of learning sciences and mathematics. This part is very important for this project since it main objective of this project was to developed an edutainment adventure game.

6.3 Test Implementation

The test process starts from finding the target user since MCO prevent visiting school, target users are gathered in a WhatsApp's group. In that group, the target user will have an unofficial Q&A session where we discuss about what they know about gaming, how much time they spend playing, what type of genre they like to play, and do they believe that game can bring education. This can help to help them clearly see the purpose of this project. After the Q&A session, there some tutorial on how to install the game where the target user will get a link to download the game, pre-game questionnaire, and post-game questionnaire. The pre-game questionnaire contain question that being answer during unofficial Q&A session so the data can be recorded. Target user will be given 5 days to play the game before answering the post-game questionnaire. The post-game questionnaire is answer after the target user have played

the game. This questionnaire contain question about Playtesting, User interface, User Experience, Gameplay, Visual Aesthetics, and Understanding and Acknowledgment.

6.3.1 Test Questionnaire

The questionnaire consist of 33 question was used to evaluate the game. In the questionnaire, there is 9 elements that are used to evaluate the game which are Playtesting, User interface, User Experience, Gameplay, Visual Aesthetics, and Understanding and Acknowledgment. The score method for this questionnaire is based on Linkert Scale where target user answers the question based on the score and its description (Refer to table 8).

Table 8: Linkert Scale with range of 5

Description	Strongly Disagree	Disagree	Somewhat Agree	Agree	Strongly Agree
Score	1	2	3	4	5

Table 9: Playtesting question

Playtesting
I feel the controls are easy to use

I understand the user interface elements (HUD, button, text) are easy to see and understand
The game is easy to be played
I am satisfied with player's powers and ability

The table 9 above shows Playtesting question use for the evaluation. The question was used to see if the game is easy to be understand and played. This evaluation help to know if the game is too difficult which making the game difficult to be played.

Table 10: User Interface question

User Interface
The main menu design is suitable for edutainment game
I understand the objective of the game
I know my task for each level
I can complete the task easily with the user interface shown

The table 10 above shows the User Interface question that are used for evaluation. The question was used to see if the user interface is easy to see and appropriate with the theme of the game. This evaluation help see if player able to know their objectives, their task, and how well does the user interface assist them in completing the game. From this evaluation result, the game user interface can be improved based on elements that it is lacking such as UI for objective and task.

Table 11: User Experiences question

User Experiences
I can see the environment setup for the game
The enemy should be easier
I can hear enemy footstep and determine their location
Player should have all his equipment without buying it
The puzzles are difficult to solve
I enjoy the game sound design

The table 11 above shows the User Experiences questions. These questions were used to see if the target users are having a great gaming experience when playing the game. This evaluation help to see if enemy and puzzle inside the game are difficult.

It also helps to ensure that game sound design is working properly. From this evaluation, the game sound, puzzle, and enemy AI can be improved.

Table 12: Gameplay question

Gameplay
I enjoy playing The Reporter
I can play the game the way I want
I will recommend this game to others
I find the game is unique or original

The table 12 above shows Gameplay question. These questions will ask about target users feeling and views toward the game. This evaluation will help to see if user enjoy playing the game, do they think it is unique, and will they recommend this game to their friends. From this evaluation, the game can be improved to make it more unique and adding or changing mechanics to make it fun for the player.

Table 13: Visual Aesthetics question

Visual Aesthetics
I enjoy the game's graphics
I find the graphics of the game fit the mood or style of the game
I find the GUI is easy to understand
I find the level design of the game is good

The table 13 above shows Visual Aesthetics questions. These questions ask the target user if they find that the game's graphics is suitable with the game, they understand the GUI, and they enjoy the level design. This evaluation can help the game design since it will show which part of the need to be improve.

Table 14: Understanding and acknowledgment question

Understanding and acknowledgment
This game helps my understanding in sciences and mathematics
The game provides interesting ways of learning sciences and mathematics

The table 14 above shows Understanding and acknowledgment questions. These questions were used to see if the game objectives were achieved when target users were playing the game. This evaluation can prove that the game has reach its development objective or still need some work to reach it.

6.4 Test Results and Analysis

6.4.1 Introduction

The survey questionnaire was used to gather data which are demographic, Playtesting, User interface, User Experience, Gameplay, Visual Aesthetics, and Understanding and Acknowledgment from target user. The questionnaire was used because MCO prevent face-to-face interview with target user so using questionnaire to get the result of observations. The survey takes less than 5 minutes for responses to answer.

6.4.2 Demographics

The demographics were used to gain user data such as their gender, race, what gaming platform they prefer, favorite game genre, time they spend playing games in a week, and their opinion on educational game.

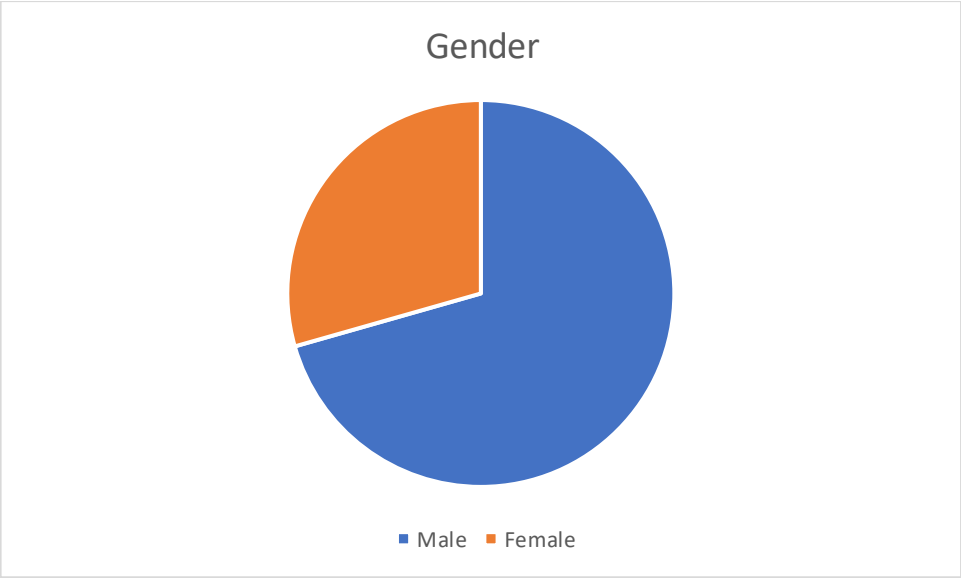


Figure 58: Gender Result

Figure 58 shows that out of 17 respondents there are 12 male (70.6%) and 5 female (29.4%) participating in the survey.

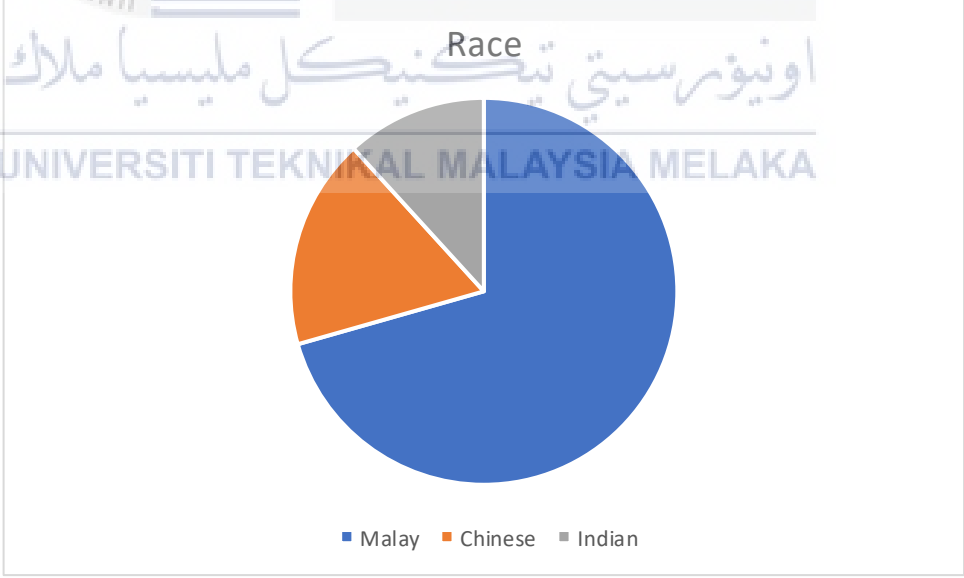


Figure 59: Race Result

Figure 59 shows that out of 17 respondents there are 3 Chinese (17.6%), 2 Indian (11.8%), and 12 Malay (70.6%) that participate in this survey.

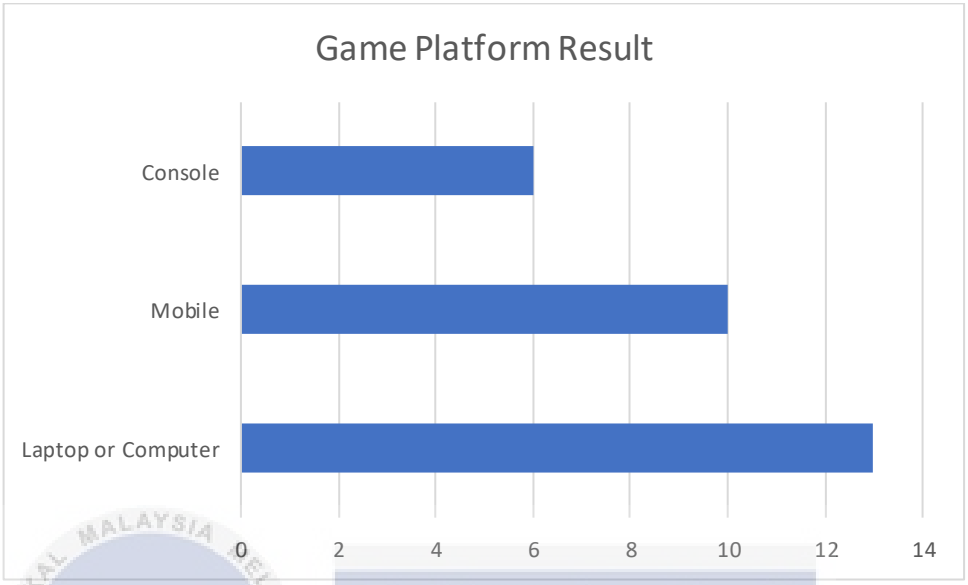


Figure 60: Game Platform Result

Figure 60 shows that out of 17 respondents there are 13 participants (76.5%) that play game on laptop or Computer, 10 participants (58.8%) play games on Mobile, and 6 participants (35.3%) play games on console. From this survey, the majority of participant play games on laptop or computer.

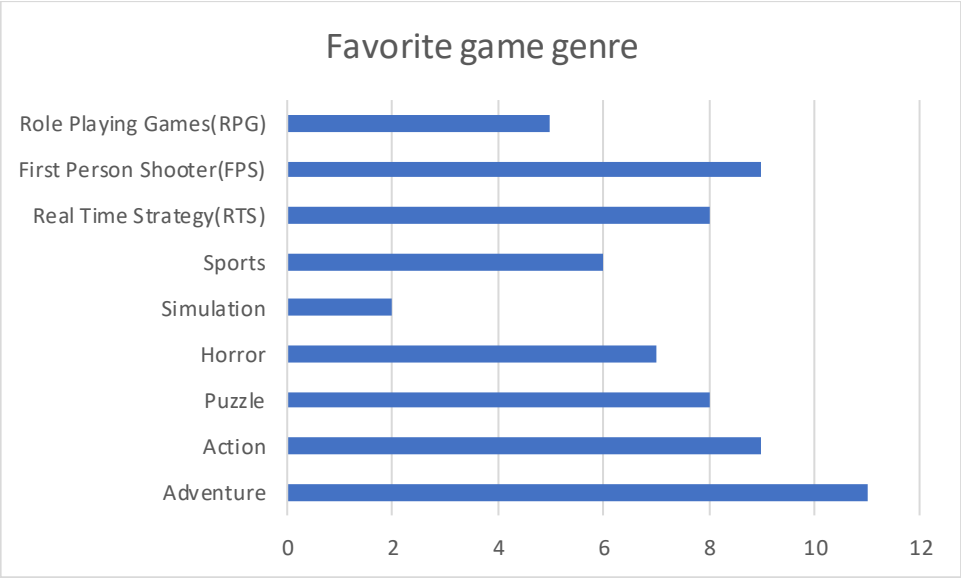


Figure 61: Favorite game genre

Figure 61 shows that 11 participants (64.7%) enjoy playing adventure games, 9 participants (52.9%) enjoy playing action games, 8 participants (47.1%) enjoy playing puzzle game, 7 (41.2%) participants enjoy playing horror games, 2 (11.8%) participants enjoy playing simulation games, 6 participants (35.3%) enjoy playing sports, 8 participants (47.1%) enjoy playing RTS games, 9 participants (52.9%) enjoy playing FPS games, and 5 participants (29.4%) enjoy playing RPG games. From the evaluation,

Figure 62: Time spend playing games in a week

Figure 62 shows that 1 participant (5.9%) play games for less than 1 hour, 5 participants (29.4%) play games between 1 to 2 hours, 6 participants (35.3%) play games between 4 to 5 hours, 3 participants (17.6%) play games between 6-8 hours, and 2 participants (11.8%) play games for more than 8 hours.

