CREATIVE EDUTAINMENT LEARNING APPLICATION FOR ELEMENTARY STUDENTS USING EXPLORATORY APPROACH

By

Ng Wei Li

A REPORT

SUBMITTED TO

Universiti Tunku Abdul Rahman

in partial fulfillment of the requirements

for the degree of

BACHELOR OF INFORMATION SYSTEMS (HONOURS)

BUSINESS INFORMATION SYSTEMS

Faculty of Information and Communication Technology

(Kampar Campus)

JUNE 2022

UNIVERSITI TUNKU ABDUL RAHMAN

REPORT STATUS DECLARATION FORM

Title: Creative Edutainment Learning Application for Elementary Students Using Exploratory Approach

Academic Session: May 2022

I _____NG WEI LI_____

(CAPITAL LETTER)

declare that I allow this Final Year Project Report to be kept in

Universiti Tunku Abdul Rahman Library subject to the regulations as follows:

1. The dissertation is a property of the Library.
2. The Library is allowed to make copies of this dissertation for academic purposes.

Verified by,

(Author's signature)

Lee Chen Kang

(Supervisor's signature)

Address:

__NO 22, Jalan Kemuliaan 7,__

__Taman Universiti 81300,____

__Skudai, Johor._____

___Ts Dr Lee Chen Kang__

Supervisor's name

Date: ___7 September 2022___

Date: _____7/9/2022_____

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

UNIVERSITI TUNKU ABDUL RAHMAN

Date: _7 September 2022_

SUBMISSION OF FINAL YEAR PROJECT /DISSERTATION/THESIS

It is hereby certified that __***Ng Wei Li***__ (ID No: __***18ACB03423***__) has completed this final year project entitled Creative Edutainment Learning Application for Elementary Students Using Exploratory Approach" under the supervision of _____Ts Dr Lee Chen Kang_____ (Supervisor) from the Department of __Information Systems__, Faculty/Institute* of __Information and Communication Technology_ , and _ Dr Abdulkarim Kanaan Jebna_ (Co-Supervisor)* from the Department of __Information Systems __, Faculty/Institute* of _Information and Communication Technology__.

I understand that University will upload softcopy of my final year project in pdf format into UTAR Institutional Repository, which may be made accessible to UTAR community and public.

Yours truly,

__NG WEI LI___

(*Student Name*)

DECLARATION OF ORIGINALITY

I declare that this report entitled "**CREATIVE EDUTAINMENT LEARNING APPLICATION FOR ELEMENTARY STUDENTS USING EXPLORATORY APPROACH**" is my own work except as cited in the references. The report has not been accepted for any degree and is not being submitted concurrently in candidature for any degree or other award.

Signature : 

Name : NG WEI LI

Date : 7 September 2022

Acknowledgment

First, I would like to thank and appreciate my supervisor, Ts Dr Lee Chen Kang who gave me a lot of information regarding the final year project. The suggestion given are helpful during the development process. Dr Lee also patiently checked my progress and report in order to enhance my project.

Besides, I would like to specially thank my family, friends and junior. During this period, they gave a lot of support and motivation for me. They also provide suggestion to me when I faced difficulty during the development of final year project.

Lastly, I would like to thank myself who putting effort to complete this project. I have overcome the difficulties when I faced problems in the development. I have appreciated that advice and encouragement given by others during this period.

ABSTRACT

Last decade, the advancement of technologies has a rapid growth in the world. The integration of technologies and education brings the advantages to the education sector. One of the examples is the interactive multimedia application. Interactive multimedia provides an interesting environment for learners to learn. The concept of 'learning while playing', also called as edutainment, able to help the learners to learn faster and enhance their memories. Instead of learning the textual lesson in classroom, learners able to learn in an enjoyable environment by interacting with the colourful graphics and animations. Besides, the interactive learning application applied with technologies able to stimulate the students' thinking and imagination. By learning with the applications, students also manage to explore more creativity idea that able to apply in their daily life.

This project is aimed to develop an edutainment learning application for elementary students who aged from eight to nine years old. This application This application does not limit the gender of the students as both female and male students can be using it. The topic of the proposed application is to let the students learning the plants and insects in a creative way rather than learning it from a textbook. Various multimedia elements such as animation, graphics and audio will be included in this application in order to make the learning environment interesting and attractive. Besides, there will be an augmented reality (AR) view for the each plant and insect. This feature helps to improve the cognitive skill of learners by assimilating the objects into the real environment. In order to develop this proposed application, the methodology used is ADDIE model which consists of five phases. The phases are analysis, design, development, implementation and evaluation.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1 : INTRODUCTION

1.1 Introduction

Recently, the technologies grew rapidly throughout the world. There are many types of technologies such as virtual reality, augmented reality, mixed reality and extended reality. The advancement of technology has slowly revolutionized different industry especially educational industry. Technologies able to provide flexibility to the education since it allow different perspectives while learning. Instead of using printed textbooks for teaching, the educational multimedia application able to deliver the content Although it can improve the quality of education that provide to the students, there are also a concern to the parents which is to integrate the technologies with the education.

There are different stages of education which are early education, elementary, secondary and tertiary. A child can be described as a piece of blank paper and they can be educated by receiving the knowledge, so the education is important for them. Hence, the integration of technologies and education able to help the students to improve their understanding and cognitive skills. By learning the contents that delivered using multimedia and technology, students are able to improve their understanding through the enjoyable learning experiences [24]. While studying with the augmented reality models, kids can clearly understand the content and concept visually [21]. This able to help them to explore new idea and territories.

The word of edutainment is the integration of education and entertainment. The concept of edutainment is to let the user gains the knowledge and information while playing a game [24-25], [20]. In general, the educational content will be served as a video games so that the learner can be easily interact. While the learners interact with the edutainment application, they can improve and enhance their basic skills such as cognitive skill, observational skill and emotional skill in the early childhood [21]. In addition, it is hard to grab children’s attention since they are active. The edutainment application able to attract them continually enjoying the content, at the same time absorbing new knowledge.

1.2 Background Information

The world is full of unknown that waiting the human to be explored. Science is able to help the students to explore and discover the new things so that they have new knowledge and understanding towards the world. Science subject is important as the foundation of education because the students who are in elementary stage are naturally curious [8]. This subject consists of interesting facts and experiments that able to fulfil the curiosity of elementary students.

Furthermore, people able to remember around 10% of the content they read, 20% on what they listen, and 30% on what they see [5]. If the person is seeing and listening at the same time, they will be able to remember 50% of the content. Moreover, 80% of the content can be remembered if they conduct the three processes at the same time. This shows that multimedia which is rich of elements able to facilitate greater retention of new knowledge. Therefore, the contents delivered can be well understand by the learners, at the same time improve their learning process and outcome.

Multimedia is important for elementary students in order to help them improve their capabilities of communication, thinking and understanding [18]. For traditional learning style, students will use textbook for learning together with the explanation from the teachers. This way of learning is flat and bored for the students. In this case, multimedia learning application provide a different way of learning for the students. Compared to traditional learning, multimedia application is more attractive and interesting since it contains colourful graphics and animation as well as cheerful background music and sound effect.

In short, this project will be delivering an interactive multimedia learning application for elementary students. By providing different modules in the application, the students able to learn some plants and insects, at the same time exploring the knowledge by themselves. The application aims to help them have a better understanding on plants and insects through this creative learning process.

1.3 Problem Statement

- Unclear guidance and information for users to refer

  Providing detailed information for users is important for them to refer while using the application [24]. The guidelines given in the multimedia application should be clear and easily to understand. The application that unable to provide sufficient instructions can be defined as poor multimedia application. There have one journal stated that an edutainment multimedia application should consist elementary instruction to let the users clearly understand the content presented [5]. If the users did not give the guidance, they will feel messy and no idea to continue using the application. Since children are the target audience, they will lose the interest on using the multimedia application as well. Therefore, it is important to provide a clear guidance to the users. By having the guidance, users able to proceed and access the content by themselves easily without any confuse toward the application.

- Lack of interactivity feature for users to interact

  Interactivity is one of the important features for the edutainment application. Other than the multimedia element such as images, audio and text, some unique button or features can be added. Interactive multimedia application provides the navigation feature which allows users to control the content by themselves [2]. The application that lacks interactivity feature is hard to stimulate the users' learning skill and attract the users' interest. This is because users are only allowed to follow the content that are set. Users may feel bored to follow the constant content since it is not interesting to blindly follow it. In addition, some of the application will provide a lengthy introduction animation in the beginning without giving a button for users to skip. Users are forced to watching it every time they open the application. It is time consuming, and users' interest may slowly reduce. Instead of letting users obeying the content passively, the users should have the action to control the content while using the edutainment application [8].

- Content and user interface of application is inappropriate

  One of the common issues that occurs in edutainment application is the content delivered is inappropriate. Some of the application did not focus on the content to design it in a creativity way. This may unfulfilled the purpose of application to be a learning while playing application. Meaningless content will not help the users to acquire new knowledge but distracting their interest to use the application. The content delivered should be designed that will help the users stimulate their thinking so that they can acquire new knowledge from it. For example, some technologies such as augmented reality can be developed in the edutainment application to help the users enhancing their learning process in the education [12]. By utilizing the technology, the learning process can be interesting and attractive so that the students will be motivated [3]. Besides, the user interface should be designed as simple as possible so that the users can clearly understand what deliver by the application. It is significant to have a user-friendly interface so that the users have the motivation to use the application.

1.4 Project Objective

- **To study the usage of multimedia technology in supporting elementary education**

  The integration of technologies and education able to improve the learning effectiveness among the children. The interactive multimedia application is a multimedia that provide navigation to users. Compared with receiving the knowledge by listening or reading, students able to deeply remember the knowledge if they able to interact with the content. When interactive multimedia application use in the elementary education, the students are able to stimulate their thinking as well as help them to have clear understanding on the content since they are allowed to navigate the content by themselves. Some multimedia elements such as two-dimensional (2D) graphics and augmented reality view can be added in the application to improve the users' understanding. Users' imagination skill and creativity can be nurtured through

the creativity of the application as well. Hence, the teaching and learning process can be effectively conducted with the support of interactive multimedia application.

- **To design a creative multimedia application using exploratory approach**

  Exploratory approach emphasizes on users' involvement by encouraging them to investigate the content learnt through their own action. Instead of passive learning, the users are able to absorb the contents well if they are actively learning. By using exploratory approach, the users can be motivated to discover a topic through self-exploration. Besides, the users' thinking can be stimulated while exploring the multimedia application. The users are able to discover the new knowledge by themselves instead of memorizing the knowledge taught by the teachers. This will also enhance their education achievement which helps to improve the confidence level.

- **To evaluate the effectiveness of multimedia application to support learning**

  In order to ensure the objective achievement, the multimedia application should be effectively delivered to the target audience. The multimedia application which developed for elementary students should contain the feature that will attract their attention. By remaining the usability and functionality, the creative interface is important for a multimedia application. The more effective the multimedia application delivers, the more beneficial the users can get. This is because the users' performance depends on how much they can receive knowledge from the application. By having the more realistic learning context that provided by interactive multimedia, users can enjoy the learning environment in an effective way that is different from the traditional learning in classroom [4].

1.5 Project Scope

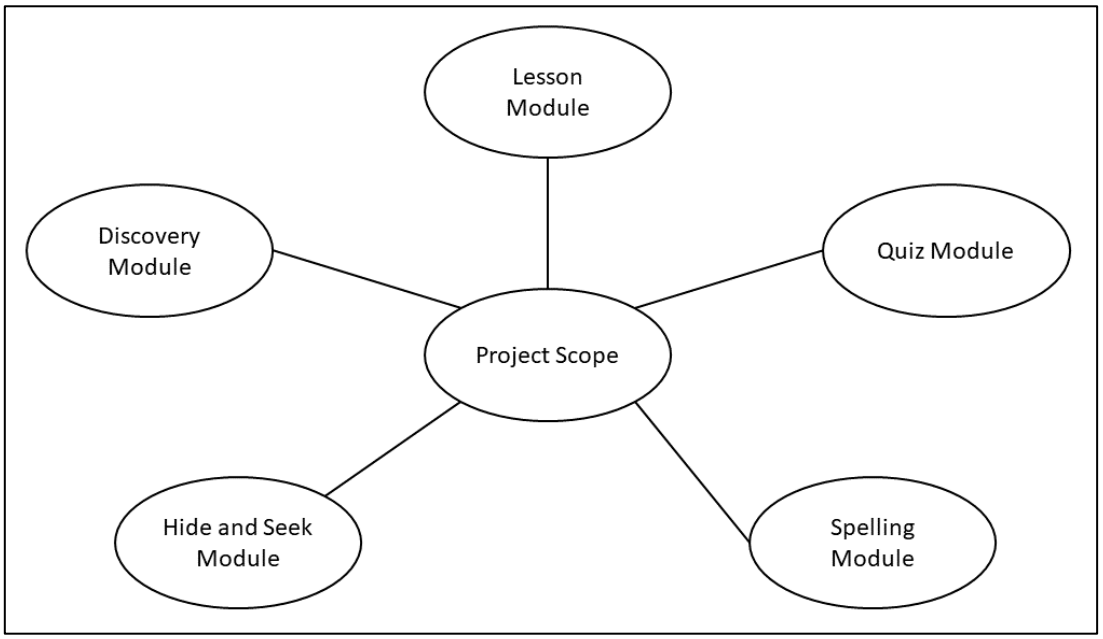


Figure 1.1 Project Scope

The target audience of the proposed application is the elementary students who aged from eight to nine years old. This edutainment application aims to provide a platform for them to learn some plants and insects in the creativity way. The proposed application provides different modules which are lesson module, quiz module, spelling module, hide and seek module as well as discovery module.

Learning Module

In this module, the course materials provided are the information about plants and insects. For plants, the users able to get the information of the particular plants as well as the ways to plant and take care it. For insect module, information such as characteristic, body part and life cycle will be provided to the users. Besides that, users can view the particular plants or insect in the augmented reality view. This feature able to let the objects assimilate into the real environment so that the users can have clear cognition on it.

Quiz Module

Quiz module is a module to let users test their understanding after viewing the lesson. There are around ten questions in the module where each question will ask about the content in the lesson module. This module helps the users to strengthen their memories after enjoying the lesson. Furthermore, the types of the questions are different which contains text style multiple choice question, graphic style multiple choice question and fill in the blank. After each question is answered, the sound effect will be provided as the feedback based on the answer given. After the questions are completed, there will be animation shown in the scene to motivate the users.

Spelling Module

This module is a mini game module for the users to test their vocabulary. The question displayed is the words that mentioned in the lesson module. This module contains different elements such as animation, text, graphic and audio where the audio will be presented in background music and sound effect. Instead of reciting the words, this mini game module helps the users to enhance their vocabulary in a creative way. The feedback will be displayed as the encouraging element after the users answer each vocabulary question.

Hide and Seek Module

Hide and seek module is a mini game for the users to enjoy while learning. In this module, there will have 5 plants or insects for users to start the game. After the games start, the users have to find out the plants or insects selected in the scene. In order to make the game fun and interesting, users are able to navigate the scene to other scene so that they can find the selected plant or insect in different scene. After the users successfully found, there will have an encouraging feedback shown to the users with some colourful graphics.

Discovery Module

Discovery module provides an interesting way for users to interact with the proposed application. The users able to experience different scenes and objects in this module. This is because the module allows users to click on the object which will result a different output. For example, when the users click on a butterfly in a scene, the butterfly may fly away from the scene. In this module, there will be using colourful background image and graphics. This will attract the users in order to enjoy and play the module.

1.6 Impact, Significance and Contribution

The proposed application is a multimedia learning application that provide an environment for learners to learn plants and insects. The application will contain different multimedia elements such as text, graphics, animation and audio. Instead of reading a full text content like a textbook, the proposed application provides an interesting way for learners to learn such as through exploratory module and mini game module. Besides, there are also some modules to help the learners enhance their knowledge and information. For example, learners can revise and test their understanding through quiz module and spelling module. The mini game module and discovery module also let the users to explore and discover the information.

In addition, some necessary skills such as brainstorming, creative thinking and problem solving able to be enhanced for the learners through the proposed application. It is critical to train the learners to actively thinking since elementary education. Since the learning pace of each person is different where some are slow learner and some are fast learner, the learners can learn the content in the proposed application by following their self-learning pace. This will help them to absorb the knowledge in an effective way. Furthermore, the proposed application provides convenient and flexible to the learners. They can use it even in their own room instead of going to the school. Learners are flexible to choose the learning time which is more effective for them.

1.7 Target Audience

Since the proposed application is targeted for science learning about plants and insects, the target audience is the elementary school students in Malaysia. Generally, the target students are aged from eight to nine years old who will learn science study in school. There is no specific gender for this application as both male and female are able to use this application. The elementary students are naturally curious towards the world, this application helps them to explore the plants and insects in a creative way.

Besides, the students are able to build a science foundation since elementary education [8]. This is because early science education is significance for a child's growth. Instead of passively absorbing, the students also will be trained the exploration habit in their life. This habit helps them to discover new knowledge by themselves since childhood.

CHAPTER 2: LITERATUR REVIEW

2.1 Multimedia Definition

The notion of multimedia consists of two words from Latin which are ‘multi’ and ‘medium’. In Latin, ‘multi’ means many and much where ‘medium’ means that the software and hardware combination that is use for communication [16]. Multimedia can be defined as the integration of different media elements using a computer. The examples of media elements are text, graphics, audio, video and animation. Besides, multimedia also can be used to inform the users some information or entertain the users [1]. There are two categories of multimedia which are linear multimedia and interactive multimedia.

2.1.1 Linear Multimedia

Linear multimedia is a multimedia that presented in sequential. In general, linear multimedia did not provided the feature to let users control the content [19]. Users have to follow the sequence of multimedia presented that is set by the designer. Normally, the purposes of linear multimedia are to deliver information or knowledge, or to familiarize particular topic. Hence, there is not much interaction with the audience. In this case, linear multimedia also called as ‘passive multimedia’ because the audience participation in the multimedia is less. Linear multimedia is a direct active content development where there is no navigation control for users just like watching a cinema movie [1]. The examples for linear multimedia are the montage presentation slideshow, an advertisement and a movie.

Linear multimedia is useful to help the audience focus on a particular topic. This is because the contents provided are organized for users to follow. It also ensures the information are delivered in an effective way to let the audience absorb. However, this category of multimedia did not provide an interactivity for the audience. It means that the audience are seldom participate in the contents.

2.1.2 Interactive Multimedia

Interactive multimedia is a multimedia that enable the audience to take over the control on the content [19]. Different outputs will be provided based on the inputs given. This encourages the audience to take part in the contents to control the multimedia elements such as text, graphics, animation, audio or video. Instead of letting the users be a viewer, interactive multimedia let the users play the role as a participant to involve in the application. By using interactive multimedia, the audiences able to absorb the content in an effective way since the audience able to take over the control of the content. Interactive multimedia also can be presented in the live mode [1]. For instance, the presenter able to interact with the audiences in a live multimedia presentation.

Besides, interactive multimedia provides an immersive experience for the audience since they can participate in it. Instead of viewing or listening to the content, interactive multimedia provides a different environment to deliver the information to the audience. This is able to help in well information transmitting to the audience. The examples for interactive multimedia are video games, simulation, kiosk system and learning courseware.

2.2 Interactive Multimedia Issues

2.2.1 Benefits

Interactive multimedia has brought some advantages to the people. Interactive multimedia provides a better understanding to the users [18]. Instead of viewing the text content in the reference book, the users are able to view the content through attractive graphics and animation. This allows the users to easily understand the information provided through the interactive multimedia. Besides, it is convenient and flexible since the users are able to control the information in the multimedia. The users can use the multimedia based on their preference and learning style [23]. An immersive experience will be given to the users while interacting with the multimedia as well. The intuitive interface provided by interactive multimedia allows users to understand the system easily without any training. This also able to help the users to save the time to learn the system. Lastly, this type of multimedia is useful for information archive, particular training and educational purpose.

2.2.2 Limitations

The interactive multimedia also brings some limitation to the users. Since the multimedia will be using computer software to conduct, it might not be user-friendly for some elderly. This is because the elderly normally will spend more time on learning the operation of computer software. Every learner has their own pace of learning and studying. This will affect the effectiveness of application delivery which depends on the learners [23]. In addition, the delivery method of interactive multimedia may not be suitable for all courses to use for teaching [6]. The multimedia has the relationship with the form of content. However, the form of the contents will be determined by each content where the form will react to each content as well. In this situation, some teaching method will not suitably be presented in interactive multimedia form.

2.3 Applications of Multimedia

Multimedia able to apply in different industry to bring convenient to the people. For house, the family will interact with the multimedia while playing the video games through mobile phone or television. Usually, the television sets will come with the built-in user inputs to let users choose the display. Users can choose to connect to YouTube or watching a channel while interacting with the television. For gaming application, it becomes interesting and entertain with the integration effect of video and audio [1]. In public area, the kiosk system is a kind of multimedia application. Kiosk system will be used in the tourism area for tourist to view information or in a shopping mall for visitor to search information. Besides, the e-advertisement that displayed in the street or shops are also using the multimedia feature.

In the business industry, multimedia application is also widely used to ensure the business progress. When a company conducting product demos, the simulation normally will be done in the multimedia type to demonstrate a product. Multimedia application also helps the businesses to illustrate the data analysis in a visual form. This helps the organization to make decision in an effective and efficiency way. In school, the educational multimedia software able to enhance the students' learning process [17]. The multimedia application has provided an environment which is friendly interaction to the users [1]. Multimedia can be used in simulate the life situation or a particular

environment that is danger such as medical science area. For instance, the simulation of airplane driving helps the pilot to be trained instead of driving a real plane in the sky.

2.4 Multimedia in Elementary Education

The use of multimedia has improved the quality of education. Learning through multimedia will help the students to experience a different learning process. The form of multimedia slowly become a critical visual language in the teaching and learning process especially in primary level. The use of multimedia able to present a creative learning process in an effective and efficient way [23]. The mind and education performance of the students will deeply be affected by the animation used in a multimedia [18]. This is because animation is able to grab the attention and interest of the students [9][18]. Hence, the use of multimedia allows the students in elementary education understanding the concept and knowledge as they are unable to learn the complex and dull content which full of text.

