

**DESIGN AND DEVELOPMENT OF 2D ANIMATION FOR YEAR 3  
SCIENCE SUBJECTS WITH A GAME-BASED LEARNING APPROACH**



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

DESIGN AND DEVELOPMENT OF 2D ANIMATION FOR YEAR 3 SCIENCE  
SUBJECTS WITH A GAME-BASED LEARNING APPROACH

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

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY  
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2021

## DECLARATION

I hereby declare that this project report entitled  
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is written by me and is my own effort and that no part has been plagiarized  
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STUDENT : \_\_\_\_\_ Date : 23 June 2021  
(AIMI KHALEEDA BINTI AZMI)



I hereby declare that I have read this project report and found  
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A handwritten signature in black ink, likely belonging to the supervisor, is written over the text area.

SUPERVISOR : \_\_\_\_\_ Date : 23 June 2021  
(ASS. PROF. TS. DR. HJH. NORASIEN BAKAR)

## DEDICATION

This report is wholeheartedly dedicated to my beloved parents for being my source of inspiration, giving me endless guidance, always there whenever needed, and provide me financial support.

Not to forget my supervisor, Ass. Prof. Ts. Dr. Hj. Norasiken Bakar helped me write this report by giving me feedback and great ideas for me to finish it.

Finally, my friends are always there to give me emotional support whenever I need them the most. They also helped me by providing brilliant ideas and solved problems that I was facing.



## ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude to Almighty Allah for His showers of blessings throughout this project. I am able to complete this report as well as developing it.

I want to thank my supervisor, Ass. Prof. Ts. Dr. Hjh. Norasiken Bakar has given me endless support, positive feedback, and guidance from the commencement of this project. I am fortunate to have her as my supervisor.

Without the help of my parents, I would not have been able to complete this project. It is all thanks to their prayers, love, and care for me that get me going. All the little things that they had done for me genuinely matters.

Last but not least, many thanks go to my friends that helped me in completing this project. Whenever I have doubts about this project, I will refer to them and ask for their opinions. They gave me a clear idea to make this project successful.



## ABSTRACT

"Rescue The Animals" is a computer game-based learning for third-year primary school students. This game focuses on the subtopic Animals in the year 3 Science subject. This game was designed in a flat design style for that simple look. The problem is that the learning material provided is unattractive, which leads students to lost interest in learning. Therefore, the main objective of this project is to evaluate the effectiveness of learning the subtopic Animals in the year 3 Science subject for third-year primary school students using this game-based learning. Few existing games are pretty similar to the one developed. However, the main difference between this game and the existing ones is that "Rescue The Animals" is more engaging and exciting. The methodology used for this project is the Prototyping Model. An end-product prototype was created with this model, then tested and refined based on user feedback until the final acceptable prototype was established. This game was developed with a laptop and a mouse. The software used was GDevelop to create the game, Adobe Illustrator to design the graphics, and Audacity to remove audio noise. Among the 5 multimedia elements, text, graphic, audio, and animation were implemented in this game. Alpha and Beta testing were performed during the user evaluation phase to see if the game meets the main objective. Alpha testing was conducted first to see if the game is qualified to be used by the target users. If the game is qualified, then the game can proceed to Beta testing. Based on the testing results, "Rescue The Animals" is an effective e-learning tool for teachers and students. Even though this game was qualified, some suggestions were given during Alpha testing to improve this game. The suggestions were to add more sound effects and a storyline to let the player what the game is about.

## ABSTRAK

"Rescue The Animals" adalah pembelajaran berasaskan permainan komputer untuk pelajar sekolah rendah tahun tiga. Permainan ini berfokuskan kepada subtopik Haiwan dalam subjek Sains tahun 3. Permainan ini direka dalam 2D dengan gaya reka bentuk rata untuk penampilan yang sederhana. Masalahnya ialah bahan pembelajaran yang disediakan tidak menarik, yang menyebabkan pelajar hilang minat untuk belajar. Oleh itu, objektif utama projek ini adalah untuk menilai keberkesanan pembelajaran subtopik Haiwan dalam subjek Sains tahun 3 untuk pelajar sekolah rendah tahun tiga dengan menggunakan pembelajaran berasaskan permainan ini. Beberapa permainan yang wujud hampir sama dengan permainan yang dibangunkan ini. Namun, perbezaan utama antara permainan ini dan yang wujud ialah "Rescue The Animals" lebih menarik dan mengujakan. Metodologi yang digunakan untuk projek ini adalah Model Prototaip. Prototaip produk akhir dibuat dengan model ini, kemudian diuji dan diperhalusi berdasarkan maklum balas pengguna sehingga prototaip akhir yang dapat diterima dihasilkan. Permainan ini dibangunkan dengan menggunakan komputer riba dan tetikus. Perisian yang digunakan adalah GDevelop untuk membuat permainan ini, Adobe Illustrator untuk mereka grafik, dan Audacity untuk menghilangkan bunyi *noise* di audio. Di antara 5 elemen multimedia, teks, grafik, audio, dan animasi telah dilaksanakan dalam permainan ini. Pengujian Alpha dan Beta dilakukan semasa fasa penilaian pengguna untuk melihat adakah permainan memenuhi objektif utama. Ujian alpha dilakukan terlebih dahulu untuk melihat adakah permainan ini layak untuk digunakan oleh pengguna sasaran. Sekiranya permainan ini memenuhi syarat, maka permainan ini dapat dilanjutkan ke pengujian Beta. Berdasarkan keputusan daripada ujian, "Rescue The Animals" adalah alat e-pembelajaran yang berkesan untuk guru dan pelajar. Walaupun permainan ini memenuhi syarat, beberapa cadangan penambahbaikan telah diberikan semasa ujian Alpha. Cadangannya adalah untuk menambahkan lebih banyak kesan bunyi dan jalan cerita untuk membiarkan pemain memahami permainan ini.

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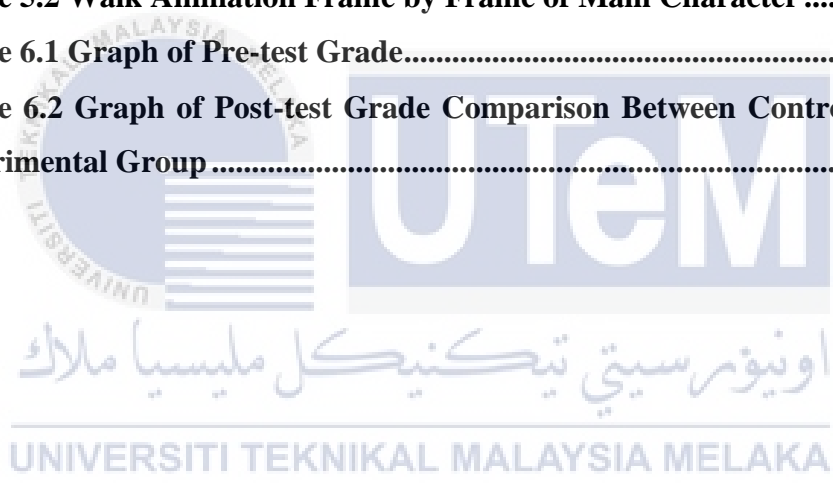
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**LIST OF ABBREVIATIONS**

<b>FYP</b>	-	<b>Final Year Project</b>
<b>SME</b>	-	<b>Subject Matter Expert</b>
<b>IT</b>	-	<b>Information Technology</b>
<b>ITE</b>	-	<b>Information Technology Expert</b>
<b>SE</b>	-	<b>Student Expert</b>



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## CHAPTER 1: INTRODUCTION

### 1.1 Introduction

Playing video games is usually seen as a negative thing. However, these days, society's perception of video games has changed. This is because video games can be educational, informative, and be used as a learning tool. Even educators believe that using entertainment and fun-based teaching methods allows the students to have direct experience from the active interactions in the learning process. Educational games can be considered an example of these fun-based teaching methods (Ambu-saidi and Balushi, 2009).

This game-based learning was developed for third-year primary school students, and it focuses on the subtopic Animals in the year 3 Science subject. This game provides 3 different notes based on the subtopic at every level. This means that third-year primary school students can use this game-based learning method instead of using a textbook as learning material.

Third-year primary school students are still in the age where they get distracted easily by whatever happens around them. Keeping them focused during a learning session can be very challenging. The way a school conducts its teaching lesson by having a teacher explain from the textbook to the entire class is ineffective, especially when teaching Science. Klisch, Miller, Wang, and Epstein (2012) discovered that science education games effectively increased adolescents' knowledge about the science content presented in the game.

## 1.2 Problem statement

- Lack of attractiveness

According to Ong and Jambulingam (2015), many learning courses' failures can be attributable to their inability to pique learners' interest and attention due to unattractive content. Learners must be able to access e-learning content on various devices, including laptops, tablets, and even smartphones. This is critical for increasing an educational institution's e-learning penetration rate.

- Lost interest in learning

According to Raymond (2008), the respondents from his study stated that the teaching process is ineffective due to the instructor's dull characteristic. Most of the respondents also stated that during class, the instructor only reads the text. If this keeps on going, the students will not gain anything from the class.

- Failures of instructor in giving a proper explanation

According to Raymond's study (2008), many of the respondents stated that the instructor's lack of explaining ability causes them not to understand what is being taught. The instructor does not give good examples and better methods to make their students understand a certain topic.

## 1.3 Objective

This project embarks on the following objectives:

- To analyse the ability of the third-year primary school students to understand the subtopic Animals in year 3 Science subject.

- To develop a 2D platform game-based learning for third-year primary school students that focuses on the subtopic Animals in year 3 Science subject.
- To evaluate the effectiveness of learning the subtopic Animals in the year 3 Science subject for third-year primary school students using this game-based learning.

#### 1.4 Scope

This game-based learning was developed for educational purposes for third-year primary school students. It focused on the subtopic Animals in the year 3 Science subject. It provided notes based on the subtopic and was designed to attract third-year primary school students to study. There are three levels in this game-based learning, and each level consists of 3 different notes. The software used in developing this project were GDevelop, Adobe Illustrator and Audacity. The elements of multimedia involved in this game-based learning are text, graphics, animation and audio.

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#### 1.5 Project significance

This game-based learning aims to help third-year primary school students to understand the subtopic Animals in year 3 Science subject. This game-based learning can give them a new study experience with exciting design and interactivity. In addition, this game-based learning can help the students understand better about the subtopics since they are learning visually and not just reading texts. Visual learning has proven effective, and the information gets stored as long-term memory. Furthermore, this game-based learning can help teachers achieve learning outcomes by using it as a learning tool. This is because games are a lot more interactive and enjoyable.

## 1.6 Conclusion

This chapter discusses the game-based learning overview that can help the students understand better about the subtopics since they are learning visually and not just reading texts. There is also an explanation of what game-based learning is about and what its primary goal is.

Furthermore, the explanation of the problem statement is discussed: lack of attractiveness, lost interest in learning, and failures of instructor in giving a proper explanation. Therefore, three objectives need to be achieved by this game-based learning. The first is to analyse the ability of the third-year primary school students to understand the subtopic. To develop a 2D platform game-based learning for third-year primary school students that focuses on the subtopic is the second one. The last one is to evaluate the effectiveness of learning the subtopic for third-year primary school students using this game-based learning.

The software used in developing this game-based learning was also stated: GDevelop, Adobe Illustrator, and Audacity. The multimedia elements involved are mentioned as well, which are text, graphics, audio, and animation.

The literature review and project methodology will be discussed in the following chapter. The initial project or product that dealt with this problem is covered in the following chapter. Finally, the methodology used during production will be discussed.

## CHAPTER 2: LITERATURE REVIEW AND PROJECT METHODOLOGY

### 2.1 Introduction

Firstly, the main objective of this chapter is to review the literature on any previous system educational tools that have been developed. There are observed and compared, and then a problem is identified that could contribute to this project. The comparison that is made is based on content, multimedia element, and design. This chapter will clarify the methodology used in the process of developing this project. This chapter will also discuss the required software and hardware for this project.

### 2.2 Domain

#### (a) *E-Learning Content*

E-learning refers to the use of electronic media or technologies for educational purposes such as teaching and learning (Teo, 2011). According to Roffe (2002), he described e-learning education as the way of people communicate and learn using electronic devices. E-learning is a complex strategy that includes a variety of technologies and methodologies (Clarke, 2007). Newton (2003) stated that the use of technology in education will increase access to education as well as improving teaching and learning quality. Furthermore, e-learning allows students to progress at their own pace (Rao, 2011). Since everyone have a different learning styles and abilities, e-learning allows students to absorb information in a method that is comfortable and acceptable to them, therefore improving the learning process. In fact, according to Simonson, Smaldino, Albright, and Zvacek (2009), the most widely

acknowledged benefit of e-learning is its flexibility, which allows learners to learn whenever and wherever they want.

(b) *Platform Game*

Toni Minkkinen (2016) stated that "platformers" or "platform games" are games in which the player controls a character who runs and jumps to avoid obstacles and defeat enemies. Platformers are believed to be one of the original game genres and are typically classed as a sub-genre of action games. Platform games have remained popular over the years despite being one of the first game genres. The popularity of platform games had decreased during the early 2000s, and the golden period was passed. Despite this, the genre remained alive and well. Platform games on consoles and personal computers began to merge into numerous genres, with rich interactivity being traded for a mix of varied features. According to Boutros (2006), platformers, on the other hand, have recreated the gameplay of the 1980s and 1990s on handheld systems. This would attract more players if the games were more rewarding and easier to play.

### 2.3 Existing Game

The existing game which has some what the same purpose of this game-based learning can be found from the website called Y8 Games (<https://www.y8.com/>). The traditional method of teaching which is by using the textbook will also be discussed in this context.

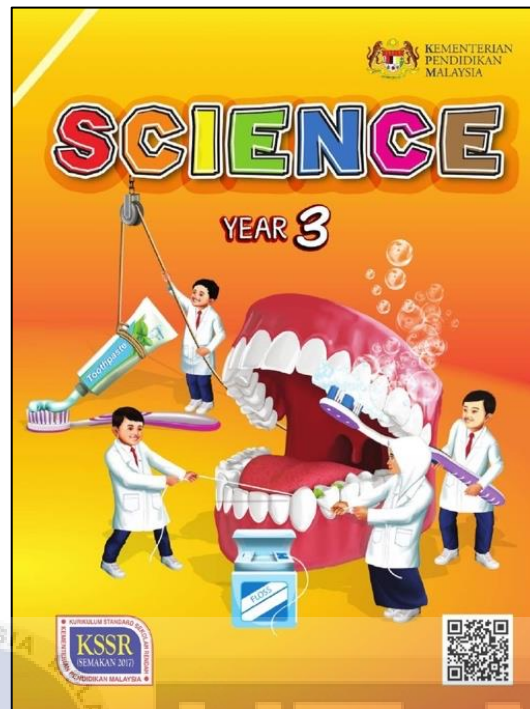


(a) *Animal House*



**Figure 2.1 Animal House**

"Animal House" is a game that is found on the website Y8 Games. This game is a quiz game that teaches the natural habitat of each animal. An animal will be shown, and the player requires to choose the correct for the animal. This game uses realistic photos of the animals and the habitat that is good for educational purposes because it allows the player to know how the animals and the habitat look in real life. This game has no level, which can give the player boredom throughout the game.

(b) *Year 3 Science Textbook*

**Figure 2.2 Year 3 Science Textbook**

Nowadays, every student studying at the government school is provided with textbooks used in the classroom. Every year, they are given the textbooks according to their level of learning, and at the end of the year, the textbooks needed to be returned so other students can use them. In simple word, the students are borrowing the textbooks. If the students lost their textbooks or their textbooks got poorly damaged, they need to replace it with a new textbook or pay according to the price of the textbook. Due to this borrowing system, other students can steal the textbook to avoid replacing the textbook or pay for it when theirs are missing and got damaged. Plus, the pages of the textbook are paper-based, which is very fragile when it got wet.

(c) *Animal Name*



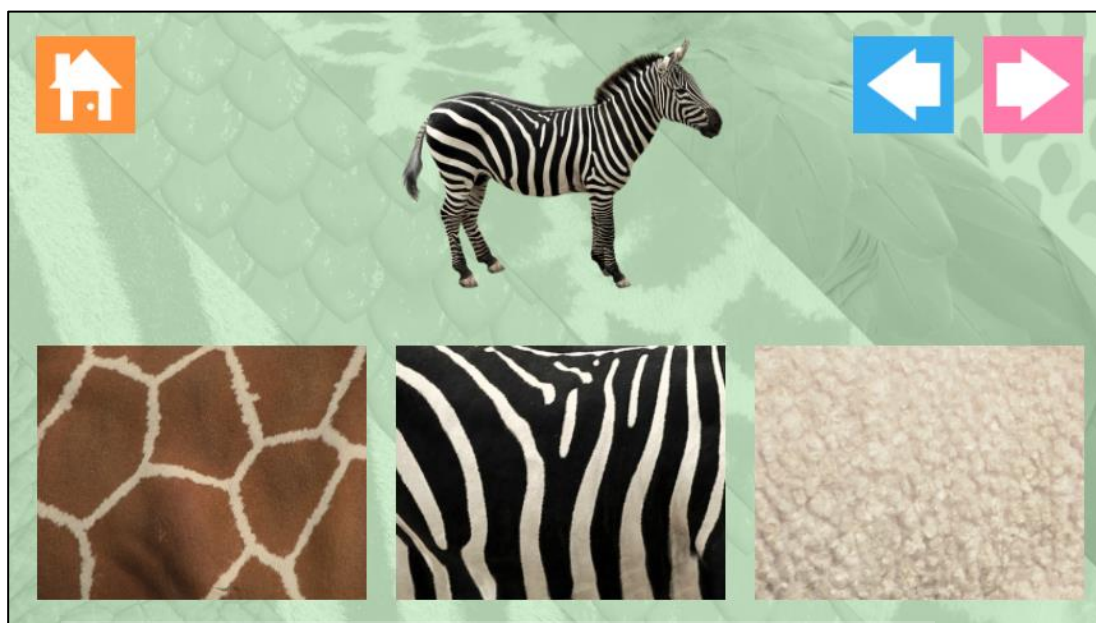
**Figure 2.3 Animal House**

"Animal House" is a game that is found on the Y8 Game website. This game is targeted at kids, and it is a quiz game. At the top row, it will show a text which is a name of an animal. On the bottom row, it will display four different animals. The player must click on the animal according to the text in the row above. If the player clicks on the wrong animal, it will show a cross on the incorrect animal they clicked. If they clicked on the correct animal, it will show a check and show a different text with different animals.

(d) *Learn Animals Game*

**Figure 2.4 Learn Animals Game**

"Learn Animal Game" is a game that is found on the Y8 Game website. This game is targeted at kids, and it is a quiz game. When the player clicks on the start button, it will show a picture of fifteen different animals. On the right side of the screen, it will show a list of animal names. At the top row, there is a timer. The player needs to match the animal names to the picture of the animals within the time limit given. If the player matches the name of the animals with the correct picture, the text will be gone, and a check will appear on the picture of the animal. Whether the player succeeds or not in matching the animal's name with the correct picture, the game will show a "Play Again" button. If the player clicks on the button, the same process will be repeated. It will display a picture of fifteen different animals and a list of animal's names exactly like the previous one.

(e) *Animal Skins*

**Figure 2.5 Animal Skins**

"Animal Skins" is a game that is found on the Y8 Game website. This game is targeted at kids, and it is a quiz game. When the player clicks on the start button, it will show a picture of an animal at the top row. the bottom row will show three different pictures of an animal's skin. The player needs to click on the correct skin for the animal shown on the row above. If the player clicks on the wrong skin, a cross will appear on the skin, meaning it is wrong. When the player clicks on the correct skin, a check will appear on the skin, meaning it is correct. Then, the player needs to click on the left arrow button. After that, the picture of the animals and the skins will differ from the previous one.