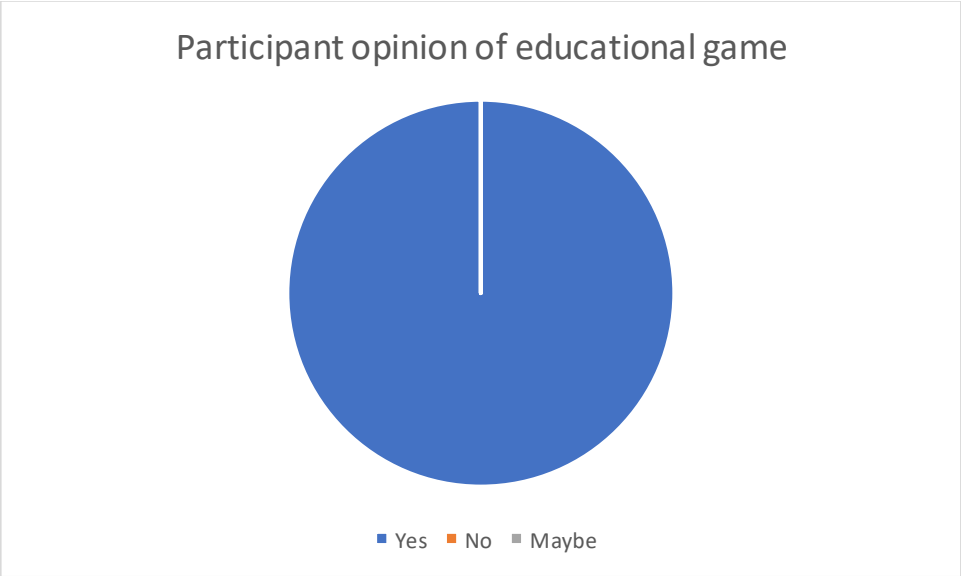


Figure 63: Participant opinion of educational game

Figure 63 shows that 17 participants (100%) agree that game can be educational.

6.4.3 Playtesting

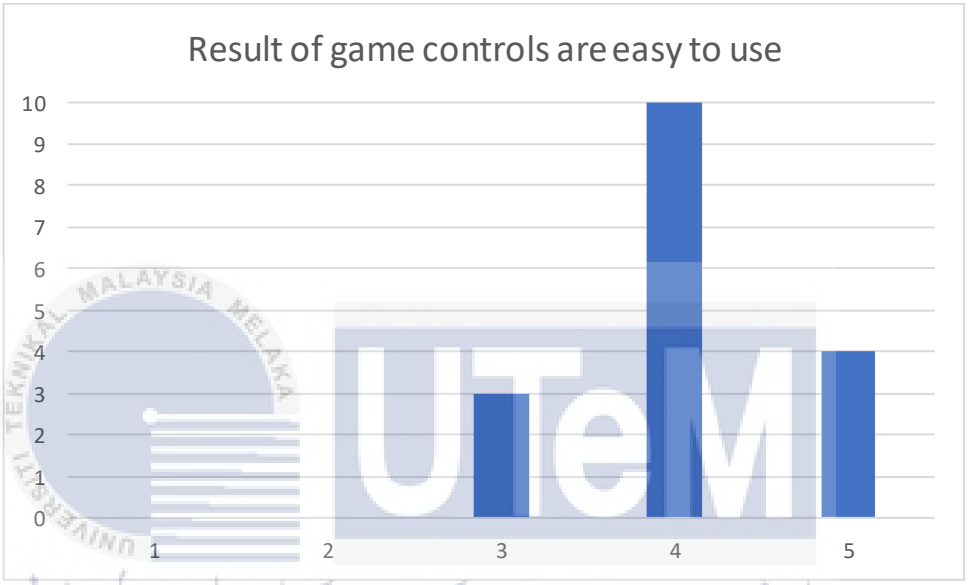


Figure 64: Result of game controls are easy to use

Figures 64 shows that 10 participants agree that controls for the game are easy to use with mean of 4.1. This shows that the control of the game is easy to be understand for users. From this evaluation, it can be said that the movement of the game is quite easy to use.

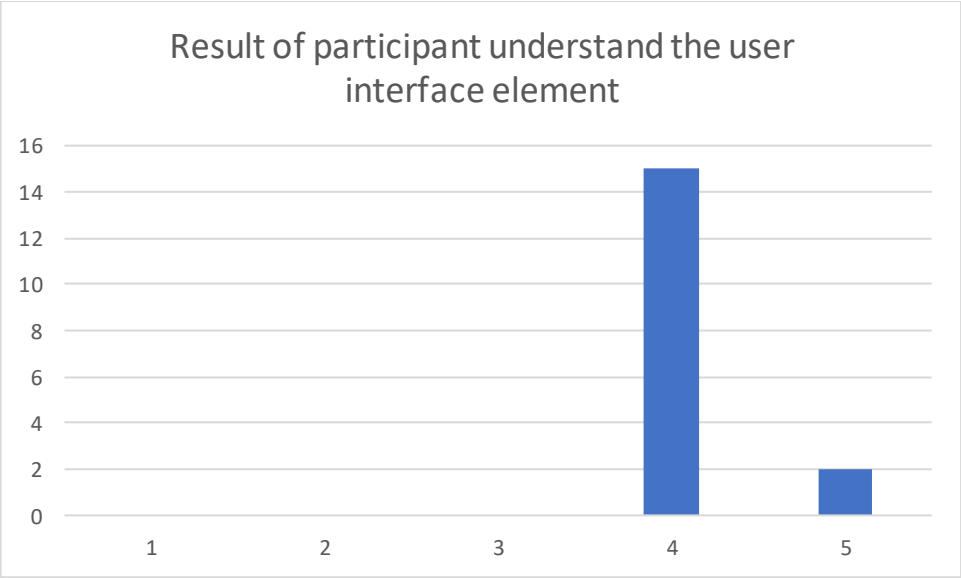


Figure 65: Result of participant understand the user interface element

Figure 65 shows that 15 participants agree that understand the user interface elements inside the game with mean of 4.1. This shows that user interface inside the game is clear and easy for player to see it. Player also understand what the function of user interface.

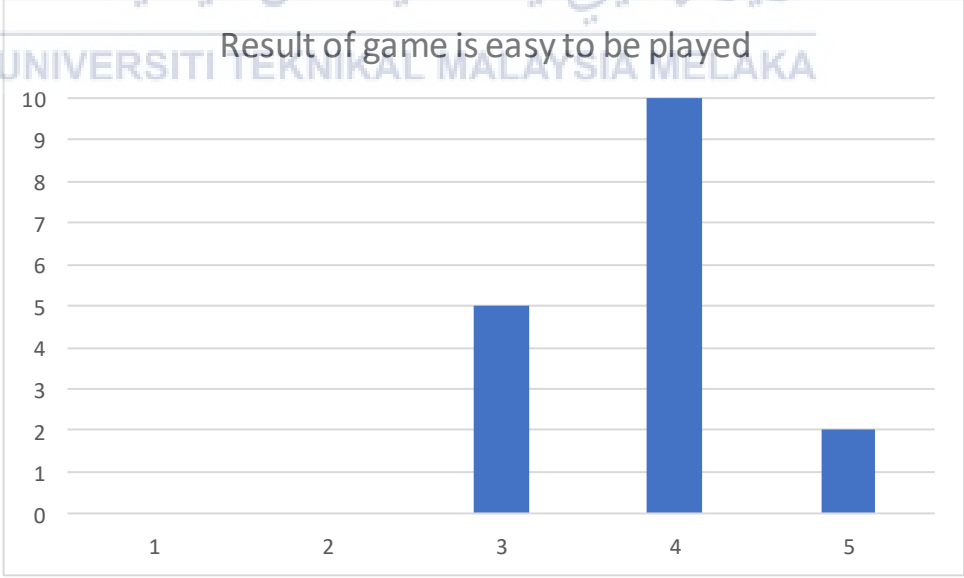


Figure 66: Result of game is easy to be played

Figure shows that 10 participants agree that the game is easy to be played with mean of 3.8. This show that difficulty of the game is not very hard, and it is possible for player to win the game.

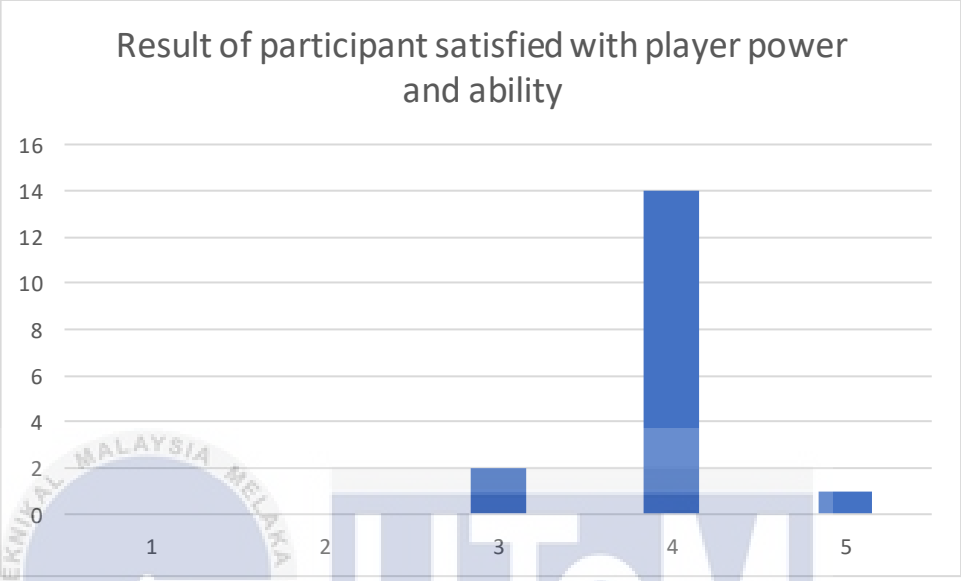


Figure 67: Result of participant satisfied with player power and ability

Figure 67 shows that 14 participants agree that they are satisfied with player's power and ability with mean of 3.9. This prove that player ability and power are enough to be played inside the game.