Furthermore, the effective use of multimedia in elementary education brings benefit to both students and teachers. The teachers are able to change the teaching method in a more effective way by making the good use of multimedia. At the same time, multimedia application also helps in increasing the participation of the students and developing the students' learning attitudes [18][23]. In the traditional learning method, the students will be receiving the knowledge feeding by the teachers spoon by spoon. This may cause the ability of self-learning and creative thinking of students become poor. By having an immersive experience while learning using multimedia, students will be motivated in learning process. Since the students are highly participated in the learning environment, they are able to stimulate their creative idea and thinking in the daily life.

On the other hand, each student has their own learning pace. Some students are able to absorb the knowledge easily in the lesson where some students may need more time to digest it. The learning pace of students which is diverse will affect their learning performance in the school [23]. Multimedia application helps in delivering the knowledge and information in the simpler way in order to let the students learn it in their own pace which is more comfortable. This will also ensure the students will not overloaded while receiving the new knowledge. It is important because when the

students fully understand the knowledge, they will not be feeling confused or difficult to understand if they received added information that is deeper.

2.5 Critical Remarks of Previous Works

2.5.1 Review on Previous Works

1. Science Kids Learning [13]

Science Kids Learning is a mobile application that provide different games related to basic science concept. The topics covered in this application are human body, microorganisms, living things food chains and others. Different types of games are provided for each topic for the users to play. While interacting and playing the games, the users can explore the new knowledge provided. The figure 2.1 shows the menu selection page of the application. Users can click on the arrow to swap to other topics.

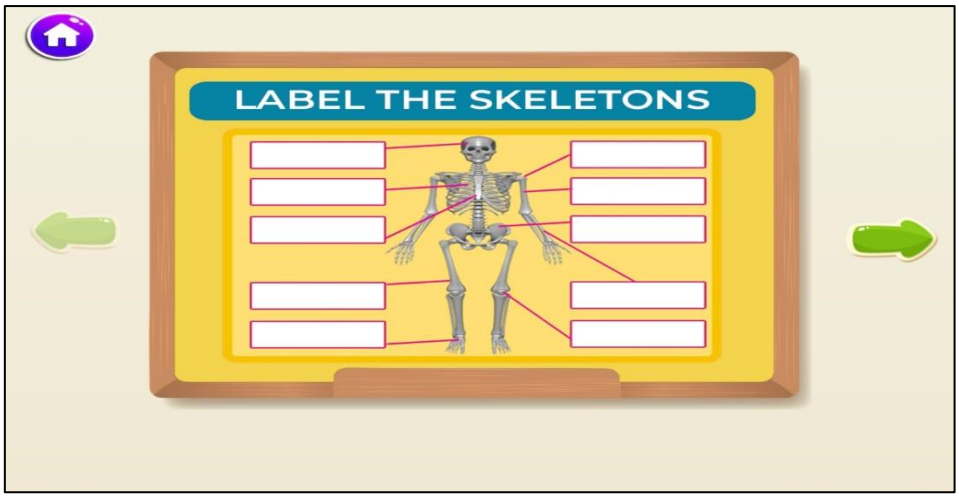


Figure 2.1 Menu Selection Page of Science Kids Learning

Strengths

The application has provided simple instruction for every game that is easily understand. Each game interface consists of a colourful graphics and some animation. This will attract the users to actively interact with the games. Besides, some extra information and description are provided in the game. This ensures the users able to learn the contents while playing the games.

Figure 2.2 Example of Game Interface

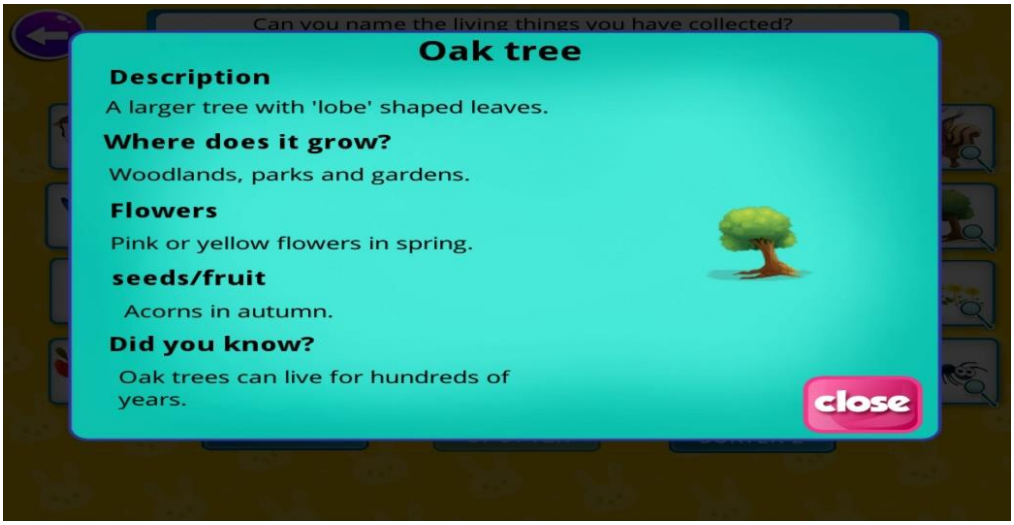


Figure 2.3 Example of Information Provided

Weaknesses

The form of application is displayed as games since it does not provide lesson for users to learn before they play the games. The main menu of the application is difficult to navigate because the users have to click on the arrow and slowly change the topics. It is not user-friendly and inefficiency for the users to change and choose a topic to learn. Besides, there are no augmented reality feature provided in the application.

2. Learning Games for Kids [11]

Learning Games for kids is an open-source website for children to learning while playing. It also available on App Store and Play Store for iOS device and Android devices. This website contains a variety of games from different aspect such as mathematics topic, alphabet topic, animal topic art and music topic. Other than edutainment games, Learning Games for Kids also provide some videos and lessons in different topics for children. Children able to choose the topic for learning based on their preferences.

Figure 2.4 Main Page of Learning Games for Kids

Strengths

This website promotes a variety of creative edutainment games for kids. By playing the games, children able to nurture their creativity and imagination in their life. The interface of the website is colourful design which able to attract the children's attention while using the website. Besides that, this website provides different method to help the children understand and memorize the particular topic. For instance, different lessons and games for alphabetical learning are given on the website.

Figure 2.5 Example of Games in Learning Games for Kids

Weaknesses

The website uses a lot of textual form for lessoning. This type of lessoning did not provide a creativity environment for children to learning. Besides, most of the multimedia elements used by the website are text and video. There is less animation and sound effect added in the website which able to grab the children's interest on learning.

3. Science Learning Worksheet [15]

This is a mobile application that provide some science topics for learners to learn and play. Different topics are provided such as animals, foods, body, senses, plants and others. For each topic, the application provides some mini games and levels for the users to complete. The figure 2.6 shows that the main menu of the application. Users can choose the topics and click on the arrow to view other topics.

Figure 2.6 Menu Page of Science Learning Worksheet

Strengths

The application provides a colourful graphic and interactive interface for the users. This will attract the users while using the application. Instruction also given for each level and game for the users to understand what have to complete. Besides, there will have sound effect when the users interact with the application so that the users able to be motivated. The figure 2.7 shows that the example of the games in animal topic.

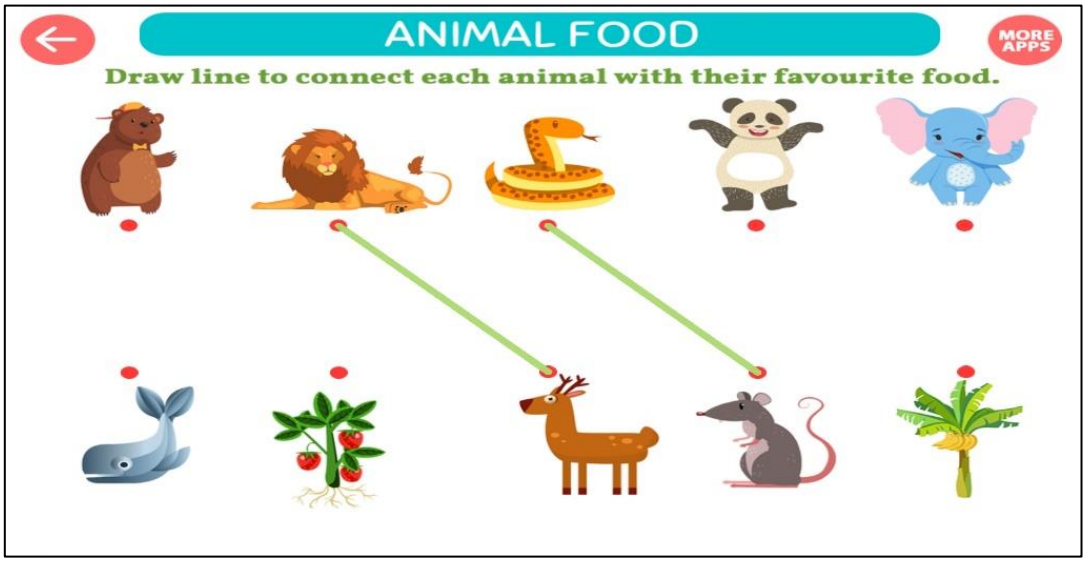


Figure 2.7 Example of Games in Science Learning Worksheet

Weaknesses

Although the application consists of colourful interface, the design of interface is too flat since it does not contain some three-dimensional objects or words. There is also lack of background music in both main menu and games scene. Compared to graphic, animation is less provided in the application. Animation is an important element that will help to grab the users' attention while using the application.

4. Kids Science True False [10]

This is a mobile application which available in Android devices. This application provides different topics of science for learners to learn. The topics covered are environment, body, animals, matter, space and others. By choosing the topic, the learners able to view the statements and choose whether it is true or false. The figure 2.8 shows the main menu of the application.

Figure 2.8 Main Menu of Kids Science True False

Strengths

Kids Science True False cover different areas of science for the learners. The learners are able to discover different topics through this application to enhance their science knowledge. Besides, the application provides feedback after the learners answer each question. Different outputs of answer will lead to different feedback. For example, if the answer given is correct, a great sound effect will be provided where a dull sound effect will be provided if the answer is wrong. This feature may encourage the learners while they interact with the application.

Figure 2.9 Quiz Interface for Kids Science True False

Weaknesses

The contents of this application may be underloaded since it is only let children to complete the quizzes. In order to continue to the next level, the learners have to complete the quiz level every time they start entering the quiz. It is not user-friendly where it does not provide level selection for the users. Besides, the interface of the application is flat since it did not contain colourful graphics and animation. This may distract the learners while learning and cause the learners feel uninterested.

5. Science Lab Experiment [14]

Science Lab Experiment is a mobile application that is available in Android devices. This application provides a series of interesting lab experiments for the users. The users have to go through the experiment levels by levels. Each of the lab experiments contain a specific theory so that the users able to learn while experiencing it. The figure 2.10 shows the main menu of the application. Users can swap left or right to view each level.

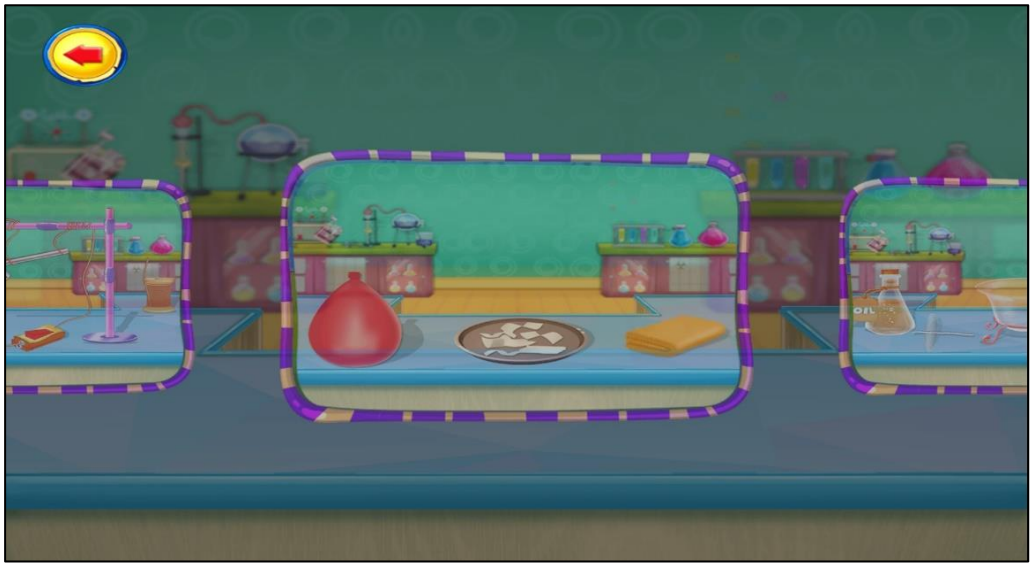


Figure 2.10 Menu Interface for Science Lab Experiment

Strengths

Science Lab Experiment provide cheerful background music and encouraging sound effect. The interface design of the application is colourful which will attract the learners. In addition, there will have spoken instruction in each experiment so that the users able to follow it to complete level. After completing all levels in the application, the users can choose the level in case they need for revision. The figure 2.11 shows that the experiments for Bernoulli's principle. Explanation will be provided after the users complete each experiment.

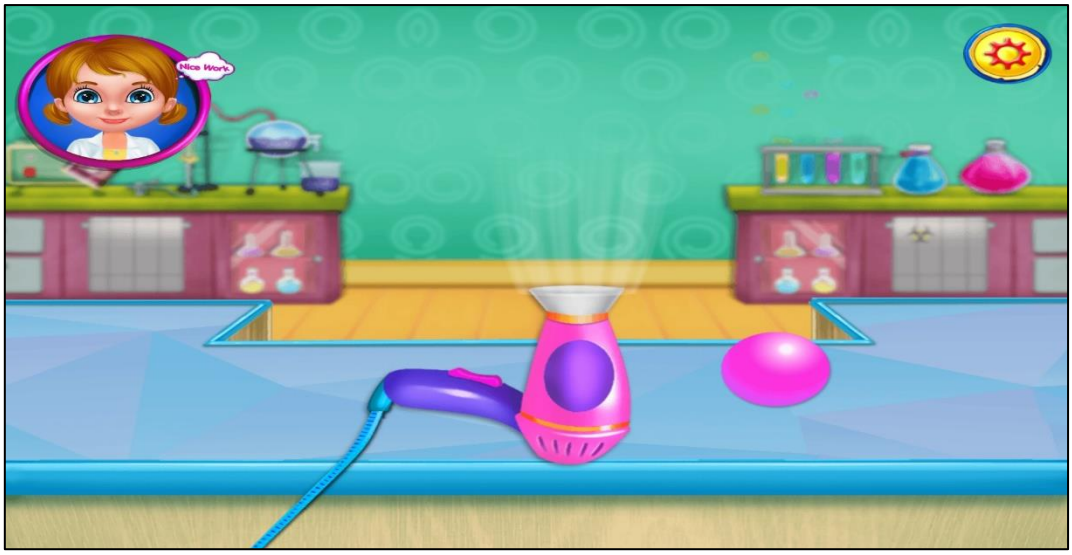


Figure 2.11 Example of Experiment for Science Lab Experiment

Weaknesses

Since the application provides step by step level of the experiments, it causes a lesser interactivity for the users to explore and discover by themselves in the application. This may cause a passive learning for the users that unable to stimulate the users' thinking. Besides, the application lack of the feature to let users skip the instruction given before each experiment. The users are forced to wait the spoken instruction finished before they start the experiment. The explanation given after each experiment are unable to skip as well.

2.5.2 Comparison Between Applications

1. **Compare Multimedia Elements Provided**

Table 2.1 Comparison of Multimedia Elements Used

		Text	**Graphics / Images**	**Animation**	**Audio**	**Video**	**AR**
2.1	Science Kids Learning [13]	√	√	√	√		
2.2	Learning Games for Kids [11]	√	√		√	√	
2.3	Science Learning Worksheet [15]	√	√	√	√		
2.4	Kids Science True False [10]	√			√		
2.5	Science Lab Experiment [14]	√	√	√	√		

2. Compare Features Between Platforms

Table 2.2 Comparison of Features Between Applications

Features	Science Kids Learning [13]	Learning Games for Kids [11]	Science Learning Worksheet [15]	Kids Science True False [10]	Science Lab Experiment [14]	Proposed Application
Available on PC or laptop		√				
Available on tablet or mobile device	√	√	√	√	√	√
Lessons or further information provided	√	√			√	√
Quizzes or practices provided		√		√		√
Games provided	√	√	√		√	√
Background music provided					√	√
Feedback provided	√		√	√	√	√
Required to download	√		√	√	√	√

2.6 Exploratory Approach

Exploratory approach is a learning approach that will motivate the learners to discover a topic or content through self-exploration and experiment. By having the tutorial support, the learning process will be exploring the environment and virtual experiences [22]. This approach emphasizes on learners' involvement by encouraging them to investigate the content learnt through a series of action. Instead of passive learning, the learners are able to absorb the contents well if they are actively learning.

Learners are able to shift from habitual learning method while experiencing the exploratory approach. This is because this approach is less focus on didactic training [4]. Besides, exploratory method can stimulate the learners' creative thinking and problem solving skills instead of memorization. Through the cognitive process, learners able to draw out the lessons from the interaction with the content and thus extracting the meaningful information. This helps to enhance their achievement in education by thinking out of the box. Hence, it is an effective way of learning in every stages of education.

In addition, exploratory approach will be used in the proposed application. In the discovery module, the users are able to participate in the module to explore and discover the contents in different scenes by themselves. For example, clicking on different objects in the scene will trigger different types of scenario for the users. This method not only helps them in content learning, but also stimulating their creative idea.

2.7 User Requirements Gathering

2.7.1 Survey Questionnaire

The method that used to collect data and information for this project is questionnaire and survey. Questionnaire and survey are a useful method to collect information from a group of users. By designing a set of questions which is related in a specific topic, the author able to collect the opinion of users regarding the system development. This method helps the author to collect information in an effective way by spreading the survey to the target respondents. In order to design an effective survey and questionnaire, the author have to define the questions to be asked for information

collection. The result of survey able to help the author in designing the application that will match the users' requirement.

Secondly, the other method used is observation. This method is to observe the users performing task in their working environment. This allows the author to catch the detailed information that the users may not pay attention to. This method also applied on the application. The author can observe the existing multimedia application which in the similar area to make comparison. The author can analyse the strengths and weaknesses of each application. By collecting the analysis, the author can improve the weaknesses and learn the strengths to develop the proposed application. Users' requirement can be met through the improvement done.

2.7.2 Data Collection

In a set of questionnaires, it consists 3 section where section A will be collecting the respondents' information, section B will collect the perception of respondents towards multimedia application and section C will be collecting the opinion of respondents regarding the proposed multimedia application. The questionnaire is distributed to 30 primary school teachers to answer the survey. The following are the analysis for each question in the questionnaire.

Section A

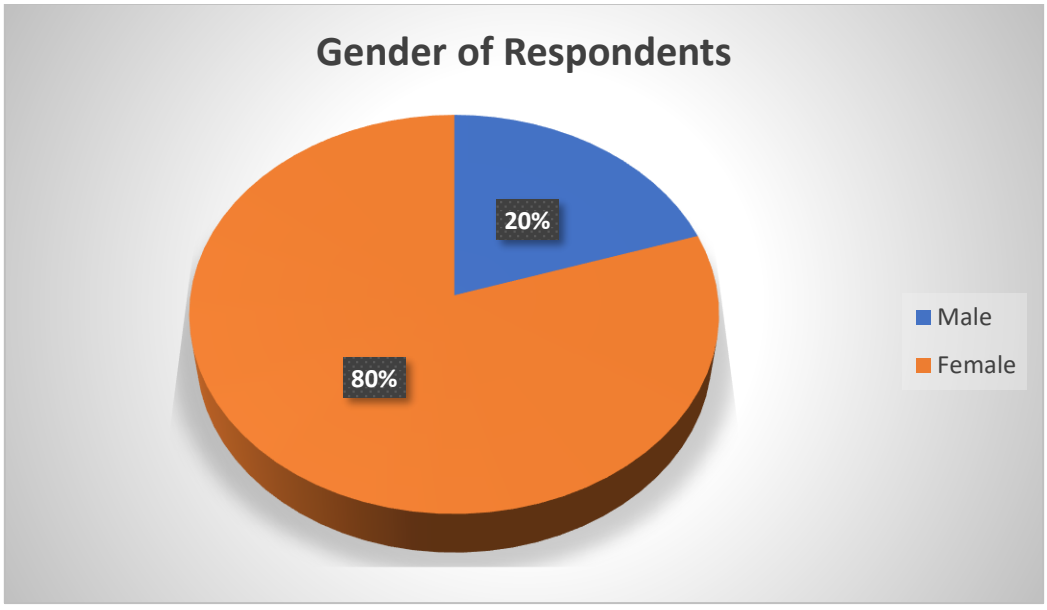


Figure 2.12 Graph Represents Gender of Respondents

Based on figure 2.12, 80% of the respondents are female, which is 24 out of 30. The other 6 respondents are male which is 20%.