### 2.3.1 Comparison of Existing Games

**Table 2.1 Comparison Between Existing Games**

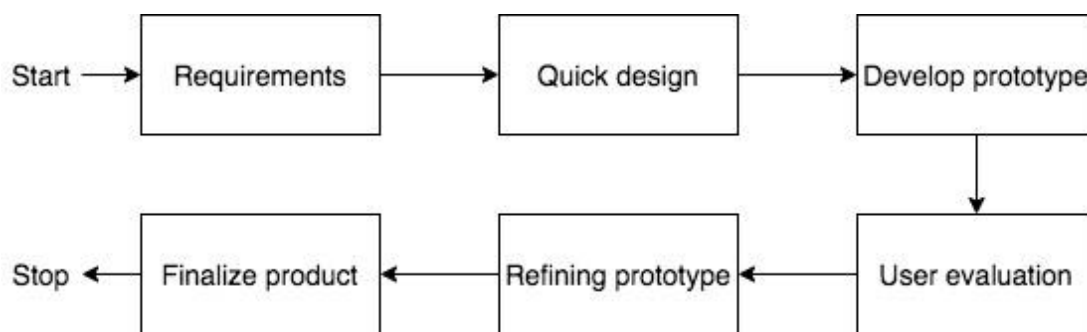
Existing Games	Animal House	Year 3 Science Textbook	Animal Names	Learn Animals Game	Animal Skins
Target User	Kids	Third-year primary	Kids	Kids	Kids



		school students			
<b>Platform</b>	Website	Book	Website	Website	Website
<b>Price</b>	Free	RM12	Free	Free	Free
<b>Multimedia Elements</b>	Text, Graphic, Audio, Animations	Text, Image	Text, Graphic, Audio, Animations	Text, Graphic, Audio, Animations	Text, Graphic, Audio, Animations
<b>Language</b>	English	Bahasa Malaysia	English	English	English
<b>Strength</b>	Use bright colors suitable for the target users and have many multimedia elements	Colorful and have interesting graphics	Use bright colors suitable for the target users and have many multimedia elements	Have many multimedia elements	Use bright colors suitable for the target users and have many multimedia elements
<b>Weakness</b>	Have no level of difficulties which can be boring after a while	Does not have any activities that the user can do	Have no level of difficulties which can be boring after a while	The color is very dull for the targeted users	Have no level of difficulties which can be boring after a while

## 2.4 Project Methodology

The Prototyping Model was used in the methodology of this game-based learning. The prototyping model is a software development method in which a prototype is developed, tested, and altered until it is acceptable. It also provides a framework for the creation of the final system or software. It is best used in situations where the project's requirements are not fully understood. It is an iterative, trial-and-error process that occurs between the developer and the client.



**Figure 2.6 Prototyping Model**

**Table 2.2 Description of The Phases in The Prototyping Model**

Phase	Description
Requirement	A prototyping model starts with requirement analysis. In this phase, the requirements for this project are defined in detail. During the process, the system users for this project, a third-year Science teacher, are interviewed to know their expectations for the system.
Quick design	During this phase, a simple design of the system is created. A storyboard is created and shown to the user, giving them a brief idea of the system. The quick design will help in developing the prototype.
Develop prototype	During this phase, the information gathered from the previous stage is used to create the actual prototype. The prototype development for this project is done by arranging the game's environment and setting the blueprints in the project. Arrange every level and step planned in the storyboard, including adding specific sounds for specific actions.
User evaluation	The finished prototype is presented to the experts for an initial evaluation. The experts will give feedback and suggestion about the project, whether it needs any improvement or not.

Refining prototype	During the refining prototype phase, the lack of the project will be listed. All requirements specified by the experts will be considered to develop a better game-based learning.
Finalize product	In this phase, the game-based learning has been improved successfully based on the requirements. This application will be used as educational tools by teachers for the year 3 Science subject.

## 2.4.1 Instructional Design

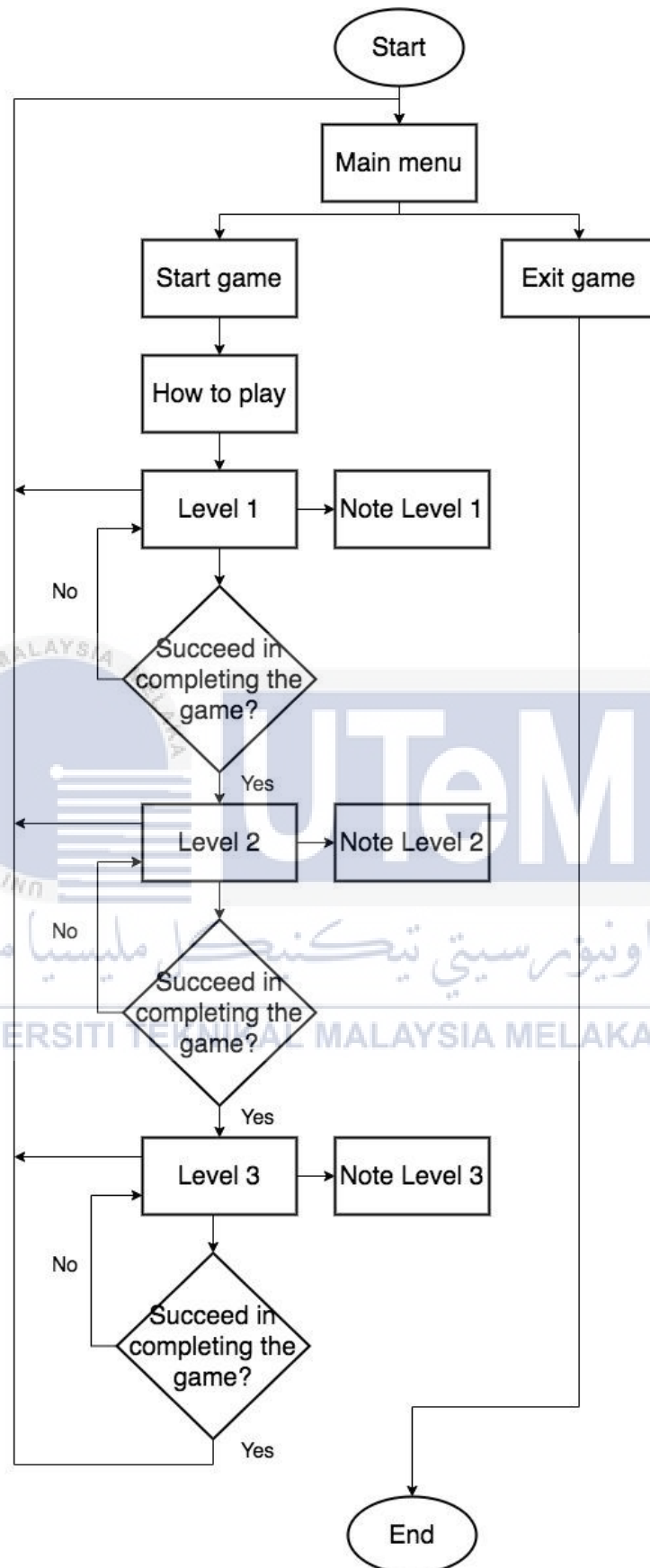
### 2.4.1.1 Educational Goals

The objective of this game-based learning application is to invest the ability of third-year primary school students to understand the subtopic of Science subject Unit 4: Animals via 2D platform game-based learning. Third-year primary school students can remember and know about the subtopic by using this learning method.

### 2.4.1.2 Flowchart

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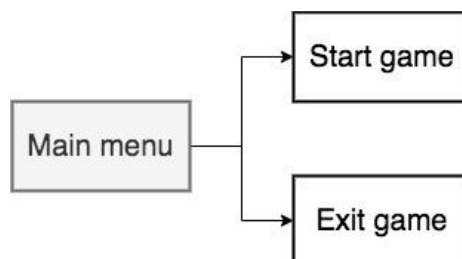




**Figure 2.7 Flowchart**

### 2.4.1.3 Detailed Course Content

#### (a) Main Menu



**Figure 2.8 Detailed Course Content (Main Menu)**

#### (b) Game start

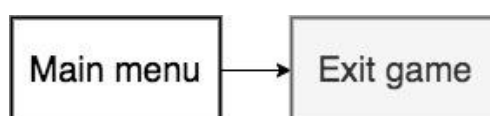


**Figure 2.9 Detailed Course Content (Game Start)**

- Level

At each level, players are required to rescue three trapped animals, so the title for this game is "Rescue The Animals". The three animals that need to be saved have different characteristics. The player needs to rescue the three animals to move to the next level. After the player successfully rescues an animal, a note will pop-up. The note that appeared is based on the subtopic Animals in the year 3 Science subject.

#### (f) Exit game



**Figure 2.10 Detailed Course Content (Game Exit)**

- Test Questions

This game does not provide quizzes but only notes. Hence, there are no test questions.

- Metaphor

This platform game-based learning was designed in 2D with a flat design style, and the theme for this game is the jungle. The main colours for this game-based learning are green, brown, and red for a pop of colour. The usage of the different hues of green and brown was to create the environment of a jungle. According to Wilson (1966), cold colours such as green can keep the learners calm. The red colour was used for the title of the game. Wilson also stated that warm colours such as red as the perfect colours for attracting students' attention and encouraging active participation in activities and prevent learners from getting bored. The instructions and settings were displayed on a piece of wood to match with the jungle theme.

## 2.5 Project Requirements

The software and hardware required in developing game-based learning are discussed below.

### 2.5.1 Software Requirements

The table below shows the software required and their functions.

**Table 2.3 Software Requirements**

<b>Software</b>	<b>Function</b>
GDevelop	To develop the game-based learning
Adobe Illustrator	To design the graphics of the game-based learning
Audacity	To remove noise to recorded audio

### 2.5.2 Hardware Requirements

The table below shows the hardware required and their functions.

**Table 2.4 Hardware Requirements**

<b>Hardware</b>	<b>Function</b>
Laptop	To develop, design and edit the game-based learning
Mouse	Make the editing process a lot easier

### 2.6 Conclusion

In conclusion, this chapter discussed the existing systems, domains, methodology used to develop the project successfully and the hardware. This chapter clearly states all of the requirements, including software and hardware requirements. The educational design has also been discussed. The following chapter will discuss the analysis phase.

## CHAPTER 3: ANALYSIS

### 3.1 Current Scenario Analysis

This analysis is a process for breaking down potential future events by considering various elective outcomes. The current scenarios being analysed are the Animal House game and the traditional year 3 Science textbook. Based on the analysis, no application was developed particularly for the subtopic Animals in the year 3 Science subject. The majority of the existing tools rely on paper and digital platforms that are insufficiently appealing to primary school students in order for them to memorise the facts. The existing system that has been analysed is as a reference to be used in this new project.

### 3.2 Requirement Analysis

The goal of requirement analysis is to figure out what users need from a new or upgraded product. Requirement analysis will cover tasks such as determining the requirements or criteria that must be met for a new or upgraded item. The target user for this application is third-year primary school students.

#### 3.2.1 Project Requirement – Analysis of system to be developed

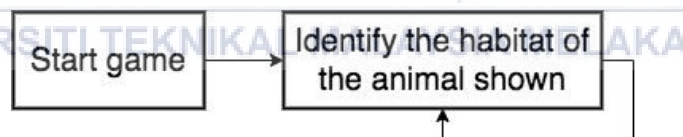
The evolution of information technology (IT) has significantly impacted education, particularly in the last decade. The growth of IT and the ease of access to such IT applications have greatly facilitated the adoption of IT aspects in education. E-learning has become a common feature of teaching and learning at educational

institutions such as schools, colleges, and universities. The more extensive allocation of resources for e-learning at such institutions confirms this. The topic chosen to focus on for this project is the subtopic Animals in year 3 Science subject. This initiative aims to assist primary school teachers in teaching students another way to pique their attention and help them memorise information through a game-based learning method.

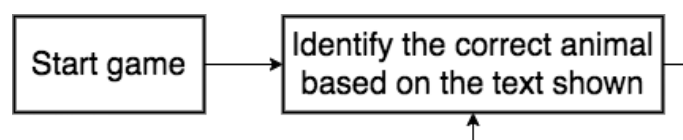
### 3.2.1.1 Requirement Gathering

The genre of this game-based learning is a platformer genre and designed in 2D with a flat design style. The title given for this game-based learning is "Rescue The Animals." It is about an explorer in the jungle whose mission is to rescue the trapped animals from the enemies. In each level, the explorer needs to rescue all three animals to get to the next level. When the explorer succeeds in rescuing the animals, a note will pop-up. The note is based on the subtopic Animals in the year 3 Science subject.

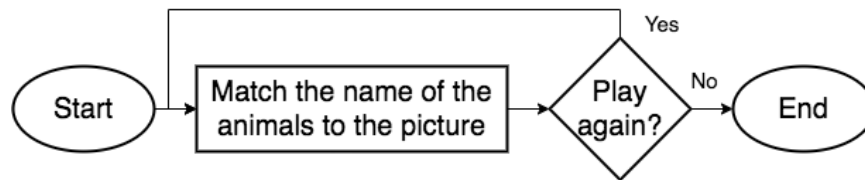
The existing game that was used as a reference was found on the website Y8 Game. These four games are targeted towards kids. No reference was found about the specific targeted age group for these games. These games are quiz games to test the knowledge of the players about animals. The downside of these games is that there is not much excitement. Players can get bored after playing them.



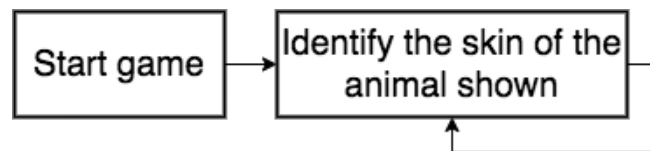
**Figure 3.1 Flow of The Existing Game (Animal House)**



**Figure 3.2 Flow of The Existing Game (Animal Skin)**



**Figure 3.3 Flow of The Existing Game (Learn Animals Game)**



**Figure 3.4 Flow of The Existing Game (Animal Skin)**

The existing game has a less interactive element and repeats the same thing after the player fails or succeeds. However, the 2D platform game-based learning developed is more fun and interesting. The significant difference between the existing system and the "Rescue The Animals" is that challenges make the learning process a lot more exciting. Because of the media elements and interactivity, this game-based learning also helps students understand and remember what they need to remember.

### 3.2.1.2 Technical Analysis

Technically, this game-based learning was designed by using Adobe Illustrator. The software needed to developed this project was GDevelop. GDevelop is a free and open-source game engine and can be downloaded at their official website (<https://gdevelop-app.com/>). This project can be used by using a personal computer.

### 3.2.2 Software Requirement

The table below shows that software used and their functions.

**Table 3.1: Software requirement**

Software	Function
GDevelop	This software was used to develop game-based learning.
Adobe Illustrator	This software was used to design the main characters, enemies, and the game's environment.
Audacity	This software was used to remove the noise of the recorded audio.

### 3.2.3 Hardware Requirement

In addition to software requirements, hardware requirements are also necessary for the development of this project. Therefore, a laptop and a mouse are all that are needed. This hardware was used to develop better game-based learning to be used. The table below explains the role of each piece of hardware.

**Table 3.2: Hardware requirement**

Hardware	Function
Laptop	This hardware was used to design and run the project.
Mouse	This hardware was unnecessary, but it makes the designing process a lot easier.

### 3.2.4 Other Requirements

There are no other requirements in the process of developing this project.

## 3.3 Project Schedule and Milestones





6.	Apply multimedia element in the multimedia content																		
7.	Progress of multimedia content development																		
8.	Implementation of multimedia content development																		
9.	Testing the product																		
10.	Evaluate the product																		
11.	Final presentation of the product																		

### 3.4 Conclusion

This chapter summarises all of the analysis completed before beginning the new phase and explains the need for analysis, the current design, and the game-based learning developed. The design of the game-based learning will be discussed in the next chapter.

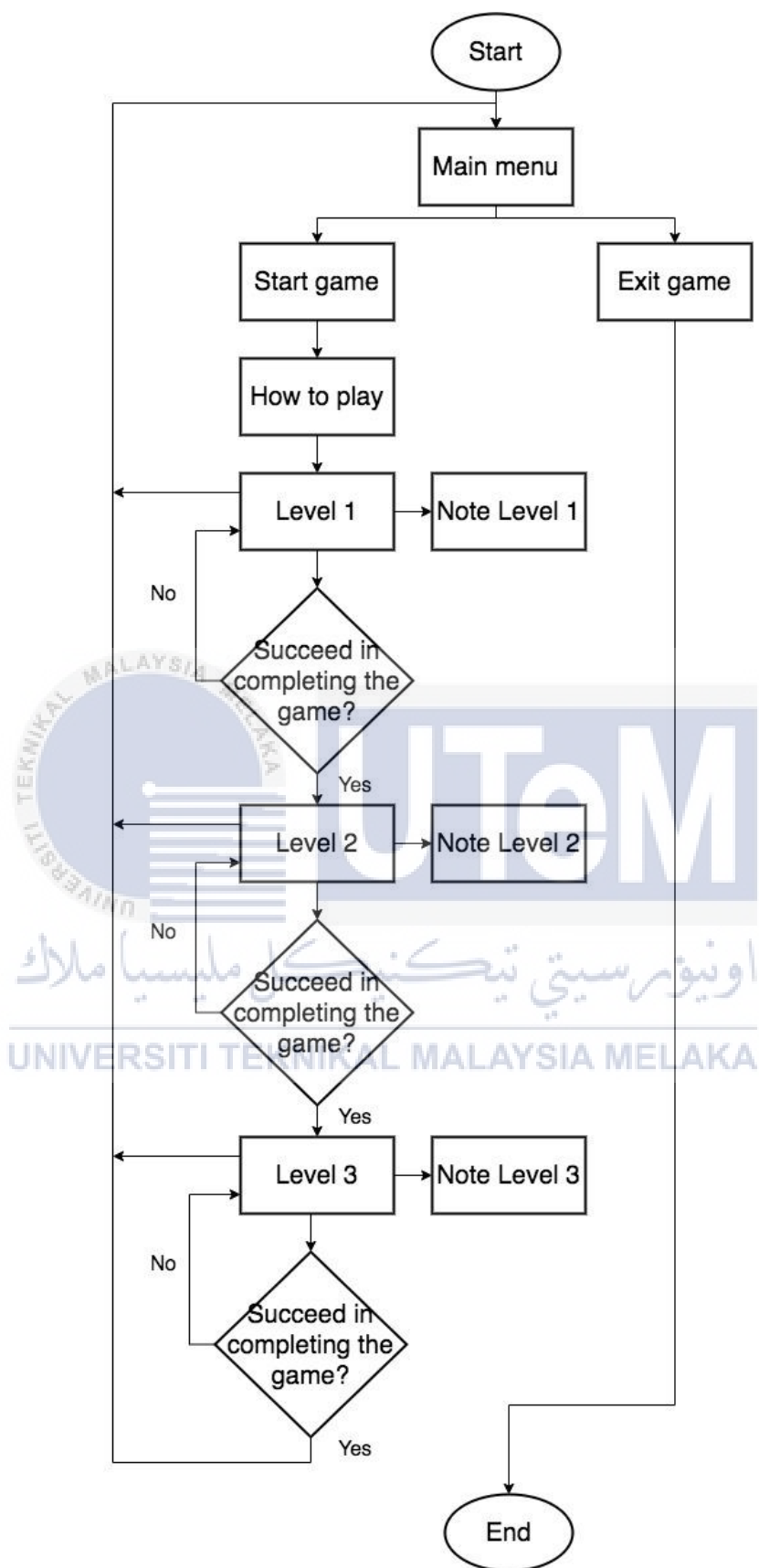
## CHAPTER 4: DESIGN

### 4.1 Introduction

The second phase of developing this game-based learning is design. Typically, one or more designs were produced throughout this phase to achieve a good design. The project requirements determine the product design phase. Finally, an application was developed to address the issue. A method for developing a new product plan is referred to as design. The preliminary design, as well as the input design, are both included in this chapter.