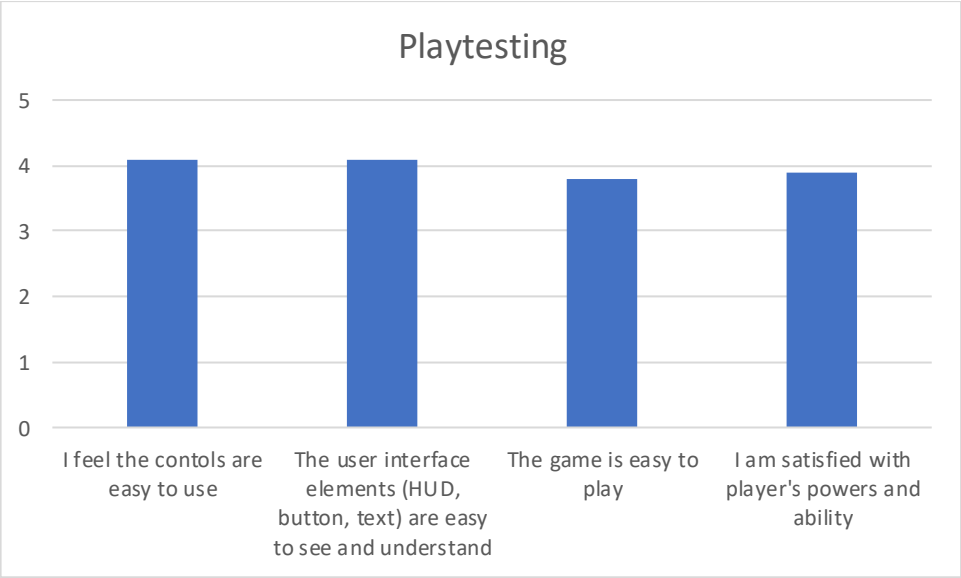


Figure 68: Playtesting mean result

Based on figure 68, the mean for result for playtesting questions were gathered. The playtesting asked participants if the game was good enough to be played, can participant see the UI, is the game easy, and participant satisfied with main character ability. This result helps the developer to see if the game need improvement based on the questions. The game is easy to play has low mean compared to others because the game can be quite difficult probably due to user trying to finish the game as fast as they can. The mean for each question were not far apart from each other showing that most participant agree with the playtesting of the game.

6.4.4 User Interface

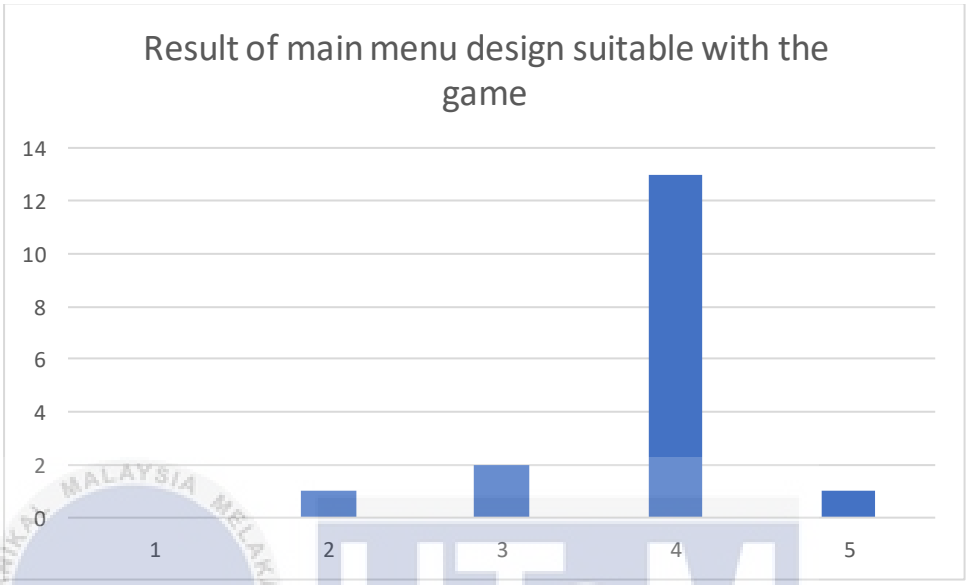


Figure 69: Result of main menu design suitable with the game

Figure 68 shows that 13 participants agree that the main menu design is suitable for edutainment game with mean of 3.8. This shows that most participant agree that the main menu design is suitable, but more improvement can be done since there participant that does not agree.

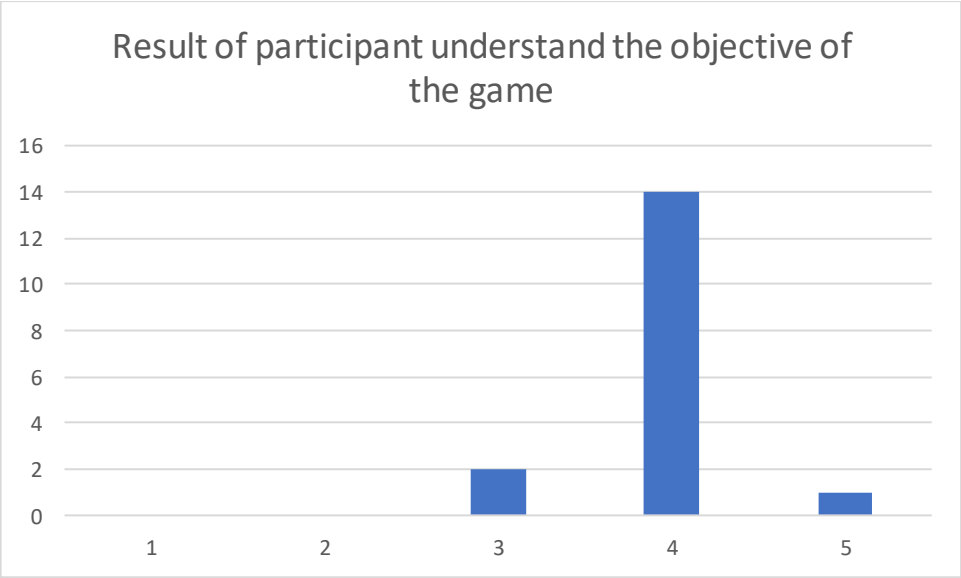


Figure 70: Result of participant understand the objective of the game

Figure 69 shows that 14 participants agree that they understand the objective of the game with mean of 3.8. The objective of the game can be found through note and dialogue in game. From this evaluation, user understand the main objective of the game.

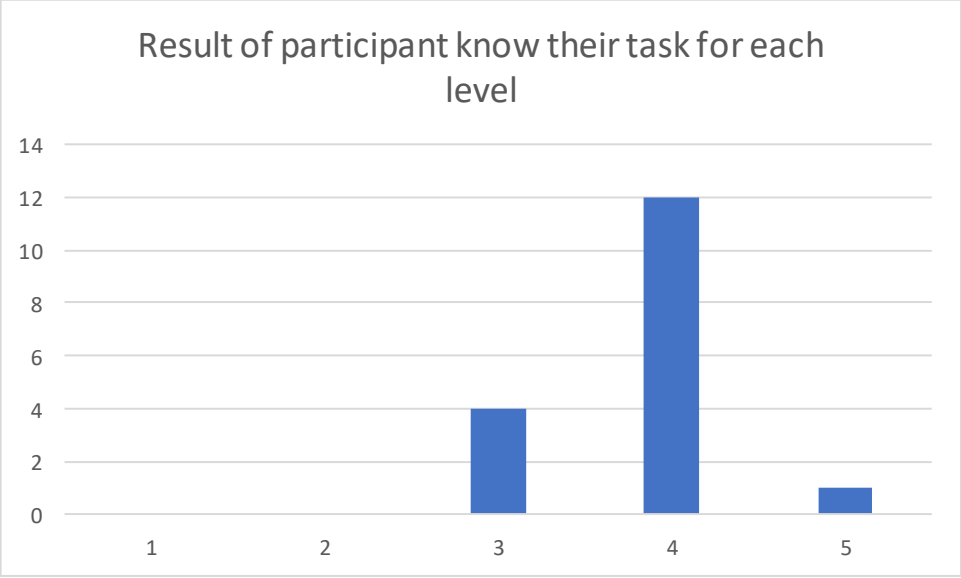


Figure 71: Result of participant know their task for each level

Figure 70 shows that 12 participants agree that they know task for each level with mean of 3.8. The task for each level can be seen by player if they purchase the navigator. Player also can explore the house and see puzzle that they need to solve.

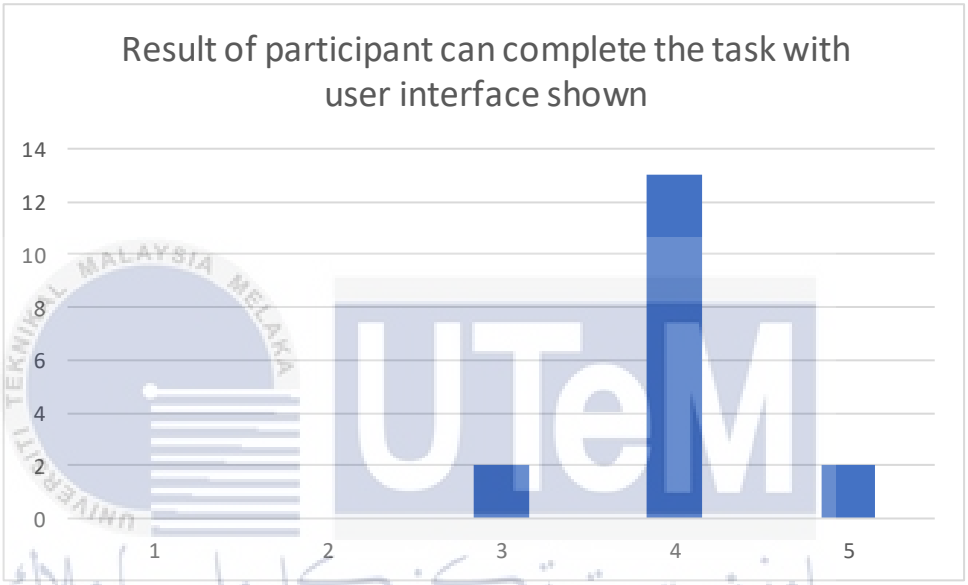


Figure 72: Result of participant can complete the task with user interface shown

From figure 71, 13 participant agree that they can complete their task easily with the user interface shown. The user interface includes the button for interaction, maps, and objective if player have purchased the navigator.

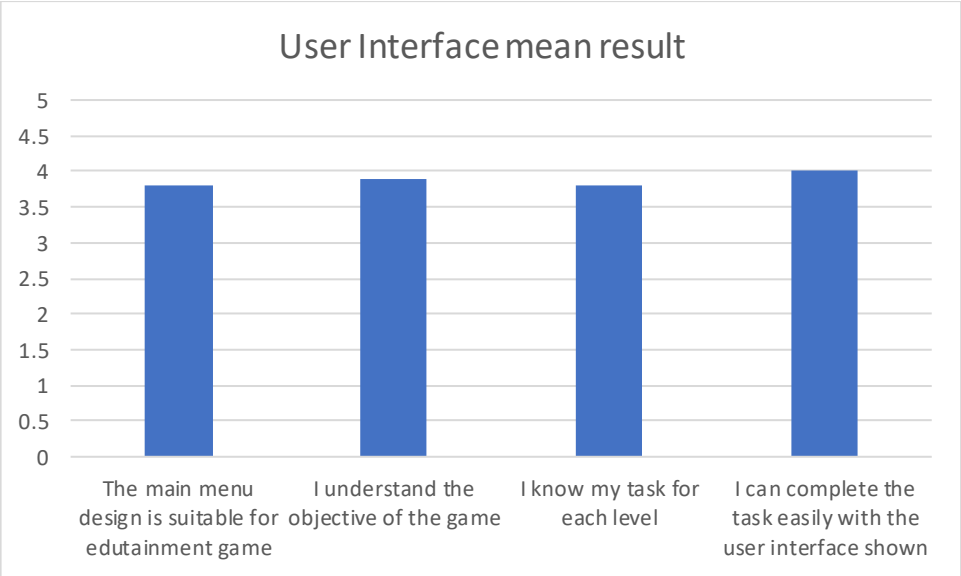


Figure 73: User Interface mean result

Based on table 16, the mean for the User Interface questions were gathered. The user interface questions asked participants about the main menu design, do they understand the objective of the game, do they know their task for each level, and can they complete the task easily with user interface shown. This result can help the developer to improve the UI design of the game to make it better for the player such as having a suitable main menu design with the theme of the game. The value of mean were not far apart from each other indicates that most participant agree with the user interface of the game.