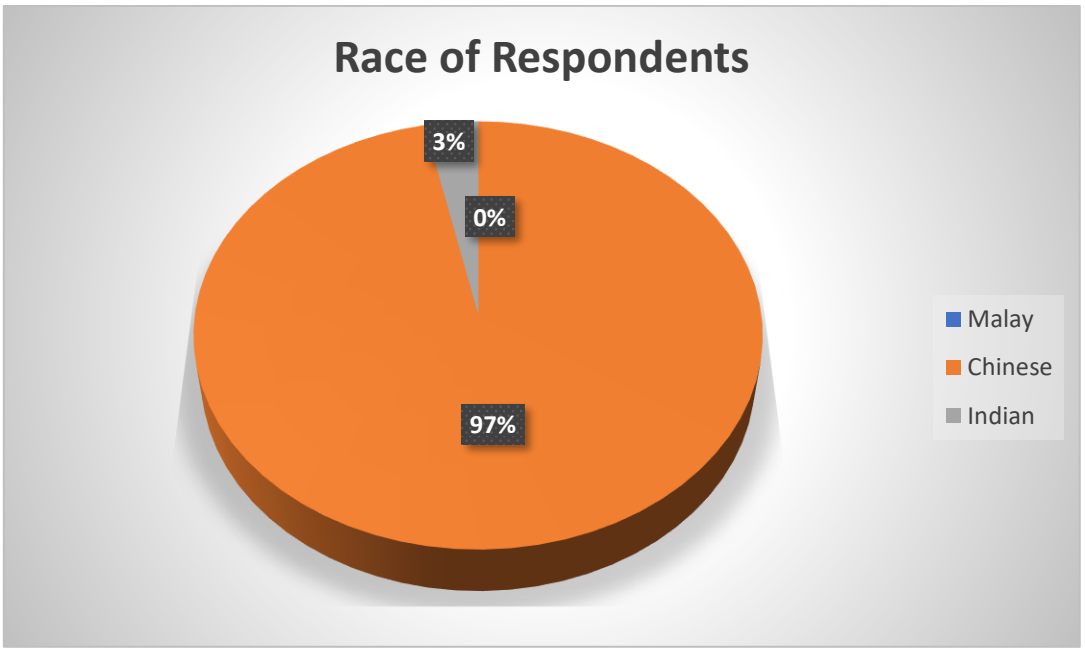


Figure 2.13 Graph Represents Region of Respondents

The figure 2.13 shows that the race of the 30 respondents. 97% which is 29 respondents are raced Chinese and the 3% which is 1 respondent is raced Indian. There is no respondent is raced Malay.

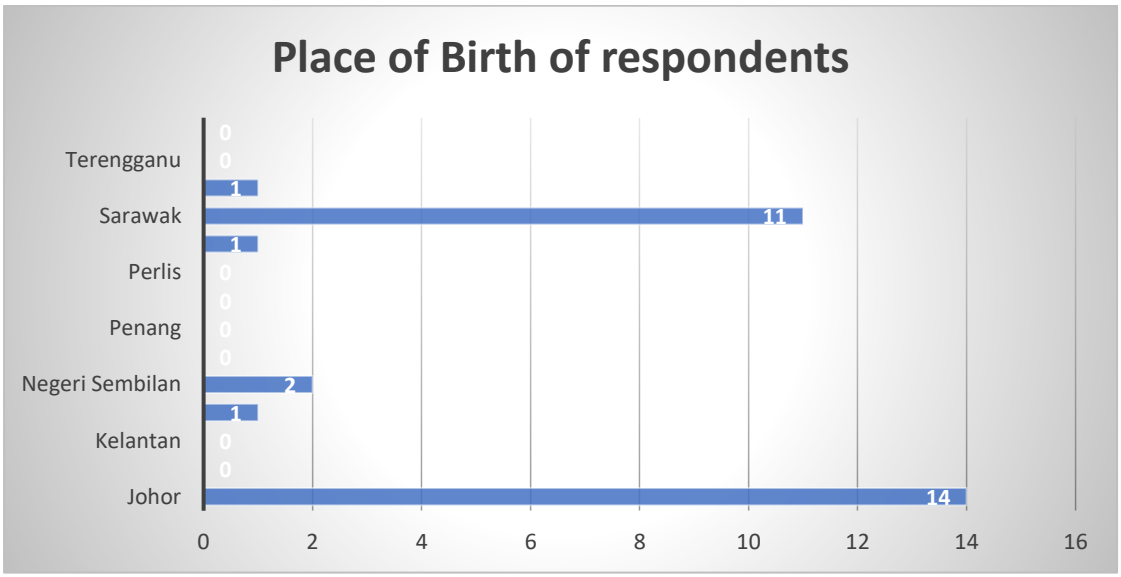


Figure 2.14 Graph Represents Place of Birth of Respondents

The figure above represents the place of birth of 30 respondents. 14 respondents are come from Johor and 11 respondents come from Sarawak. Besides, there are 2

respondents come from Negeri Sembilan and 3 respondents come from Selangor, Sabah and Melaka.

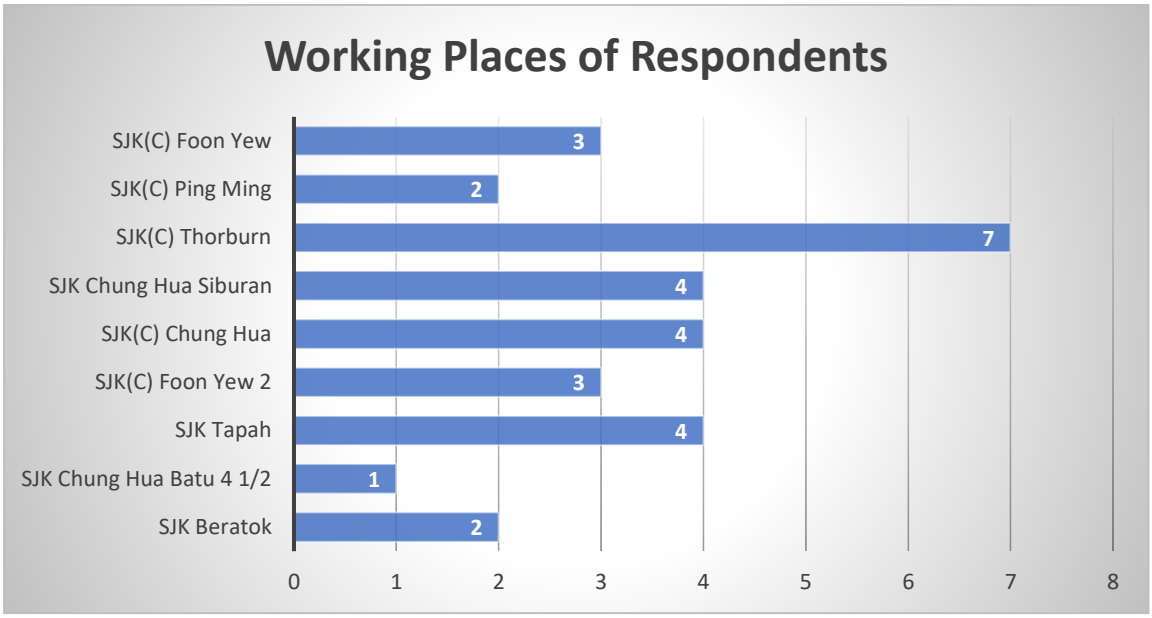


Figure 2.15 Graph Represents Working Places of Respondents

The figure 2.15 shows that the working places of 30 respondents. There are 7 respondents work in SJK(C) Thorburn. SJK Chung Hua Siburan, SJK(C) Chung Hua and SJK Tapah each having 4 respondents work at. Besides, there are 3 respondents work in SJK(C) Foon Yew and SJK(C) Foon Yew 2, 2 respondents work in SJK(C) Ping Ming and SJK Beratok, the last respondent works in SJK Chung Hua Batu 4 ½.

Section B

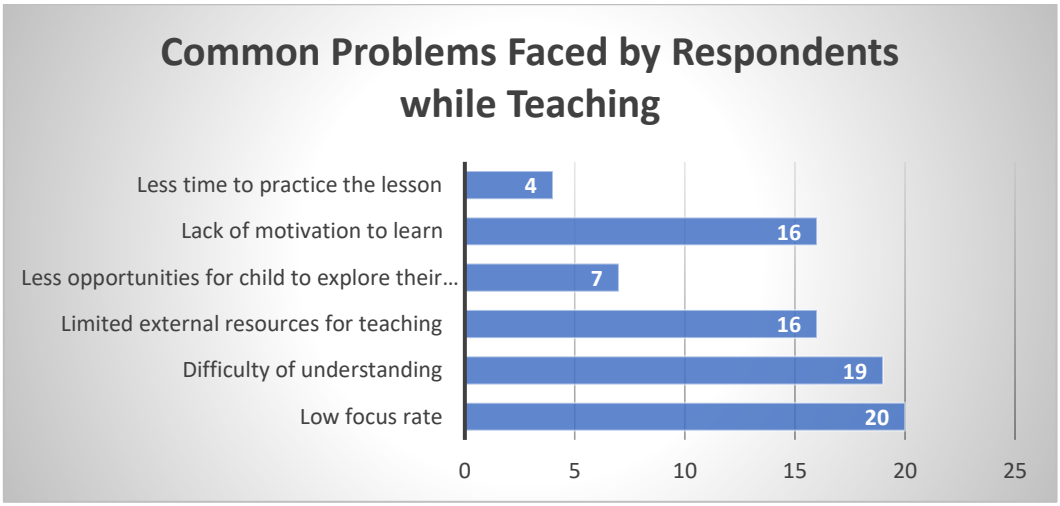


Figure 2.16 Graph Represents Common Problems Faced by Respondents while Teaching

The figure 2.16 shows that the common problems faced by 30 respondents while they are teaching in primary school. 20 respondents think that one of the problems is the low focus rate of children, and 19 respondents think that the difficulty of understanding will affect the teaching process. Besides, 16 respondents gave opinion that children are lack of motivation to learn, and the external resources are limited for them to teaching. There are 7 votes for less opportunities for children to explore their creativity as well as 4 votes for children are not enough time to practice the lesson learnt.

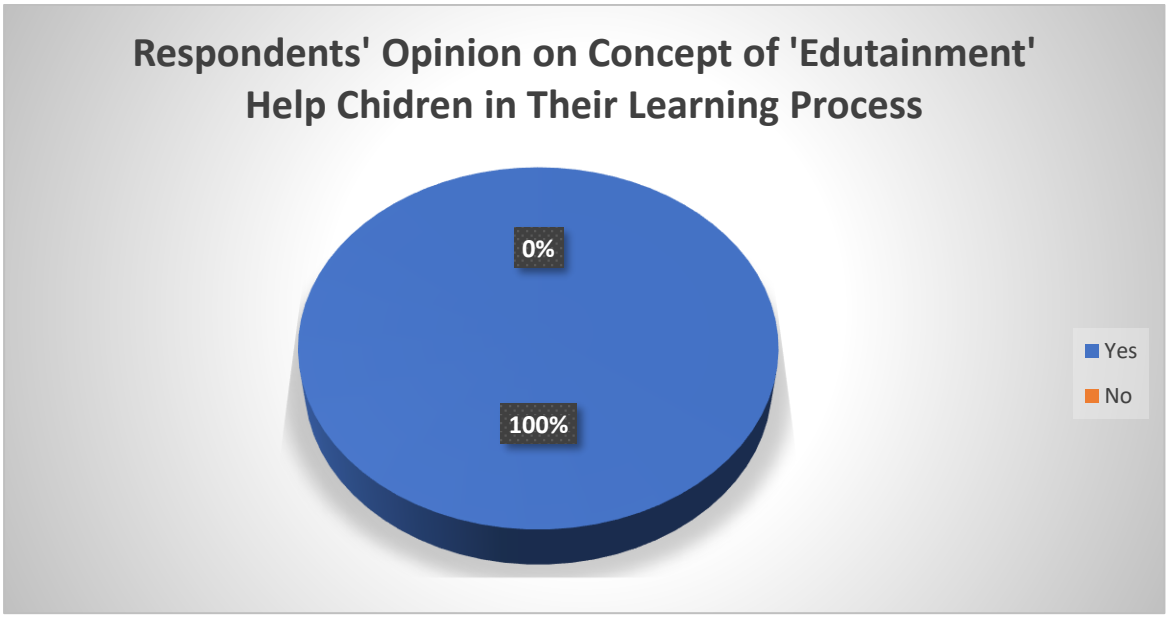


Figure 2.17 Graph Represents Opinion on Whether 'Edutainment' Helps in Learning Process

Based on the figure 2.17, the graph shows that the result of 30 respondents' opinion on the concept of 'edutainment' will help children in their learning process. All the respondents agree that the concept of 'edutainment' which is learning while playing will help the children in their learning process.

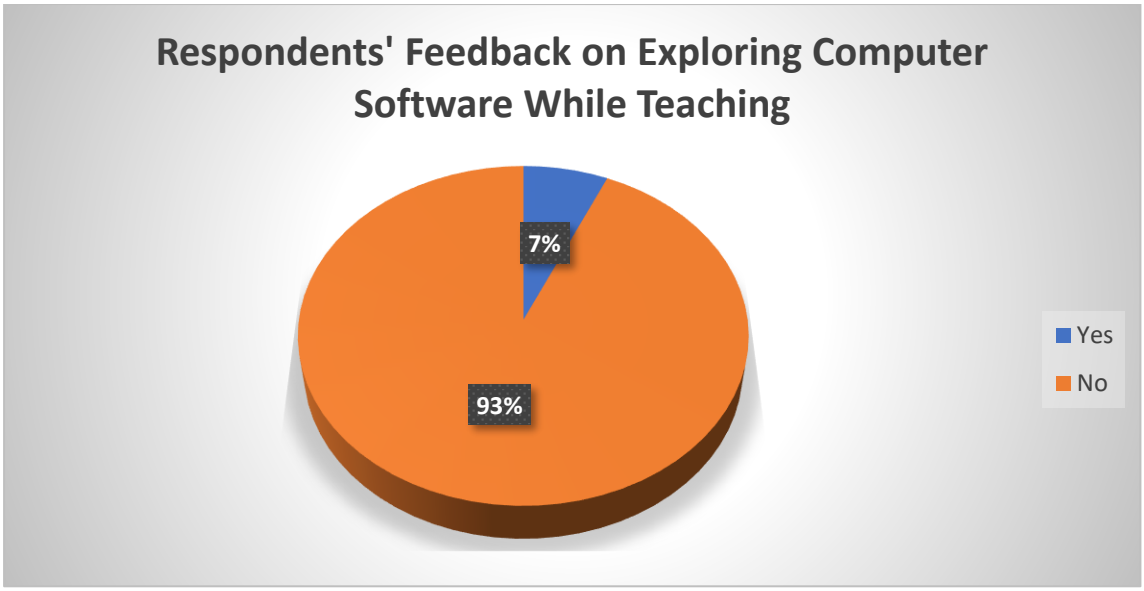


Figure 2.18 Graph Represents Feedback on Whether Respondents Explore Software while Teaching

Based on figure 2.18, 93% which is 28 respondents did not explore or use the computer software to support the teaching process. There are only 2 respondents used before the computer software while they are teaching.

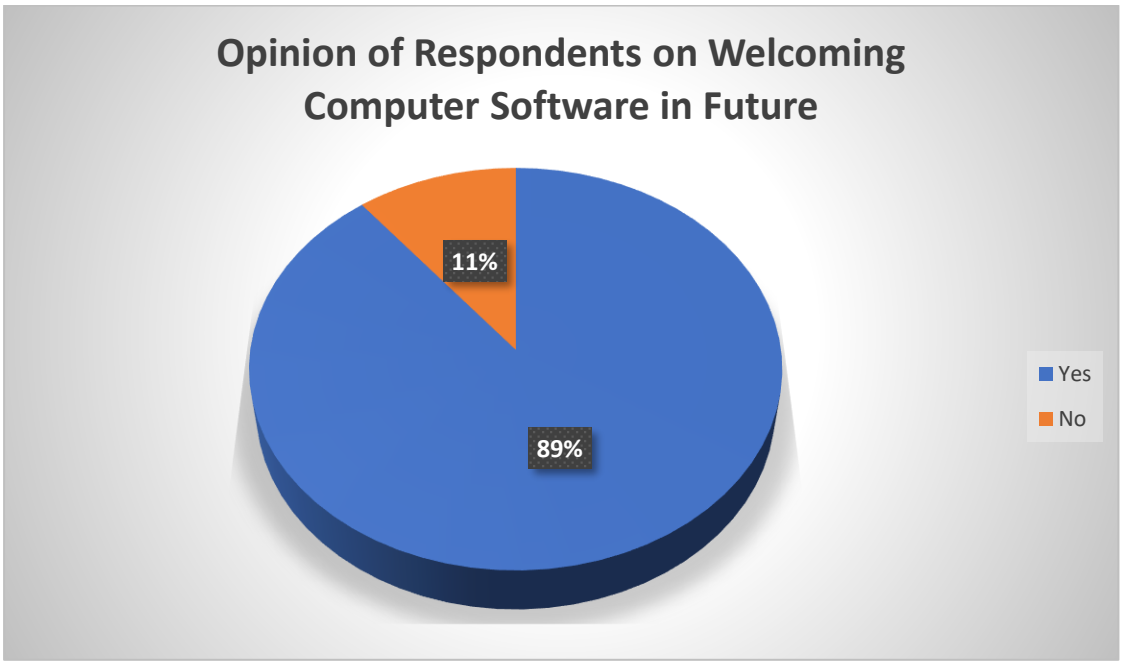


Figure 2.19 Graph Represents Feedback on Whether Respondents Welcome Software

The figure 2.19 shows that whether the 28 respondents who did not explore software will welcome to use the software while teaching in the future. 89% which is 25 respondents are willing to give a try to use the computer software for teaching and the

other 3 respondents gave opinion that they will not use the software to teach in the future.

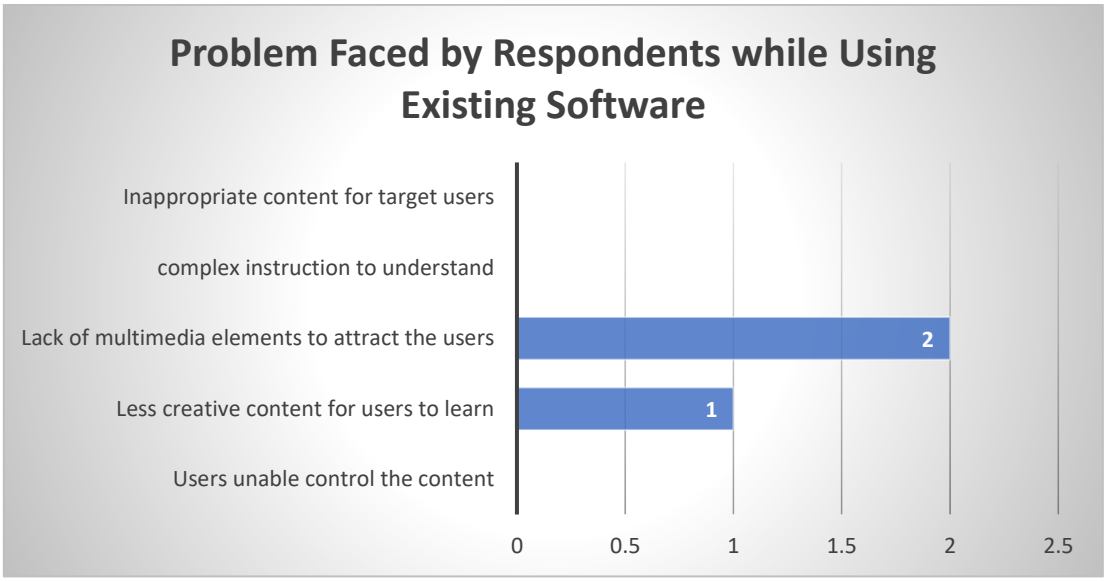


Figure 2.20 Graph Represents Feedback on Whether Respondents Welcome Software

The figure above shows that the problems faced by the 2 respondents who used software before. The software that used by the 2 respondents are Kahoot and Fun Learn English. Both of the respondents think that the software used are lack of multimedia elements which will attract the users. One of the respondents think that there is less content that is creative for users to learn and use.

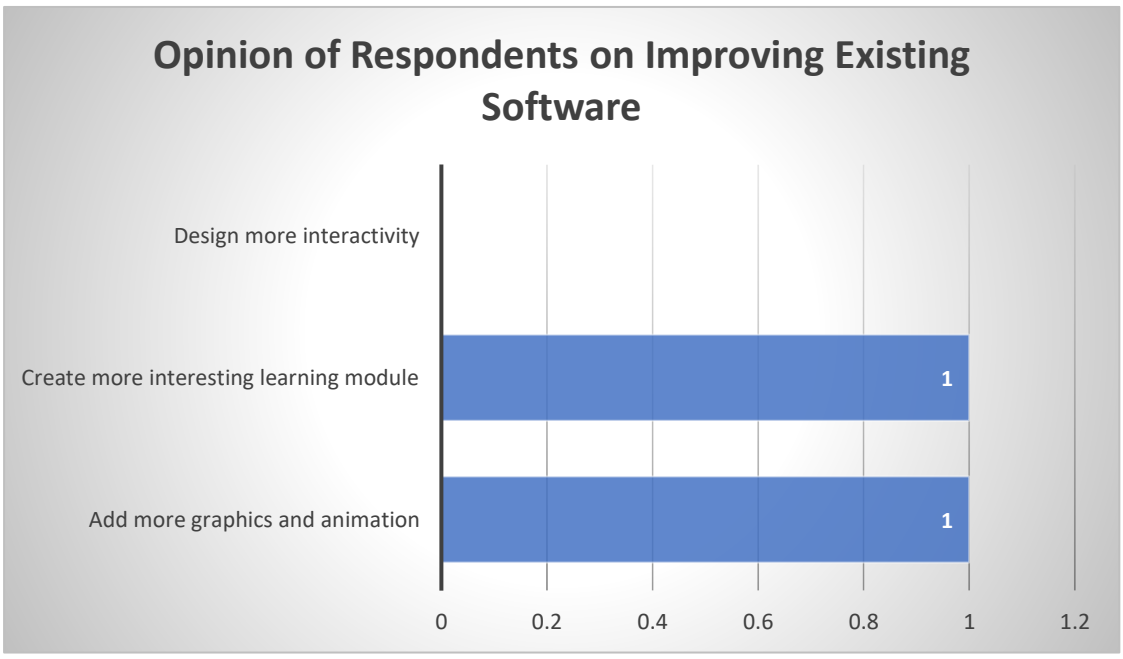


Figure 2.21 Graph Represents Opinion to Improve Existing Software

The figure 2.21 shows the opinion of the 2 respondents on improving the existing software that used before. One of the respondents think that creating more interesting learning module will improve the software. The other one respondent say that the software can add more graphics and animation that will attract users.