### 4.2 Game Architecture

In this phase, the system architecture was identified and designed. Diagrams and diagram systems were used to demonstrate the game structure's design. In this game-based learning, there are three levels. These levels consist of three notes based on the subtopic Animals in the year 3 Science subject. The higher the level, the higher the difficulty. The level becomes challenging due to the increase of obstacles and enemies.



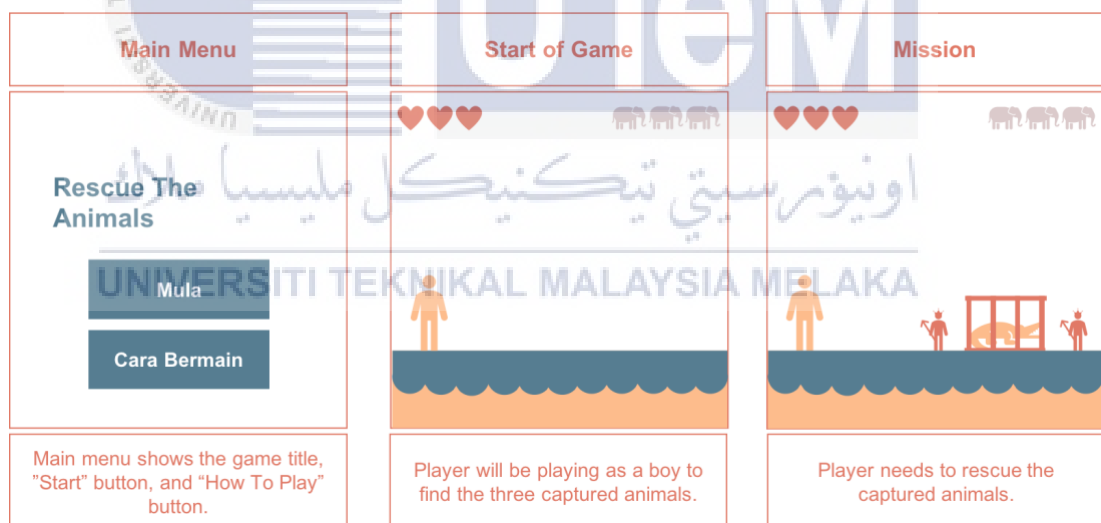
**Figure 4.1 Game Architecture**

### 4.3 Preliminary Design

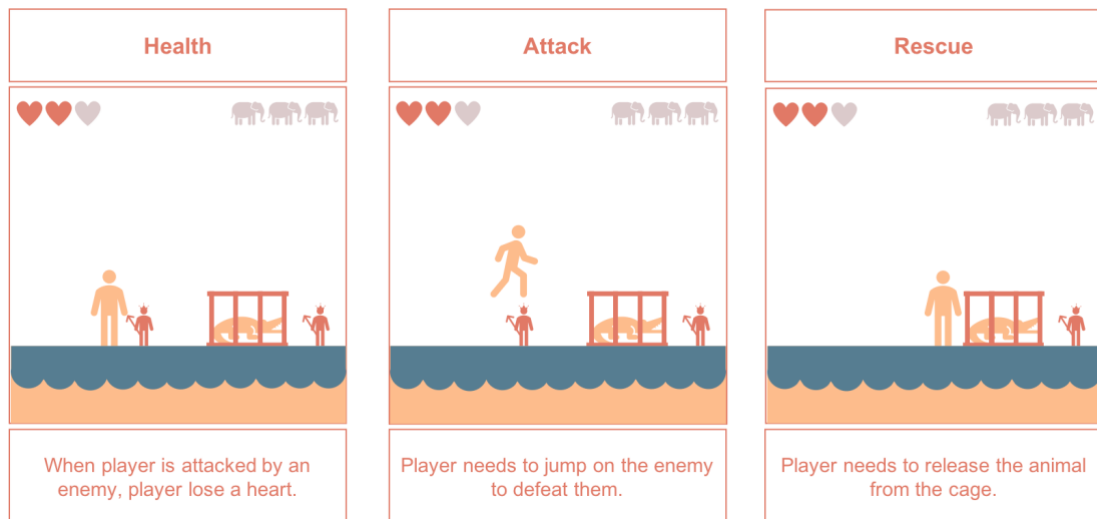
The preliminary design for the entire treatment facility is the design that must be implemented. It is also seen as the high-level architectural design used to create a design that satisfies the demand. The game's architecture, which includes the user interface, is determined by the high-level design. In addition, one of the most important aspects of a developer's interface design is user interface design. Finally, it is a rough sketch of a project based on the chosen theme.

#### 4.3.1 Storyboard

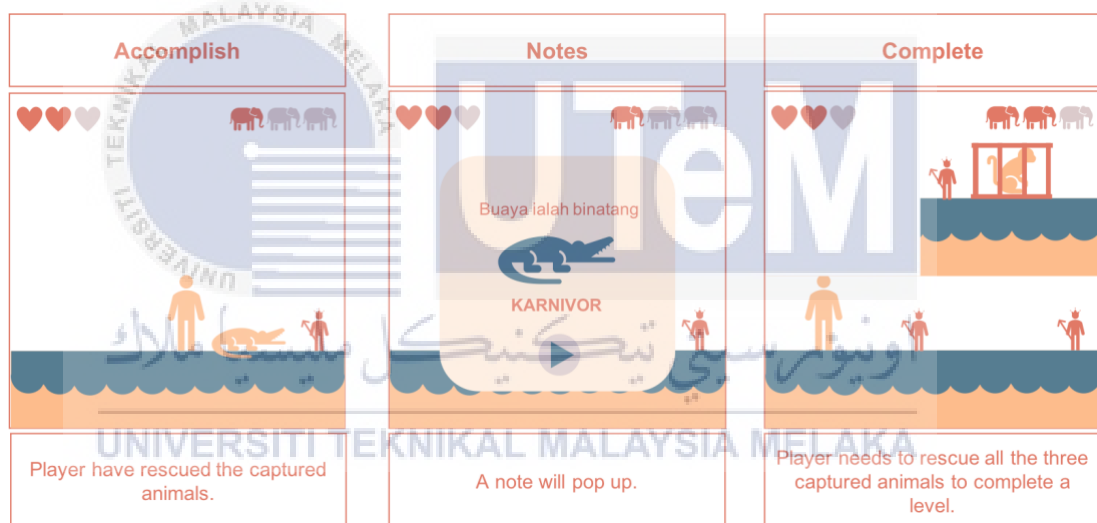
A storyboard is a visual representation of a story that is created in mind. It will use a linear sequence of illustrations to summarize the story's chronological maps. It will also help to keep the development on track. When there is a fresh idea for the storyline, a storyboard will lead to a better improvement.



**Figure 4.2 Storyboard for The Main Menu, The Start of The Game, and Its Mission**



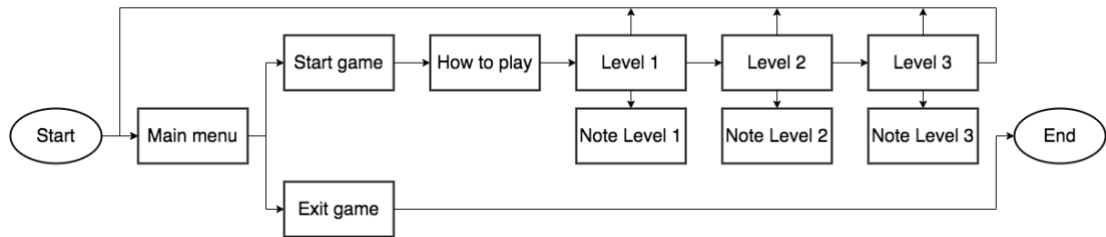
**Figure 4.3 Storyboard About The Health of The Players, How The Player Can Attack The Enemies, and What They Need to Do in The Game**



**Figure 4.4 Storyboard About The Accomplishment of The Player, The Pop-up Notes, and How to Complete The Game**

#### 4.4 User Interface Design

##### a) *Navigation Design*



**Figure 4.5 Navigation Design**

b) *Input Design*

This game-based learning is intended to assist primary school teachers in assisting primary school students in learning and remembering the subtopic. This game-based learning provides notes based on the subtopic Animals in the year 3 Science subject. Every note at every level is different. Third-year primary school students and Science teachers can use this game-based learning on their personal computers.

c)

*Output Design*

The output design creates game-based learning that provides notes based on the subtopic Animals in year 3 Science subject. There are three levels in the game. At every level, there are three trapped animals. The players are required to rescue these three animals to complete the level. When the trapped animals are rescued, notes will pop-up. Every note provided in each level is different.



Figure 4.6 Output Design (Main Menu Page)



Figure 4.7 Output Design (How to Play Page)





Figure 4.8 Output Design (Level 1 Page)



Figure 4.9 Output Design (One of The Notes at Level 1)



Figure 4.10 Output Design (Level 1 Completed Page)



Figure 4.11 Output Design (Level 2 Page)

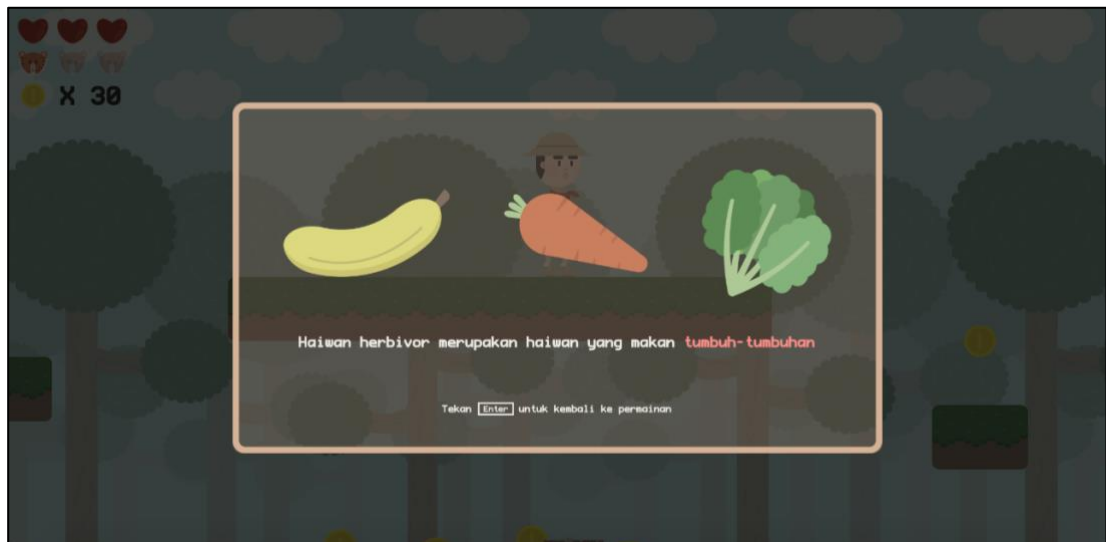


Figure 4.12 Output Design (One of The Notes at Level 2)



Figure 4.13 Output Design (Level 2 Completed Page)



Figure 4.14 Output Design (Level 3 Page)

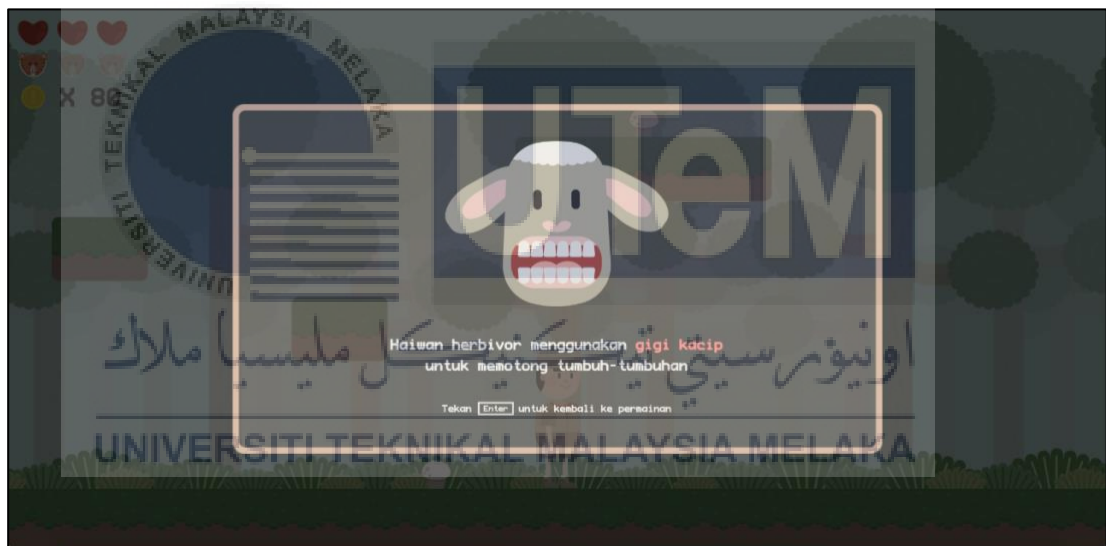


Figure 4.15 Output Design (One of The Notes at Level 3)



Figure 4.16 Output Design (Level 3 Completed Page)



Figure 4.17 Output Design (Game Paused)



**Figure 4.18 Output Design (Try Again?)**

d) *Metaphor*

The theme for this game-based learning is the jungle, and it was designed in 2D with a flat design style. The story behind this game is an explorer whose mission is to rescue all the trapped animals. He needs to rescue all the animals to complete the game.



e) *Template Design*

This game-based learning does not have a template design. Instead, the designs were made following the game's story.

f) *Media Creation and Integration*

All the designs for this game-based learning were designed using Adobe Illustrator. The audio and font were taken from the website YouTube (<https://www.youtube.com/>), Freesound (<https://freesound.org/>), FontSpace (<https://www.fontspace.com/>) and Dafont (<https://www.dafont.com/>). All of the media

elements that were taken were made sure royalty-free and free for commercial use. The background music was taken from YouTube and converted to mp4 using the website MP3Juices (<https://www.mp3juices.cc/>).

#### 4.5 Conclusion

In conclusion, it can be stated that all of the components mentioned in this chapter are essential for creating flowcharts and storyboards. This is since it delivers a high-quality result when developing the game.

The game architecture gave a brief idea about the flow of this game-based learning. The purpose of user interface design is to demonstrate the structure of the game. From a project standpoint, the developer must also create a storyboard that helps in the development process. The navigation design has been stated in this chapter to show the flow of this game. The output design is shown as well to show the overall look of the game. All the source of the multimedia elements used that is taken from the Internet is stated.

The implementation phase will be explained in the next chapter. The next chapter will go over the implementation phase.



## CHAPTER 5: IMPLEMENTATION

### 5.1 Introduction

This chapter discusses the implementation and evaluation process that carried on the project. The development of the environment, the game mechanics, platform development, and the game levels are also described in terms of implementation. During this phase, the project will focus on the development of the texts, graphic elements, and audio.

In this chapter, the things that will be discussed are media creation, game assets, and implementation status. Media creations are including texts, graphic elements, and audio production. Media integration is about the integration of projects from different media. The implementation status will be identified later on. User requirements and user-friendly design were used as a target to produce the expected outcome.

### 5.2 Media Creation

Text, graphics, music, video, and animation are all examples of media creation. Not all of the media creations in this project are appropriate to use in this game-based learning. As a result, just three types of media creation will be discussed: text production, graphics production, audio production, and animation production.




### 5.2.1 Production of Texts

Text is one of the multimedia elements used to develop this game. Text will convey a message to players so that they understand how to play and how the game works.

**Table 5.1 Sample of Texts**



Texts	Type of Texts	Fonts Handling	Texts Format
	Descriptive	04b_19	Regular with 5.375px stroke
	Narrative	ProFrontWindows	Bold
	Descriptive	ProFrontWindows	Bold
	Descriptive	ProFrontWindows	Bold
	Descriptive	ProFrontWindows	Bold
	Descriptive	ProFrontWindows	Bold
	Narrative	ProFrontWindows	Bold
	Descriptive	ProFrontWindows	Bold



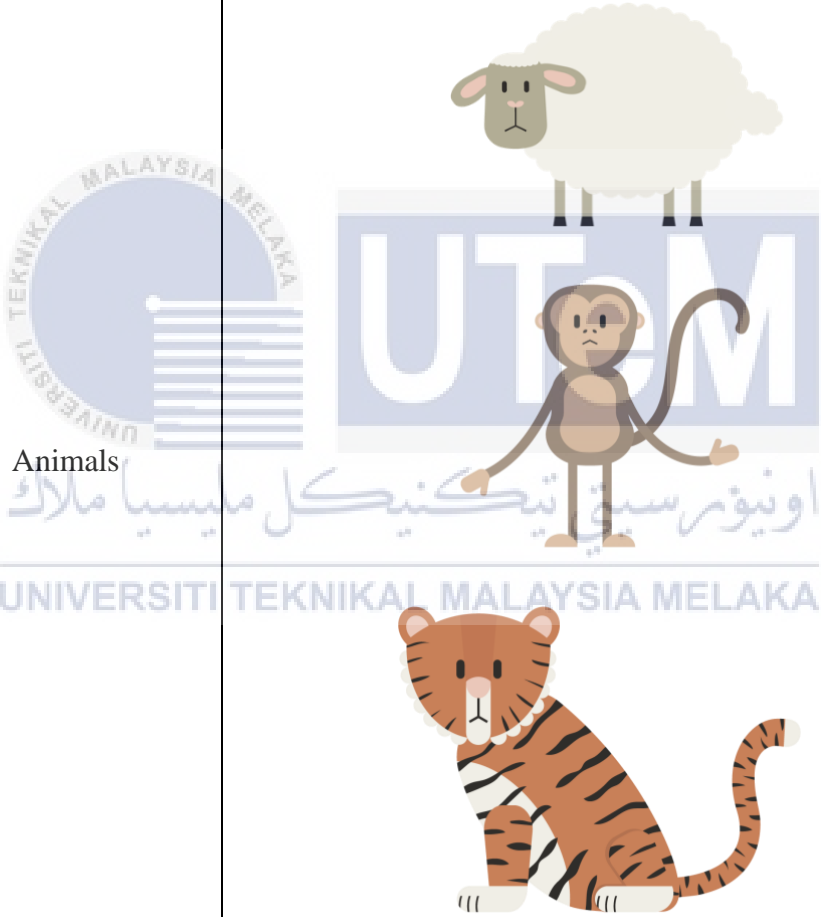

	Narrative	ProFrontWindows	Bold
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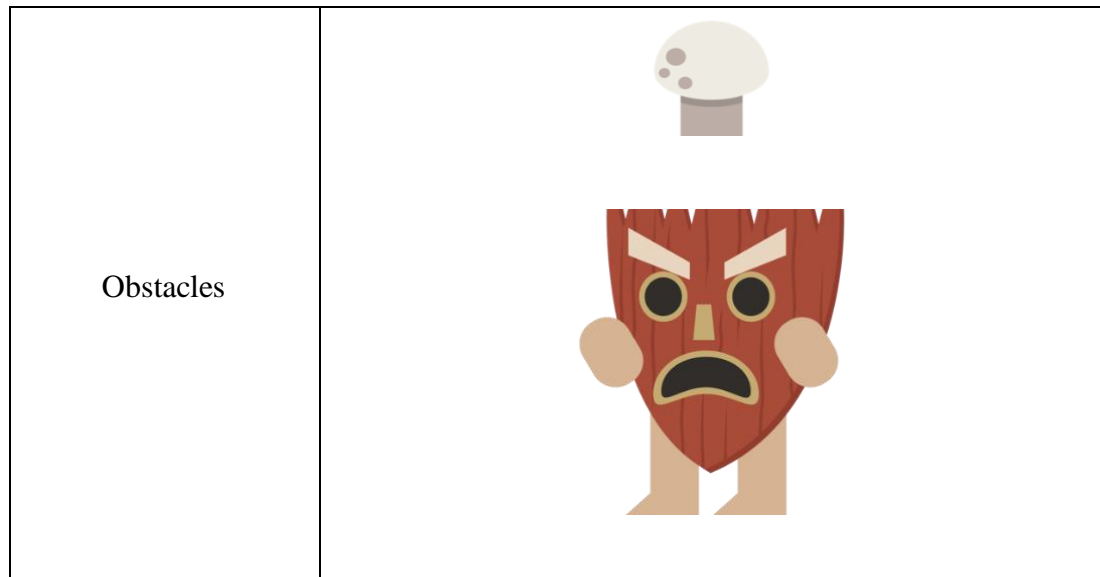
### 5.2.2 Production of Graphics

Graphics are the most crucial part of the game. The graphics are the elements that make the players attracted to it. The graphics were designed in vector using Adobe Illustrator. The theme for this game is jungle. According to Spiliotopoulos, Rigou, and Sirmakessis (2018), flat design focuses on bright colors, simple lines, and 2D drawing techniques to emphasize simplicity. All the graphics in the game were designed in flat design.