6.4.5 User Experiences

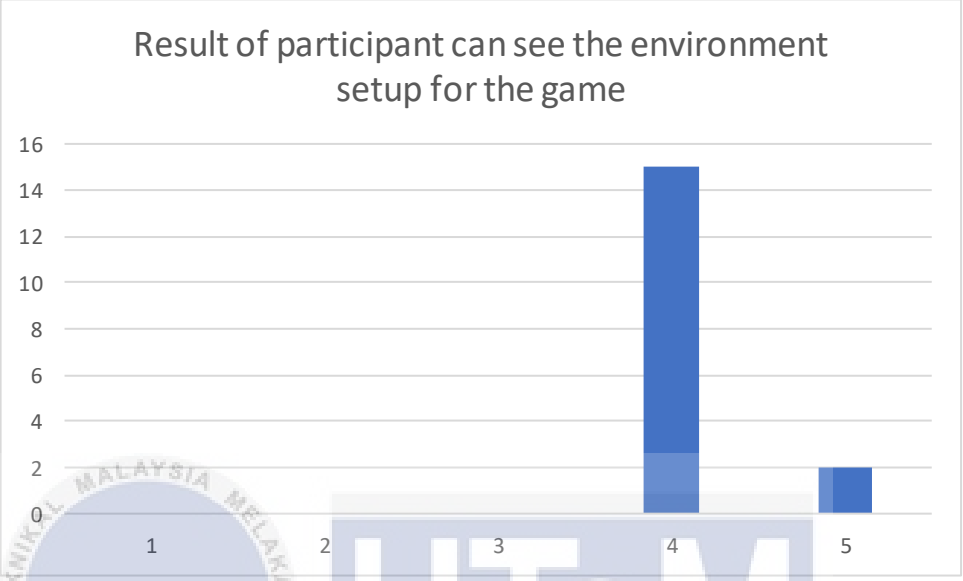


Figure 74: Result of participant can see the environment setup for the game

Figure 72 shows that there are 15 participants that agree they can see the environment setup for the game with mean of 4.1. The environment setup is sound and maps design is it suitable with the game theme.

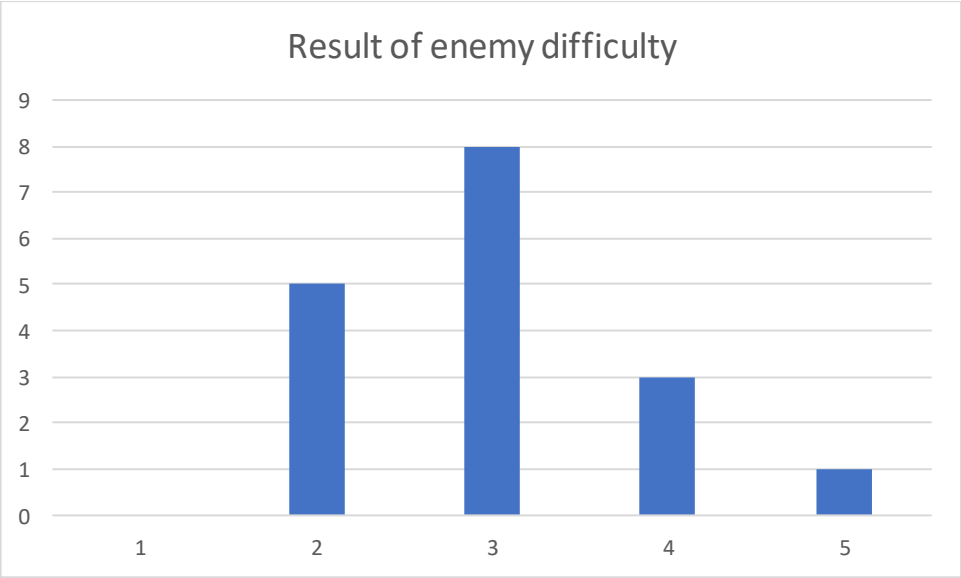


Figure 75: Result of enemy difficulty

Figure 73 shows that there 8 participants somewhat agree with the statement that the enemy should be easier with mean of 3.0. The enemy will roam around the house and try to capture player. The enemy need improvement by slowing the movement speed of the enemy since there participant that said the enemy are difficult.

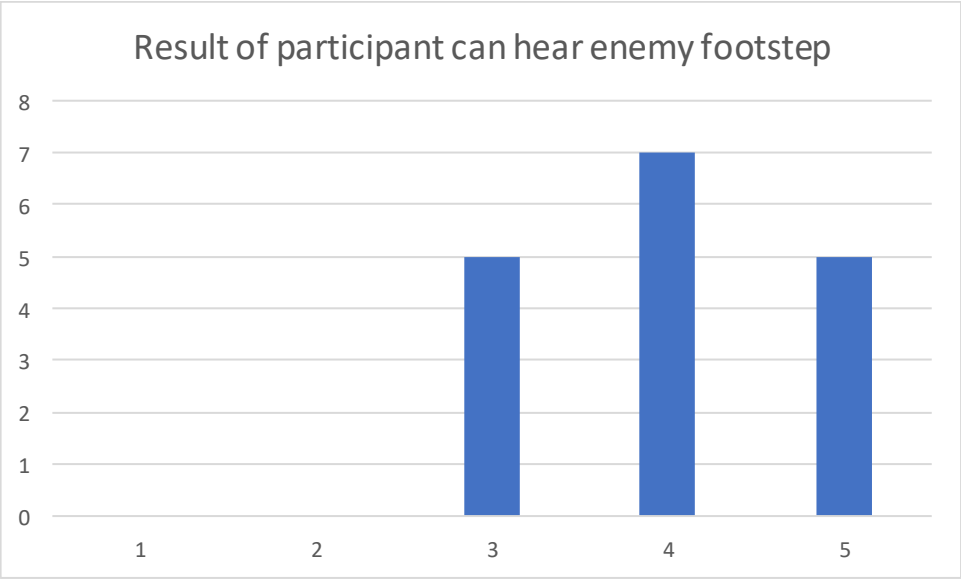


Figure 76: Result of participant can hear enemy footstep

Figure 74 shows that participant can hear enemy footstep and determine their location with mean of 4.0. This indicate that player can hear the footstep of the enemy which help them to evade the enemy.

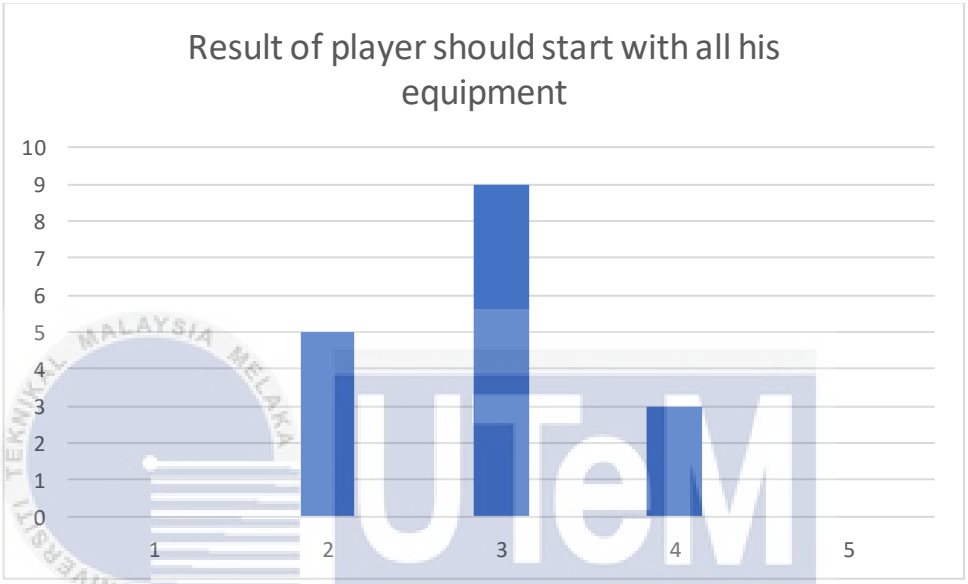


Figure 77: Result of player should start with all his equipment

Figure 75 shows that player should have all his equipment without buying it with mean of 2.9. The equipment of player such as navigator, energy drinks and Apple for the quest. Since there some participants agree, having different difficulties that player can gain more value of coins to buy equipment can help solve this problem.

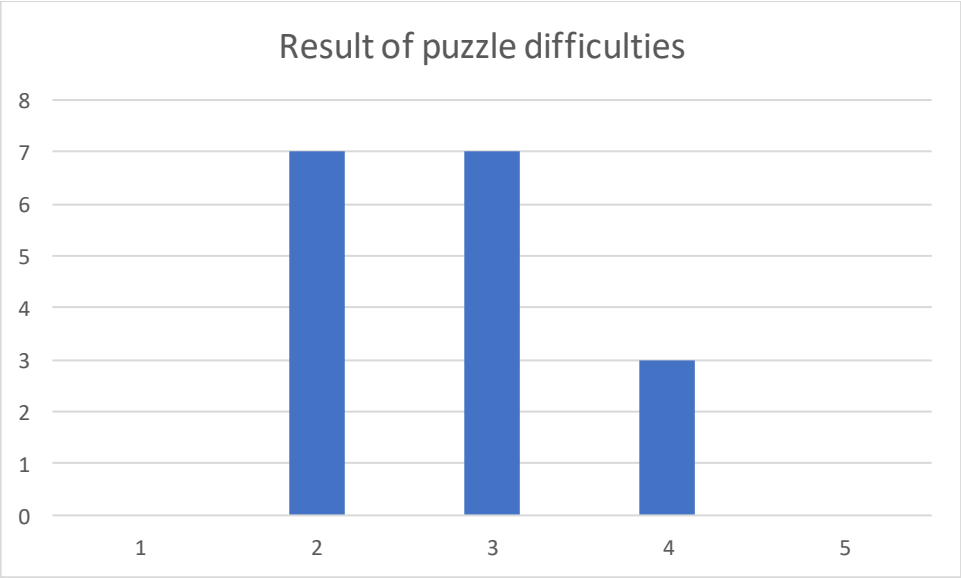


Figure 78: Result of puzzle difficulties

Figure 76 shows that participant don't agree that puzzle is difficult to solve with mean of 2.8. The puzzle are the main objective of the game and player need to solve all of them to proceed through the game. Some participants agree that the puzzles are difficult probably due to amount of movement that player need to do in order to solve the puzzle. Having different difficulties can help reduce the amount of puzzle player need to solve.

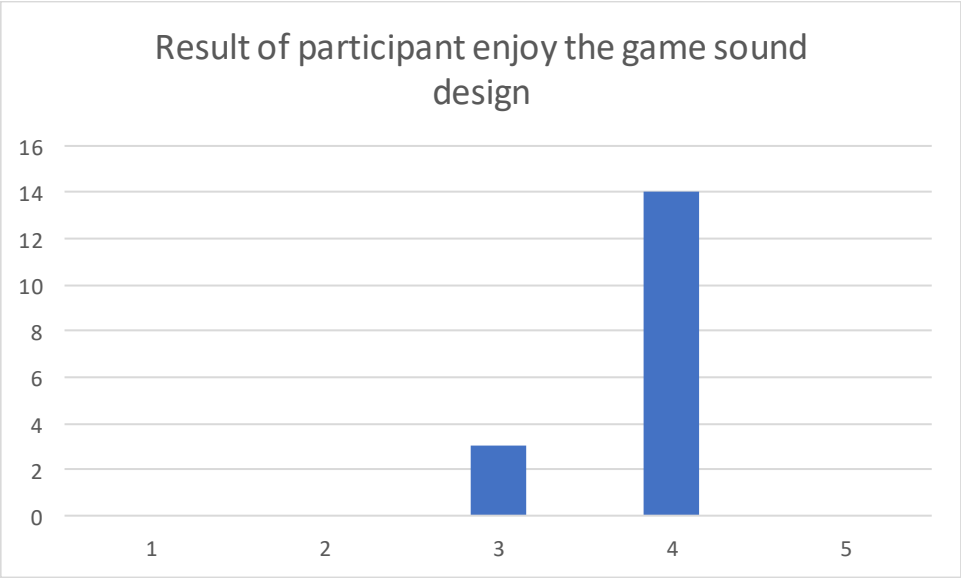


Figure 79: Result of participant enjoy the game sound design

Figure shows that participant agree that they enjoy the game sound design with mean of 3.8. The sound design in game includes the background music, enemy walk, and attack sound.