Section C

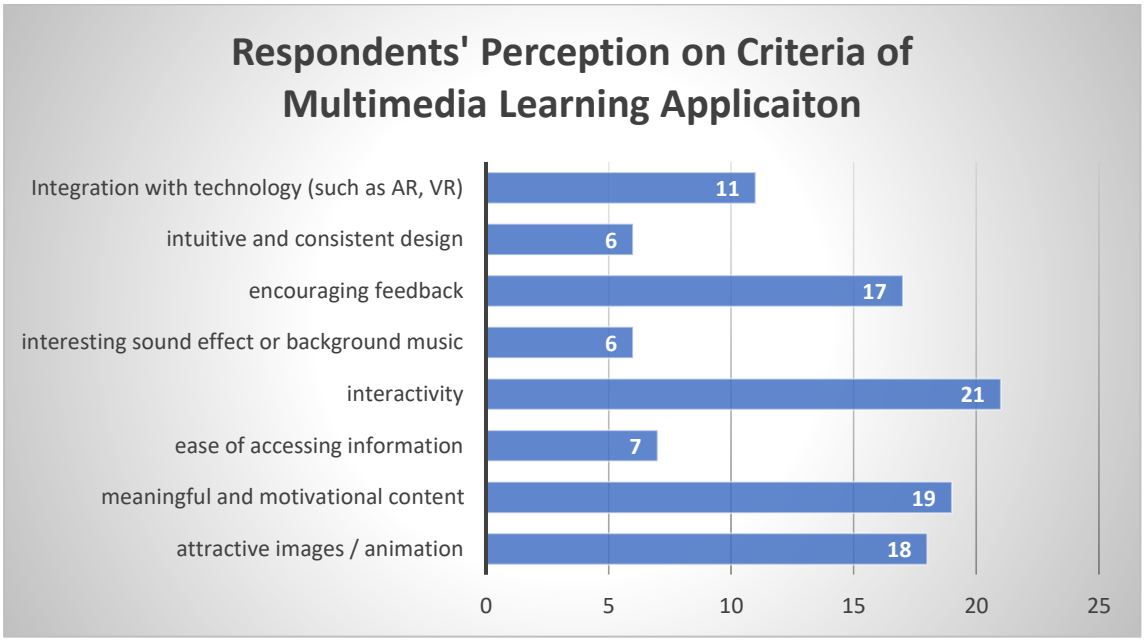


Figure 2.22 Graph Represents Perception on Multimedia Learning Application Criteria

The figure above shows that the perception of 30 respondents on the multimedia learning application's important criteria. Most of the respondents which are 21 respondents think that interactivity is the important criteria for multimedia learning application. 19 respondents vote for meaningful and motivation content, 18 respondents vote for attractive images and animation as well as 17 respondents vote for encouraging feedback. Besides, there are 11 respondents think that the integration with technology is important for a multimedia application. There are also 7 respondents think that the information should be easily access and 6 respondents vote for interesting sound effect or background music as well as intuitive and consistent design.

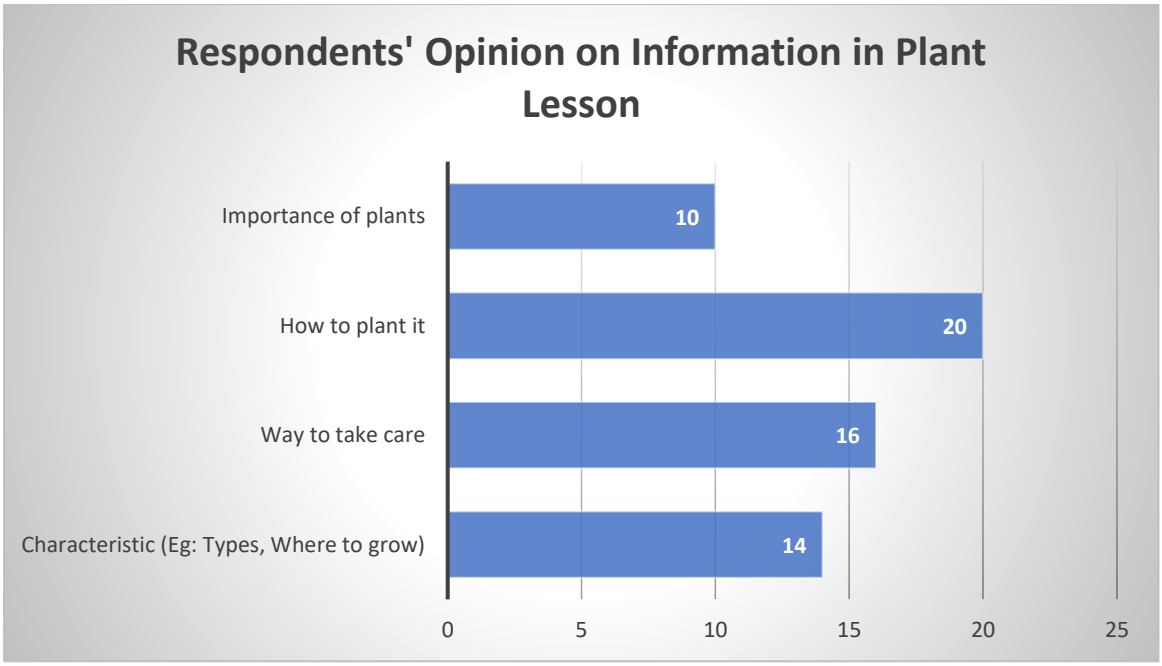


Figure 2.23 Graph Represents Opinion on Information Provided in Plant Lesson

The figure 2.23 shows that the opinion of respondents on the information can be provided in plant lesson. 20 respondents give the suggestion to provide the way to plant it in the plant lesson, follow by way to take care which suggest by 16 respondents. Besides, 14 respondents think that the characteristic of plants can be added, and 10 respondents think that the importance of plants can be added in this lesson.

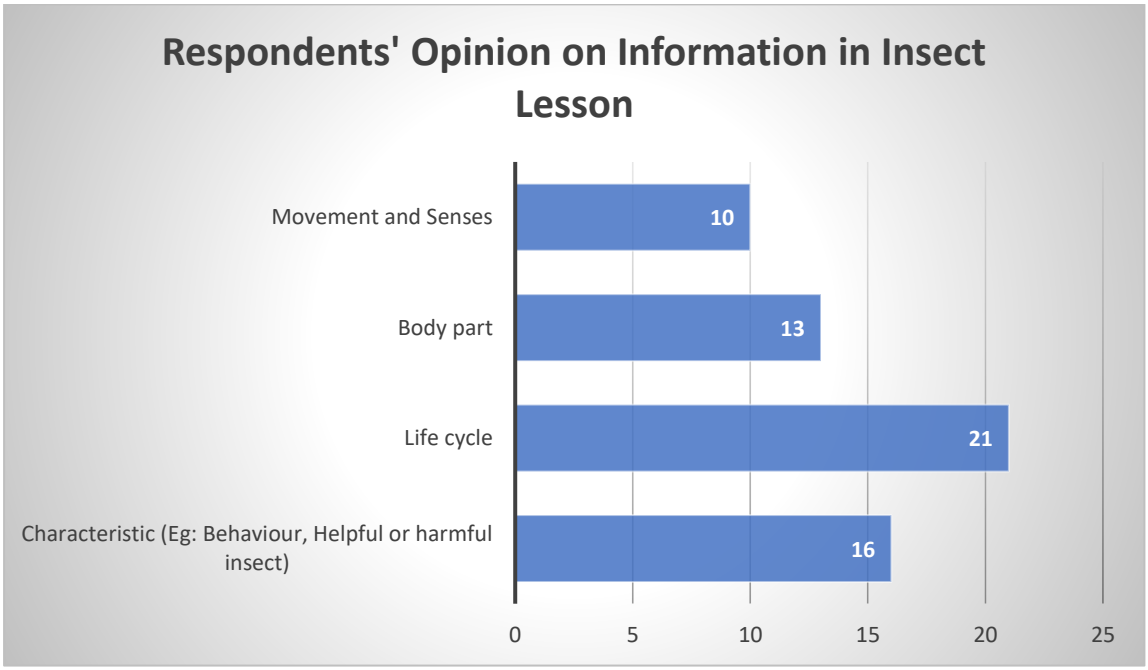


Figure 2.24 Graph Represents Opinion on Information Provided in Insect Lesson

The figure 2.24 shows that the opinion of respondents on the information can be provided in insect lesson. 21 respondents suggest providing the life cycle of each insect, follow by the characteristic of insects which vote for 16 respondents. Besides, 13 respondents think that the body part of insects can be provided, and 10 respondents think that the information can be provided is insects' movement and senses.

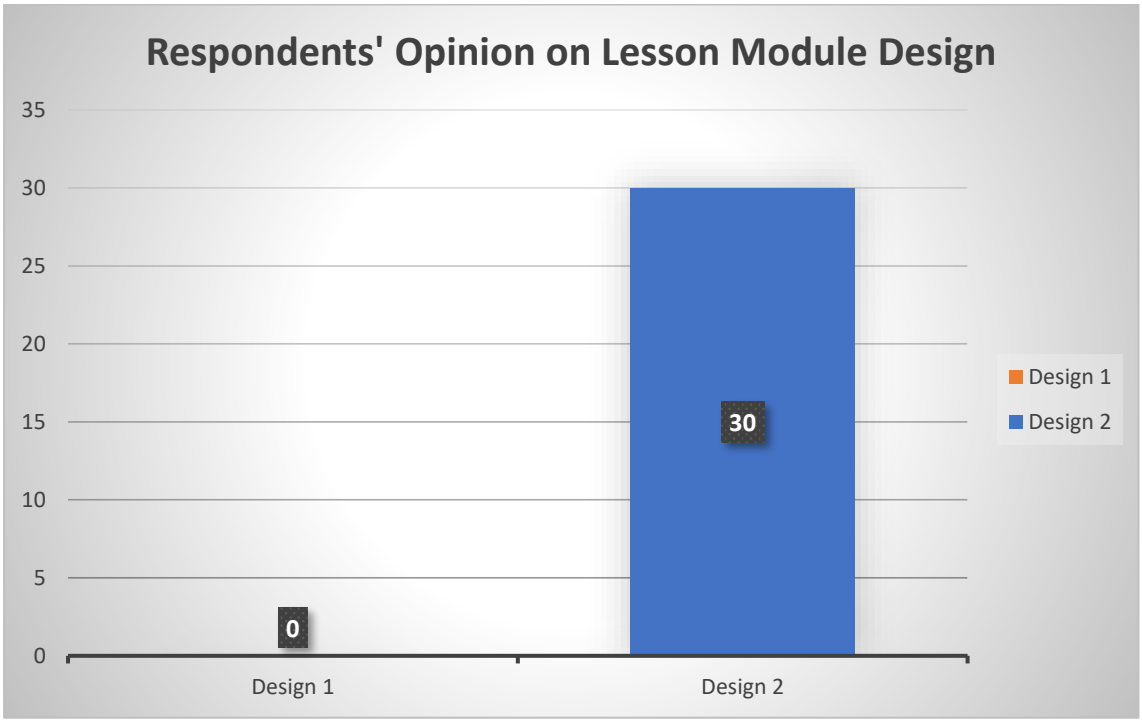


Figure 2.25 Graph Represents Opinion on Design of Lesson Module

Figure 2.26 Lesson Module Design 1

Figure 2.27 Lesson Module Design 2

The figure 2.25 shows that the opinion of respondents on the lesson module design. All the respondents agree that the design 2 is the most favourable design compare with design 1. The figure 2.26 is the design 1 for lesson module and figure 2.27 is the design 2 for lesson module.

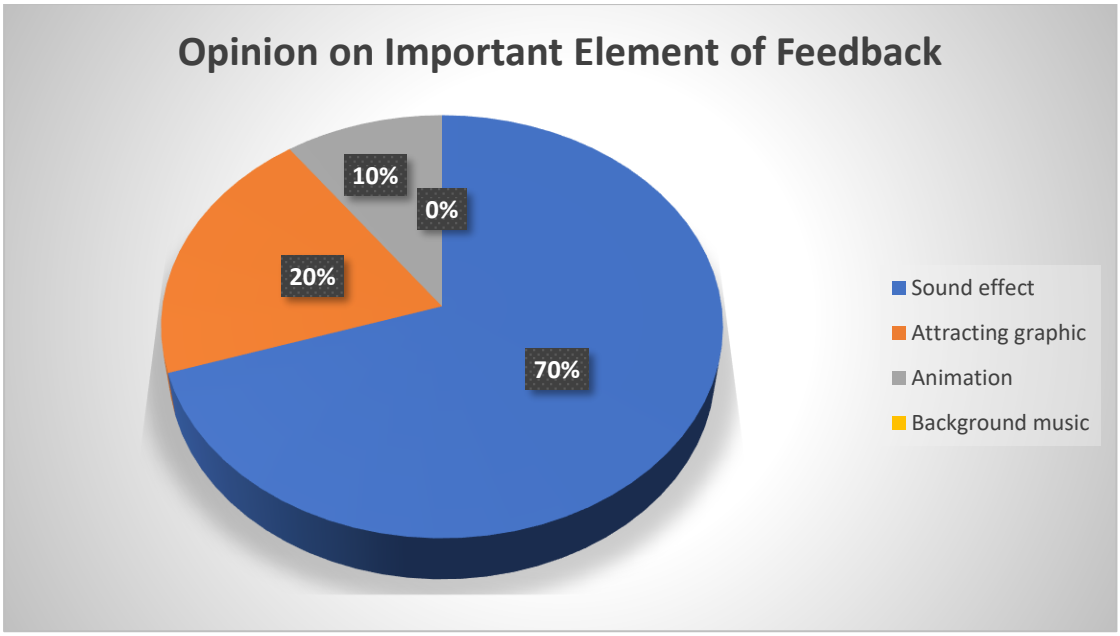


Figure 2.28 Graph Represents Opinion of Quiz Feedback Important Element

Based on figure 2.28, the graph represents the perception on the important element for the feedback of each question in the quiz module. 70% which are 21 respondents think that the sound effect is an important feedback. There are also 6 respondents answer that attracting graphics as the important element, and 3 respondents select animation. According to the result, there is no respondent choose background music as the element for feedback.

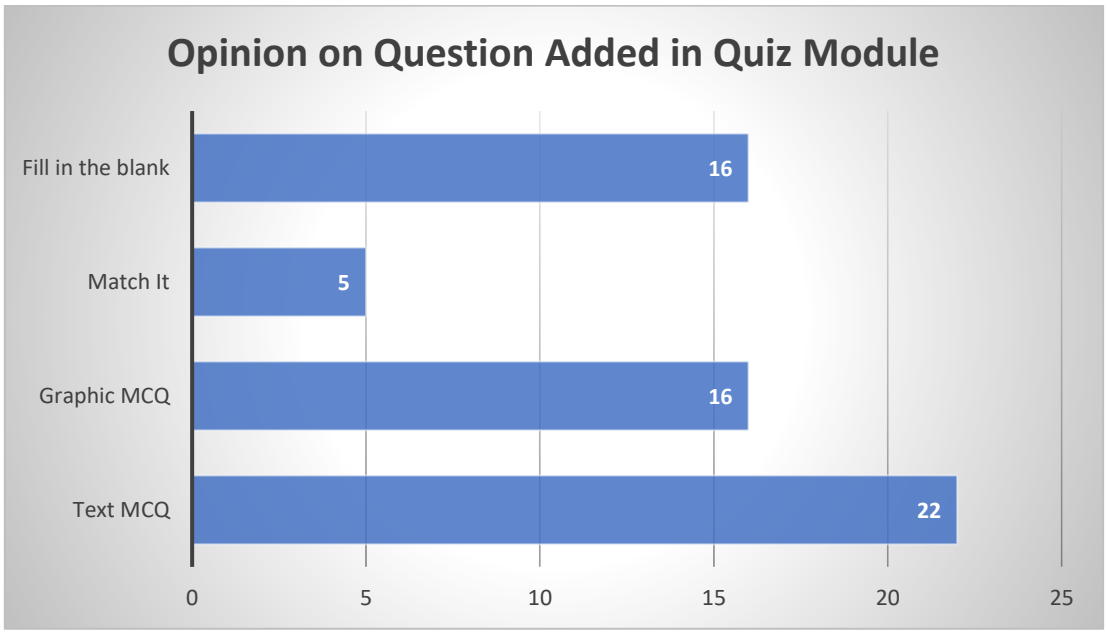


Figure 2.29 Graph Represents Opinion of Quiz Question Type

The figure 2.29 shows the graph of question type added in the quiz module. There are 22 respondents suggest providing text multiple choice question and 16 respondents suggest graphic multiple choice question and fill in the blank. Besides, there is only 5 respondents vote for match it for the question type.

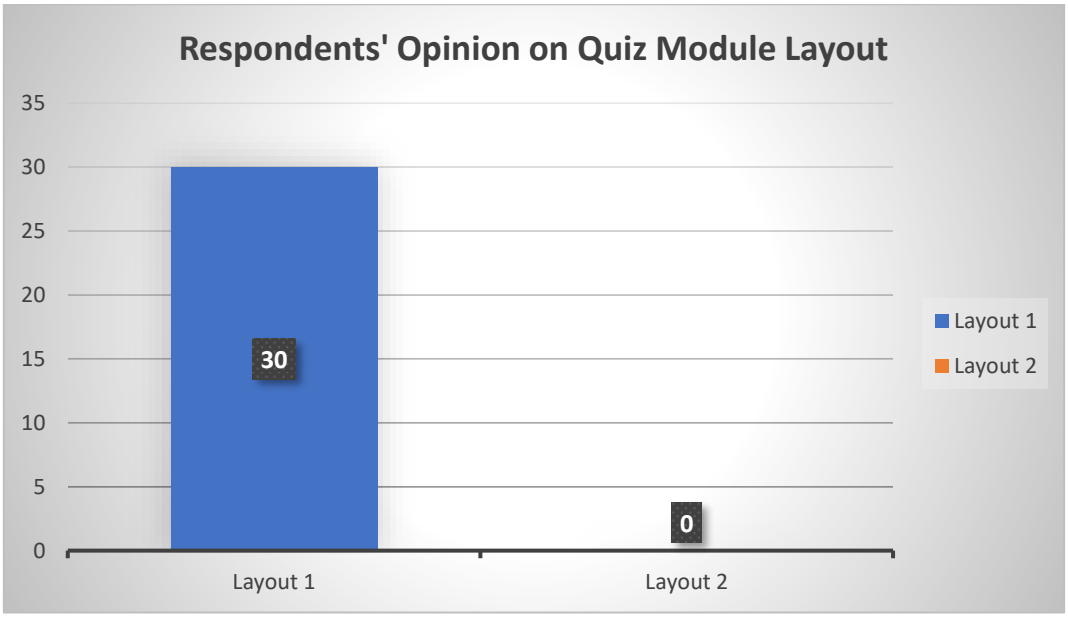


Figure 2.30 Graph Represents Opinion of Quiz Module Layout

Figure 2.31 Quiz Module Layout 1

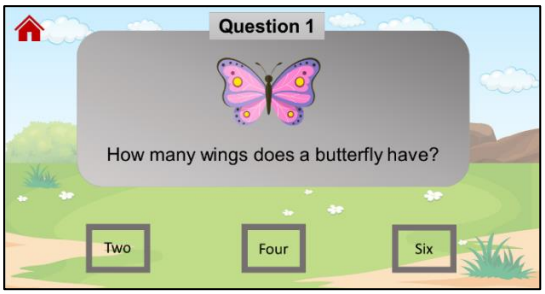


Figure 2.32 Quiz Module Layout 2

The figure 2.30 shows that the opinion of respondents on the quiz module layout. All the respondents agree that the most favourable layout is layout 1. The figure 2.31 is the layout 1 and figure 2.32 is the layout 2 for quiz module.

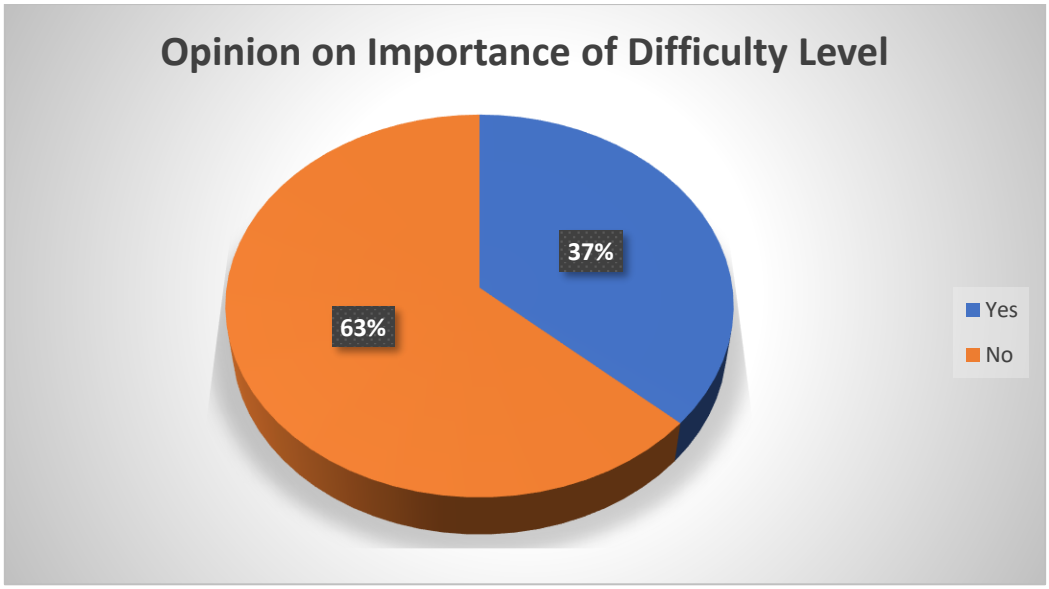


Figure 2.33 Graph Represents Opinion of Importance of Difficulty Level

The figure 2.33 represents the opinion of importance of difficulty level in spelling module. 63% which is 19 respondents give the opinion that the difficulty level is not important in the module. However, there are 11 respondents think that the difficulty level is important.