Table 5.2 Sample of Graphics

Type of Graphics	Graphics
Main menu background	
Environment	

Platform	
Main character	
Animals	
Enemies	

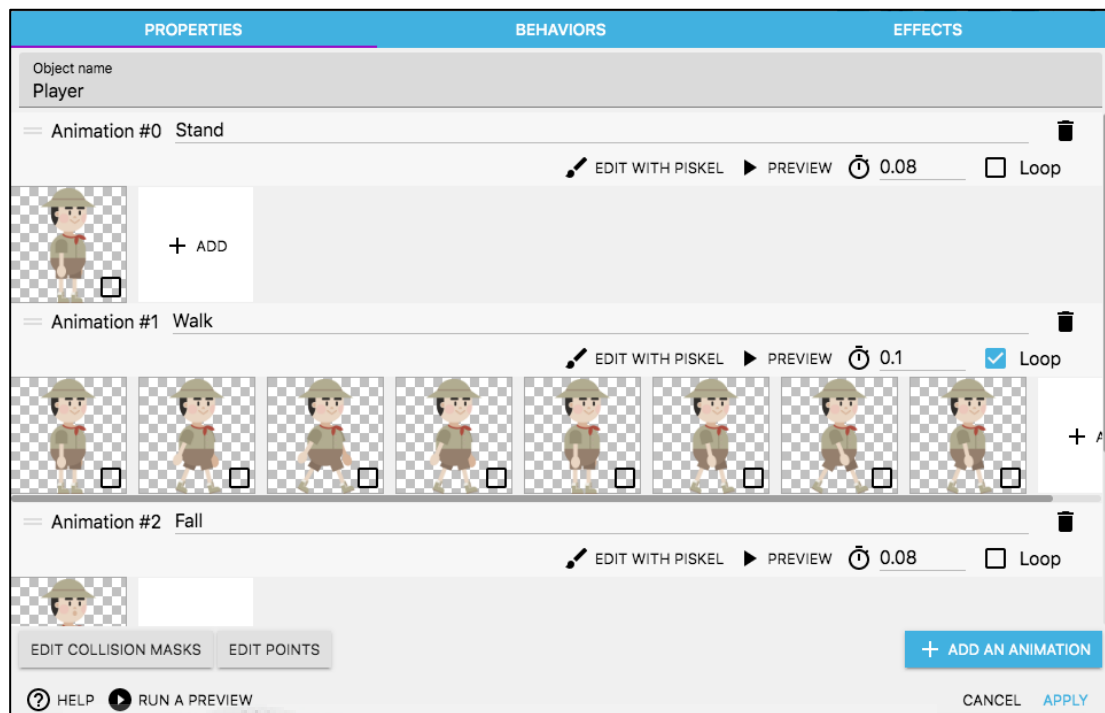


### 5.2.3 Production of Audio

The addition of audio for the notes can be beneficial to players who are not good at reading. A voice talent was recruited to read the text of the pop-up notes. The text was sent to the voice talent via WhatsApp. The voice talent recorded her voice using her phone then sent it via WhatsApp as well. Audacity was used to remove the noise of the audio and pitching adjustment. Non-copyright background music from YouTube was converted from video to .wav file using the website MP3Juices. The sound effects downloaded from the website Freesound does not require any conversion since the downloaded file is already in a .wav file.

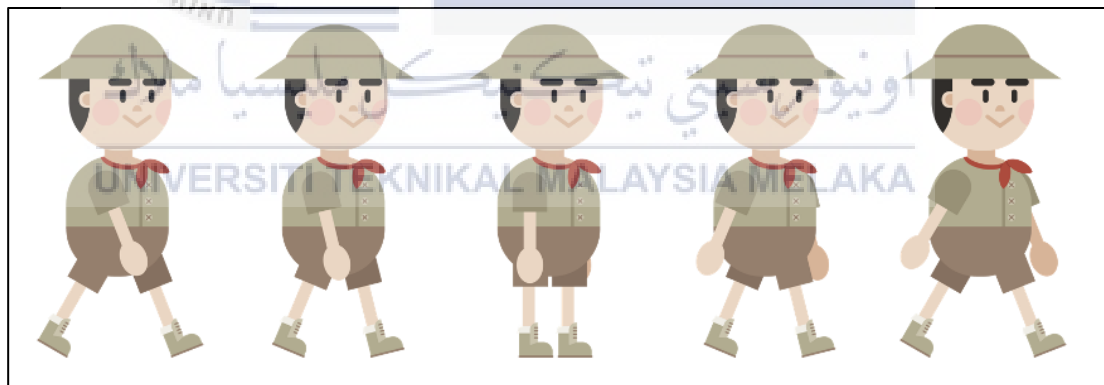
### 5.2.4 Production of Animation

GDevelop has a feature to create animations using the graphics imported to the application. However, the character needs to have a frame by frame graphics of their movement to make it happen. Frame by frame animation was designed using Adobe Illustrator and exported one by one in a .png file. The figure below shows the interface where animation can be created in GDevelop.



**Figure 5.1 Add an Animation in GDevelop**

The figure below shows the walk animation frame by frame of the main character.



**Figure 5.2 Walk Animation Frame by Frame of Main Character**

### 5.3 Media Integration

This game-based learning project consists of various of multimedia elements. The graphics used for image and objects in the games were created by using Adobe Illustrator. All the graphics in this game were exported to .png format to get the high quality graphic then imported them to GDevelop. The graphics were used in this game

as assets during project implementation. The function of the buttons were created by using the tools in the GDevelop. After the game-based learning was developed, then the game can be launch and played in PC or laptop.

## 5.4 Product Configuration Management

### 5.4.1 Configuration Environment Setup

All the graphics for the game designed using Adobe Illustrator were saved in png file. The files were then transferred into the default GDevelop projects folder. All the files were sorted and kept in specific folders, so it is easier to find them.

This game-based learning used three non-copyright background music from YouTube. The background music chosen has a chiptune musical style. The YouTube video was converted to an mp3 file using a website called MP3Juices. The sound effect for behavior like jumping and collecting items are from freesound.

## 5.5 Implementation Status

This status is used to keep track and record the progress of project development status. In this section, the progress status of the project development will be discussed.

**Table 5.3 Implementation Status**

Module	Duration	Status
Design the characters for the game	2 weeks	Complete
Design the backgrounds for the game	1 week	Complete
Design the button and other graphics for the game	1 week	Complete
Set up the game environment in GDevelop5	1 week	Complete
Develop the game and make it well functioned	4 weeks	Complete

Add sound to the game	1 weeks	Complete
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## 5.6 Conclusion

As the conclusion, the implementation phase is very essential in project development. In this section, the development of graphics, text and audio that will be used in the game-based learning are stated clearly. The development of every element are explained in detail. In the next chapter, testing phase will be discussed to proof that this game-based learning project achieve the objectives.



## CHAPTER 6: TESTING

### 6.1 Introduction

This chapter discusses the process and the results of the findings obtained from the testing activity. Testing was performed to determine whether the game meet the objectives or otherwise. The data collected was from the questionnaire and surveys answered by the Alpha and Beta testers. Before distributing the questionnaire and survey, the game was tested many times to ensure it runs as smoothly as required and expected. This activity was conducted to achieve the last objective: to evaluate the effectiveness of learning the subtopic Animals in the year 3 Science subject for third-year primary school students using this game.

### 6.2 Test Plan

Testing was performed to test the effectiveness of understanding the subtopic Animals in the year 3 Science subject using the game developed. There are many methods available to collect data. The questionnaire and surveys method was used for this project since it is the most suitable method to gather data during this pandemic. Alpha and Beta testing were performed as well in this testing activity. Alpha and Beta testing is a type of acceptance testing to uncover any possible issues before the game launches.



### 6.2.1 Test User

There were two groups of test users which were Alpha tester and Beta tester. The Alpha tester performed Alpha testing, while the Beta tester performed Beta testing. Alpha testers were Information Technology Expert (ITE), Subject Matter Expert (SME), and Student Expert (SE). ITE consists of experts in one or more of these fields: content learning, mobile application, multimedia development, and game development. SME is the Science teacher who teaches in primary school while SE is fourth to sixth-year primary school students. Fourth to sixth-year primary school students were chosen to be the SE because they had learnt the subtopic Animals in year 3. Beta testers were the target users of this game who are third-year primary school students.

There were 7 Alpha testers involved, 2 were ITEs, 2 were SMEs, and the rest were SE. There were 26 third-year primary school students for Beta testers. They were divided into two groups, the control and experimental groups. The control group used the traditional teaching method, the textbook, while the experimental group used the game to answer the test. The results can determine the effectiveness of the game in helping the students to understand the subtopic.

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### 6.2.2 Test Environment

Supposedly, the test needs to be performed by meeting the Alpha testers and Beta testers. Due to the pandemic, schools are closed, and it is very dangerous to go outside. The best way to carry out the test is online. So, the testing took place solely in the homes of the testers. The test was conducted via Google Form, YouTube, WhatsApp, and Telegram. The hardware required to perform the testing is a laptop, smartphone and Wi-Fi.

### 6.2.3 Test Schedule

The testers were given a quick brief about the game and the purpose of conducting this testing via WhatsApp. All the details about the game and the project were explained, and a link to the demonstration video was also provided in Google Form.

Table 6.1 shows the details about the testing. The table stated the experts and testers involved, the duration, location, date of distribution and method used in detail.

**Table 6.1 Test Schedule**

Type of Testing	Alpha Testing	Beta Testing
Tester Involved	1. ITE Experts in: <ul style="list-style-type: none"> <li>• Content learning</li> <li>• Mobile application</li> <li>• Multimedia developer</li> <li>• Game developer</li> </ul> 2. SME Primary school Science teacher  3. SE Fourth to sixth-year primary school students	Third-year primary school students
Number of Tester	<ul style="list-style-type: none"> <li>• ITE: 2</li> <li>• SME: 2</li> <li>• SE: 3</li> </ul>	<ul style="list-style-type: none"> <li>• Control group: 15</li> <li>• Experimental group: 15</li> </ul>
Date of Distribution	14.08.2021	27.08.2021
Duration	Following tester's time	Following tester's time

Location	Tester's home	Tester's home
Data Collection Method	Questionnaire and survey	Questionnaire and survey

### 6.3 Test Strategy

#### 6.3.1 Alpha Testing

The ITEs can give feedback based on their experience and knowledge in design, colour selection, layout, and so on. Professional comments and criticism from SMEs can help improve the content of the game and the knowledge delivery. Meanwhile, SEs can give their perceptions about the game in terms of suitability for people their age.

The Google Form link was distributed to the Alpha testers via WhatsApp. The Alpha testers will watch the video demonstration first then play the game by clicking the link provided in Google Form. The questionnaire answered by Alpha testers focuses on the design aspect, content, knowledge delivery, and suitability. Alpha testers can leave any suggestion for improvement at the final part of the questionnaire.

#### 6.3.2 Beta Testing

26 third-year primary school students performed Beta testing via Google Form. The 26 students were divided into two groups, the control group and the experimental group. The result of this test can determine if this game meet the objectives. The limitation while conducting Beta testing was that all schools in Malaysia are closed due to Covid-19 cases. So, the Google Form link was shared with friends, relatives, and acquaintances with children or siblings in year 3. The fault in doing this is that the students are not from the same school. Nevertheless, all the Beta testers were third-year primary school students even they were from different schools.

Beta testers need to answer two tests for Beta Testing. One is a pre-test, and another one is a post-test. Both groups, control and experimental, are required to answer pre-test and post-test. Firstly, both groups will answer the pre-test. They need to answer the test without referring to any sources. Then, the control group will use the textbook to study. At the same time, the experimental group will use the game before answering the post-test. After they study using the mentioned learning materials, they can answer the post-test. The data obtained from both tests were compared to see which learning materials explain the subtopic better.

## **6.4 Testing Implementation**

The topics that will be discussed in test implementation are test description and test data. The details will be discussed further below.

### **6.4.1 Test Description**

The test description will describe the two testings, Alpha testing and Beta testing, in detail.

#### **6.4.1.1 Alpha Testing**

Alpha testing was conducted to see if the game is qualified to be used by the target users. If the game is not qualified, beta testing cannot be performed. Modification to the game needs to be done until it is qualified. The data from Alpha testing can be manipulated to obtain the mean of the data. The mean is what determines the qualification of the game. The average scale of each question in every construct was calculated to obtain the mean value of every construct. The table below shows the value of mean that requires improvement and modifications and the value of mean that can proceed to Beta testing.

**Table 6.2 Mean for Alpha Testing**

Mean	Details
Mean > 3.0	Requires improvement and modification
Mean < 3.0	Can proceed to Beta testing

#### 6.4.1.2 Beta Testing

There were two tests that Beta testers took during Beta testing, which were pre-test and post-test. The pre-test was performed to know the Beta testers knowledge about the subtopic Animals. The data obtained from the pre-test was used to divide Beta testers into two groups. This is to ensure that both groups have the same knowledge level about the subtopic.

After they were divided, the post-test was distributed to each of them. The marks for pre-test and post-test were compared to see how much do both groups improve. Their improvements are what determine the success of this game.

#### 6.4.2 Test Data

The evaluation of data was collected after the testing session for both types of testing were completed. The result was recorded to be evaluated. The result of these tests is what determines whether this project meets the objectives of the game. The test result was collected and analysed.

##### 6.4.2.1 Alpha Testing

There were six construct questions in Alpha Testing. Learnability, effectiveness, ease of use, flexibility, attitude, and perceptions. The questionnaire for ITEs and SMEs had all the constructs. However, SE had only four which were learnability, effectiveness, attitude and perceptions. The table below shows the scale value used in the questionnaire.

**Table 6.3 Scale Value for Alpha Testing**

Scale value	Scale
Strongly disagree	1
Disagree	2
Less agree	3
Agree	4
Strongly agree	5

The first section of the questionnaire that needed to fill by the Alpha testers was demographic questions. These data were collected to ensure that the testers who involved in the testing were the right person.

(a) *Information Technology Expert (ITE)*

They were 2 ITEs who answered the questionnaire. The first ITE was Assoc. Prof. Ts. Dr. Ahmad Naim Che Pee @ Che Hanapi. He is an expert in content learning, mobile application, multimedia development, and game development. The second ITE was Ts. Dr. Hamzah Asyrani Sulaiman. Unlike the first ITE, he is an expert only in game development. Nevertheless, they both work in Universiti Teknikal Malaysia Melaka (UTeM) and have more than 10 years of working experience.

The table below shows the rating scale of the game rated by ITEs.

**Table 6.4 Rate of Usability of Game (ITE)**

No.	Questions	Scale				
		1	2	3	4	5
<b>A. Learnability</b>						
1.	The game can be used without any problems.				1	1
2.	The game can be controlled from beginning to end.					2

3.	Learning the subtopic Animals becomes easier and attractive to the students.				1	1
<b>B. Effectiveness</b>						
1.	The game helps the lessons delivered more effectively.			1		1
2.	The modules in the game are easy to follow and understand.				1	1
3.	Integration of media such as audio, graphics, and animation are accurate and very helpful to the students.				1	1
4.	Game modules contained in the game are appropriate and realistic to help the students gain knowledge.				1	1
<b>C. Ease of Use</b>						
1.	The use of colour and design layout in the game are interesting.				1	1
2.	Interface and the graphical display are appropriate, clear and attractive.				1	1
3.	The game is user-friendly and easy to use.				1	1
4.	The screen display is appropriate, attractive and increases interest.				1	1
5.	The readability of the text is clear and easy to understand by the target.			1		1
6.	Menus available in the game are easy to understand.				1	1
7.	Navigations and interactions are easy to use.					2
8.	Multimedia elements in the game are interesting.				1	1
9.	A very short time is required to understand how the game is functioning.					2
<b>D. Flexibility</b>						
1.	The game is not easy to 'crash'.					2
2.	The game is easy to find and used.				1	1

3.	The game is not problematic and not easy to 'hang'.					2
<b>E. Attitude</b>						
1.	The game is able to motivate the students.			1		1
2.	Description and 2D animated given in the courseware fulfil the students' desire to learn the subtopic Animals.				1	1
3.	The game offerings are suitable, funny and not offensive to the students.			1		1
4.	The game is able to stimulate thinking and develop the minds of the students.				1	1
5.	The game allows the students to learn collaboratively with it.					2
6.	The game helps the students become more creative.				1	1
7.	The game can increase the students' interest in learning the subtopic Animals.				1	1
<b>F. Perceptions</b>						
1.	This game is easy to understand.				1	1
2.	This game motivates the students to learn the subtopic Animals.			1		1
3.	The students can relate what they have learned through this game with their environment.				1	1
4.	Learning the subtopic Animals become easier with this game.				1	1
5.	The game provided is easy and fun.			1		1
6.	This game can improve the students' performance.				1	1
7.	This game uses information technology to stimulate the students.			1		1



The table below shows the rating scale of the overall game rated by ITEs.

**Table 6.5 Overall Rate (ITE)**

Questions	ITE 1	ITE 2
Your rate	4	5
Your opinion for improvement (if necessary)	<ul style="list-style-type: none"> <li>Add more use of sound effects such as during when kill the enemy, step on the poison mushroom</li> <li>Add a storyline /mission objective before the game start. This is to ensure that the player know what to do and understand the storyline.</li> </ul>	Well designed game with smooth graphics and good color theme. Great mechanic and it is quite fun to learn about animal by saving the animal from the cage. Great Games!!!
I recommended this game...	Accepted	Accepted

(b) Subject Matter Expert (SME)

They were 2 SMEs who answered the questionnaire. Mrs. Nor Aini Binti Bujang and Mr. Maslienor bin Daud. They both teach in Sekolah Kebangsaan Senai Utama and have more than 10 years of working experience.