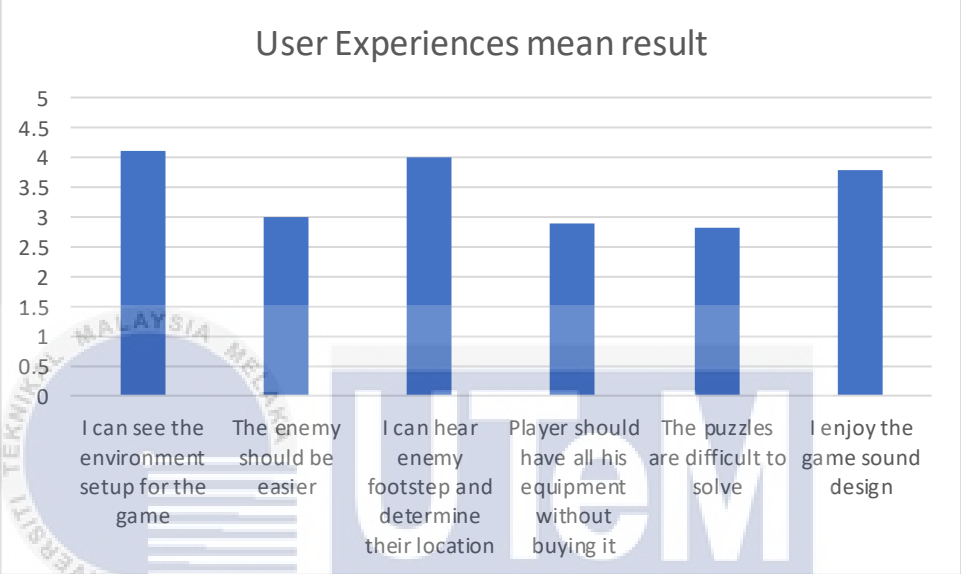


Figure 80: User Experiences mean result

Based on table 17, the mean result of user experiences questions was gathered. The user experiences questions gathered data about environment setup for the game, enemy difficulty, enemy footstep sound, player start with equipment, puzzles difficulties, and game sound design. Participants agree with the environment setup, enemy footstep, and game sound design but they somewhat agree with the difficulties of enemy, difficulties of puzzle, and player start with equipment. This is because some participant thinks that the enemy and puzzle are difficult and some of them thinks that it is easy. Same as the player start

with equipment, some participants want player to start with all equipment while other don't. Having different difficulties for the game can solve this problem.

6.4.6 Gameplay

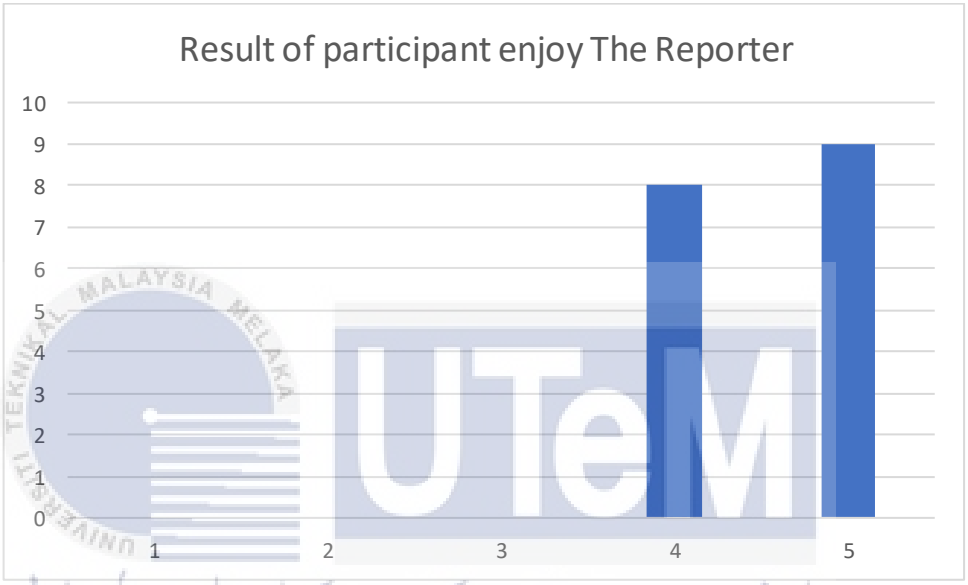


Figure 81: Result of participant enjoy The Reporter

Figure 78 shows that participant strongly agree that they enjoy playing The Reporter with mean of 4.5. This shows that the game is fun to played.

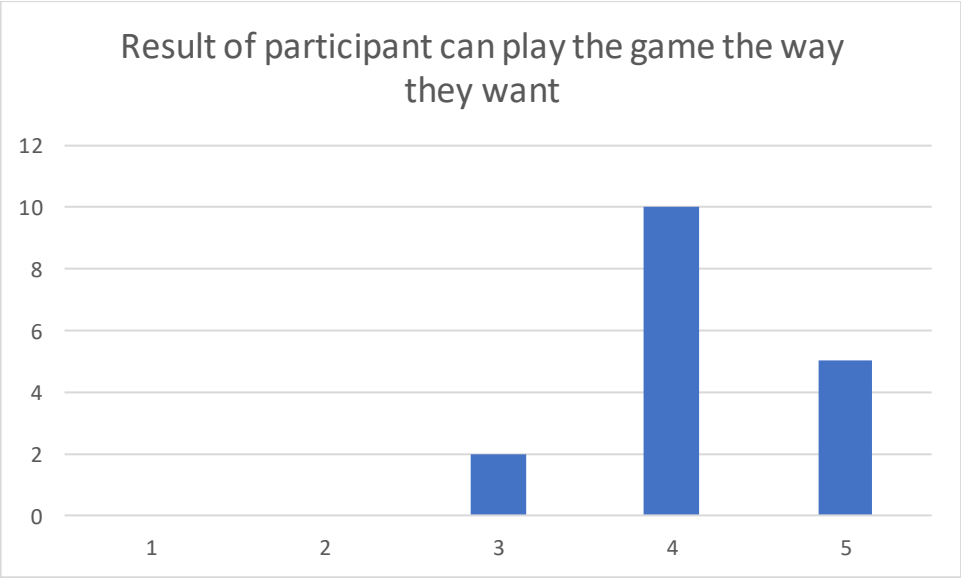


Figure 82: Result of participant can play the game the way they want

Figure 79 shows that participant agree that they can play the game the way they want with mean of 4.2. This show that player can play the game freely where they can collect coins and buy solver to finish the puzzle or search for clues and try to figure out the puzzle.

Figure 83: Result of participant will recommend this game to other people

Figure 80 shows that participant agree that they will recommend this game to other people with mean of 4.2.

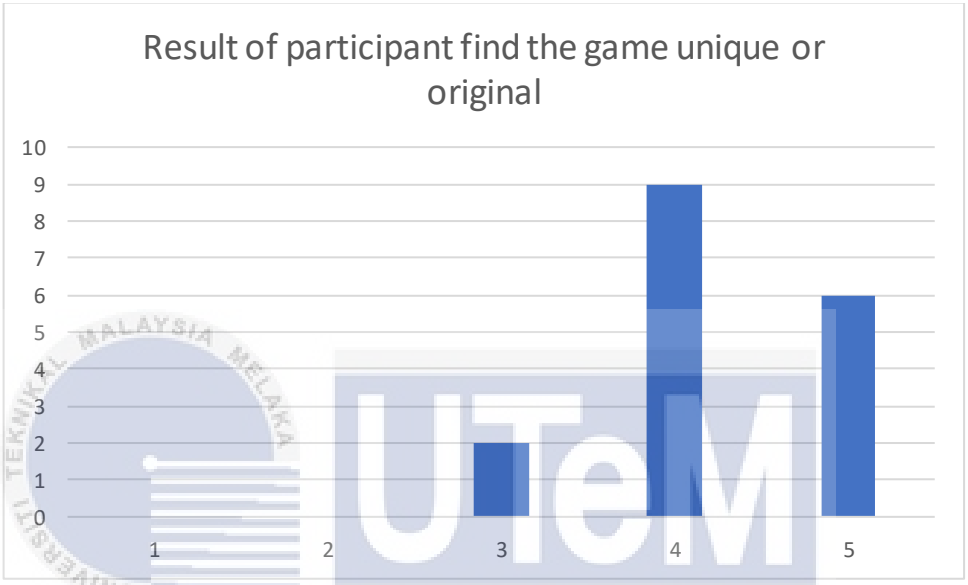


Figure 84: Result of participant find the game unique or original

Figure 81 shows that participant agree that they find the game is unique or original with mean of 4.5. Creating an original game is based on the storyline of the game, the different of mechanics with other game, and the level design of the game.

Figure 85: Gameplay mean result

Based on table 18, mean result of gameplay were gathered. The gameplay questions asked participants about do they enjoy playing The Reporter, can they play the game the way they want, will they recommend the game to other people, and do they find the game unique or original. The mean were not far apart from each other shows that most participant agree with the gameplay of the game.

6.4.7 Visual Aesthetics

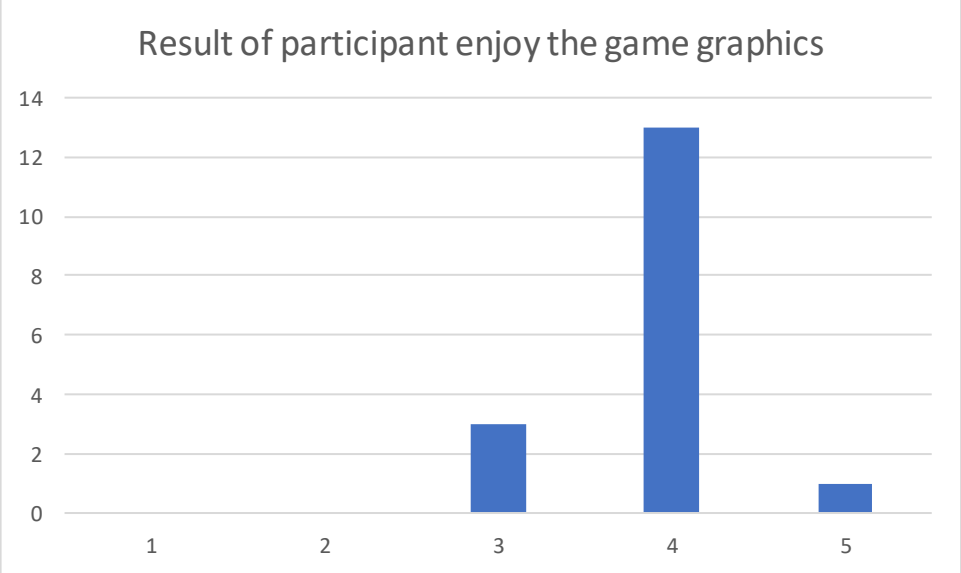


Figure 86: Result of participant enjoy the game graphics

Figure 82 shows tat most participant agree that they enjoy the game graphics with mean of 3.9. This shows that graphics of the game are setup up properly where the font, background, and presentation are nicely implemented.