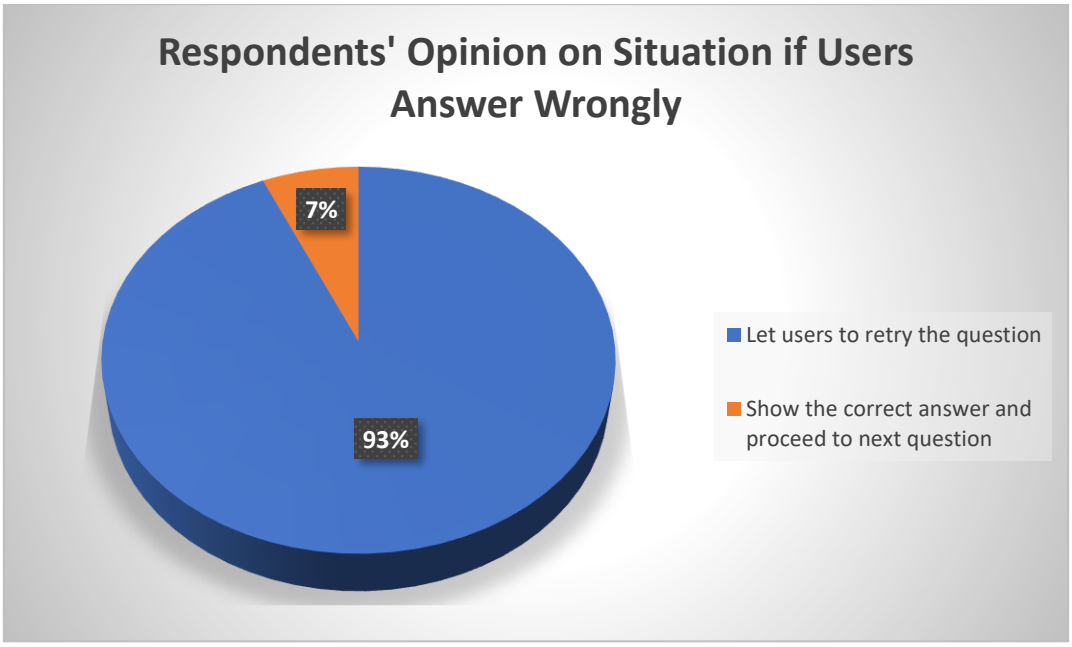


Figure 2.34 Graph Represents Opinion on Situation if Answer Wrongly

Figure 2.34 shows the graph of opinion on the situation if the users answer wrongly in the spelling module. The situation given are let users retry the question or show the correct answer to proceed the next question. There are 28 respondents suggest letting

the users to retry the question. 2 respondents suggest to show the correct answer directly and proceed to next question.

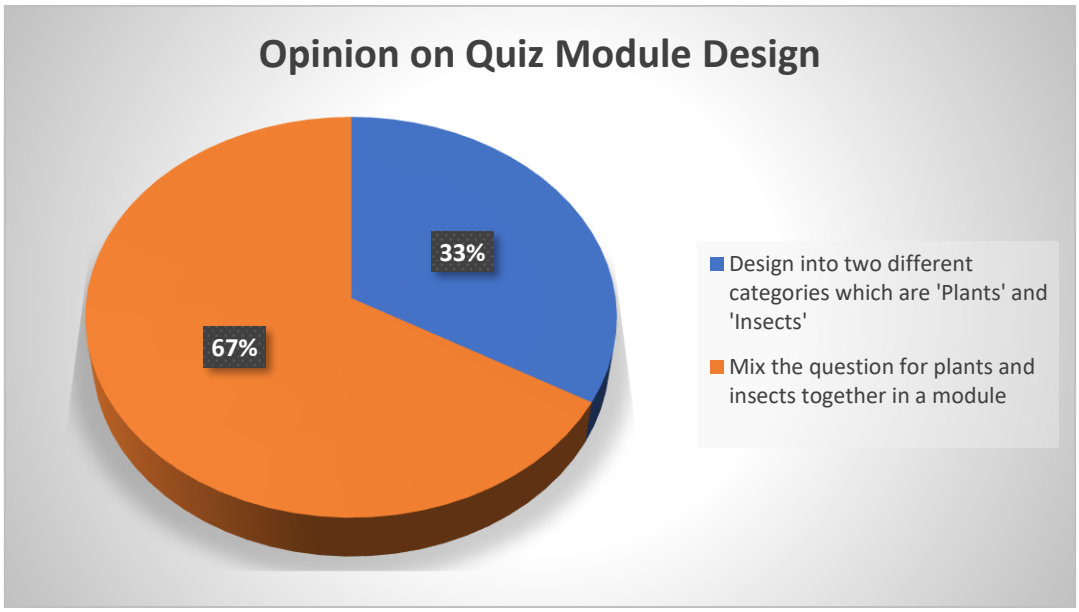


Figure 2.35 Graph Represents Opinion on Design of Quiz Module

Based on figure 2.35, the graph shows the result of quiz module design. The design of module are separate the category into plant and insect or mix the question together in a section. According to the result, 20 respondents suggested to mix the plant and insect questions together. However, there are 10 respondents think that the question should be designed into different categories which are plants and insects.

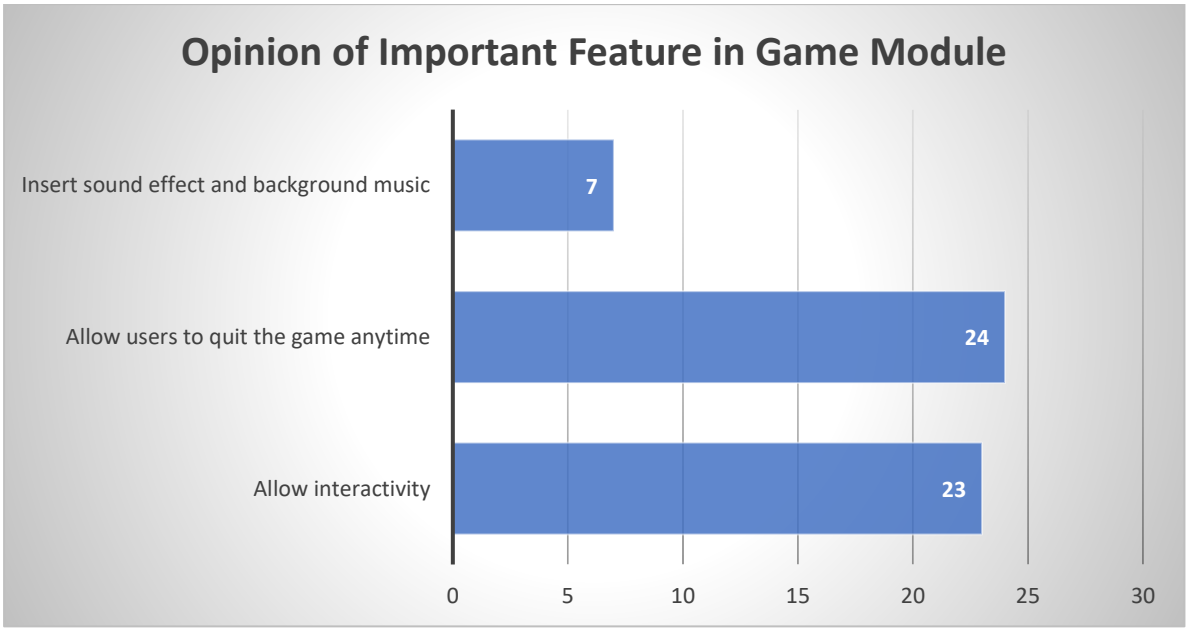


Figure 2.36 Graph Represents Opinion on Important Feature in Game Module

The figure 2.36 shows the graph of opinion on important feature in game module. 24 respondents vote for allowing users to exit the game anytime. There are also 23 respondents think that interactivity is important feature in this module. Besides, 7 respondents think that the sound effect and background music is important feature.

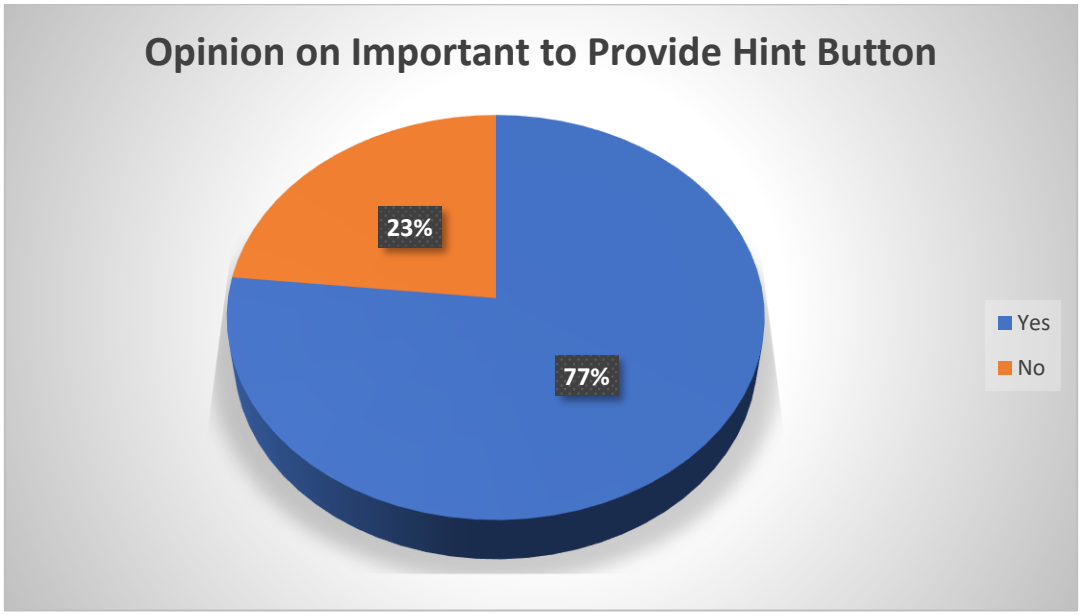


Figure 2.37 Graph Represents Opinion on Important of Hint Button

The above figure shows that the opinion of respondents on importance to provide hint button in game module. 23 respondents think that it is important to provide hint button to the users. However, there are 7 respondents think that there is no need to provide hint button in this module.

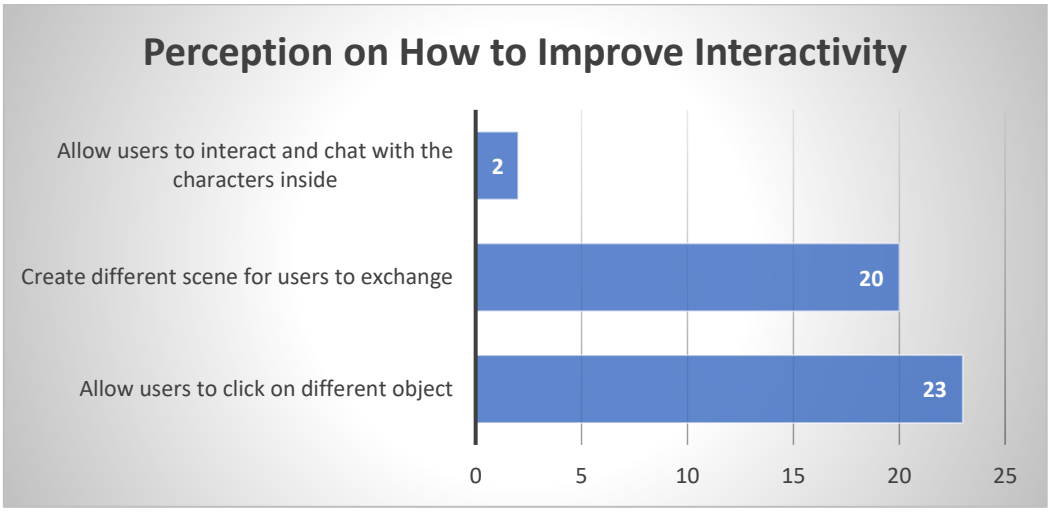


Figure 2.38 Graph Represents Perception on Improving Interactivity

The figure 2.38 shows the respondents' perception on how to improve the interactivity in game module. 23 respondents suggest that the module can allow the users click on different object; 20 respondents think that different scene can be created for the users to exchange. Besides, there are 2 respondents suggest allowing the users interact with the characters inside the module.

Furthermore, for overall software development, there are 2 respondents give the suggestion and opinion. 1 respondent suggest to use a pleasure and fun background music and 1 respondent suggest to create some interesting animation to attract the users' attention.

2.7.3 Discussion

According to the survey analysis, the 30 respondents mostly did not used computer software to support education but willing to use it in the future. The most common problems that met by majority respondents are low focus rate and difficulty to understand. In order to solve the problems, the proposed application should be designed to attract the users with the appropriate contents that is easily understand by the target audience. Based on the most respondents' point of view, interactivity is the most important feature for a multimedia learning application Other than interactivity, it should also let the users choose to quit the module based on their preferences.

For quiz module, the suggested element for feedback given after each question is sound effect. The sound effect will be provided depends on the answer provided whether is correct or wrong. Besides, the respondents prefer to mix the question for plant and insects in spelling module. If the users answer wrongly, the respondents suggest letting the users retry the question. This will stimulate the users' thinking instead of just viewing the correct answers. The suggestion given by the respondents on the overall software are to use funny background and animation. This is to attract the users while learning in the application.

CHAPTER 3: METHODOLOGY AND SYSTEM DESIGN

3.1 Overview

There are some stages which are investigating, designing, developing and testing the project. To designing a multimedia application, there will need a problem. By defining the problem or situation, a design brief can be collected so that the application can be developed through skills and knowledge which able to solve the problem. Hence, a system design can be decided through the result collected from the problems and solutions.

System design is a process to design the system elements of the systems such as the components, modules and system flow. The system flow diagram able to help the author to visualize the system in sequence flow. The author able to control and monitor the system flow through the flow diagram. Furthermore, storyboarding also will be used in system design. Storyboard able to illustrate the scene's design of overall system. This will provide a basic visual for author to understand the system draft design.

3.2 System Specifications

3.2.1 Software Requirements

Table 3.1 Software Requirements

Elements	Software Used	Description
Text	Microsoft Power Point, Macromedia Director MX 2004	To design the text style
Graphic	Freepik, Unsplash, 3D Paint	To create graphics, edit and remove graphics' background
Animation	Marcomedia Director MX 2004	To create the animation needed
Audio	VoiceBooking, ZapSplat	To create and edit the audio for sound effect and background music
AR	Blender, Unity, Vuforia	To develop the augmented reality view of the content
Authoring Software	Macromedia Director MX 2004	To develop the proposed application

3.2.2 Hardware Requirements

Table 3.2 Hardware Requirements

Hardware	**Specification**
Hard Drive Capacity	1.0 TB
RAM	12.0 GB
Processor	Intel(R) Core(TM) i5-8250U CPU @ 1.60GHz 1.80 GHz
Graphic	Intel UHD Graphics 620 DDR4 SDRAM
Free Disk Space	at least 5 GB free space and above
Sound	Speaker, headset
System	64-bit operating system

3.3 ADDIE Model

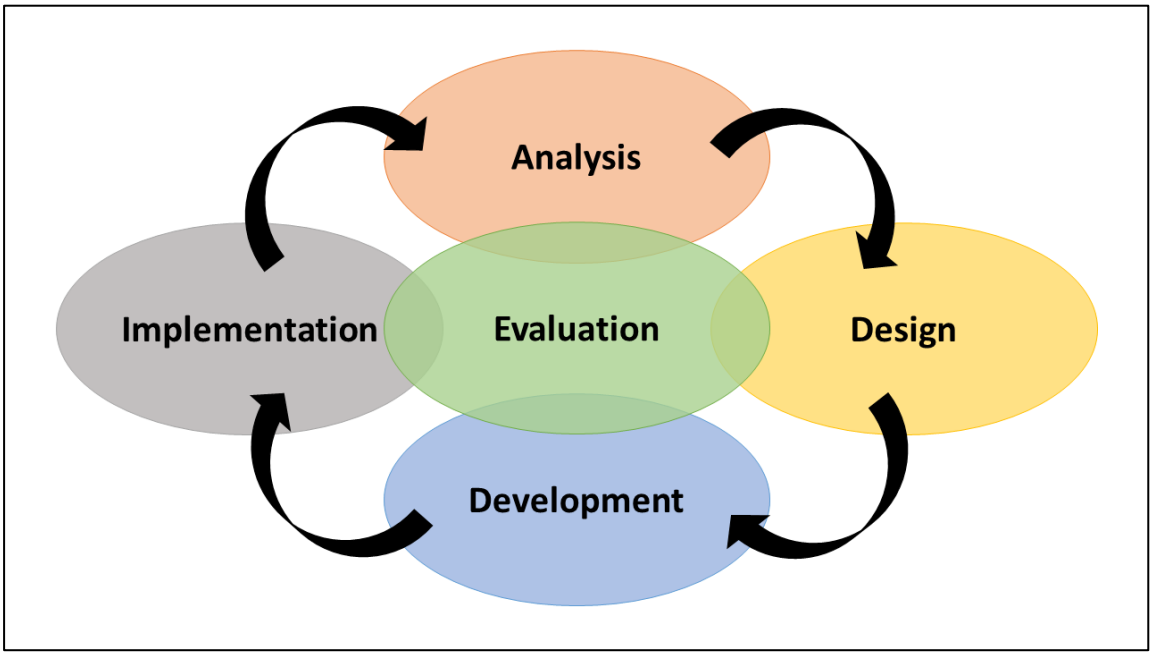


Figure 3.1 Diagram for ADDIE Model [7]

Methodology is a formalize approach that used to implement system development life cycle (SDLC). It categorized in different approach. The method used by this proposed application is ADDIE model which is used for instructional design process. ADDIE model include five phases which are analysis phase, design phase, development phase, implementation phase and evaluation phase.

3.3.1 Analysis

Analysis phase is the important fundamental phase to determine the problem and solution towards a topic so that the meaningless information can be avoided. Through the information collected, the author able to define the problems and suitable learning environment. During this phase, the relevant data and information will be collected to ensure a better understanding before developing the application. An overall cost and project planning will also be developed in this phase.

To develop the proposed application, the problems and issues will be firstly developed. The author studied the project background in order to understand the topic. Audience analysis has conducted through the survey in order to collect the users' requirement. Besides, the resources were identified such as hardware and software tools that will be used as well as the final platform to deliver the proposed application. To ensure the project is under the control, a project timeline has developed using Gantt Chart. All the progress will follow the schedule set.

3.3.2 Design

During the design phase, a strategy plan was developed in order to accomplish the application. Some processes were done during this phase such as identify system flow, creating storyboard, design user interface and design the multimedia elements for the proposed application. The content of the system also identified in this phase to ensure the effective of delivery.

In this phase, the author identified the authoring software used to develop the proposed application. After the flow of the system including the module is defined, the author conducted a research or design the multimedia elements that will be used such

as text, graphics, animation, audio and video. Besides, storyboard has designed in this phase in order to visualize the application interface.

3.3.3 Development

Development phase is the phase that start the action to develop the application by using the software. There will need the multimedia elements designed and learning material that prepared on previous phase in order to develop the application. The design of system will follow the storyboard.

In this phase, the author has started to develop the application using selected authoring software. The multimedia elements that created in design phase were used during the development. The design of interface depends on the storyboard created with some minor changes occurred during the development.

3.3.4 Implementation

Implementation phase refers to the delivery method of the instruction to the target audience. Some training or user manual can be provided to the users so that they can use the application. Video demonstration of the system also provided to the users. In addition, users' understanding will be promoted in this phase in order to ensure the effectiveness and efficiency of the instruction delivered. By collecting the feedback from users, some errors and bugs can be identified so that the modification can be done to satisfy the users' requirement.

For the proposed application, the delivery method will be computer-based. In order to ensure user's understanding, the instruction will be given in the application when the users each module.

3.3.5 Evaluation

For the last phase, which is evaluation, this is the phase to measure the effectiveness and efficiency of the application. The evaluation phase can be formative or summative. Formative evaluation will be conducted before moving to a new phase to ensure the progress of the application. Summative evaluation will be conducted after

the application is implemented to assess the overall effectiveness of the application on delivering the learning content.

In this phase, the author ensured the phase's progress during formative evaluation. After the proposed application is implemented, a summative evaluation has done to evaluate the effectiveness of application in order to make decision on the successful of application.