The table below shows the rating scale of the game rated by SMEs.

**Table 6.6 Usability of Game (SME)**

No.	Questions	Scale				
		1	2	3	4	5
<b>A. Learnability</b>						
1.	The game can be used without any problems.				1	1

2.	The game can be controlled from beginning to end.				1	1
3.	Learning the subtopic Animals becomes easier and more interesting.				1	1
4.	Students can learn and gain knowledge from the sound as well as the colourful animation and pictures.				1	1
<b>B. Effectiveness</b>						
1.	The game helps the lessons delivered more effectively.				1	1
2.	The modules in the game are easy to follow and understand.				1	1
3.	Integration of media such as audio, graphics, and animation are accurate and very helpful to the students.				1	1
4.	Game modules contained in the game are appropriate and realistic to help the students gain knowledge.				1	1
<b>C. Ease of Use</b>						
1.	The use of colour and design layout in the game are interesting.				1	1
2.	Interface and the graphical display are appropriate, clear and attractive.				1	1
3.	The game is user-friendly and easy to use.				1	1
4.	The screen display is appropriate, attractive and increases interest.				1	1
5.	The readability of the text is clear and easy to understand by the target.				1	1
6.	Menus available in the game are easy to understand.				1	1
7.	Navigations and interactions are easy to use.				1	1
8.	Multimedia elements in the game are interesting.				1	1

9.	A very short time is required to understand how the game is functioning.				1	1
<b>D. Flexibility</b>						
1.	The game is not easy to 'crash'.				2	
2.	The game is not problematic and not easy to 'hang'.				2	
<b>E. Attitude</b>						
1.	The game is able to motivate the students.				1	1
2.	Description and 2D animated given in the courseware fulfil the students' desire to learn the subtopic Animals.				1	1
3.	The game offerings are suitable, funny and not offensive to the students.				1	1
4.	The game is able to stimulate thinking and develop the minds of the students.				1	1
5.	The game allows the students to learn collaboratively with it.				1	1
6.	The game helps the students become more creative.				2	
7.	The game can increase the students' interest in learning the subtopic Animals.				2	
<b>F. Perceptions</b>						
1.	This game is easy to understand.				2	
2.	This game motivates the students to learn the subtopic Animals.				2	
3.	The students can relate what they have learned through this game with their environment.				1	1
4.	Learning the subtopic Animals become easier with this game.				1	1
5.	This game can improve the students' performance.				1	1

6.	This game uses information technology to stimulate the students.				1	1
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The table below shows the rating scale of the overall game rated by SMEs.

**Table 6.7 Overall Rate (SME)**

Questions	SME 1	SME 2
Your rate	5	4
Your opinion for improvement (if necessary)	-	-
I recommended this game...	Accepted	Accepted

(c) *Student Expert (SE)*

They were 3 SEs who answered the questionnaire. Adriana Batrisyia binti Zunaidi, Zayyad Rabbani bin Zunaidi and Siti Farishah binti Mohamed Wahab. Adriana and Farishah were both 12 years old, while Zayyad was 10 years old. Adriana and Zayyad went to the same school, which was Sekolah Kebangsaan Bandar Teknologi, Kajang, Selangor while Farishah went to Sekolah Kebangsaan Damai Jaya. Zayyad is the only male among the 3 SEs. The three of them were familiar with the mobile phone, tablet computer, and phone tab. Zayyad was the only SE that used the electronic gadget mentioned to play games. In contrast, Adriana and Farishah used it to watch edutainment video clips.

The table below shows the rating scale of the game rated by SEs.

**Table 6.8 Rate of Usability of Game (SE)**

No.	Questions	Scale				
		1	2	3	4	5
<b>A. Learnability</b>						
1.	I can use the game without any problems.					3
2.	I can control the game from beginning to end smoothly.				1	2
3.	I can learn the subtopic Animals easier and fun.				1	2
4.	I can gain knowledge from the sound as well as the colourful animations and pictures.					3
<b>B. Effectiveness</b>						
1.	I can understand the lessons delivered more effectively.					3
2.	I can easily follow and understand the modules in the game.					3
3.	The integration of media such as audio, graphics, and animation are accurate and can help me to understand the subtopic Animals.				1	2
4.	I can learn from the game because it looks realistic.					3
5.	I know how to play this game very quickly.					3
<b>C. Attitude</b>						
1.	This game gives me the spirit to learn better.					3
2.	I fell happy when playing this game.				1	2
3.	I enjoyed while playing this game.					3
<b>D. Perceptions</b>						
1.	This game is easy to handle.					3
2.	This game motivates me a lot to learn the subtopic Animals.					3
3.	This game is fun and great.					3

The table below shows the rating scale of the overall game rated by SEs.

**Table 6.9 Overall Rate (SE)**

Questions	SE 1	SE 2	SE 3
Your rate	5	5	5
Your opinion for improvement (if necessary)	-	-	-
I recommended this game...	Accepted	Accepted	Accepted

## 6.5 Test Results and Analysis

According to data and results obtained from Alpha testing, analysis was performed to determine if the game could proceed to Beta testing. Charts and tables were constructed to summarize the data and results collected.

### 6.5.1 Alpha Testing

For ITE and SME, there are 6 construct questions: learnability, effectiveness, ease of use, flexibility, attitude, and perceptions of the game. On the other hand, SE has 4 construct questions: learnability, effectiveness, attitude, and perceptions of the game. The mean of each construct is calculated to determine if the game requires any improvement or not.

#### (a) Information Technology Expert (ITE)

The table below shows the mean of every construct rated by ITEs.

**Table 6.10 Mean for Construct Learnability (ITE)**

No.	Questions	ITE 1	ITE 2	Average Scale
1.	The game can be used without any problems.	4	5	4.5
2.	The game can be controlled from beginning to end.	5	5	5.0
3.	Learning the subtopic Animals becomes easier and attractive to the students.	4	5	4.5
<b>Mean: 4.7</b>				

**Table 6.11 Mean for Construct Effectiveness (ITE)**

No.	Questions	ITE 1	ITE 2	Average Scale
1.	The game helps the lessons delivered more effectively.	3	5	4.0
2.	The modules in the game are easy to follow and understand.	4	5	4.5
3.	Integration of media such as audio, graphics, and animation are accurate and very helpful to the students.	4	5	4.5
4.	Game modules contained in the game are appropriate and realistic to help the students gain knowledge.	4	5	4.5
<b>Mean: 4.4</b>				

**Table 6.12 Mean for Construct Ease of Use (ITE)**

No.	Questions	ITE 1	ITE 2	Average Scale
1.	The use of colour and design layout in the game are interesting.	4	5	4.5

2.	Interface and the graphical display are appropriate, clear and attractive.	4	5	4.5
3.	The game is user-friendly and easy to use.	4	5	4.5
4.	The screen display is appropriate, attractive and increases interest.	4	5	4.5
5.	The readability of the text is clear and easy to understand by the target.	3	5	4
6.	Menus available in the game are easy to understand.	4	5	4.5
7.	Navigations and interactions are easy to use.	5	5	5.0
8.	Multimedia elements in the game are interesting.	4	5	4.5
9.	A very short time is required to understand how the game is functioning.	5	5	5.0
<b>Mean: 4.6</b>				

**Table 6.13 Mean for Construct Flexibility (ITE)**

No.	Questions	ITE 1	ITE 2	Average Scale
1.	The game is not easy to 'crash'.	5	5	5.0
2.	The game is easy to find and used.	4	5	4.5
3.	The game is not problematic and not easy to 'hang'.	5	5	5.0
<b>Mean: 4.8</b>				

**Table 6.14 Mean for Construct Attitude (ITE)**

No.	Questions	ITE 1	ITE 2	Average Scale
1.	The game is able to motivate the students.	3	5	4.0
2.	Description and 2D animated given in the courseware fulfil the students' desire to learn the subtopic Animals.	4	5	4.5



3.	The game offerings are suitable, funny and not offensive to the students.	3	5	4.0
4.	The game is able to stimulate thinking and develop the minds of the students.	4	5	4.5
5.	The game allows the students to learn collaboratively with it.	5	5	5.0
6.	The game helps the students become more creative.	4	5	4.5
7.	The game can increase the students' interest in learning the subtopic Animals.	4	5	4.5
<b>Mean: 4.4</b>				

**Table 6.15 Mean for Construct Perceptions (ITE)**

No.	Questions	ITE 1	ITE 2	Average Scale
1.	This game is easy to understand.	4	5	4.5
2.	This game motivates the students to learn the subtopic Animals.	3	5	4.0
3.	The students can relate what they have learned through this game with their environment.	4	5	4.5
4.	Learning the subtopic Animals become easier with this game.	4	5	4.5
5.	The game provided is easy and fun.	3	5	4.0
6.	This game can improve the students' performance.	4	5	4.5
7.	This game uses information technology to stimulate the students.	3	5	4.0
<b>Mean: 4.3</b>				

**Table 6.16 Mean for All Constructs (ITE)**

Construct	Mean
Learnability	4.7
Effectiveness	4.4
Ease of use	4.6
Flexibility	4.8
Attitude	4.4
Perceptions	4.3

The table above shows the mean for all the constructs in the questionnaire. The mean for all the constructs for ITE exceeds 3.0. Hence, the game does not require any improvements and modifications and can proceed to Beta testing.

(b) *Subject Matter Expert (SME)*

The table below shows the mean of every construct rated by SMEs.

**Table 6.17 Mean for Construct Learnability (SME)**

No.	Questions	SME 1	SME 2	Average Scale
1.	The game can be used without any problems.	4	5	4.5
2.	The game can be controlled from beginning to end.	5	5	4.5
3.	Learning the subtopic Animals becomes easier and more interesting.	4	5	4.5
4.	Students can learn and gain knowledge from the sound as well as the colourful animation and pictures.	4	5	4.5
<b>Mean: 4.5</b>				

**Table 6.18 Mean for Construct Effectiveness (SME)**

No.	Questions	SME 1	SME 2	Average Scale
1.	The game helps the lessons delivered more effectively.	4	5	4.5
2.	The modules in the game are easy to follow and understand.	4	5	4.5
3.	Integration of media such as audio, graphics, and animation are accurate and very helpful to the students.	4	5	4.5
4.	Game modules contained in the game are appropriate and realistic to help the students gain knowledge.	4	5	4.5
<b>Mean: 4.5</b>				

**Table 6.19 Mean for Construct Ease of Use (SME)**

No.	Questions	SME 1	SME 2	Average Scale
1.	The use of colour and design layout in the game are interesting.	4	5	4.5
2.	Interface and the graphical display are appropriate, clear and attractive.	4	5	4.5
3.	The game is user-friendly and easy to use.	4	5	4.5
4.	The screen display is appropriate, attractive and increases interest.	4	5	4.5
5.	The readability of the text is clear and easy to understand by the target.	4	5	4.5
6.	Menus available in the game are easy to understand.	4	5	4.5
7.	Navigations and interactions are easy to use.	4	5	4.5
8.	Multimedia elements in the game are interesting.	4	5	4.5

9.	A very short time is required to understand how the game is functioning.	4	5	4.5
<b>Mean: 4.5</b>				

**Table 6.20 Mean for Construct Flexibility (SME)**

No.	Questions	SME 1	SME 2	Average Scale
1.	The game is not easy to 'crash'.	4	4	4.0
2.	The game is not problematic and not easy to 'hang'.	4	4	4.0
<b>Mean: 4.0</b>				

**Table 6.21 Mean for Construct Attitude (SME)**

No.	Questions	SME 1	SME 2	Average Scale
1.	The game is able to motivate the students.	4	5	4.5
2.	Description and 2D animated given in the courseware fulfil the students' desire to learn the subtopic Animals.	4	5	4.5
3.	The game offerings are suitable, funny and not offensive to the students.	4	5	4.5
4.	The game is able to stimulate thinking and develop the minds of the students.	4	5	4.5
5.	The game allows the students to learn collaboratively with it.	4	5	4.5
6.	The game helps the students become more creative.	4	4	4.0
7.	The game can increase the students' interest in learning the subtopic Animals.	4	4	4.0
<b>Mean: 4.4</b>				

**Table 6.22 Mean for Construct Perceptions (SME)**

No.	Questions	SME 1	SME 2	Average Scale
1.	This game is easy to understand.	4	4	4.0
2.	This game motivates the students to learn the subtopic Animals.	4	4	4.0
3.	The students can relate what they have learned through this game with their environment.	4	5	4.5
4.	Learning the subtopic Animals become easier with this game.	4	5	4.5
5.	This game can improve the students' performance.	4	5	4.5
6.	This game uses information technology to stimulate the students.	4	5	4.5
<b>Mean: 4.3</b>				

**Table 6.23 Mean for All Constructs (SME)**

Construct	Mean
Learnability	4.5
Effectiveness	4.5
Ease of use	4.5
Flexibility	4.0
Attitude	4.4
Perceptions	4.3

The table above shows the mean for all the constructs in the questionnaire. The mean for all the constructs for SME exceeds 3.0. Hence, the game does not require any improvements and modifications and can proceed to Beta testing.

(c) *Student Expert (SE)*

The table below shows the mean of every construct rated by SEs.

**Table 6.24 Mean for Construct Learnability (SE)**

No.	Questions	SE 1	SE 2	SE 3	Average Scale
1.	I can use the game without any problems.	5	5	5	5.0
2.	I can control the game from beginning to end smoothly.	5	5	4	4.7
3.	I can learn the subtopic Animals easier and fun.	5	5	4	4.7
4.	I can gain knowledge from the sound as well as the colourful animations and pictures.	5	5	5	5.0
<b>Mean: 4.9</b>					

**Table 6.25 Mean for Construct Effectiveness (SE)**

No.	Questions	SE 1	SE 2	SE 3	Average Scale
1.	I can understand the lessons delivered more effectively.	5	5	5	5.0
2.	I can easily follow and understand the modules in the game.	5	5	5	5.0
3.	The integration of media such as audio, graphics, and animation are accurate and can help me to understand the subtopic Animals.	5	5	4	4.7
4.	I can learn from the game because it looks realistic.	5	5	5	5.0
5.	I know how to play this game very quickly.	5	5	5	5.0

<b>Mean: 4.9</b>
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**Table 6.26 Mean for Construct Attitude (SE)**

No.	Questions	SE 1	SE 2	SE 3	Average Scale
1.	This game gives me the spirit to learn better.	5	5	5	5.0
2.	I fell happy when playing this game.	5	5	4	4.7
3.	I enjoyed while playing this game.	5	5	5	5.0
<b>Mean: 4.9</b>					

**Table 6.27 Mean for Construct Perceptions (SE)**

No.	Questions	SE 1	SE 2	SE 3	Average Scale
1.	This game is easy to handle.	5	5	5	5.0
2.	This game motivates me a lot to learn the subtopic Animals.	5	5	5	5.0
3.	This game is fun and great.	5	5	5	5.0
<b>Mean: 5.0</b>					

**Table 6.28 Mean for All Constructs (SE)**

Construct	Mean
Learnability	4.9
Effectiveness	4.9
Attitude	4.9
Perceptions	5.0

The table above shows the mean for all the constructs in the questionnaire. The mean for all the constructs for SE exceeds 3.0. Hence, the game does not require any improvements and modifications and can proceed to Beta testing.

## 6.5.2 Beta Testing

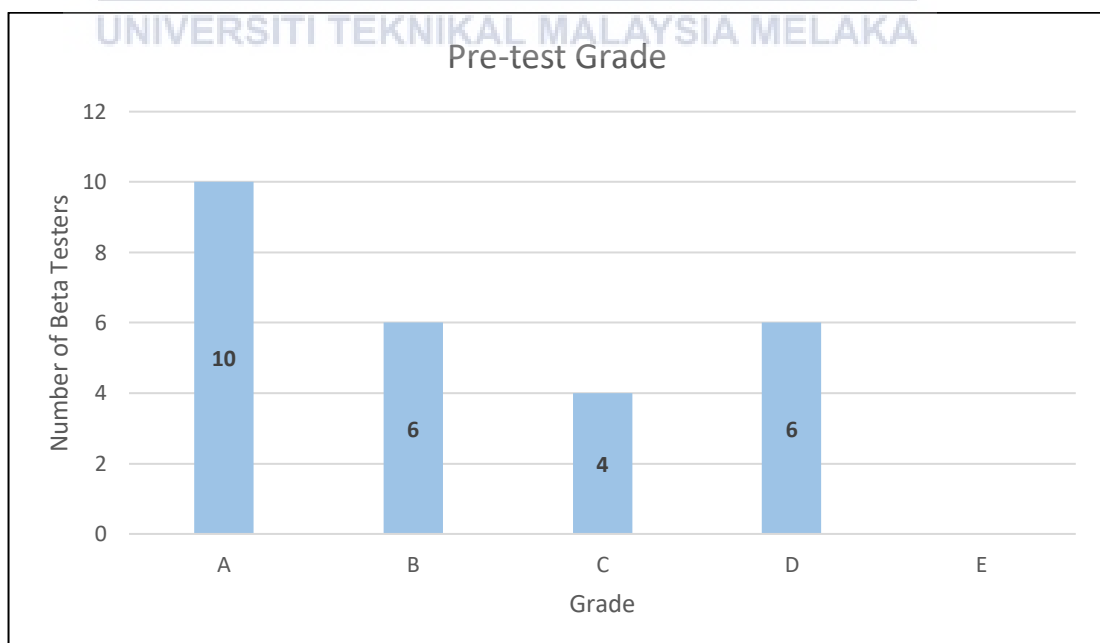
Beta testers improvement in understanding the subtopic Animals was determined from the data from pre-test and post-test. Data gathered were manipulated to see if there are any improvements from pre-test to post-test. The grade given were based on the grade for Ujian Penilaian Sekolah Rendah (UPSR) 2021.

**Table 6.29 UPSR Grade**

Marks (%)	Grade
80 - 100	A
65 - 79	B
50 - 64	C
40 - 49	D
0 - 39	E

### 6.5.2.1 Pre-test

The first step for Beta testing is to determine Beta testers' knowledge about the subtopic Animals. The grade obtained from the pre-test is shown in the chart below.



**Figure 6.1 Graph of Pre-test Grade**



From the table above, the highest grade obtained was 'A' while the lowest was 'C' with 10 and 4 number of Beta testers, respectively. The number of Beta testers obtained grade 'B', and 'D' was the same which is 6. There were no Beta testers that got a grade of 'E' for the pre-test.

Based on the grade achieved during the pre-test, Beta testers were divided into 2 groups, control and experimental. Every group have equal grades, 5A's, 3B's, 2C's and 3D's so that both groups are equal in terms of knowledge about the subtopic Animals. The table below shows Beta testers in their divided group.