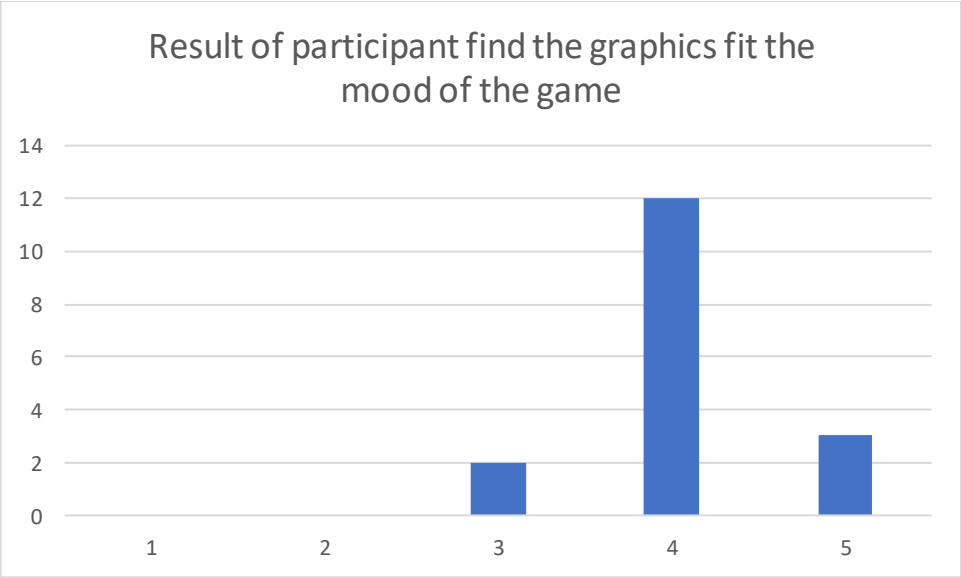


Figure 87: Result of participant find the graphics fit the mood of the game

Figure 83 shows that most participant agree that the graphics of the game fit the mood or style of the game with mean of 4.1. This shows that graphics of the game are suitable with the theme, mood, and playstyle of the game.

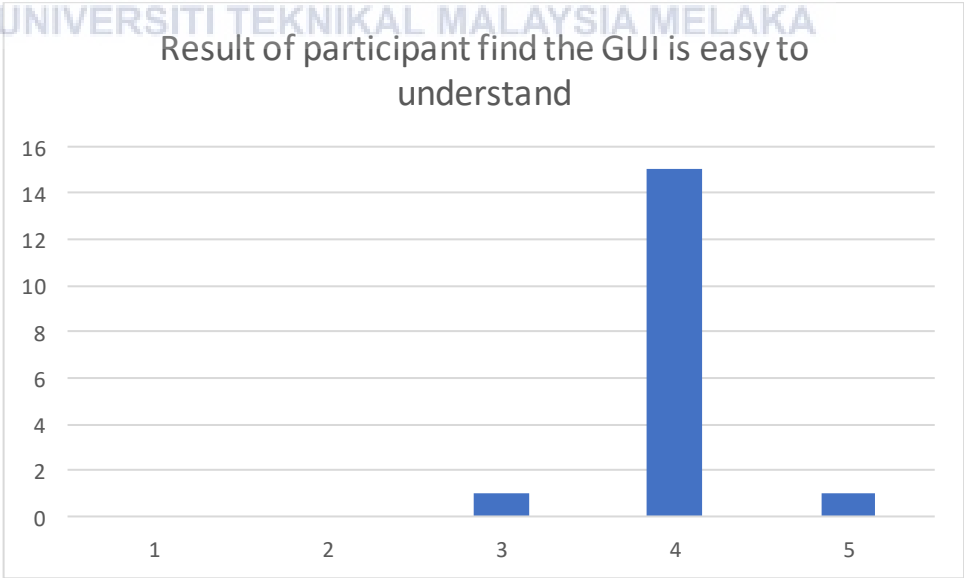


Figure 88: Result of participant find the GUI is easy to understand

Figure 84 shows that most participant agree that they can understand the GUI easily with mean of 4.0. This shows that player can clearly see and understand the HUD, UI in store, and inventory.

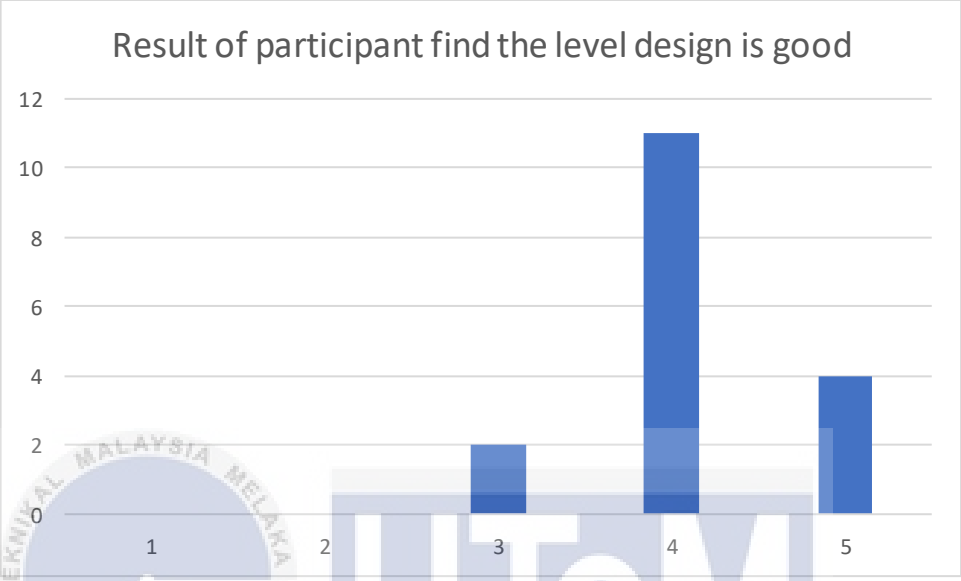


Figure 89: Result of participant find the level design is good

Figure 85 shows that most participant agree that the level design of the game is good with mean of 4.1. This shows that the level design of the game is suitable and appropriate for the game.

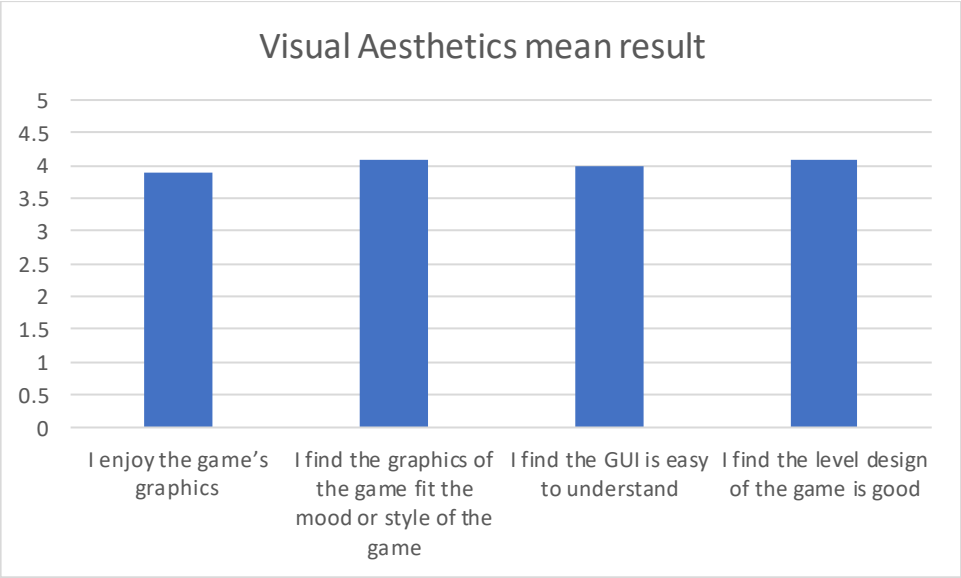


Figure 90: Visual Aesthetics mean result

Based on table 19, mean result of visual aesthetics questions were gathered. The visual aesthetics questions asked participants about the game graphics, do the game graphics fit the mood of the game, does the GUI easy to understand, and do they find the level design good. The mean value for each question were not far apart prove that most participant agree with the visual aesthetics of the game.

6.4.8 Understanding and Acknowledgment

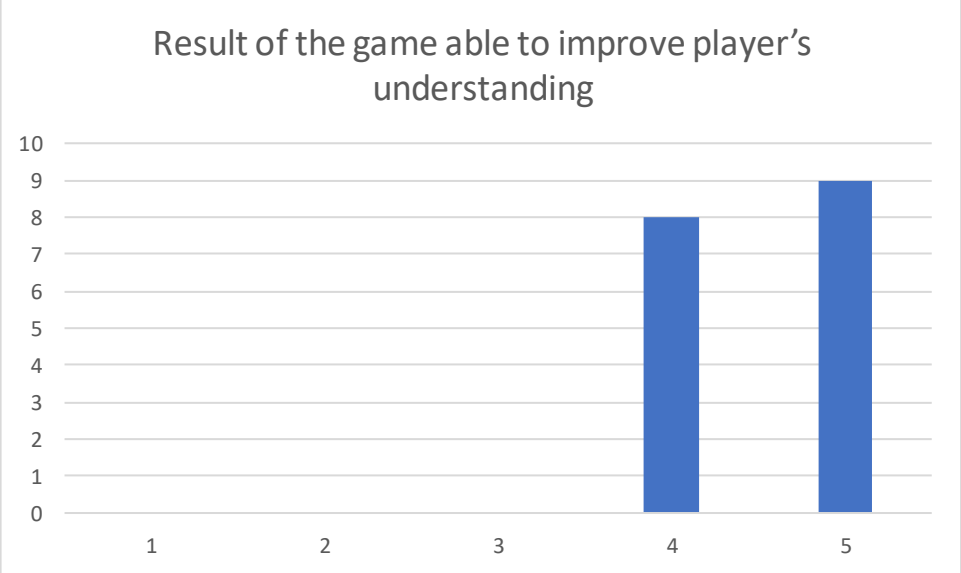


Figure 91: Result of the game able to improve player's understanding

Figure 86 shows most participant strongly agree that the game able to help their understanding in sciences and mathematics with mean of 4.5. This proves that the game able to reach it objective which is to help improve understanding of user in sciences and mathematics through adventure edutainment game.

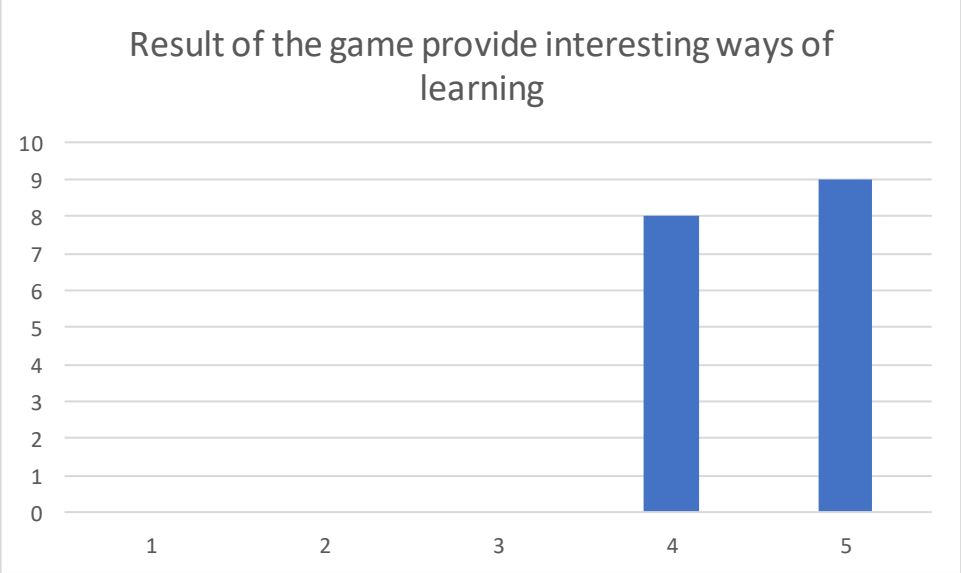


Figure 92: Result of the game provide interesting ways of learning

Figure 87 shows most participants strongly agree that the game provide interesting ways of learning sciences and mathematics with mean of 4.5. This shows that the game able to bring interesting ways for the user to learn sciences and mathematics since they need to do interaction with object in game to complete the puzzle.