3.4 System Flow Diagram

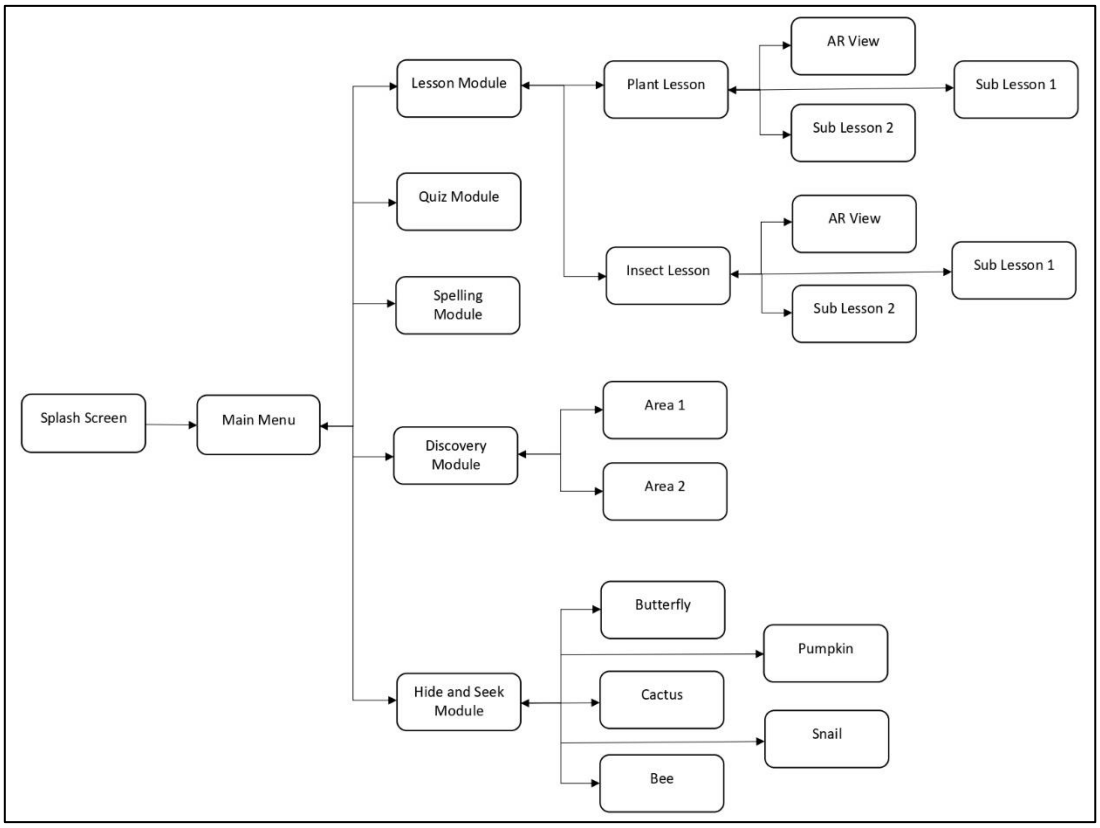


Figure 3.2 System Flow Diagram for Proposed Application

Figure 3.2 is the system flow diagram of the proposed application. The proposed application contains five modules which are lesson module, discovery module, quiz module, spelling module and hide and seek module. In lesson module, there are two subsection which are plants and insect. Each subsection will navigate to different parts. For hide and seek module, there are five plants or insects. Each selection will navigate to the different scene to let users start the game.

3.5 Storyboarding Design

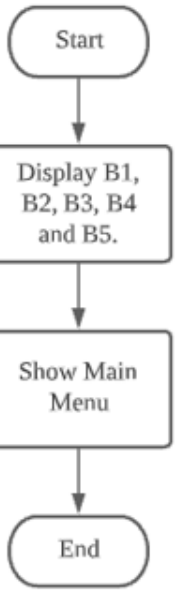
Storyboard No : 1

Topic : Splash screen

G(Graphic), Au(Audio), T(Text)

Figure 3.3 Storyboard for Splash Screen

Table 3.3 Storyboard 1 Description

Instruction for Animation, Audio, Text, Graphic	**Flow diagram for Animation, Audio, Text, Graphic**
An1: G1 will fade in. T1 will fly in from left to the center of the screen. **Au1:** Splash screen background music **G1:** Splash screen background image **T1:** Title of the software	

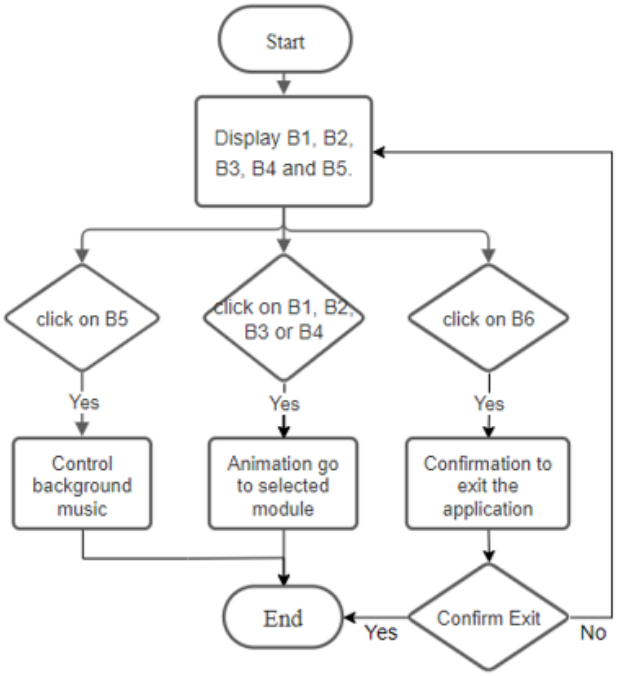
Storyboard No : 2

Topic : Main Menu

G(Graphic), Au(Audio), T(Text), B(Button)

Figure 3.4 Storyboard for Main Menu

Table 3.4 Storyboard 2 Description

Instruction for Animation, Audio, Button, Graphic, Text	**Flow diagram for Animation, Audio, Button, Graphic, Text**
An2: T1 move up and become smaller. B1, B2, B3, B4 and B5 fade in. **Au1:** background music **G1:** background image **T1:** Title of the software **B1:** Go to lesson module **B2:** Go to spelling module **B3:** Go to quiz module **B4:** Go to hide and seek module **B5:** Background music control **B6:** exit application	

Storyboard No : 3

Topic : Lesson - Plant or Insect

G(Graphic), B(Button)

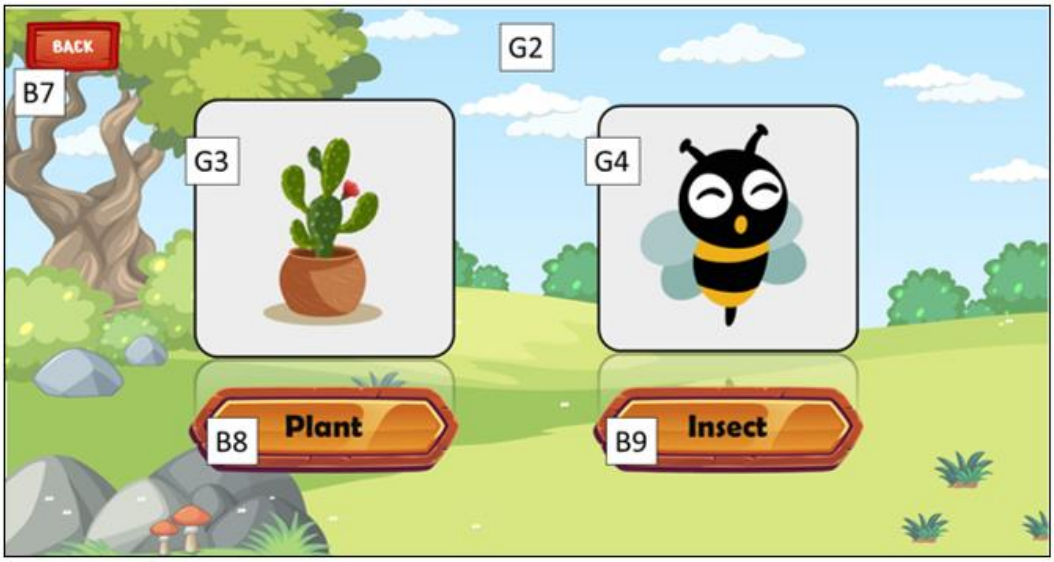
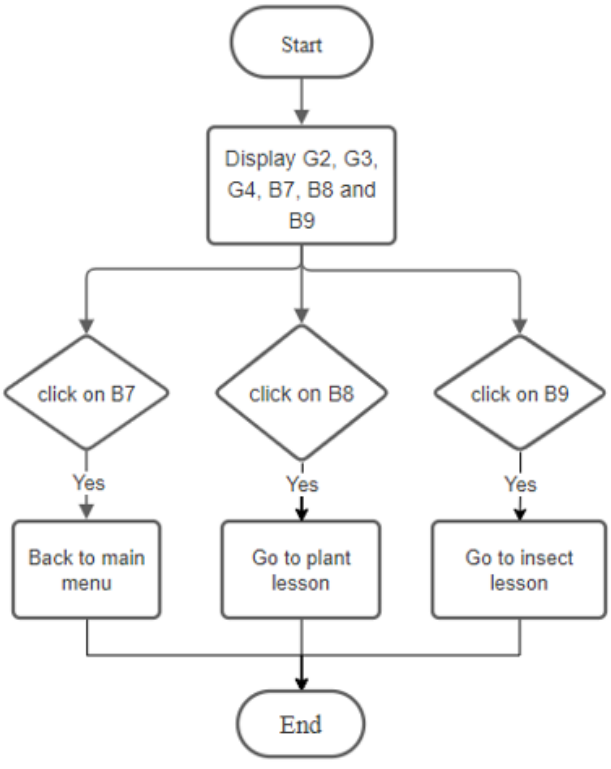


Figure 3.5 Storyboard for Lesson - Plant or Insect

Table 3.5 Storyboard 3 Description

Instruction for Animation, Button, Graphic	**Flow diagram for Animation, Button, Graphic**
An3: G2 move in, then B7, G3, G4, B8 and B9 appear. **G2:** background image **G3:** Plant image **G4:** Insect image **B7:** Back to main menu **B8:** Go to plant lesson **B9:** Go to insect lesson	

Storyboard No : 4

Topic : Lesson - Selection

G(Graphic), B(Button)

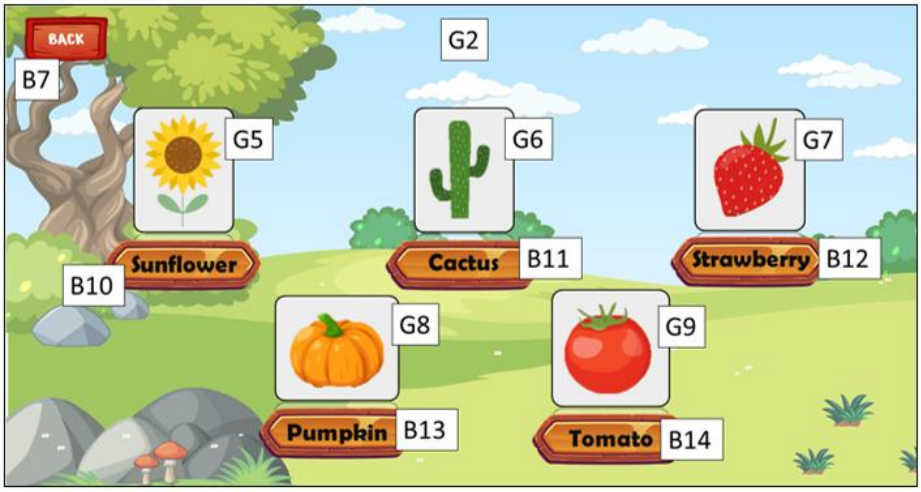
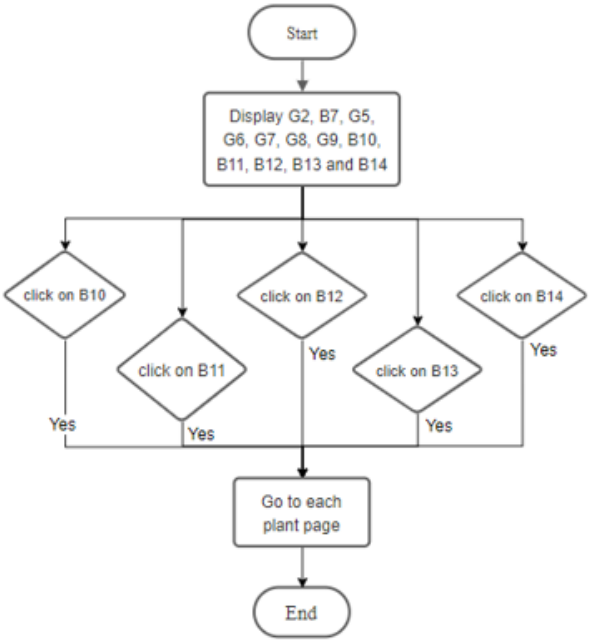


Figure 3.6 Storyboard for Lesson - Selection

Table 3.6 Storyboard 4 Description

Instruction for Animation, Button, Graphic	**Flow diagram for Animation, Button, Graphic**
An4: G2 and B7 fade in, then G5 and B10 appear, follow by G6 and B11, G7 and B12, G8 and B13, G9 and B14. **G2:** background image **G5:** Sunflower image **G6:** Cactus image **G7:** Strawberry image **G8:** Pumpkin image **G9:** Tomato image **B7:** Back to previous page **B10:** Go to sunflower lesson **B11:** Go to cactus lesson **B12:** Go to strawberry lesson **B13:** Go to pumpkin lesson **B14:** Go to tomato lesson	

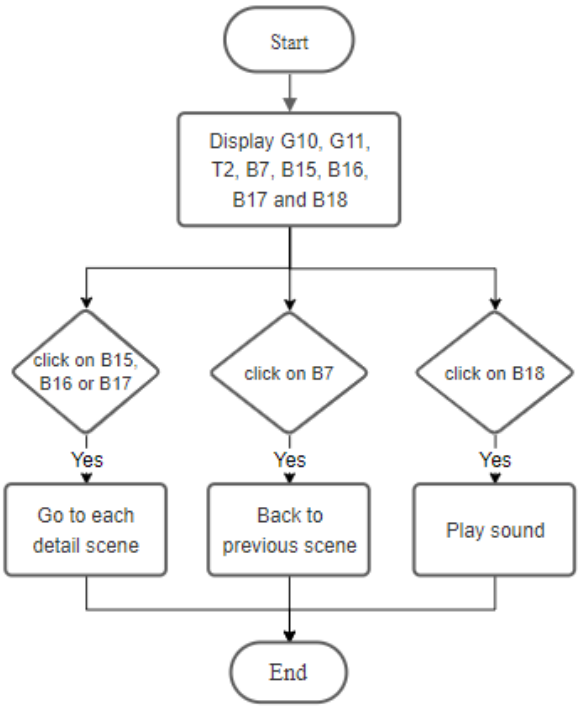
Storyboard No : 5

Topic : Lesson - Details

G(Graphic), B(Button), T(Text)

Figure 3.7 Storyboard for Lesson - Details

Table 3.7 Storyboard 5 Description

Instruction for Animation, Button, Graphic, Text	**Flow diagram for Animation, Button, Graphic, Text**
An5: G10,G11, B7, B15, B16, B17, B18 and T2 fade in. **G10:** Butterfly image **G11:** Text background board image **B7:** Back to previous page **B15:** Go to AR view **B16:** Go to life cycle lesson **B17:** Go to body part lesson **B18:** Play sound for pronunciation **T2:** Animal introduction text	

Storyboard No : 6

Topic : Quiz - Instruction

G(Graphic), B(Button), T(Text), Au(Audio)

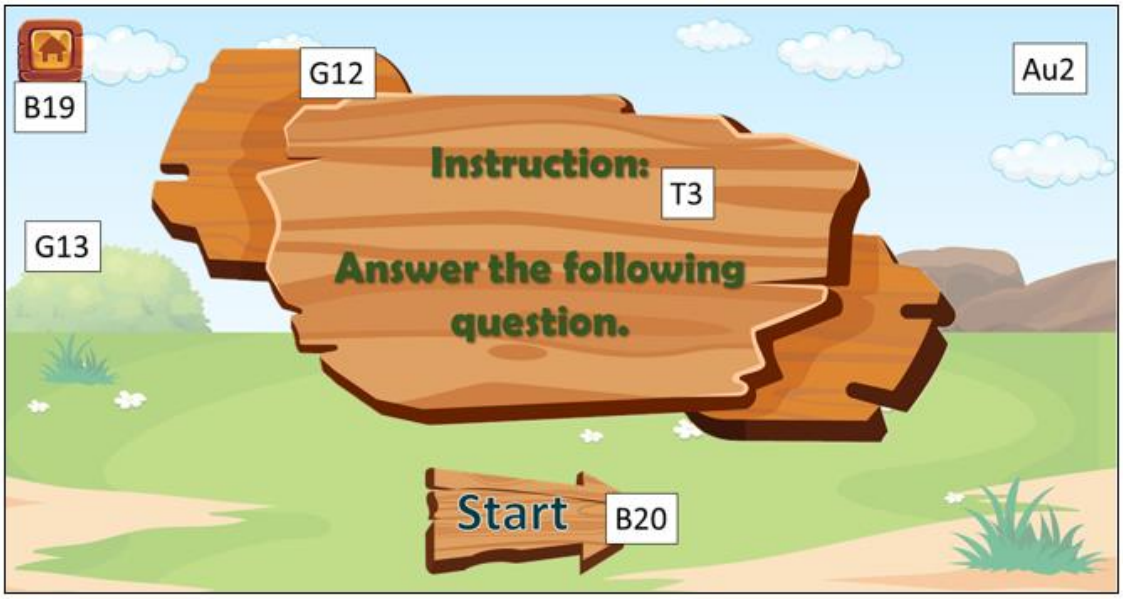
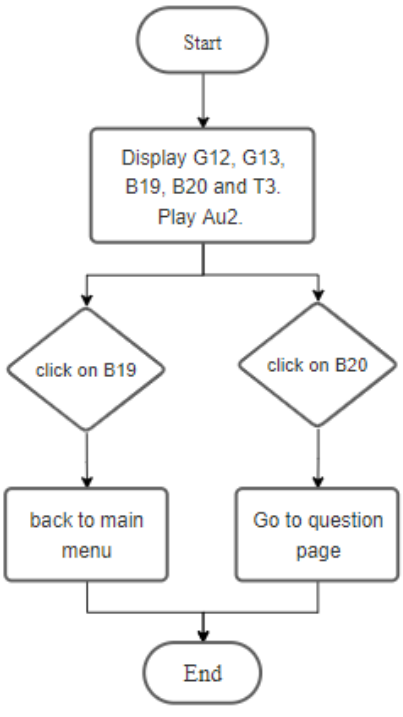


Figure 3.8 Storyboard for Quiz - Instruction

Table 3.8 Storyboard 6 Description

Instruction for Animation, Button, Graphic, Text, Audio	**Flow diagram for Animation, Button, Graphic, Text, Audio**
An6: G13 and G12 slowly appear, follow by T3, B19 and B20. **G12:** Instruction text background image **G13:** background image **B19:** Back to main menu **B20:** Go to question scene **T3:** Instruction text **Au2:** quiz background music	

Storyboard No : 7

Topic : Quiz - Question

G(Graphic), B(Button), T(Text)

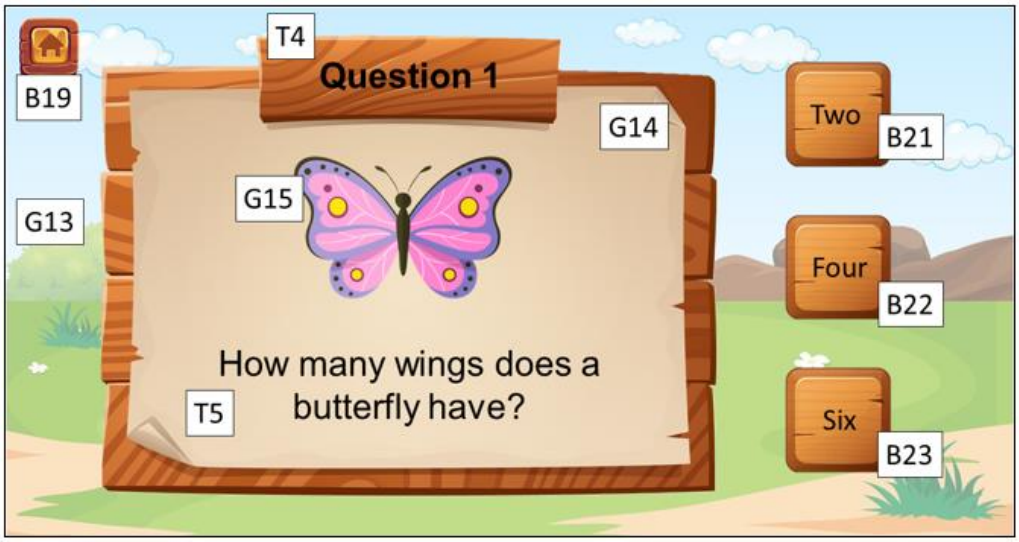
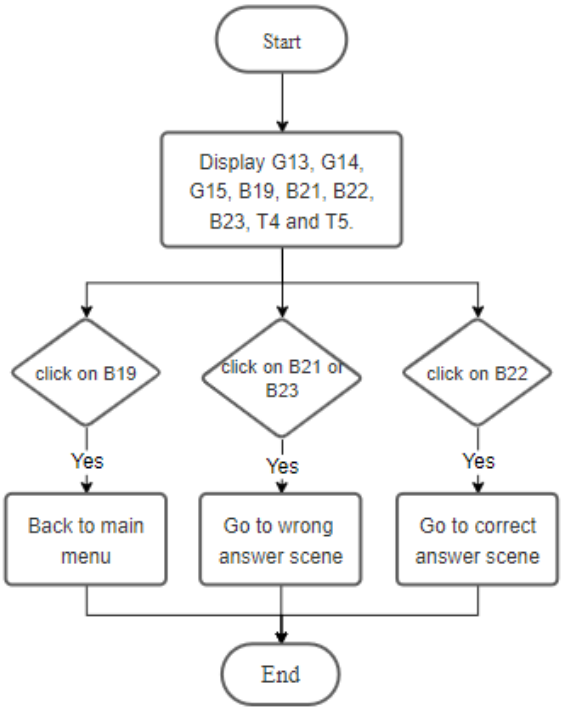


Figure 3.9 Storyboard for Quiz - Question

Table 3.9 Storyboard 7 Description

Instruction for Animation, Button, Graphic, Text	Flow diagram for Animation, Button, Graphic, Text
An7: G13 and G14 fade in. T4, G15 and T5 fade in. Then, B19, B21, B22 and B23 fade in. **G13:** background image **G14:** question board background image **G15:** question image **B19:** Back to main menu **B21:** choice 1 button **B22:** choice 2 button **B23:** choice 3 button **T4:** question number **T5:** question text	

Storyboard No : 8

Topic : Quiz - Correct Answer

G(Graphic), B(Button), T(Text), Au(Audio)