**Table 6.30 Pre-test Marks for Control Group**

Beta Testers	Pre-test (%)	Grade
C1	90	A
C2	90	A
C3	80	A
C4	80	A
C5	80	A
C6	70	B
C7	70	B
C8	70	B
C9	60	C
C10	50	C
C11	40	D
C12	40	D
C13	40	D

**Table 6.31 Pre-test Marks for Experimental Group**

Beta Testers	Pre-test (%)	Grade
E1	90	A
E2	80	A
E3	80	A
E4	80	A

E5	80	A
E6	70	B
E7	70	B
E8	70	B
E9	60	C
E10	50	C
E11	40	D
E12	40	D
E13	40	D

### 6.5.2.2 Post-test

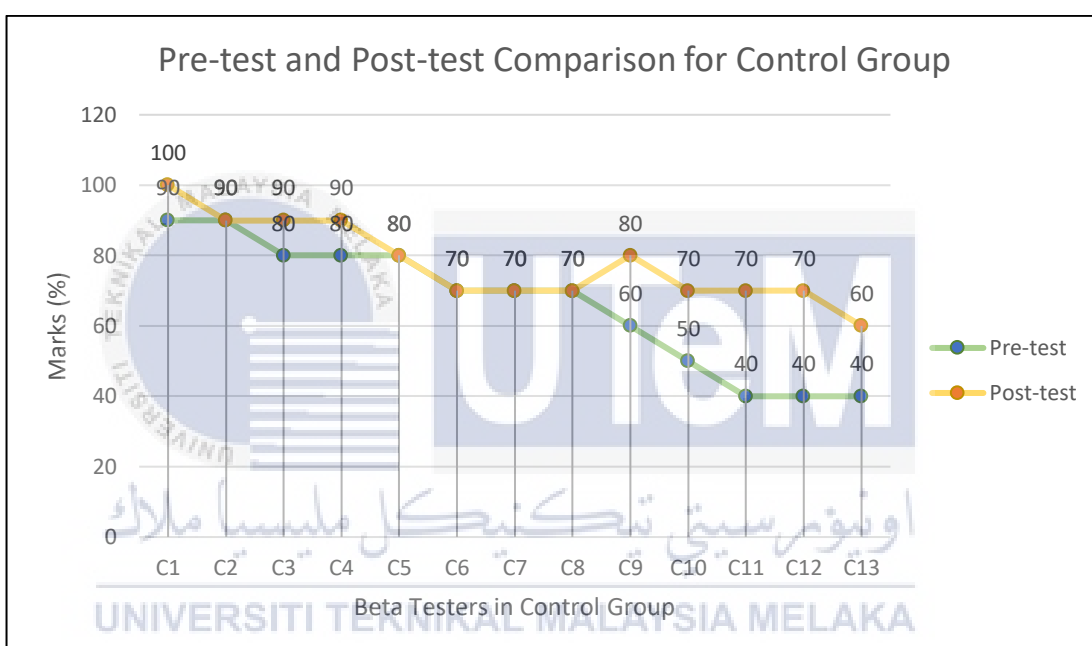
The second step in Beta Testing was to see Beta testers achievements in post-test. Both groups were asked to study the subtopic using the learning material set for them. The control group used the textbook or any notes, while the experimental group used the "Rescue The Animals" game. The marks of the pre-test and post-test for each group were compared.

**Table 6.32 Pre-test and Post-test Marks for Control Group**

Beta Testers	Pre-test (%)	Grade	Post-test (%)	Grade	Improvement (%)
C1	90	A	100	A	10
C2	90	A	90	A	0
C3	80	A	90	A	10
C4	80	A	90	A	10
C5	80	A	80	A	0
C6	70	B	70	B	0
C7	70	B	70	B	0
C8	70	B	70	B	0
C9	60	C	80	A	20
C10	50	C	70	B	20
C11	40	D	70	B	30

C12	40	D	70	B	30
C13	40	D	60	C	20

The table shows the scores obtained by Beta testers from the control group during pre-test and post-test. There is an increase in scores from pre-test to post-test. There is also no improvement at all for some of the Beta testers. During pre-test, the total grade achieved by Beta testers was 5A's, 3B's, 2C's and 3D's, while during post-test, the grade has changed to 6A's, 6B's, and 1C.



**Figure 6.1: Graph of Pre-test and Post-test Comparison for Control Group**

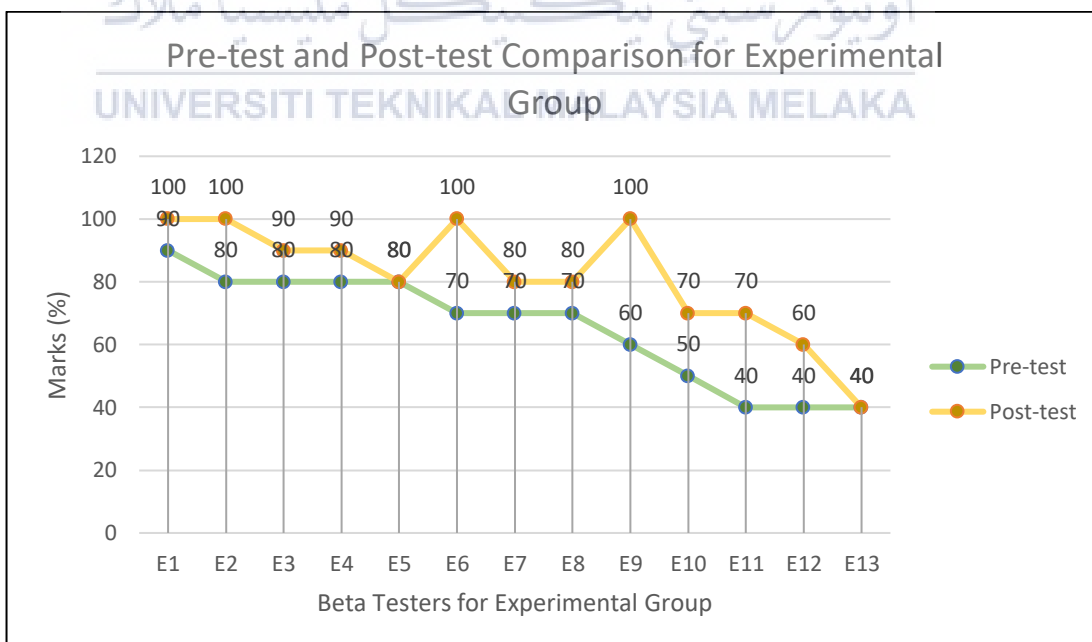
From the line graph above, it is clear that 5 Beta testers from the control group have no improvements from pre-test to post-test. The highest improvement achieved was 30% by 2 of the Beta testers, C11 and C12. C1 is the only one who got 100% during the post-test.

**Table 6.33 Pre-test and Post-test Marks for Experimental Group**

Beta Testers	Pre-test (%)	Grade	Post-test (%)	Grade	Improvement (%)
E1	90	A	100	A	10
E2	80	A	100	A	20

E3	80	A	90	A	10
E4	80	A	90	A	10
E5	80	A	80	A	0
E6	70	B	100	A	30
E7	70	B	80	A	10
E8	70	B	80	A	10
E9	60	C	100	A	40
E10	50	C	70	B	20
E11	40	D	70	B	30
E12	40	D	60	C	20
E13	40	D	40	D	0

The table shows the scores obtained by Beta testers from the experimental group during pre-test and post-test. There is an increase in scores from pre-test to post-test. There is also no improvement at all for some of the Beta testers. During pre-test, the total grade achieved by Beta testers was 5A's, 3B's, 2C's and 3D's, while during post-test, the grade has changed to 9A's, 2B's, 1C, and 1D.



**Figure 6.2: Graph of Pre-test and Post-test Comparison for Experimental Group**

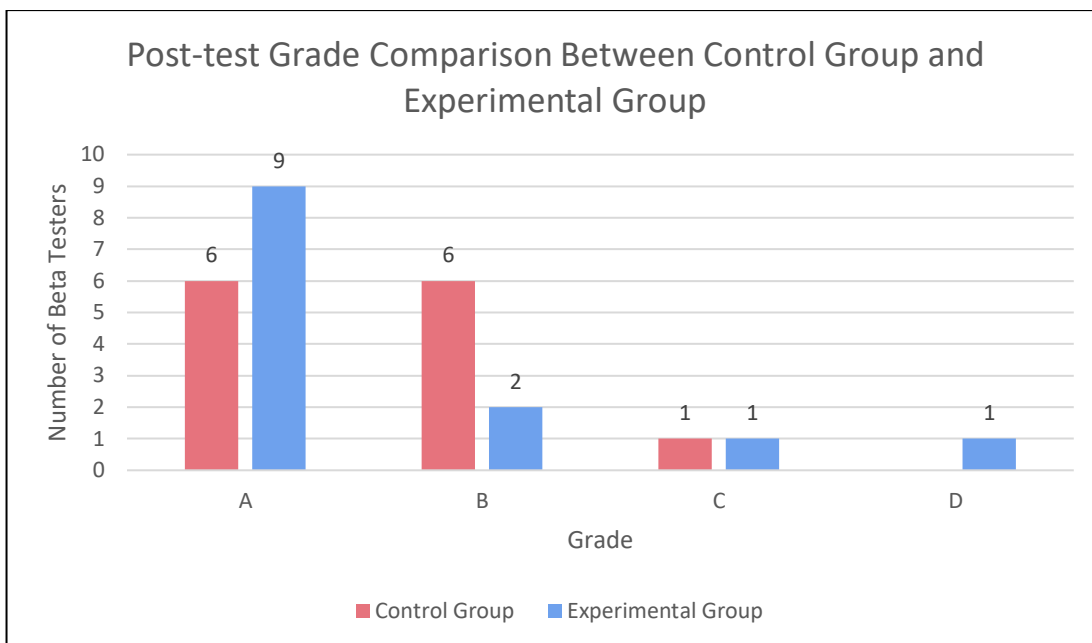
From the line graph above, E5 and E13 were the only 2 Beta testers from the experimental group who had no improvements from pre-test to post-test. The highest improvement achieved was 40% by E9. 4 Beta testers achieved 100% during the post-test, E1, E2, E6 and E9.

## 6.6 Analysis Testing

The data obtained from data manipulation from Beta Testing, will be discussed. To determine whether the game meets the objectives will also be discussed in this subchapter.

### 6.6.1 Beta Testing

The grade achieved during the post-test and the mean of improvements for both groups were compared to see which learning tool delivers better knowledge about the subtopic Animals. The result comparison of both groups will also be discussed for the same purpose.



**Figure 6.2 Graph of Post-test Grade Comparison Between Control Group and Experimental Group**

Based on the bar graph above, the grade obtained by the control group was 6A's, 6B's and 1C, while the experimental group was 9A's, 2B's, 1C and 1D. The experimental group have more A's than the control group with 9A's and 6A's. Despite that, the control group does not have a D grade, but the experimental group does.

**Table 6.38: Mean of Improvements**

Groups	Mean
Control	11.54
Experimental	16.15

Based on the table above, the experimental group have a higher mean than the control group with 16.15 and 11.54. this shows that "Rescue The Animals" is a success because it meets the third objective, which is to evaluate the effectiveness of learning the subtopic Animals in the year 3 Science subject for third-year primary school students using this game-based learning.

## CHAPTER 7: CONCLUSION

### 7.1 Observation on Weaknesses and Strengths

Every product has advantages and disadvantages, which is especially true for this project because it is a novel approach to learning and teaching that uses cutting-edge technology. As a result, the product's strengths and weaknesses may provide an opportunity to make additional improvements in the future to create a better product. According to the observations, this game received a massive response from testers, which can help to strengthen this project. Identifying faults and strengths is critical for improving this game in the future and determining whether or not it meets its objectives.

#### 7.1.1 Weaknesses

There was a section for the testers to leave their opinion or suggestions for the game in Google Form. One of the ITEs stated that the game could have more sound effects. For example, when the player jumps on the enemy, a sound effect should be added to show that the enemy was defeated. The same ITE also stated that the game should have a storyline or a mission objective. This suggestion is to let the player know what they should do and understand the story of the game.

#### 7.1.2 Strengths

In the opinion section, an ITE stated that the game is well designed because of the smooth graphics. The ITE also complimented the colour theme selection for the

game. The great game mechanics got noticed by the ITE as well. The idea of learning about the subtopic with this game by saving the animals from the cage is fun. The students from Alpha testers find the game interesting. The cute characters and graphics, colour selection, and the idea of the game have succeeded in attracting the testers.

## 7.2 Propositions for Improvement

During Alpha testing, one of the ITEs stated that the game could have more sound effects. The sound effect can be added when the player jumps on the enemy. A splat or squash sound effect could be suitable for this situation. Another sound effect could be added when the player steps on the poisonous mushroom. This is because when the player steps on the mushroom, it means game over. Adding a suspense sound effect at this part could make the game more interesting.

The ITE also stated that the game lacks a storyline. The storyline can be added after the player clicks on "Mula" before the instruction page. The game could be more exciting if the storyline were in a 2D animation video. An animation video is more suitable and fun for the player than a lengthy text explaining the storyline. It also does not take a long time for the player to understand.

## 7.3 Project Contribution

"Rescue The Animals" can help 3rd-year primary school students learn the subtopic Animals in year 3 Science subject. This game can motivate students to learn and focus while also teaching them about the subtopic in an exciting way. The cute graphics and animations, and exciting music can prevent the students from feeling bored while learning. It helps primary school teachers who teach Science ensure that their students pay attention during learning sessions. The teacher can also use this game as a learning module. They do not need to find any resources from the website anymore, saving the teacher's time and energy.



#### 7.4 Conclusion

"Rescue The Animals" is a computer game developed within 14 weeks during the last semester in FYP 1. This project aims to evaluate the effectiveness of learning the subtopic Animals in year 3 Science subject for 3rd-year primary school students using this game. From the result and analysis, the majority of the testers was satisfied with the game. The ideas and suggestions for improvement are helpful in future references. Thus, "Rescue The Animals" proved to help 3rd-year primary school students understand the subtopic by playing this 2D game.



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**APPENDIX A: ALPHA TESTING (ITE)**

11/09/2021, 21:40

Questionnaire of The Effectiveness of Game-based Learning Titled "Rescue The Animals" for Third-year Primary School Students

## Questionnaire of The Effectiveness of Game-based Learning Titled "Rescue The Animals" for Third-year Primary School Students

(To be completed by Multimedia Expert / Multimedia Developer / Instructional Designer of  
Learning Content)

\*Required

### A. Introduction

Dear respondent,

I am Aimi Khaleeda binti Azmi, a final year student in Bachelor of Computer Science (Interactive Media) with Honors at Universiti Teknikal Malaysia Melaka (UTeM). I have developed a 2D game-based learning titled "Rescue The Animals". The game is targeted at year 3 primary school students. The focus of this game is to help year 3 primary school students to understand the subtopic (Animals) in year 3 Science subject. I am required to conduct this research to determine whether this game succeeded in achieving my objectives or vice-versa.

Thank you for taking the time to answer this questionnaire. Your cooperation is greatly appreciated.

### B. Details of The Game "Rescue The Animals"

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Questionnaire of The Effectiveness of Game-based Learning Titled "Rescue The Animals" for Third-year Primary School Students

Details about the game are as follows:

Title:

Rescue The Animals

Target user:

Third-year primary school students

This game is about:

Subtopic (Animals) in year 3 Science subject

To play this game, you need:

1. Laptop / Desktop computer
2. Good Internet connection

This game can be played in two ways:

1. Play through a web browser
2. Download the game

Before that, you can watch this video demonstration first:

<https://youtu.be/bPaHovuDjQc>

If you want to play through a web browser, click this link:

<https://games.gdevelop-app.com/game-205a2134-7c00-4a4d-8778-45f9b0567afd/index.html>

Reminder: A good internet connection is required to play via this platform, or the audio might disappear.

If you want to play by downloading the game, click this link:

1. Mac: <https://drive.google.com/file/d/1rc-jBQ77ZqJaLnOkX6Y7Ya4-IWTQv93v/view?usp=sharing>

2. Windows: [https://drive.google.com/file/d/1mcfodUu0ogwr7\\_iMgHBQDtm83dvheoNz/view?usp=sharing](https://drive.google.com/file/d/1mcfodUu0ogwr7_iMgHBQDtm83dvheoNz/view?usp=sharing)



C. Background

1. Name \*

2. Workplace \*

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3. Gender \*

Mark only one oval.

Male

Female

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## 4. Major expertise \*

*Tick all that apply.*

- Content Learning  
 Mobile Application  
 Multimedia Developer  
 Game Developer

Other:  \_\_\_\_\_

## 5. Experience in this field \*

*Mark only one oval.*

- Below 1 year  
 1-3 years  
 4-6 years  
 7-9 years  
 Above 10 years



Please select the following scale to reflect your opinion about the effectiveness of this game.

D. Usability of Game

- 1 - Strongly disagree  
 2 - Disagree  
 3 - Less agree  
 4 - Agree  
 5 - Strongly agree

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 A. LEARNABILITY

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## 6. The game can be used without any problems. \*

*Mark only one oval.*

- 1      2      3      4      5  
 Strongly disagree      Strongly Agree

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Questionnaire of The Effectiveness of Game-based Learning Titled "Rescue The Animals" for Third-year Primary School Students

7. The game can be controlled from beginning to end. \*

Mark only one oval.

1      2      3      4      5

---

Strongly disagree                  Strongly Agree

8. Learning the subtopic Animals becomes easier and attractive to the students. \*

Mark only one oval.

1      2      3      4      5

---

Strongly disagree                  Strongly Agree

#### B. EFFECTIVENESS

9. The game helps the lessons delivered more effectively. \*

Mark only one oval.

1      2      3      4      5

---

Strongly disagree                  Strongly Agree

10. The modules in the game are easy to follow and understand. \*

Mark only one oval.

1      2      3      4      5

---

Strongly disagree                  Strongly Agree

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11. Integration of media such as audio, graphics, and animation are accurate and very helpful to the students. \*

Mark only one oval.

1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> Strongly Agree

12. Game modules contained in the game are appropriate and realistic to help the students gain knowledge. \*

Mark only one oval.

1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> Strongly Agree

### C. EASE OF USE

13. The use of colour and design layout in the game are interesting. \*

Mark only one oval.

1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> Strongly Agree

14. Interface and the graphical display are appropriate, clear and attractive. \*

Mark only one oval.

1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> Strongly Agree



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15. The game is user-friendly and easy to use. \*

Mark only one oval.

1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> Strongly Agree

16. The screen display is appropriate, attractive and increases interest. \*

Mark only one oval.

1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> Strongly Agree

17. The readability of the text is clear and easy to understand by the target. \*

Mark only one oval.

1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> Strongly Agree

18. Menus available in the game are easy to understand. \*

Mark only one oval.

1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> Strongly Agree

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19. Navigations and interactions are easy to use. \*

*Mark only one oval.*

1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> Strongly Agree

20. Multimedia elements in the game are interesting. \*

*Mark only one oval.*

1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> Strongly Agree

21. A very short time is required to understand how the game is functioning. \*

*Mark only one oval.*

1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> Strongly Agree

D. FLEXIBILITY

22. The game is not easy to 'crash'. \*

*Mark only one oval.*

1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> Strongly Agree

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Questionnaire of The Effectiveness of Game-based Learning Titled "Rescue The Animals" for Third-year Primary School Students

23. The game is easy to find and used. \*

*Mark only one oval.*

1	2	3	4	5		
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

24. The game is not problematic and not easy to 'hang'. \*

*Mark only one oval.*

1	2	3	4	5		
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

**E. ATTITUDE**

25. The game is able to motivate the students. \*

*Mark only one oval.*

1	2	3	4	5		
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

26. Description and 2D animated given in the courseware fulfil the students' desire to learn the subtopic Animals. \*

*Mark only one oval.*

1	2	3	4	5		
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

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Questionnaire of The Effectiveness of Game-based Learning Titled "Rescue The Animals" for Third-year Primary School Students

27. The game offerings are suitable, funny and not offensive to the students. \*

Mark only one oval.

1	2	3	4	5		
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

28. The game is able to stimulate thinking and develop the minds of the students. \*

Mark only one oval.

1	2	3	4	5		
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

29. The game allows the students to learn collaboratively with it. \*

Mark only one oval.

1	2	3	4	5		
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

30. The game helps the students become more creative. \*

Mark only one oval.