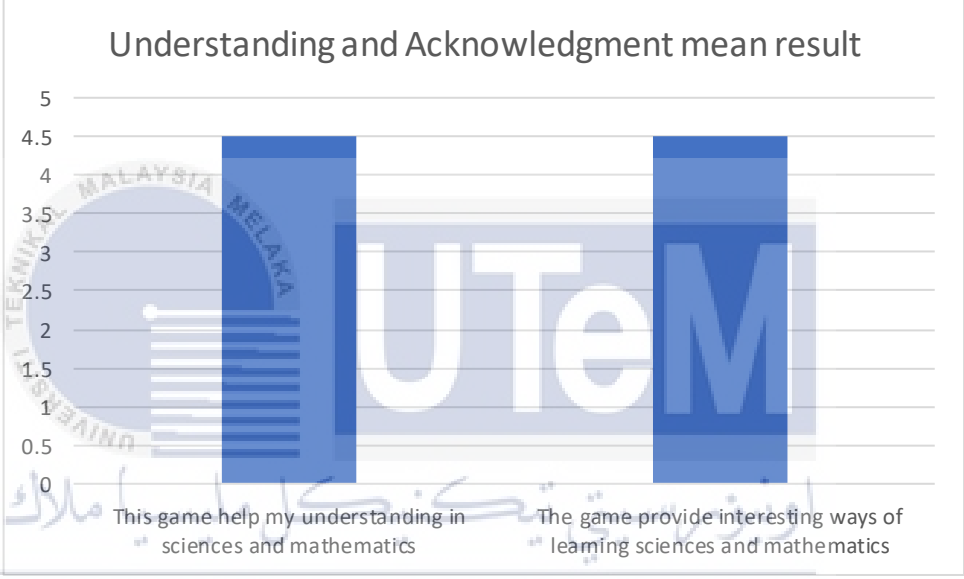


Figure 93: Understanding and Acknowledgment mean result

Based on table 18, mean result of understanding and acknowledgment questions were gathered. Understanding and Acknowledgment questions asked participants about does the game help their understanding in sciences and mathematics, and does the game provide an interesting ways of learning sciences and mathematics. This result help developer to see if they have successfully developed an edutainment game. From the result of the mean, it

can be said that most participant agree with the understanding and acknowledgment.

6.4.9 Respondent's Feedback

There were couple of suggestion on why player enjoy the game and ways to improve the game which can be refer on Appendix A. Based on the suggestion on why player enjoy playing the game, it proves that player enjoy the game through the game mechanics and puzzle of the game. 10 out of 17 participants give suggestion on how to improve the game. Some of the suggestions are decrease one of the puzzle difficulties, improve the in-game sound, and add more storyline for the game. These improvements will be taken into consideration to see which improvement will make the game better.

6.5 Conclusion

As the conclusion, this chapter cover the testing and result of the game from target user. The use of Game User Experience Satisfaction Scale (GUESS) as the guideline for questionnaire of this testing. There are 17 participants, and 33 questions were answered from the questionnaire to get the result of the game testing. The result shows that the majority participants agree that the game able to reach it objective. Participant also provide suggestion on how to improve the game through the game mechanics,

design, and user interface. In the next chapter, the strength, weakness, improvement, and contribution of the project will be discussed.

CHAPTER 7: CONCLUSION

7.1 Observation of Strength and Weakness

The strength of this project is the game mechanics for puzzle and the enemy AI. Every puzzle inside the game will have different ways of solving it. These mechanics can keep the solving puzzle inside the game interesting as player will see the variety of ways to solve the puzzle. Certain puzzle requires player to roam around the house and gather object, once player have all the item, they can solve the puzzle. Other puzzle will ask the puzzle to do some calculation and enter the result of the calculation. Solver also can help player to solve the puzzle as they will provide the answer and ways to solve the puzzle.

For the enemy, in the game there are three enemy that player need to face. These enemy will have their own attributes and special ability. The enemy will spawn based on the level of the game, where Brother Bob will spawn on the first and second level, Cousin Wade spawn on second level, and Vulkan spawn on the third level. Brother Bob will roam the first floor entering random room. It will disturb player to solve the puzzles that are present on the first floor. Cousin wade will roam the second floor giving player hard time to solve the multiplication puzzle. Vulkan will roam around the house with high movement speed. These enemy will have footstep sound which will help player to know their location.

The weakness of this project based on observation and user feedback, the user interface of the game does not give plenty of impact toward the game. The design is not quite suitable with the game theme. The presentation of certain item such as note,

and puzzle are not too entertaining for the user. Using different font style and color can help put player into the right mood when reading notes or solving the puzzle. The level design is not suitable with the game theme. The maps size also big which can cause player to waste time walking. This can cause the game to become boring for the player. Since the game need exploration, unnecessary walking around the house can cause player to feel troublesome.

7.2 Proposition for Improvement

From the testing and evaluation, there a lot of suggestion for improvement from user feedback.

Firstly, improvement would be the level design of the game. More assets and props can be insert into the level to make it look suitable with the theme of the game. Props such as corpse, bloody cloth, and body part can help increase the thrilling effect of the game. The size of the maps also quite large which can cause player to walk around more inside the game. Making the maps smaller can help decrease the amount of unnecessary exploration and increase the rate of player meeting the enemy. Adding different effect for each level can help player to differentiate between each level since all level take place in same map.

Secondly, improvement is to make the game easier for the player. Difficulty will be added into the game allowing player to choose which difficulty they want to play. Easy difficulty will make the enemy to move slower and roam around the house less frequently. This allows player to explore the house and see the layout of the map.

On this difficulty, the value of coins will increase to 50 allowing the player to purchase all item on the store and trying them. On hard difficulty, the enemy movement speed will increase, and they will roam the map more frequently. The value of coin will be 10 on this difficulty. Having different difficulties allow player to have different play experiences.

Thirdly, improvement is to make the UI of the game suitable with the theme of the game. Adjusting the color, size, and design of the HUD can help player to understand the control of the game better. The UI for note and clues also can be improved where the note look like it an old letter, so player know that the note is old. The clues might need more explanation for it through graphics to help player understanding.

Other improvement for the game is to make the game shorter since it an edutainment game. Making item easier to find can help player to decrease the amount of exploration of the game. Adding item that can help player to locate their objective also can help shorten the gameplay.

7.3 Contribution

The development of this game is intended to create an edutainment adventure game based on sciences and mathematics for mobile. This game can help improve the understanding of sciences and mathematics for player. The objective for this development is to implement adventure element into edutainment game where player can increase their understanding for sciences and mathematics.

7.4 Conclusion

As conclusion, this project was a success, but a lot of improvement can add into the project to make it much better. Finding more resources about edutainment game, adventure game, and sciences and mathematics can help finding proper problem and objectives. Preparing a proper milestone and task for the project allow the development process to run smoothly. The Reporter should be tested from time to time to see the balance of the game, the user interface whether it is suitable or not, and checking the game mechanics if it is working properly. The character were made using Blender 3d and animated using Mixamo. Target user was collected based on the purpose of the project which was to evaluate the implementation of adventure in edutainment game based on sciences and mathematics. Creating a correct questionnaire based on the objectives of the project which was adventure edutainment game. The feedback from target user were taken and converted into pie chart and bar-graph to have better understanding about their opinion.

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APPENDIX A

The reason why player enjoy playing the game

The involve lot of exploration and puzzle solving
I like doing the puzzle and finding item
the game is fun
The game have scary and exciting element
Some of the puzzle are fun
Fun game
Hiding and find item is fun
Hiding from monster
I like playing games
I enjoy exploring and finding item.
I love hiding from the monster and running around
The monster chasing around the house and we need to hide is fun
Puzzle solving in this game is fun but there a lot of walking
Exploration and hiding from monster
i just tryinng the game
Yes because it has multiple puzzle that can test my way of thinking
the game is fun

Improvement Suggestion

The game can be improve with better sound
Having more cutscene to explain the story
The game is too dark making it difficult to see
The main character need more item
Good game
The game is little dark and hard to see
One of the puzzle is difficult to solve
Reduce the amount of walking needed
level design maybe
Have more story in the game

APPENDIX B

Questionnaire used to gain feedback about The Reporter

Post-Game Form for Edutainment game

Hi, my name is MUHAMMAD AMAR TAUFIQ BIN MOHD NAZRI. I'm doing a survey for my Final Year Project about edutainment game.

This form will record your gaming activities.

This project focus on 3D adventure game about sciences and mathematics. Player will have to solve the puzzle in order to progress through the game. There clues that player can find that will explain how to solve the puzzle. Player can get coins by solving puzzle or finding them around the map. These coins can be used to purchase item that can help player from the store. There also enemy roaming around the house try to capture the player. If player get captured they will reset their current progress from the store. The goal for this game is to increase the understanding of sciences and mathematics through game.

Link for the game(The Reporter):

https://drive.google.com/file/d/12pVjF3UrfNDYEyHdtNriQ9kv0RWzCBml/view?usp=sharing

Thank you so much for your time.

amartaufiq99@gmail.com (not shared) Switch account

* Required

Gender *

Female

Male

Race *

- ○ Malay
- ○ Chinese
- ○ Indian
- ○ Other: _____

What platform do you often play your games on? *

- ☐ Laptop or Computer
- ☐ Mobile(Android or IOS)
- ☐ Console(PS4,Xbox One, Nintendo Switch, etc)

What is your favourite game genre? *

- ☐ Adventure
- ☐ Action
- ☐ Puzzle
- ☐ Horror
- ☐ Simulation
- ☐ Sports
- ☐ Real Time Strategy(RTS)
- ☐ First Person Shooter(FPS)
- ☐ Role Playing Games(RPG)

How long in hours do you spend playing a games in a week? *

- ◯ less than 1 hour
- ◯ 1 hour - 2 hours
- ◯ 4 hours - 5 hours
- ◯ 6 hours - 8 hours
- ◯ more than 8 hours

Do you think game can be educational? *

- ◯ Yes
- ◯ No
- ◯ Maybe

Next Clear form

Post-Game Form for Edutainment game

amartaufiq99@gmail.com (not shared) Switch account

* Required

Game Experiences Section

This section will ask your gaming experiences when playing The Reporter

Playtesting

I feel the controls are easy to use *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

The user interface elements(HUD, button, text) are easy to see and understand *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

The game is easy to be played *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

I am satisfied with player's powers and ability *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

User Interface

The main menu design is suitable for edutainment game *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

I understand the objective of the game. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

I know my task for each level. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

I can complete the task easily with the user interface shown. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

User Experiences

I can see the environment setup for the game. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

The enemy should be more easier. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

I can hear enemy footstep and determine their location. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

Player should have all of his equipment without buying it. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

The puzzle are difficult to solve. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

I enjoy the game sound design. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

Gameplay

I enjoy playing The Reporter. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

I can play the game the way I want. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

I will recommend this game to others. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

I find the game is unique or original. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

Visual Aesthetics

I enjoy the game's graphics. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

I find the graphics of the game fit the mood or style of the game. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

I find the GUI is easy to understand. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

I find the level design of the game is good. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

Understanding and acknowledgment

This game help my understanding in sciences and mathematics. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

The game provide interesting ways of learning sciences and mathematics. *

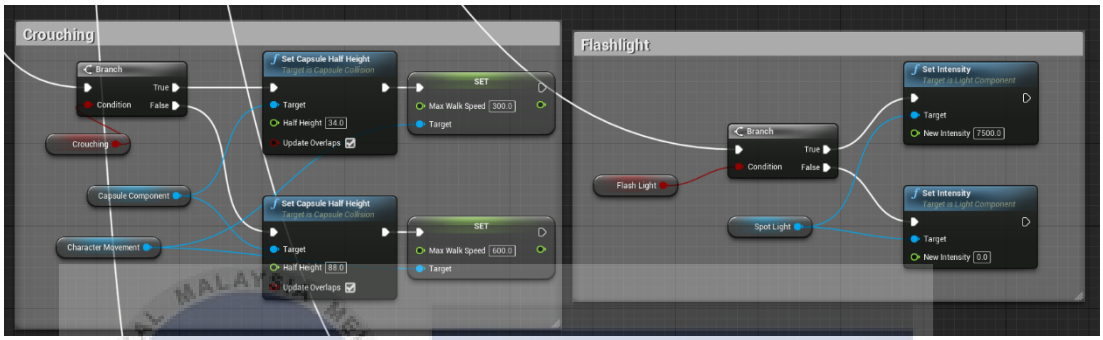
	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