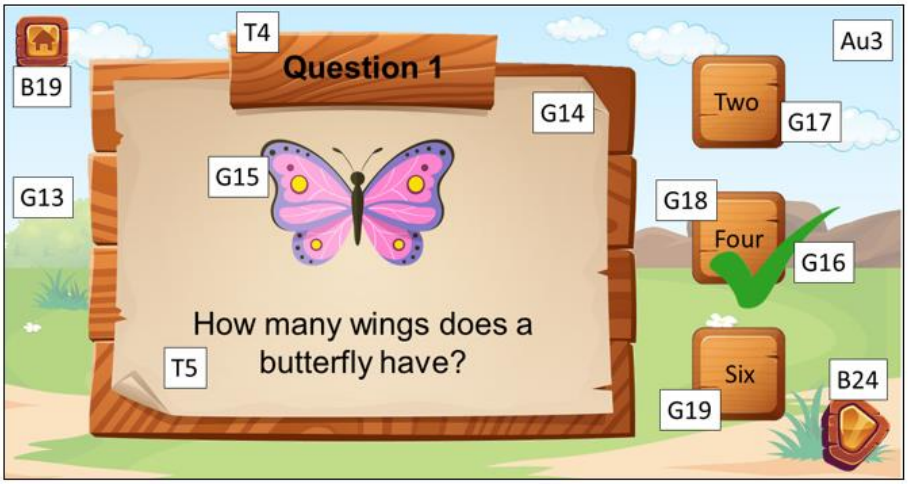
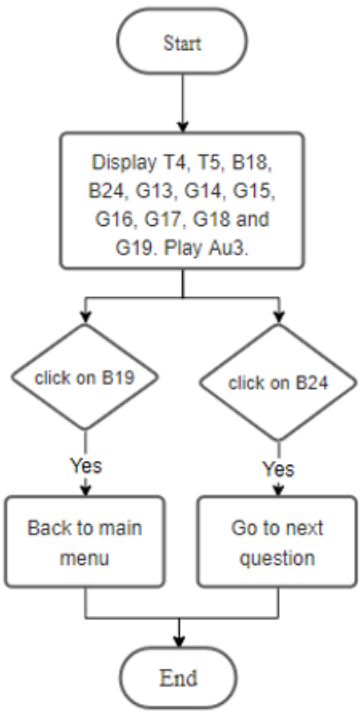


Figure 3.10 Storyboard for Quiz - Correct Answer

Table 3.10 Storyboard 8 Description

Instruction for Animation, Button, Graphic, Text, Audio	**Flow diagram for Animation, Button, Graphic, Text, Audio**
An8: Show G13, G14, G15, G17, G18, G19, B19, T4 and T5. G16 fade in, follow by B24 then play Au3. **G13:** background image **G14:** question background image **G15:** question image **G16:** correct tick image **G17:** choice 1 image **G18:** choice 2 image **G19:** choice 3 image **B19:** Back to main menu **B24:** Go to next question **T4:** question number **T5:** question text **Au3:** correct answer sound effect	

Storyboard No : 9

Topic : Quiz - Wrong Answer

G(Graphic), B(Button), T(Text), Au(Audio)

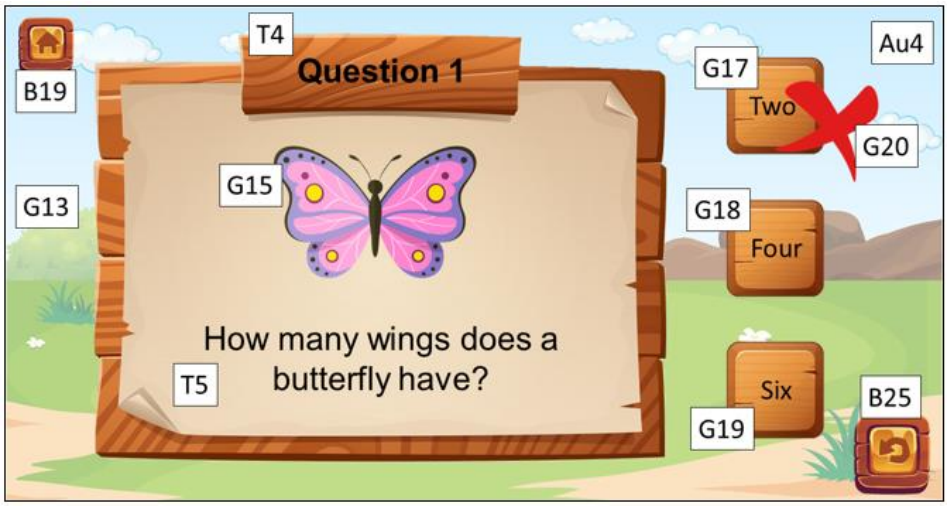
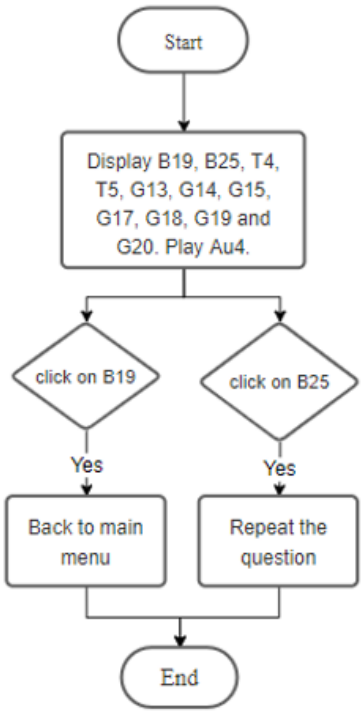


Figure 3.11 Storyboard for Quiz - Wrong Answer

Table 3.11 Storyboard 9 Description

Instruction for Animation, Button, Graphic, Text, Audio	**Flow diagram for Animation, Button, Graphic, Text, Audio**
An9: Show G13, G14, G15, G17, G18, G19, B19, T4 and T5. G20 fade in, follow by B25 then play Au4. **G13:** background image **G14:** question background image **G15:** question image **G20:** wrong answer image **G17:** choice 1 image **G18:** choice 2 image **G19:** choice 3 image **B19:** Back to main menu **B25:** Retry question button **T4:** question number **T5:** question text **Au4:** wrong answer sound effect	

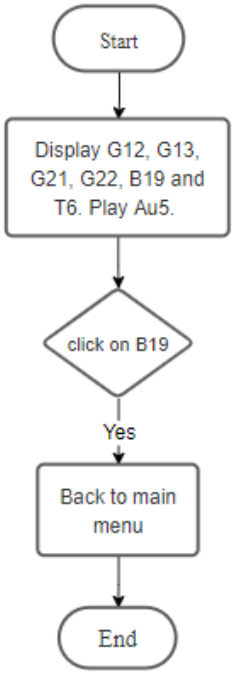
Storyboard No : 10

Topic : Quiz - Completed

G(Graphic), B(Button), T(Text), Au(Audio)

Figure 3.12 Storyboard for Quiz - Completed

Table 3.12 Storyboard 10 Description

Instruction for Animation, Button, Graphic	Flow diagram for Animation, Button, Graphic
An10: G13 appear, G12 and T6 fade in. G21 and G22 play transition. **G12:** board image **G13:** background image **G21:** animal image **G22:** animal image **B19:** Back to main menu **T6:** Quiz completed text **Au5:** quiz completed sound effect	

Storyboard No : 11

Topic : Spelling - Instruction

G(Graphic), B(Button), T(Text), Au(Audio)

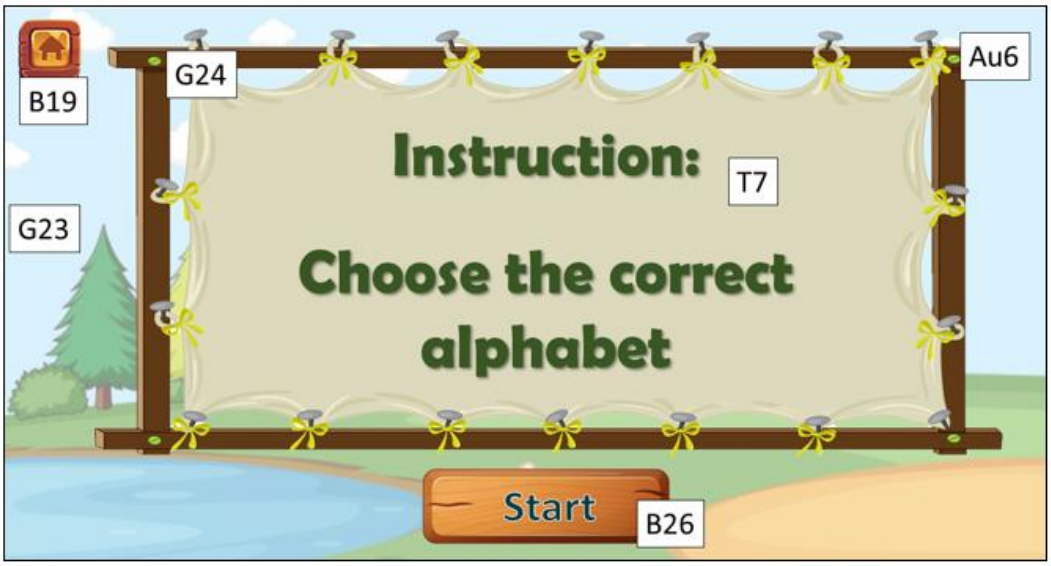
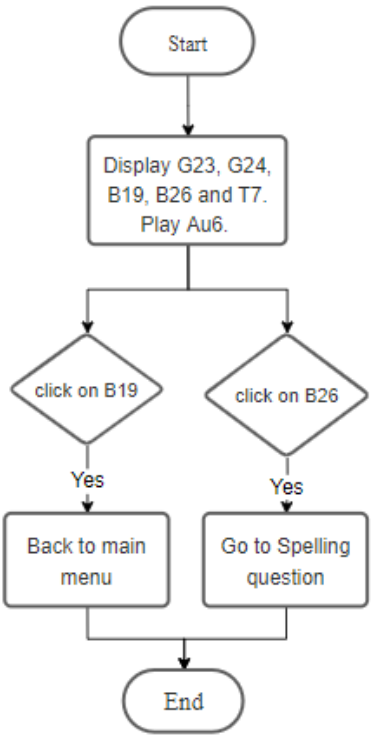


Figure 3.13 Storyboard for Spelling - Instruction

Table 3.13 Storyboard 11 Description

Instruction for Animation, Button, Graphic, Text, Audio	**Flow diagram for Animation, Button, Graphic, Text, Audio**
An11: G23 and G24 appear. T7, B19 and B26 fade in, play Au6. **G23:** background image **G24:** board image **B19:** Back to main menu **B26:** Go to spelling question **T7:** Spelling instruction text **Au6:** Spelling background music	

Storyboard No : 12

Topic : Spelling - Question

G(Graphic), B(Button), T(Text)

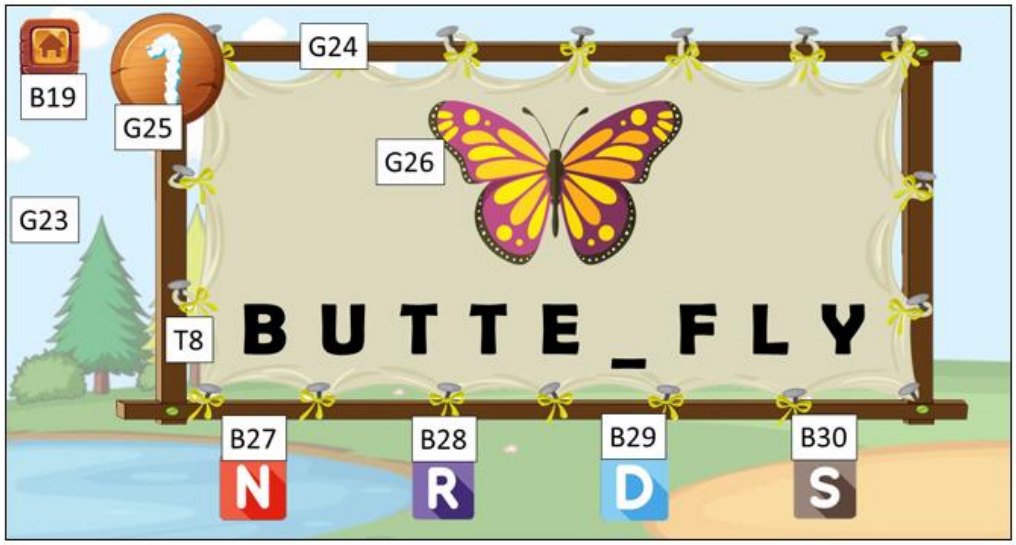
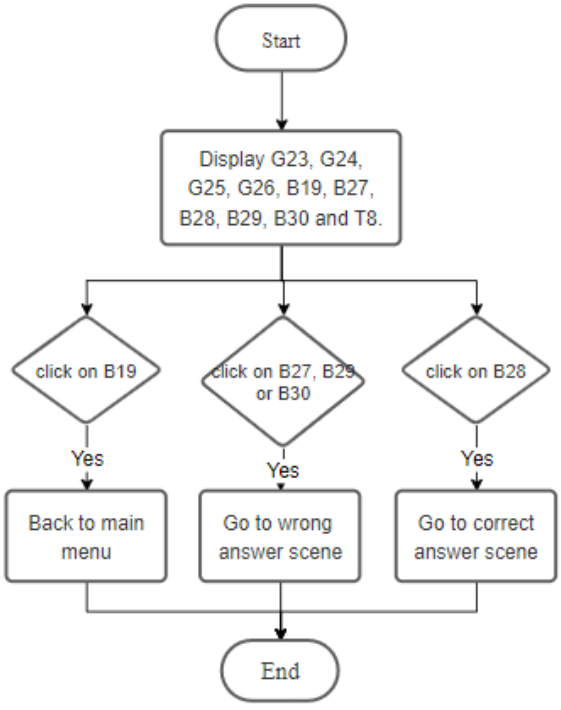


Figure 3.14 Storyboard for Spelling - Question

Table 3.14 Storyboard 12 Description

Instruction for Animation, Button, Graphic, Text	Flow diagram for Animation, Button, Graphic, Text
An12: G23 appear, then G24 and G25 fade in, follow by G26 and T8, B27, B28, B29, B30 and B19. **G23:** background image **G24:** board image **G25:** spelling question number **G26:** spelling question image **B19:** Back to main menu **B27:** alphabet choice 1 **B28:** alphabet choice 2 **B29:** alphabet choice 3 **B30:** alphabet choice 4 **T8:** Question text	

Storyboard No : 13

Topic : Spelling - Correct Answer

G(Graphic), B(Button), T(Text), Au(Audio)

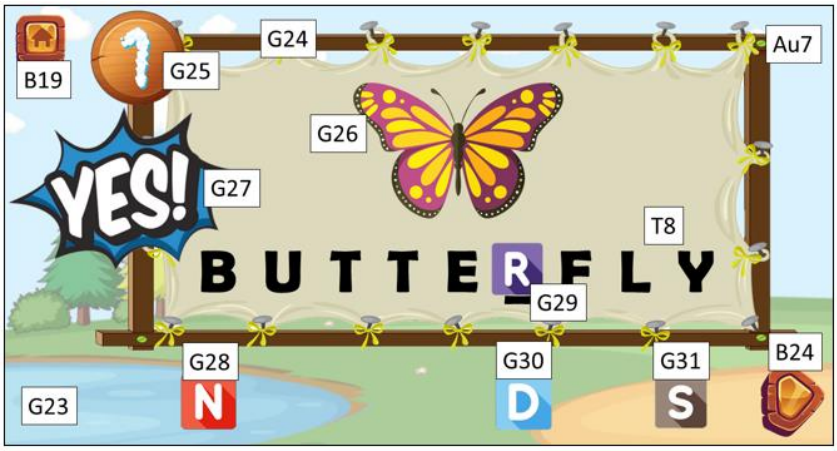
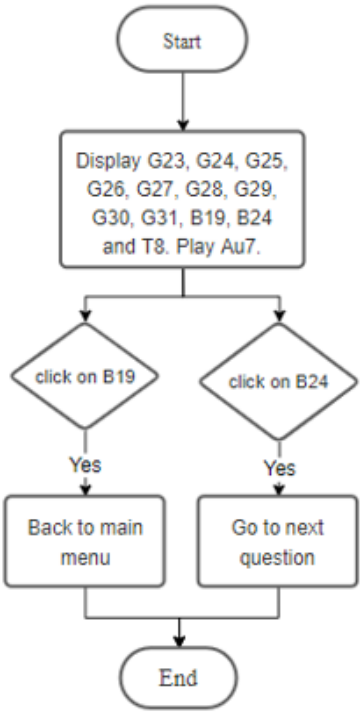


Figure 3.15 Storyboard for Spelling - Correct Answer

Table 3.15 Storyboard 13 Description

Instruction for Animation, Button, Graphic, Text, Audio	Flow diagram for Animation, Button, Graphic, Text, Audio
An13: show G23, G24, G25, G26, G28, G29, G30, G31, B19 and T8. G27 and B24 fade in then play Au7. **G23:** background image **G24:** board image **G25:** spelling question number **G26:** spelling question image **G27:** correct answer feedback **G28:** alphabet choice 1 image **G29:** alphabet choice 2 image **G30:** alphabet choice 3 image **G31:** alphabet choice 4 image **B19:** Back to main menu **B24:** next question button **T8:** Question text **Au7:** correct answer sound effect	

Storyboard No : 14

Topic : Spelling - Wrong Answer

G(Graphic), B(Button), T(Text), Au(Audio)

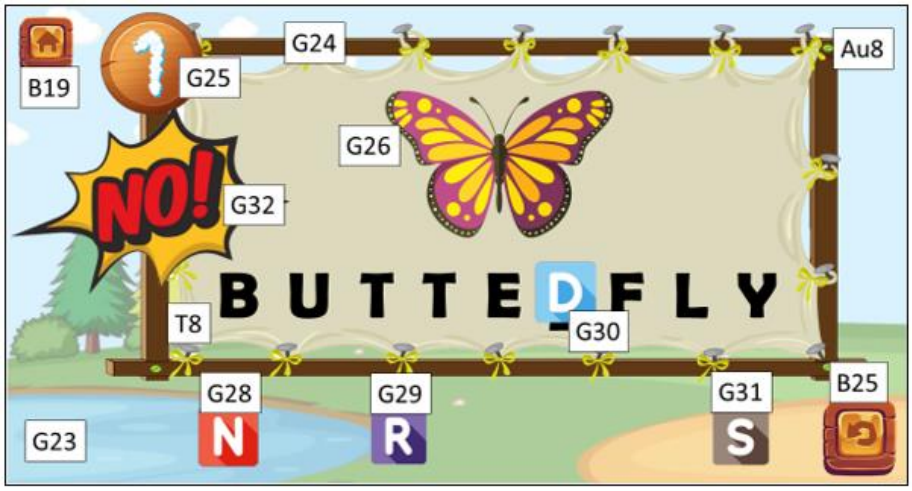
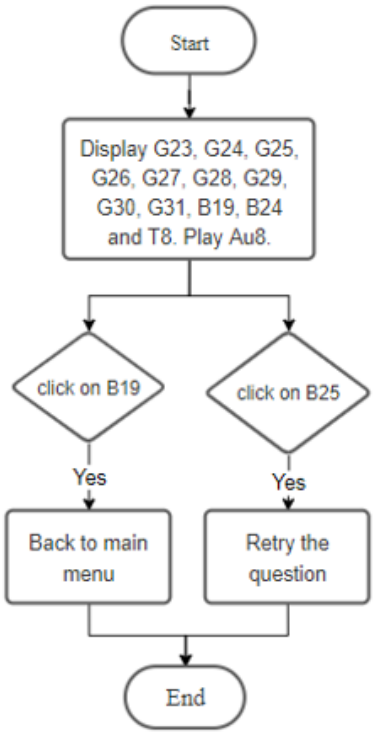


Figure 3.16 Storyboard for Spelling - Correct Answer

Table 3.16 Storyboard 14 Description

Instruction for Animation, Button, Graphic, Text, Audio	**Flow diagram for Animation, Button, Graphic, Text, Audio**
An14: show G23, G24, G25, G26, G28, G29, G30, G31, B19 and T8. G32 and B25 fade in then play Au8. **G23:** background image **G24:** board image **G25:** spelling question number **G26:** spelling question image **G32:** wrong answer feedback **G28:** alphabet choice 1 image **G29:** alphabet choice 2 image **G30:** alphabet choice 3 image **G31:** alphabet choice 4 image **B19:** Back to main menu **B25:** retry question button **T8:** Question text **Au7:** correct answer sound effect	

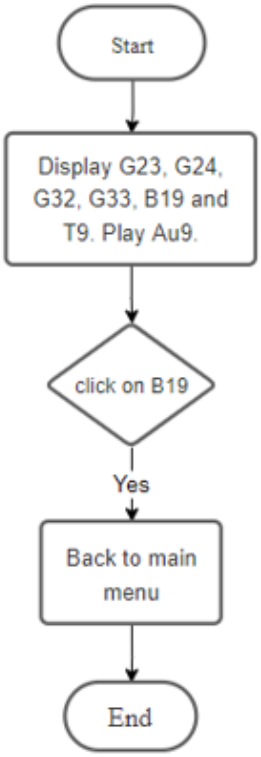
Storyboard No : 15

Topic : Spelling - Completed

G(Graphic), B(Button), T(Text), Au(Audio)

Figure 3.17 Storyboard for Spelling - Completed

Table 3.17 Storyboard 15 Description

Instruction for Animation, Button, Graphic, Text, Audio	Flow diagram for Animation, Button, Graphic, Text, Audio
An15: G23 and G24 appear. T9 fade in then G32 and G33 play transition. B19 fade in and play Au9. **G23:** background image **G24:** board image **G32:** animal image **G33:** animal image **B19:** Back to main menu **T9:** spelling completed text **Au9:** completed sound effect	