1	2	3	4	5		
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

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Questionnaire of The Effectiveness of Game-based Learning Titled "Rescue The Animals" for Third-year Primary School Students

31. The game can increase the students' interest in learning the subtopic Animals. \*

Mark only one oval.

1	2	3	4	5		
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

## F. PERCEPTIONS OF THE GAME

32. This game is easy to understand. \*

Mark only one oval.

1	2	3	4	5		
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

33. This game motivates the students to learn the subtopic Animals. \*

Mark only one oval.

1	2	3	4	5		
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

34. The students can relate what they have learned through this game with their environment. \*

Mark only one oval.

1	2	3	4	5		
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

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Questionnaire of The Effectiveness of Game-based Learning Titled "Rescue The Animals" for Third-year Primary School Students

35. Learning the subtopic Animals become easier with this game. \*

Mark only one oval.

1	2	3	4	5		
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

36. The game provided is easy and fun. \*

Mark only one oval.

1	2	3	4	5		
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

37. This game can improve the students' performance. \*

Mark only one oval.

1	2	3	4	5		
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

38. This game uses information technology to stimulate the students. \*

Mark only one oval.

1	2	3	4	5		
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

E. Overall

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Questionnaire of The Effectiveness of Game-based Learning Titled "Rescue The Animals" for Third-year Primary School Students

39. Your scale \*

1 - Strongly disagree 2 - Disagree 3 - Less agree 4 - Agree 5 - Strongly agree

Mark only one oval.

1      2      3      4      5

---

Strongly disagree      Strongly agree

40. Your opinion for improvement (if necessary)

---



---



---



---

41. I recommended this game to be... \*

Mark only one oval.

be accepted

rejected

be deferred

be repair



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## APPENDIX B: ALPHA TESTING (SME)

11/09/2021, 21:51

Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

# Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

*Questionnaire of The Effectiveness of Game-based Learning Titled "Rescue The Animals" for Third-year Primary School Students*

\*Required

### A. Pendahuluan (Introduction)

Responden yang dikasihi,

Saya Aimi Khaleeda binti Azmi, seorang pelajar tahun akhir dalam Sarjana Muda Sains Komputer (Media Interaktif) dengan Kepujian di Universiti Teknikal Malaysia Melaka (UTeM). Saya telah membangunkan pembelajaran berasaskan permainan 2D yang bertajuk "Rescue The Animals". Permainan ini disasarkan kepada pelajar sekolah rendah tahun 3. Fokus permainan ini adalah untuk membantu pelajar sekolah rendah tahun tiga untuk memahami subtopik (Haiwan) dalam subjek Sains tahun 3 dengan lebih baik dengan kaedah yang menyeronokkan. Saya perlu menjalankan penyelidikan ini untuk menentukan sama ada permainan ini berjaya mencapai objektif saya atau sebaliknya.

Terima kasih kerana meluangkan masa untuk menjawab soal selidik ini. Kerjasama anda amatlah dihargai.

Dear respondent,

*I am Aimi Khaleeda binti Azmi, a final year student in Bachelor of Computer Science (Interactive Media) with Honors at Universiti Teknikal Malaysia Melaka (UTeM). I have developed a 2D game-based learning titled "Rescue The Animals". The game is targeted at year 3 primary school students. The focus of this game is to help year 3 primary school students to understand the subtopic (Animals) in year 3 Science subject. I am required to conduct this research to determine whether this game succeeded in achieving my objectives or vice versa.*

*Thank you for taking the time to answer this questionnaire. Your cooperation is greatly appreciated.*

Perincian Permainan "Rescue The Animals"

*Details of The Game "Rescue The Animals"*



11/09/2021, 21:51

Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

Perincian mengenai permainan adalah seperti berikut:

Tajuk:  
Rescue The Animals

Pengguna sasaran:  
Pelajar sekolah rendah tahun 3

Permainan ini tentang:  
Subtopik (Haiwan) dalam subjek Sains tahun 3

Untuk bermain permainan ini, anda memerlukan:  
1. Komputer riba / Komputer meja  
2. Sambungan Internet yang baik

Permainan ini boleh dimainkan melalui dua cara iaitu:  
1. Main melalui pelayar web  
2. Muat turun permainan

Sebelum itu, anda boleh menonton video demonstrasi ini dahulu:  
<https://youtu.be/bPaHovuDjQc>

Jika anda mahu bermain melalui pelayar web, klik pautan ini:  
<https://games.gdevelop-app.com/game-205a2134-7c00-4a4d-8778-45f9b0567afd/index.html>  
Peringatan: Sambungan Internet yang baik diperlukan untuk bermain melalui cara ini. Hal ini kerana, masalah seperti kehilangan audio dan sebagainya mungkin akan berlaku.

Jika anda mahu bermain dengan muat turun permainan tersebut, klik pautan ini:  
Windows: [https://drive.google.com/file/d/1mcfodUu0ogwr7\\_iMgHBQDtm83dvheoNz/view?usp=sharing](https://drive.google.com/file/d/1mcfodUu0ogwr7_iMgHBQDtm83dvheoNz/view?usp=sharing)  
Mac: <https://drive.google.com/file/d/1rc-jBQ77ZqJaLnOkX6Y7Ya4-IWTQv93v/view?usp=sharing>

Details about the game are as follows:

Title:  
Rescue The Animals

Target user:  
Year 3 primary school students

This game is about:  
Subtopic (Animals) in year 3 Science subject

To play this game you need:  
1. Laptop / Desktop computer  
2. Good Internet connection

This game can be played in two ways:  
1. Play through a web browser  
2. Download the game

Before that, you can watch this demonstration video first:  
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Reminder: A good Internet connection is required to play through this platform. This is because problems like missing audio and etc might occur.

If you want to play by downloading the game, click this link:

Windows: [https://drive.google.com/file/d/1mcfodUu0ogwr7\\_iMgHBQDtm83dvheoNz/view?usp=sharing](https://drive.google.com/file/d/1mcfodUu0ogwr7_iMgHBQDtm83dvheoNz/view?usp=sharing)  
Mac: <https://drive.google.com/file/d/1rc-jBQ77ZqJaLnOkX6Y7Ya4-IWTQv93v/view?usp=sharing>

B. Latar Belakang Guru

B. Teacher's Background

11/09/2021, 21:51

Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

1. Nama penuh \*

*Full name*

---

2. Nama sekolah \*

*Name of the school*

---

3. Jantina \*

*Gender***Mark only one oval.**Lelaki (*Male*)Perempuan (*Female*)

4. Pengalaman mengajar di sekolah rendah \*

*Experience teaching in primary school***Mark only one oval.**Kurang dari 1 tahun (*Below 1 year*)1-3 tahun (*1-3 years*)4-6 tahun (*4-6 years*)7-9 tahun (*7-9 years*)Lebih dari 10 tahun (*More than 10 years*)

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C. Usability of The Game

C. Kebolegunaan Permainan

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Untitled title

1 - Sangat tidak setuju (*Strongly disagree*)2 - Tidak setuju (*Disagree*)3 - Kurang setuju (*Less agree*)4 - Setuju (*Agree*)5 - Sangat setuju (*Strongly agree*)

A. Keblajaraan

A. Learnability

11/09/2021, 21:51

Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

5. Permainan ini boleh digunakan tanpa sebarang masalah. \*

*The game can be used without any problems.*

Mark only one oval.

1      2      3      4      5

---

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

6. Permainan ini boleh dikawal dari awal hingga akhir. \*

*The game can be controlled from beginning to end.*

Mark only one oval.

1      2      3      4      5

---

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

7. Mempelajari subtopik (Haiwan) dalam subjek Sains tahun 3 menjadi lebih mudah dan menarik. \*

*Learning the subtopic (Animals) in year 3 Science subject becomes easier and more interesting.*

Mark only one oval.

1      2      3      4      5

---

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

8. Pelajar dapat belajar dan memperoleh pengetahuan dari bunyi serta animasi dan gambar yang berwarna-warni. \*

*Students can learn and gain knowledge from the sound as well as the colourful animation and pictures.*

Mark only one oval.

1      2      3      4      5

---

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

## B. Keberkesanan

*B. Effectiveness*

11/09/2021, 21:51

Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

9. Permainan ini membantu pelajaran yang disampaikan dengan lebih berkesan. \*

*The game help the lessons delivered more effectively.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

10. Modul dalam permainan ini mudah diikuti dan difahami. \*

*The modules in the game are easy to follow and understand.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

11. Integrasi media seperti audio, grafik, dan animasi adalah tepat dan boleh membantu para pelajar untuk memahami subtopik tersebut. \*

*The integration of media such as audio, graphics, and animation is precise and can help students to understand the subtopic.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

12. Modul permainan yang terdapat dalam permainan ini amatlah sesuai dan realistik untuk membantu pelajar memperoleh pengetahuan. \*

*The game modules available in this game are very appropriate and realistic to help students acquire knowledge.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

### C. Kebolegunaan

*C. Ease of Use*

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Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

13. Penggunaan warna dan susun atur reka bentuk dalam permainan menarik. \*

*The use of colour and design layout in the game are interesting.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

14. Antara muka dan paparan grafik sesuai, jelas dan menarik. \*

*Interface and the graphical display are appropriate, clear and attractive.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

15. Permainan ini mesra pengguna dan mudah digunakan. \*

*The game is user-friendly and easy to use.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

16. Paparan skrin sesuai, menarik dan boleh meningkatkan minat pengguna. \*

*The screen display is appropriate, attractive and can increase user's interest.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

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Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

17. Kebolehbacaan teks jelas dan senang difahami oleh pengguna. \*

*The readability of the text is clear and easy to understand by the user.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

18. Menu yang terdapat dalam permainan mudah difahami. \*

*Menus available in the game are easy to understand.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

19. Navigasi dan interaksi mudah digunakan. \*

*Navigations and interactions are easy to use.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

20. Elemen multimedia dalam permainan menarik. \*

*Multimedia elements in the games are interesting.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

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Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

21. Masa yang sangat singkat diperlukan untuk memahami bagaimana permainan ini berfungsi. \*

*A very short time is required to understand how the game is functioning.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

#### D. Keanjalan

*D. Flexibility*

22. Permainan ini tidak mudah 'crash'. \*

*The game is not easy to 'crash'.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

23. Permainan ini tidak bermasalah dan tidak mudah 'hang'. \*

*The game is not problematic and not easy to 'hang'.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

#### E. Sikap

*E. Attitude*

11/09/2021, 21:51

Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

24. Permainan ini dapat memberi motivasi kepada para pelajar. \*

*The game is able to motivate the students.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

25. Penerangan dan animasi 2D yang diberikan dalam permainan memenuhi keinginan pelajar untuk mempelajari subtopik (Haiwan) \*

*Description and 2D animated given in the game fulfil the students' desire to learn the subtopic (Animals)*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

26. Permainan ini sesuai, lucu dan tidak menyinggung perasaan pelajar. \*

*The game is suitable, funny and not offensive to the students.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

27. Permainan ini mampu merangsang pemikiran dan membangunkan minda para pelajar. \*

*The game is able to stimulate thinking and develop the minds of the students.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)



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Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

28. Permainan ini membolehkan pelajar belajar secara kolaboratif dengannya. \*

*The game allows the students to learn collaboratively with it.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

29. Permainan ini membantu pelajar menjadi lebih kreatif. \*

*The game helps the students become more creative.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

30. Permainan ini dapat meningkatkan minat pelajar untuk mempelajari subtopik (Haiwan). \*

*The game can increase the students' interest in learning the subtopic (Animals).*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

D. Persepsi Terhadap Permainan

D. Perception Towards The Game

1 - Sangat tidak setuju (*Strongly disagree*)

2 - Tidak setuju (*Disagree*)

3 - Kurang setuju (*Less agree*)

4 - Setuju (*Agree*)

5 - Sangat setuju (*Strongly agree*)

11/09/2021, 21:51

Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

31. Permainan ini mudah difahami. \*

*This game is easy to understand.*

Mark only one oval.

1 2 3 4 5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

32. Permainan ini memotivasikan pelajar untuk mempelajari subtopik (Haiwan). \*

*This game motivates the students to learn the subtopic (Animals).*

Mark only one oval.

1 2 3 4 5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

33. Pelajar dapat mengaitkan apa yang telah mereka pelajari melalui permainan ini dengan persekitaran mereka. \*

*The students can relate what they have learned through this game with their environment.*

Mark only one oval.

1 2 3 4 5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

34. Mempelajari subtopik (Haiwan) menjadi lebih mudah dengan permainan ini. \*

*Learning the subtopic (Animals) become easier with this game.*

Mark only one oval.

1 2 3 4 5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

11/09/2021, 21:51

Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

35. Permainan ini dapat meningkatkan prestasi pelajar. \*

*This game can improve the students' performance.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

36. Permainan ini menggunakan teknologi maklumat untuk merangsang para pelajar.

*This game uses information technology to stimulate the students.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

E. Keseluruhan

E. Overall

- 1 - Sangat tidak setuju (*Strongly disagree*)
- 2 - Tidak setuju (*Disagree*)
- 3 - Kurang setuju (*Less agree*)
- 4 - Setuju (*Agree*)
- 5 - Sangat setuju (*Strongly agree*)



37. Skala anda \*

*Your scale*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

11/09/2021, 21:51

Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

38. Pendapat anda untuk penambahbaikan (jika perlu)

*Your opinion for improvement (if necessary)*

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39. Saya mengesyorkan permainan ini...

*I recommended this game...***Mark only one oval.**

- Diterima (*Be accepted*)
- Ditolak (*Rejected*)
- Ditangguhkan (*Be deferred*)
- Dibaiki (*Be repaired*)



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## APPENDIX C: ALPHA TESTING (SE)

11/09/2021, 22:16

Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

### Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

*Questionnaire of The Effectiveness of Game-based Learning Titled "Rescue The Animals" for Third-year Primary School Students*

\*Required

#### A. Pendahuluan (*Introduction*)

Responden yang dikasihi,

Saya Aimi Khaleeda binti Azmi, seorang pelajar tahun akhir dalam Sarjana Muda Sains Komputer (Media Interaktif) dengan Kepujian di Universiti Teknikal Malaysia Melaka (UTeM). Saya telah membangunkan pembelajaran berasaskan permainan 2D yang bertajuk "Rescue The Animals". Permainan ini disasarkan kepada pelajar sekolah rendah tahun 3. Fokus permainan ini adalah untuk membantu pelajar sekolah rendah tahun tiga untuk memahami subtopik (Haiwan) dalam subjek Sains tahun 3 dengan lebih baik dengan kaedah yang menyeronokkan. Saya perlu menjalankan penyelidikan ini untuk menentukan sama ada permainan ini berjaya mencapai objektif saya atau sebaliknya.

Terima kasih kerana meluangkan masa untuk menjawab soal selidik ini. Kerjasama anda amatlah dihargai.

Dear respondent,

*I am Aimi Khaleeda binti Azmi, a final year student in Bachelor of Computer Science (Interactive Media) with Honors at Universiti Teknikal Malaysia Melaka (UTeM). I have developed a 2D game-based learning titled "Rescue The Animals". The game is targeted at year 3 primary school students. The focus of this game is to help year 3 primary school students to understand the subtopic (Animals) in year 3 Science subject. I am required to conduct this research to determine whether this game succeeded in achieving my objectives or vice versa.*

*Thank you for taking the time to answer this questionnaire. Your cooperation is greatly appreciated.*

Perincian Permainan "Rescue The Animals"

*Details of The Game "Rescue The Animals"*

11/09/2021, 22:16

Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

Perincian mengenai permainan adalah seperti berikut:

Tajuk:  
Rescue The Animals

Pengguna sasaran:  
Pelajar sekolah rendah tahun 3

Permainan ini tentang:  
Subtopik (Haiwan) dalam subjek Sains tahun 3

Untuk bermain permainan ini, anda memerlukan:  
1. Komputer riba / Komputer meja  
2. Sambungan Internet yang baik

Permainan ini boleh dimainkan melalui dua cara iaitu:  
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2. Muat turun permainan

Sebelum itu, anda boleh menonton video demonstrasi ini dahulu:  
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Jika anda mahu bermain melalui pelayar web, klik pautan ini:  
<https://games.gdevelop-app.com/game-205a2134-7c00-4a4d-8778-45f9b0567afd/index.html>  
Peringatan: Sambungan Internet yang baik diperlukan untuk bermain melalui cara ini. Hal ini kerana, masalah seperti kehilangan audio dan sebagainya mungkin akan berlaku.

Jika anda mahu bermain dengan muat turun permainan tersebut, klik pautan ini:  
Windows: [https://drive.google.com/file/d/1mcfodUu0ogwr7\\_iMgHBQDtm83dvheoNz/view?usp=sharing](https://drive.google.com/file/d/1mcfodUu0ogwr7_iMgHBQDtm83dvheoNz/view?usp=sharing)  
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Details about the game are as follows:

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<https://games.gdevelop-app.com/game-205a2134-7c00-4a4d-8778-45f9b0567afd/index.html>

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Windows: [https://drive.google.com/file/d/1mcfodUu0ogwr7\\_iMgHBQDtm83dvheoNz/view?usp=sharing](https://drive.google.com/file/d/1mcfodUu0ogwr7_iMgHBQDtm83dvheoNz/view?usp=sharing)  
Mac: <https://drive.google.com/file/d/1rc-jBQ77ZqJaLnOkX6Y7Ya4-IWTQv93v/view?usp=sharing>

## B. Latar Belakang Pelajar

B. Student's Background

11/09/2021, 22:16

Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

1. Nama penuh \*

*Full name*

---

2. Umur \*

*Age**Mark only one oval.*

- 9
- 10
- 11
- 12

3. Nama sekolah \*

*Name of the school*

---

4. Jantina \*

*Gender**Mark only one oval.*

- Lelaki (*Male*)
- Perempuan (*Female*)

5. Adakah anda biasa dengan telefon bimbit / komputer tablet / tab telefon? \* اونيوزر سبتي تيكنيكل مليسيا ملاك

*Do you familiar with mobile phone / tablet computer / phone tab?**Mark only one oval.*

- Ya (*Yes*)
- Tidak (*No*)

11/09/2021, 22:16

Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

6. Sekiranya jawapan anda adalah ya, maka untuk apa anda menggunakannya? \*

*If your answer is yes, then what do you use it for?*

Mark only one oval.

- Belajar Sains (*Learning Science*)
- Menonton klip video edutainment (*Watching edutainment video clips*)
- Bermain permainan (*Playing games*)

### C. Kebolegunaan Permainan

*C. Usability of The Game*

#### Untitled title

- 1 - Sangat tidak setuju (*Strongly disagree*)
- 2 - Tidak setuju (*Disagree*)
- 3 - Kurang setuju (*Less agree*)
- 4 - Setuju (*Agree*)
- 5 - Sangat setuju (*Strongly agree*)

#### A. Kebelajaraan

##### A. Learnability

7. Saya boleh menggunakan permainan ini tanpa sebarang masalah. \*

*I can use the game without any problem.*

Mark only one oval.

- 1 2 3 4 5
- Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

8. Saya dapat mengawal permainan dari awal hingga akhir dengan lancar. \*

*I can control the game from beginning to end smoothly.*

Mark only one oval.

- 1 2 3 4 5
- Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)



11/09/2021, 22:16

Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

9. Saya dapat mempelajari subtopik (Haiwan) dengan lebih mudah dan menyeronokkan. \*

*I can learn the subtopic (Animals) easier and fun.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

10. Saya dapat memperoleh pengetahuan dari suara serta animasi dan gambar yang berwarna-warni. \*

*I can get knowledge from the sound as well as the colourful animation and pictures.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

## B. Keberkesanan

*B. Effectiveness*

11. Saya dapat memahami pelajaran yang disampaikan dengan lebih berkesan. \*

*I can understand the lessons delivered more effectively.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

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12. Saya dapat mengikuti dan memahami modul dalam permainan dengan mudah. \*

*I can easily follow and understand the modules in the game.*

Mark only one oval.