Back Next Clear form

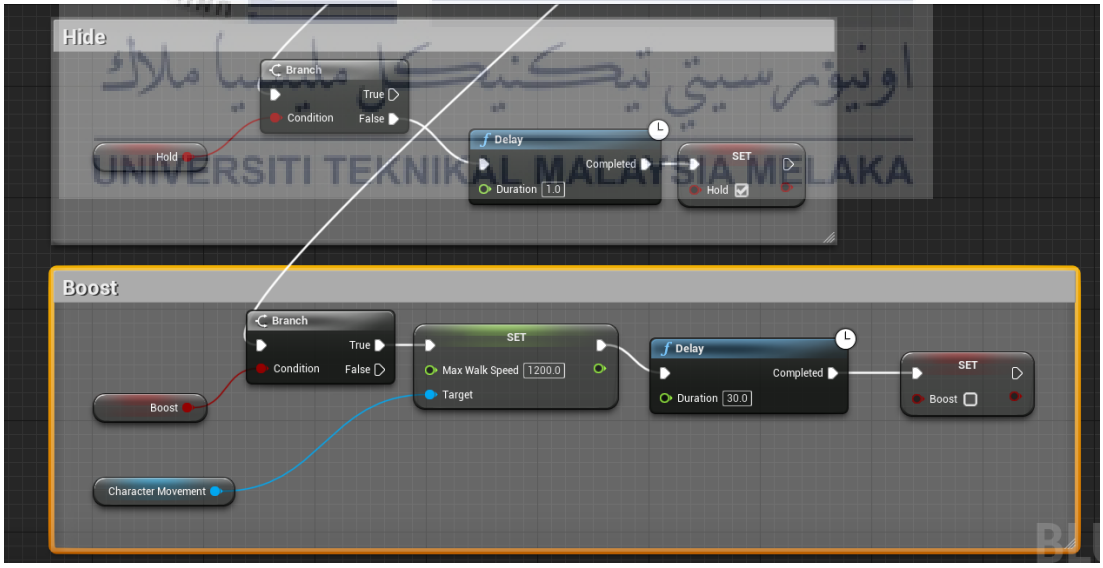
APPENDIX C

Sample Source Code

Player crouching and flashlight mechanics

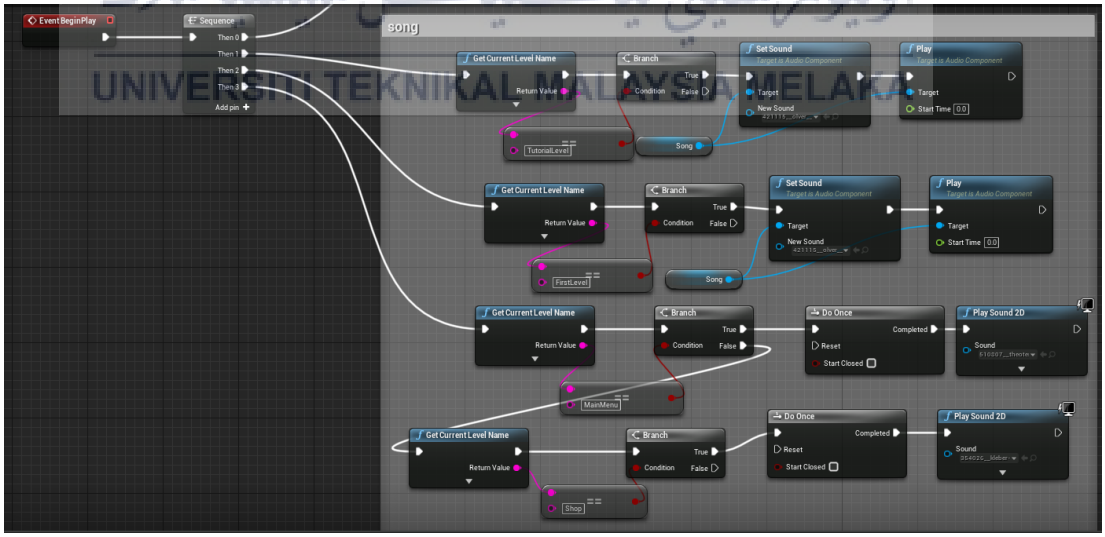


Players hide and boots mechanics

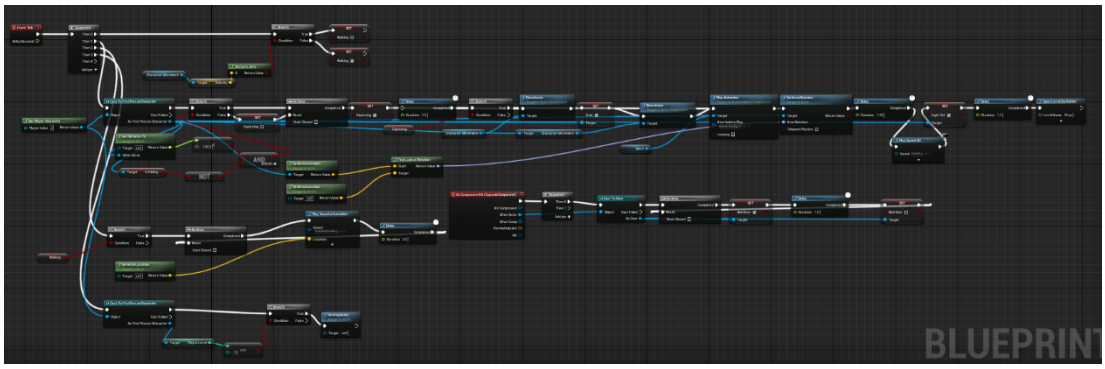


Clues and puzzle UI

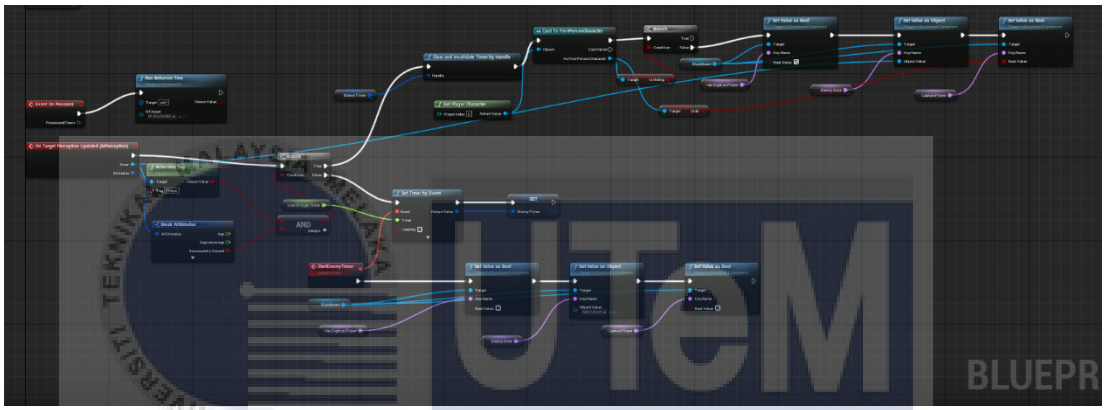
Game background song implementation



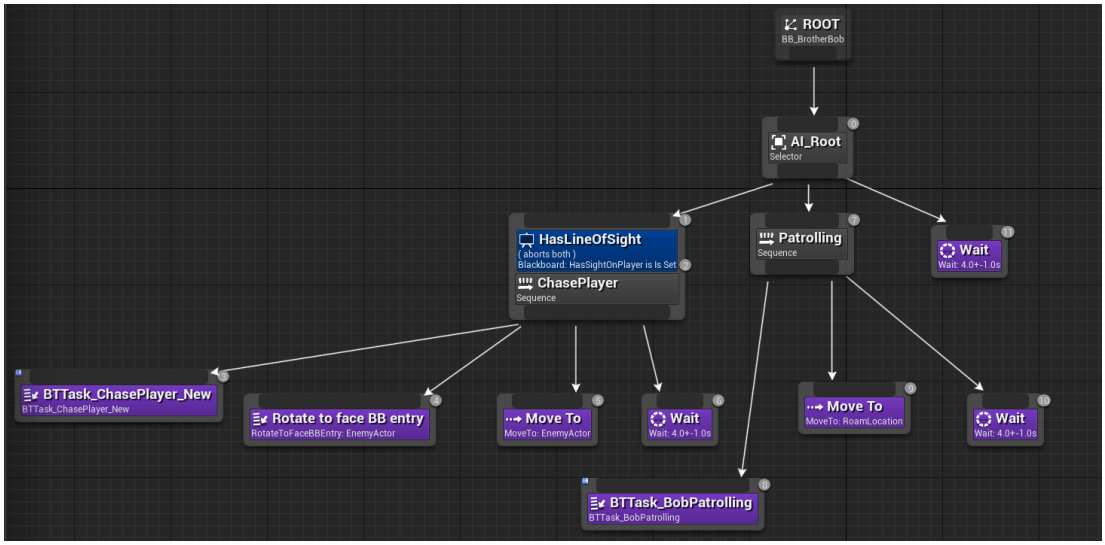
Enemy AI Blueprint



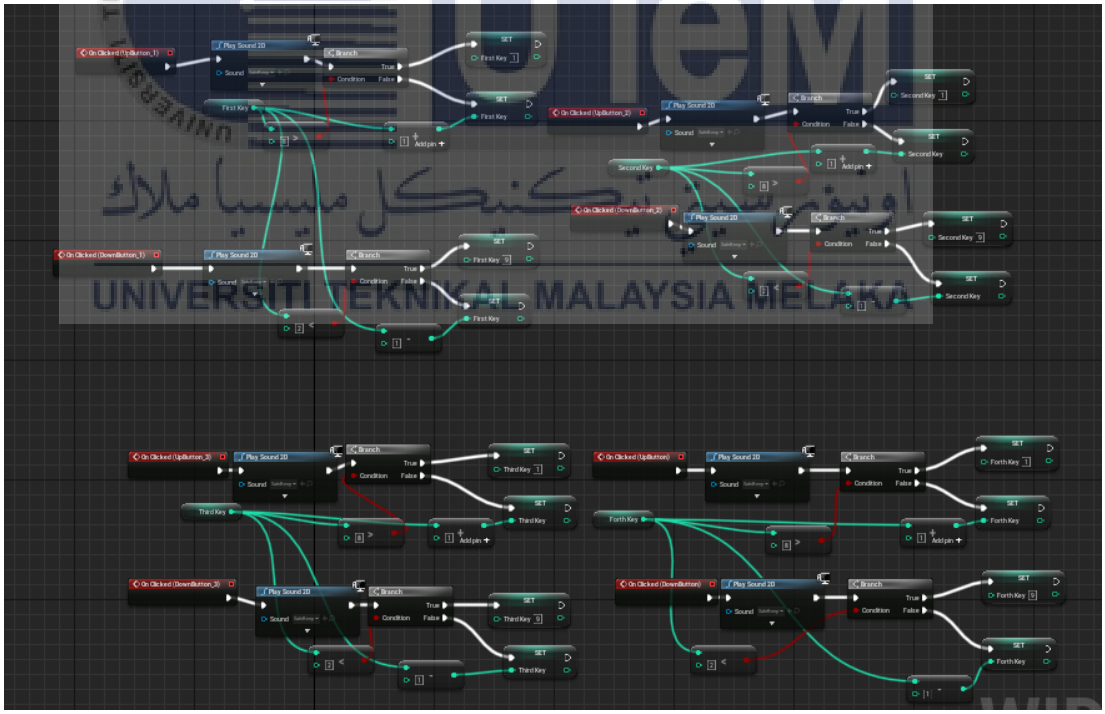
Enemy AI Controller



Enemy AI Behavior Tree



Round Off Puzzle



Store