1      2      3      4      5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

11/09/2021, 22:16

Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

13. Integrasi media seperti audio, grafik, dan animasi adalah tepat dan boleh membantu saya untuk memahami subtopik (Animals). \*

*The integration of media such as audio, graphics, and animation is precise and can help me to understand the subtopic (Animals).*

Mark only one oval.

1 2 3 4 5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

14. Saya boleh belajar dari permainan ini kerana ia kelihatan realistik. \*

*I can learn from the game because it looks realistic.*

Mark only one oval.

1 2 3 4 5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

15. Saya tahu cara bermain permainan ini dengan cepat. \*

*I know how to play this game very quickly.*

Mark only one oval.

1 2 3 4 5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

C. Sikap  
C. Attitude

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16. Permainan ini memberi saya semangat untuk belajar dengan lebih baik. \*

*The game gives me the spirit to learn better.*

Mark only one oval.

1 2 3 4 5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

11/09/2021, 22:16

Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

17. Saya berasa gembira ketika bermain permainan ini. \*

*I feel happy when playing this game.*

Mark only one oval.

1	2	3	4	5		
Sangat tidak setuju ( <i>Strongly disagree</i> )					<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Sangat setuju ( <i>Strongly agree</i> )

18. Saya seronok semasa bermain permainan ini. \*

*I enjoyed while playing this game.*

Mark only one oval.

1	2	3	4	5		
Sangat tidak setuju ( <i>Strongly disagree</i> )					<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Sangat setuju ( <i>Strongly agree</i> )

## D. Persepsi Terhadap Permainan

D. Perception Towards The Game

- 1 - Sangat tidak setuju (*Strongly disagree*)
- 2 - Tidak setuju (*Disagree*)
- 3 - Kurang setuju (*Less agree*)
- 4 - Setuju (*Agree*)
- 5 - Sangat setuju (*Strongly agree*)

19. Permainan ini mudah dikendalikan. \*

*The game is easy to handle.*

Mark only one oval.

1	2	3	4	5		
Sangat tidak setuju ( <i>Strongly disagree</i> )					<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Sangat setuju ( <i>Strongly agree</i> )

11/09/2021, 22:16

Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

20. Permainan ini banyak mendorong saya untuk mempelajari subtopik (Haiwan). \*

*The game motivates me a lot to learn the subtopic (Animals).*

Mark only one oval.

1 2 3 4 5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

21. Permainan ini menyeronokkan dan hebat. \*

*The game is fun and great.*

Mark only one oval.

1 2 3 4 5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

E. Keseluruhan

E. Overall

- 1 - Sangat tidak setuju (*Strongly disagree*)
- 2 - Tidak setuju (*Disagree*)
- 3 - Kurang setuju (*Less agree*)
- 4 - Setuju (*Agree*)
- 5 - Sangat setuju (*Strongly agree*)

22. Skala anda \*

*Your scale*

Mark only one oval.

1 2 3 4 5

Sangat tidak setuju (*Strongly disagree*)      Sangat setuju (*Strongly agree*)

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Soal Selidik Keberkesanan Pembelajaran Berasaskan Permainan Bertajuk "Rescue The Animals" untuk Pelajar Sekolah Rendah Tahun Tiga

23. Pendapat anda untuk penambahbaikan (jika perlu)

*Your opinion for improvement (if necessary)*

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## APPENDIX D: BETA TESTING (PRE-TEST QUESTIONS)

11/09/2021, 22:24

Ujian Pengguna

# Ujian Pengguna

\*Required

## Pendahuluan

Responden yang dikasihi,

Saya Aimi Khaleeda binti Azmi, seorang pelajar tahun akhir dalam Sarjana Muda Sains Komputer (Media Interaktif) dengan Kepujian di Universiti Teknikal Malaysia Melaka (UTeM). Saya telah membangunkan pembelajaran berasaskan permainan 2D yang bertajuk "Rescue The Animals". Permainan ini disasarkan kepada pelajar sekolah rendah tahun 3. Fokus permainan ini adalah untuk membantu pelajar sekolah rendah tahun tiga untuk memahami subtopik (Haiwan) dalam subjek Sains tahun 3 dengan lebih baik dengan kaedah yang menyeronokkan. Saya perlu menjalankan penyelidikan ini untuk menentukan sama ada permainan ini berjaya mencapai objektif saya atau sebaliknya.

Terima kasih kerana meluangkan masa untuk menjawab ujian ini. Kerjasama anda amatlah dihargai.

## Perincian Ujian

Untuk menjalankan Ujian Pengguna, pelajar akan dibahagikan kepada dua kumpulan iaitu:

- Kumpulan kawalan
- Kumpulan eksperimen

Kumpulan Kawalan merupakan kumpulan yang akan menggunakan teknik belajar tradisional (buku teks) sebagai bahan belajar. Manakala Kumpulan Eksperimen merupakan kumpulan yang akan menggunakan permainan "Rescue The Animals" sebagai bahan belajar.

## Perincian Permainan

Perincian mengenai permainan adalah seperti berikut:

Tajuk:

Rescue The Animals

Pengguna sasaran:

Pelajar sekolah rendah tahun 3

Permainan ini tentang:

Subtopik (Haiwan) dalam subjek Sains tahun 3

Untuk bermain permainan ini, anda memerlukan:

1. Komputer riba / Komputer meja
2. Sambungan Internet yang baik

## Bahagian ujian

Ujian Pengguna ini terdiri daripada dua bahagian iaitu:

- Ujian Pre
- Ujian Pasca

Anda perlu menjawab kedua-dua ujian tersebut dengan jujur.

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Ujian Pengguna

### Ujian Pra (Penerangan)

Untuk Ujian Pra, anda tidak perlu merujuk apa-apa bahan rujukan untuk menjawab. Anda perlu menjawab semua soalan dengan jujur. Jika anda tidak yakin dengan jawapan anda, tidak mengapa.

### Ujian Pra

1. Haiwan herbivor mempunyai kombinasi gigi \_\_\_\_ \*

Mark only one oval.

- Kacip dan taring  
 Geraham dan taring  
 Kacip dan geraham  
 Taring sahaja

2. Apakah tabiat makan dua haiwan di bawah? \*



Mark only one oval.

- Karnivor  
 Omnivor  
 Herbivor dan karnivor  
 Herbivor

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Ujian Pengguna

3. Set gigi haiwan karnivor terdiri daripada gigi jenis \_\_\_\_ \*

Mark only one oval.

- Kacip dan taring  
 Taring sahaja  
 Kacip dan geraham  
 Geraham dan taring

4. Antara berikut yang manakah benar tentang tabiat makan haiwan di bawah? \*



Mark only one oval.

- Onnivor  
 Herbivor  
 Karnivor  
 Omnivor



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5. Manakah antara haiwan berikut merupakan herbivor? \*

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Mark only one oval.

- Lembu  
 Ayam  
 Kucing  
 Beruang



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Ujian Pengguna

6. Merujuk gambar di bawah, haiwan apakah yang makan makanan tersebut? \*



Mark only one oval.

- Arnab, burung helang dan lembu
- Buaya, monyet dan arnab
- Lembu, burung helang dan tikus
- Tikus, monyet dan beruang

7. Apakah fungsi gigi yang terdapat dalam gambar di bawah? \*



Mark only one oval.

- Mengoyakkan dan memotong makanan
- Memotong dan melumatkan makanan
- Mengoyakkan, memotong dan melumatkan makanan

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Ujian Pengguna

8. Haiwan apakah yang makan makanan berikut? \*



Mark only one oval.

- Arnab, buaya dan biri-biri
- Burung helang, tikus dan beruang
- Lembu, arnab dan biri-biri
- Monyet, tikus dan buaya

9. Apakah fungsi gigi dalam gambar di bawah? \*



Mark only one oval.

Memotong makanan

Melumatkan makanan

Mengoyakkan makanan

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Ujian Pengguna

10. Mengapa harimau merupakan haiwan karnivor? \*

Mark only one oval.

- Kerana harimau makan buah-buahan
- Kerana harimau makan daging
- Kerana harimau makan buah-buahan dan daging

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## APPENDIX E: BETA TESTING (POST-TEST FOR CONTROL GROUP)

11/09/2021, 22:31

[K] Ujian Pengguna

### [K] Ujian Pengguna

**\*Required**

Ujian Pasca  
(Penerangan)

Untuk menjawab soalan Ujian Pasca, anda boleh menggunakan bahan rujukan seperti buku teks dan nota.

Ujian Pasca

1. Manakah antara haiwan berikut merupakan omnivor? \*

Mark only one oval.

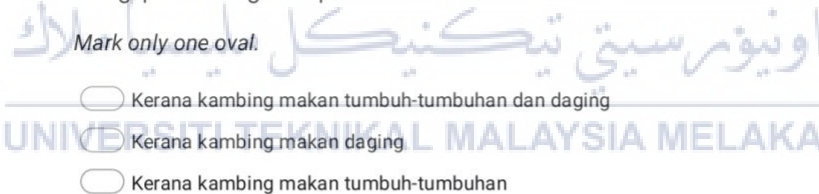


- Harimau  
 Lembu  
 Monyet  
 Biri-biri



2. Mengapa kambing merupakan haiwan herbivor? \*

Mark only one oval.



- Kerana kambing makan tumbuh-tumbuhan dan daging  
 Kerana kambing makan daging  
 Kerana kambing makan tumbuh-tumbuhan

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[K] Ujian Pengguna

3. Apakah fungsi gigi dalam gambar di bawah? \*



Mark only one oval.

- Memotong makanan
- Mengoyakkan makanan
- Melumatkan makanan

4. Antara berikut yang manakah benar tentang tabiat makan haiwan di bawah? \*



Mark only one oval.

- Omnivor
- Herbivor
- Onnivor
- Karnivor

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[K] Ujian Pengguna

5. Haiwan apakah yang makan makanan berikut? \*



Mark only one oval.

- Lembu, arnab dan biri-biri
- Burung helang, tikus dan beruang
- Arnab, buaya dan biri-biri
- Monyet, tikus dan buaya

6. Merujuk gambar di bawah, haiwan apakah yang makan makanan tersebut? \*



Mark only one oval.

- Buaya, monyet dan arnab
- Tikus, monyet dan beruang
- Arnab, burung helang dan lembu
- Lembu, burung helang dan tikus



11/09/2021, 22:31

[K] Ujian Pengguna

7. Haiwan herbivor mempunyai kombinasi gigi \_\_\_\_ \*

Mark only one oval.

- Kacip dan taring
- Geraham dan taring
- Taring sahaja
- Kacip dan geraham

8. Apakah tabiat makan dua haiwan di bawah? \*



Mark only one oval.

- Karnivor
- Herbivor
- Herbivor dan karnivor
- Omnivor

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11/09/2021, 22:31

[K] Ujian Pengguna

9. Apakah fungsi gigi yang terdapat dalam gambar di bawah? \*



Mark only one oval.

- Mengoyakkan, memotong dan melumatkan makanan
- Mengoyakkan dan memotong makanan
- Memotong dan melumatkan makanan

10. Gigi haiwan karnivor terdiri daripada gigi jenis \_\_\_\_ \*

Mark only one oval.

- Kacip dan taring
- Taring sahaja
- Kacip dan geraham
- Geraham dan taring



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## APPENDIX F: BETA TESTING (POST-TEST FOR EXPERIMENTAL GROUP)

11/09/2021, 22:37 [E] Ujian Pengguna

### [E] Ujian Pengguna


**\*Required**

Untuk menjawab soalan Ujian Pasca, anda perlu:

- Tonton YouTube video ini dahulu. (Tekan pautan di bawah)  
<https://youtu.be/bPaHovuDjQc>
- Anda diminta untuk cuba bermain permainan "Rescue The Animals" dengan tekan link di bawah.  
Permainan ini hanya boleh dimain menggunakan komputer sahaja.  
<https://games.gdevelop-app.com/game-205a2134-7c00-4a4d-8778-45f9b0567afd/index.html>

Selepas anda telah melakukan dua perkara di atas, anda boleh mula menjawab Ujian Pasca.

Ujian Pasca  
(Penerangan)



Ujian Pasca

1. Manakah antara haiwan berikut merupakan omnivor? \*

*Mark only one oval.*

Harimau  
 Lembu  
 Monyet  
 Biri-biri

2. Mengapa kambing merupakan haiwan herbivor? \*

*Mark only one oval.*

Kerana kambing makan tumbuh-tumbuhan dan daging  
 Kerana kambing makan daging  
 Kerana kambing makan tumbuh-tumbuhan

<https://docs.google.com/forms/d/1DAf0v2zDTYhu3tSF5VErY4B3Rpry9bHD36MA4MApI-I/edit>
1/5

11/09/2021, 22:37

[E] Ujian Pengguna

3. Apakah fungsi gigi dalam gambar di bawah? \*



Mark only one oval.

- Memotong makanan
- Mengoyakkan makanan
- Melumatkan makanan

4. Antara berikut yang manakah benar tentang tabiat makan haiwan di bawah? \*



Mark only one oval. اونیورسیتی تکنیکل مالیزیا ملاک

- Omnivor
- Herbivor
- Onnivor
- Karnivor

11/09/2021, 22:37

[E] Ujian Pengguna

5. Haiwan apakah yang makan makanan berikut? \*



Mark only one oval.

- Lembu, arnab dan biri-biri
- Burung helang, tikus dan beruang
- Arnab, buaya dan biri-biri
- Monyet, tikus dan buaya

6. Merujuk gambar di bawah, haiwan apakah yang makan makanan tersebut? \*



Mark only one oval.

- Buaya, monyet dan arnab
- Tikus, monyet dan beruang
- Arnab, burung helang dan lembu
- Lembu, burung helang dan tikus

11/09/2021, 22:37

[E] Ujian Pengguna

7. Haiwan herbivor mempunyai kombinasi gigi \_\_\_\_ \*

Mark only one oval.

- Kacip dan taring
- Geraham dan taring
- Taring sahaja
- Kacip dan geraham

8. Apakah tabiat makan dua haiwan di bawah? \*



Mark only one oval.

- Karnivor
- Herbivor
- Herbivor dan karnivor
- Omnivor

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11/09/2021, 22:37

[E] Ujian Pengguna

9. Apakah fungsi gigi yang terdapat dalam gambar di bawah? \*



Mark only one oval.

- Mengoyakkan, memotong dan melumatkan makanan
- Mengoyakkan dan memotong makanan
- Memotong dan melumatkan makanan

10. Gigi haiwan karnivor terdiri daripada gigi jenis \_\_\_\_ \*

Mark only one oval.

- Kacip dan taring
- Taring sahaja
- Kacip dan geraham
- Geraham dan taring



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**APPENDIX G: TABLE OF ITES' BACKGROUND**

<b>Questions</b>	<b>ITE 1</b>	<b>ITE 2</b>
Name	Ahmad Naim Che Pee @ Che Hanapi	Hamzah Asyrani Bin Sulaiman
Workplace	Universiti Teknikal Malaysia Melaka (UTeM)	Universiti Teknikal Malaysia Melaka (UTeM)
Gender	Male	Male
Major expertise	Content learning Mobile application Multimedia development Game development	Game development
Experience in field	More than 10 years	More than 10 years

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**APPENDIX H: TABLE OF SMES' BACKGROUND**

<b>Questions</b>	<b>SME 1</b>	<b>SME 2</b>
Name	Nor Aini Binti Bujang	Maslienor bin Daud
Workplace	Sekolah Kebangsaan Senai Utama	Sekolah Kebangsaan Senai Utama
Gender	Female	Male
Experience in teaching	More than 10 years	More than 10 years



**APPENDIX I: TABLE OF SES' BACKGROUND**

Questions	SE 1	SE 2	SE 3
Name	Adriana Batrisyia binti Zunaidi	Zayyad Rabbani bin Zunaidi	Siti Farishah binti Mohamed Wahab
Age	12	10	12
Name of school	Sekolah Kebangsaan Bandar Teknologi, Kajang, Selangor	Sekolah Kebangsaan Bandar Teknologi, Kajang, Selangor	Sekolah Kebangsaan Damai Jaya
Gender	Female	Male	Female
Are you familiar with mobile phone / tablet computer / phone tab	Yes	Yes	Yes
If your answer is yes, what do you use it for?	Watching edutainment video clips	Playing games	Watching edutainment video clips



**APPENDIX J: PRE-TEST MARKS**

<b>Beta Testers</b>	<b>Pre-test (%)</b>	<b>Gred</b>
S1	90	A
S2	90	A
S3	90	A
S4	80	A
S5	80	A
S6	80	A
S7	80	A
S8	80	A
S9	80	A
S10	80	A
S11	70	B
S12	70	B
S13	70	B
S14	70	B
S15	70	B
S16	70	B
S17	60	C
S18	60	C
S19	50	C
S20	50	C
S21	40	D
S22	40	D
S23	40	D
S24	40	D
S25	40	D
S26	40	D

## APPENDIX K: TURNITIN

PSM 2 REPORT (AIMI KHALEEDA)			
ORIGINALITY REPORT			
<b>11</b> %	<b>10</b> %	<b>3</b> %	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS
PRIMARY SOURCES			
<b>1</b>	<a href="http://eprints.utem.edu.my">eprints.utem.edu.my</a> Internet Source		<b>2</b> %
<b>2</b>	<a href="http://www.coursehero.com">www.coursehero.com</a> Internet Source		<b>1</b> %
<b>3</b>	Ibrahim, Roslina, Rasimah Che Mohd Yusoff, Hasiah Mohamed@Omar, and Azizah Jaafar. "Students Perceptions of Using Educational Games to Learn Introductory Programming", Computer and Information Science, 2010. Publication		<b>1</b> %
<b>4</b>	<a href="http://www.myjournal.my">www.myjournal.my</a> Internet Source		<b>1</b> %
<b>5</b>	<a href="http://doczz.net">doczz.net</a> Internet Source		<b>1</b> %
<b>6</b>	<a href="http://text-id.123dok.com">text-id.123dok.com</a> Internet Source		<b>&lt;1</b> %
<b>7</b>	<a href="http://eprints.utm.my">eprints.utm.my</a> Internet Source		<b>&lt;1</b> %
<b>8</b>	<a href="http://tasued.edu.ng">tasued.edu.ng</a> Internet Source		

		<1 %
9	<a href="http://www.everyfive.com">www.everyfive.com</a> Internet Source	<1 %
10	<a href="http://en.wikibooks.org">en.wikibooks.org</a> Internet Source	<1 %
11	<a href="http://www.elejournals.com">www.elejournals.com</a> Internet Source	<1 %
12	<a href="http://journalarticle.ukm.my">journalarticle.ukm.my</a> Internet Source	<1 %
13	<a href="http://mafiadoc.com">mafiadoc.com</a> Internet Source	<1 %
14	<a href="http://www.slpbrunei.edu.bn">www.slpbrunei.edu.bn</a> Internet Source	<1 %
15	Atika Qazi, Glenn Hardaker, Ibrahim Said Ahmad, Mohammad Darwich, Jaafar Zubairu Maitama, AD Ahad. "The Role of Information & Communication Technology in e-learning Environments: A Systematic Review", IEEE Access, 2021 Publication	<1 %
16	<a href="http://researchspace.ukzn.ac.za">researchspace.ukzn.ac.za</a> Internet Source	<1 %
17	<a href="http://archive.org">archive.org</a> Internet Source	<1 %

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