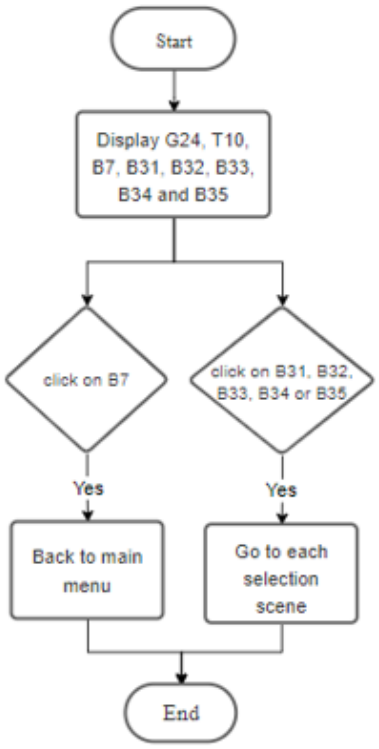
Storyboard No : 16

Topic : Hide and Seek - Selection

G(Graphic), B(Button), T(Text)

Figure 3.18 Storyboard for Hide and Seek - Selection

Table 3.18 Storyboard 16 Description

Instruction for Animation, Button, Graphic, Text	Flow diagram for Animation, Button, Graphic, Text
An16: G34 fade in, then T10, B7, B31, B32, B33, B34 and B35 fade in. **G34:** background image **B7:** Back to main menu **B31:** butterfly hide and seek **B32:** cactus hide and seek **B33:** bee hide and seek **B34:** pumpkin hide and seek **B35:** snail hide and seek **T10:** hide and seek instruction	

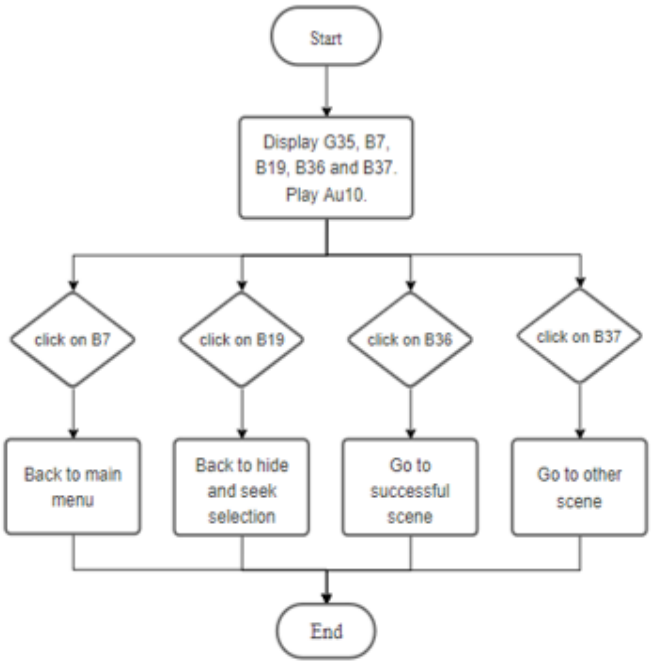
Storyboard No : 17

Topic : Hide and Seek - Scene

G(Graphic), B(Button), T(Text), Au(Audio)

Figure 3.19 Storyboard for Hide and Seek - Scene

Table 3.19 Storyboard 17 Description

Instruction for Animation, Button, Graphic, Text, Audio	Flow diagram for Animation, Button, Graphic, Text, Audio
An17: G35 appear, follow by B7, B19, B37 and B36. Play Au10. **G35:** background scene **B7:** Back to hide and seek selection **B19:** Back to main menu **B36:** hidden butterfly **B37:** change scene **Au10:** background music	

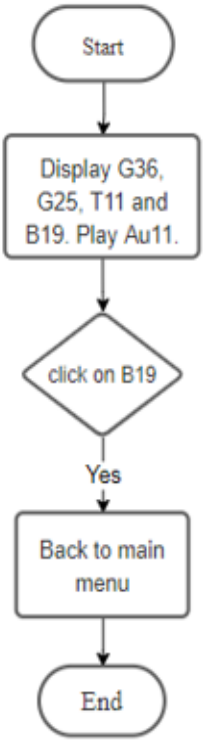
Storyboard No : 18

Topic : Hide and Seek - Object Found

G(Graphic), B(Button), T(Text), Au(Audio)

Figure 3.20 Storyboard for Hide and Seek - Object Found

Table 3.20 Storyboard 18 Description

Instruction for Animation, Button, Graphic, Text, Audio	Flow diagram for Animation, Button, Graphic, Text, Audio
An18: G36 fade in, then G25, T11 and B19 fade in. Play Au11. **G25:** butterfly image **G36:** background board image **B19:** Back to main menu **T11:** found text **Au11:** funny sound effect	

3.6 Project Planning

3.6.1 Project 1

Activity	Period (Week)											
	1 (24 Jan - 30 Jan)	2 (31 Jan - 6 Feb)	3 (7 Feb - 13 Feb)	4 (14 Feb - 20 Feb)	5 (21 Feb - 27 Feb)	6 (28 Feb - 6 Mar)	7 (7 Mar - 13 Mar)	8 (14 Mar - 20 Mar)	9 (21 Mar - 27 Mar)	10 (28 Mar - 3 Apr)	11 (4 Apr - 10 Apr)	12 (11 Apr - 17 Apr)
Analysis												
Define background information												
Develop problem statement												
Develop project scope												
Develop project objective												
Define impact and contribution												
Compare similar application												
Develop questionnaire												
Data Collection and Analysis												
Formative evaluation												
Design												
Define requirement												
Develop system flow												

Figure 3.21 Project 1 Timeline Planning

Develop storyboard design												
Formative evaluation												
Development												
Develop module prototype												
Formative evaluation												
Implementation												
Testing Delivery												
Formative evaluation												
Evaluation												
Reporting												
Summative evaluation												

Figure 3.22 Project 1 Timeline Planning (Continue)

3.6.2 Project 2

Activity	Period (Week)												
	1 (13 Jun - 19 Jun)	2 (20 Jun - 26 Jun)	3 (27 Jun - 3 Jul)	4 (4 Jul - 10 Jul)	5 (11 Jul - 17 Jul)	6 (18 Jul - 24 Jul)	7 (25 Jul - 31 Jul)	8 (14 Mar - 20 Mar)	9 (1 Aug - 7 Aug)	10 (8 Aug - 14 Aug)	11 (15 Aug - 21 Aug)	12 (22 Aug - 28 Aug)	13 (29 Aug - 4 Sep)
Development													
Refix previous module													
Develop hide and seek module													
Develop discovery module													
Develop lesson module													
Integrate module													
Formative evaluation													
Implementation													
Testing system delivery													
Module delivery													
Final modification													
Formative evaluation													
Evaluation													
Reporting													
Further enhancement													
Summative evaluation													

Figure 3.23 Project 2 Timeline Planning

CHAPTER 4: DEVELOPMENT

4.1 Overview

The development process is the stage to combine the multimedia materials in order to create an interactive system. All the materials that prepared will be used in this phase. In this chapter, the development process of the proposed system will be described based on the module.

4.2 Development Process

4.2.1 Splash Screen and Main Menu

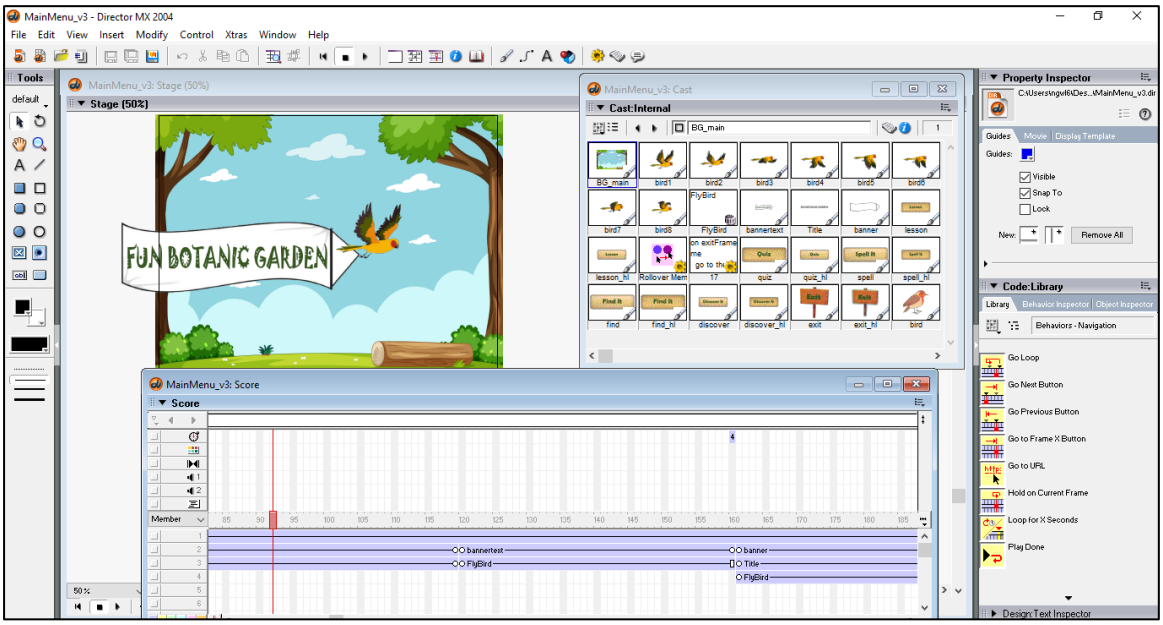


Figure 4.1 Screenshot of Splash Screen Development

Figure 4.1 shows the screenshot of splash screen development. A bird will fly into the screen from left by bringing the title banner. After reaching the center, the bird will fly out to the right and the scene will slowly change to the main menu scene.

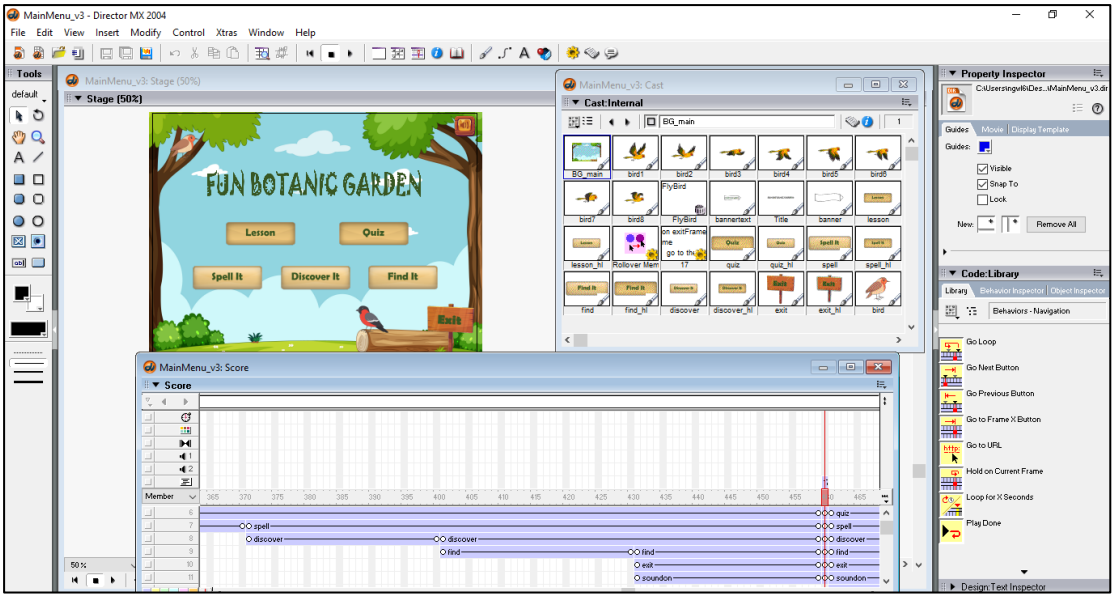


Figure 4.2 Screenshot of Main Menu Development

Figure 4.2 shows the screenshot of main menu development. After the splash screen shown, the title will slowly move to center. The module and exit button will fade into the scene. Users can choose the module or exit the application. There will have a button on the top right corner to let users control the background music.

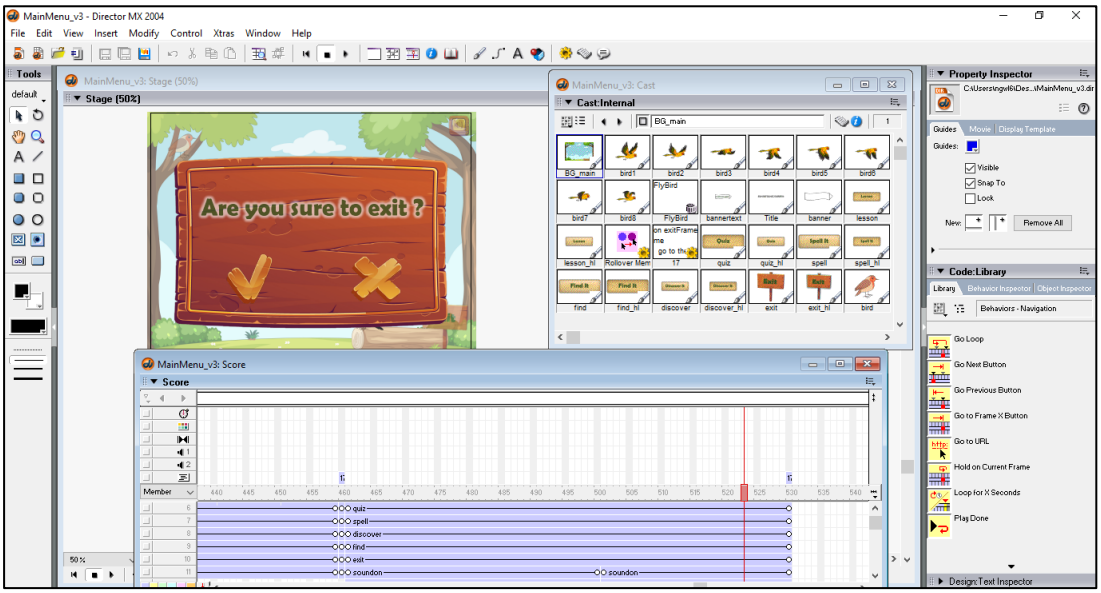


Figure 4.3 Screenshot of Exit Scene Development

Figure 4.3 shows that the screenshot of exit scene development. When users click on the exit board, a wooden board will move in from the left to the center. The text and button will slowly fade in while the background will slowly become translucent. If users click on the tick button, the application will fully exit. If users click on the cross button, the scene will back to main menu.

4.2.2 Module 1 - Lesson

4.2.2.1 Menu Selection

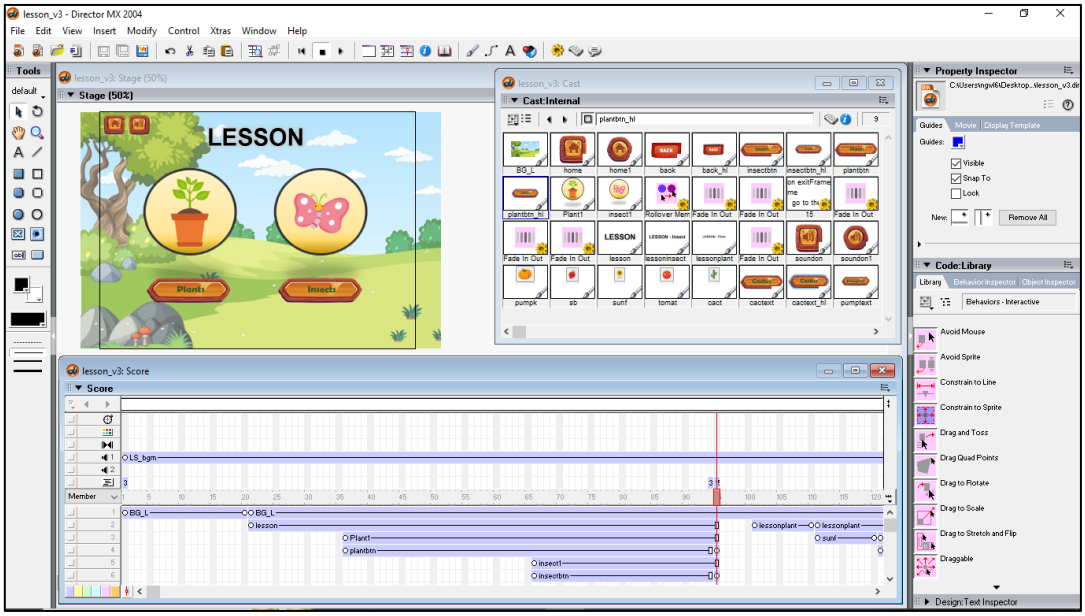


Figure 4.4 Screenshot of Lesson Menu Scene Development

Figure 4.4 shows that the screenshot of lesson menu scene development. There are four buttons in this scene which are home, sound control, plants and insects. The home button will navigate to main menu scene where the sound control button let the users to control the sound of background music. There are two parts in lesson module which are plants and insects. “Plants” button will navigate to plants menu selection scene where “insects” button will navigate to insects’ menu selection.

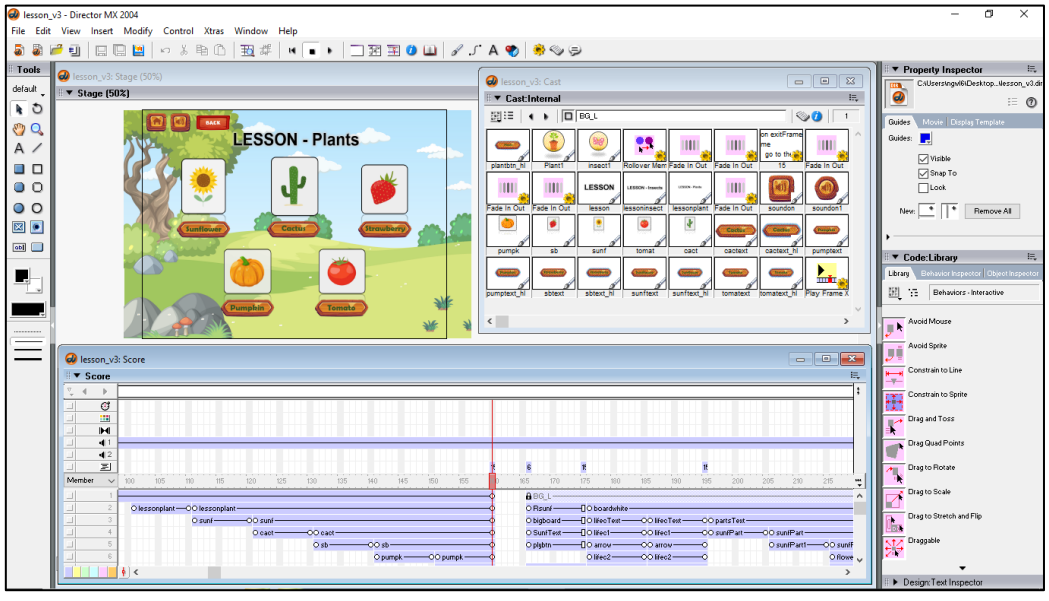


Figure 4.5 Screenshot of Plants’ Menu Selection Scene Development

Figure 4.5 shows that the screenshot of plants' menu selection scene development. There are eight buttons in this scene which are home, sound control, back button, and the other five buttons indicates different insects. When users click on back buttons, the scene will change to the lesson menu scene for users. The chosen plants for this system are sunflower, cactus, strawberry, pumpkin and strawberry. The five buttons will navigate to the particular plants' scene.

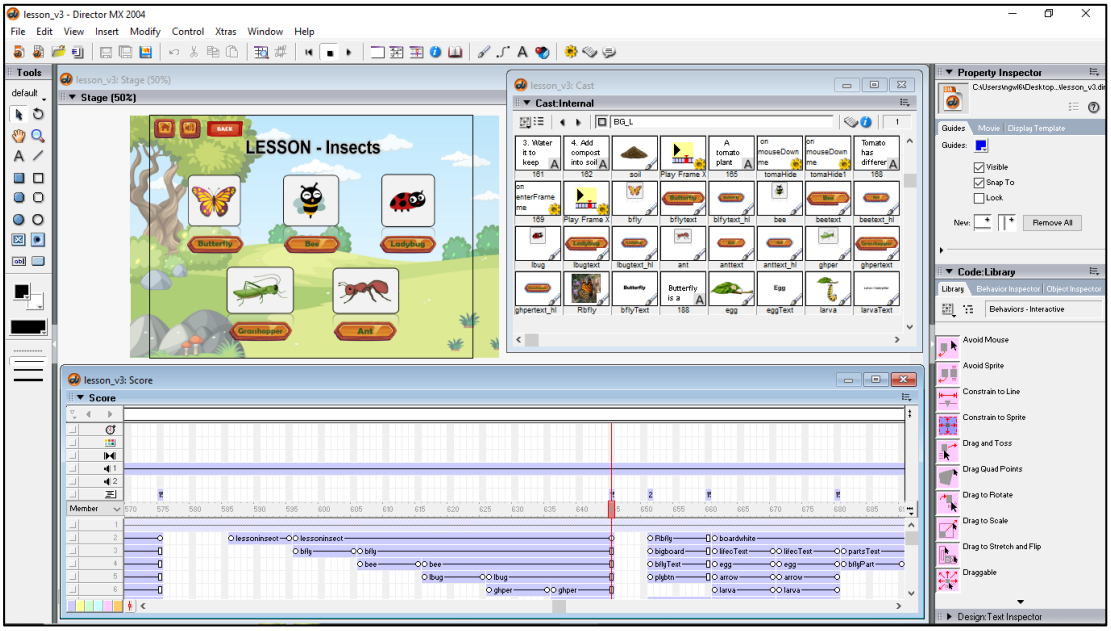


Figure 4.6 Screenshot of Insects' Menu Selection Scene Development

Figure 4.6 shows that the screenshot of insects' menu selection scene development. There are eight buttons in this scene which are home, sound control, back button, and the other five buttons indicates different insects. When users click on back buttons, the scene will change to the lesson menu scene for users. The chosen insects for this system are butterfly, bee, ladybug, grasshopper and ant. The five buttons will navigate to the particular insects' scene.

4.2.2.2 Plant

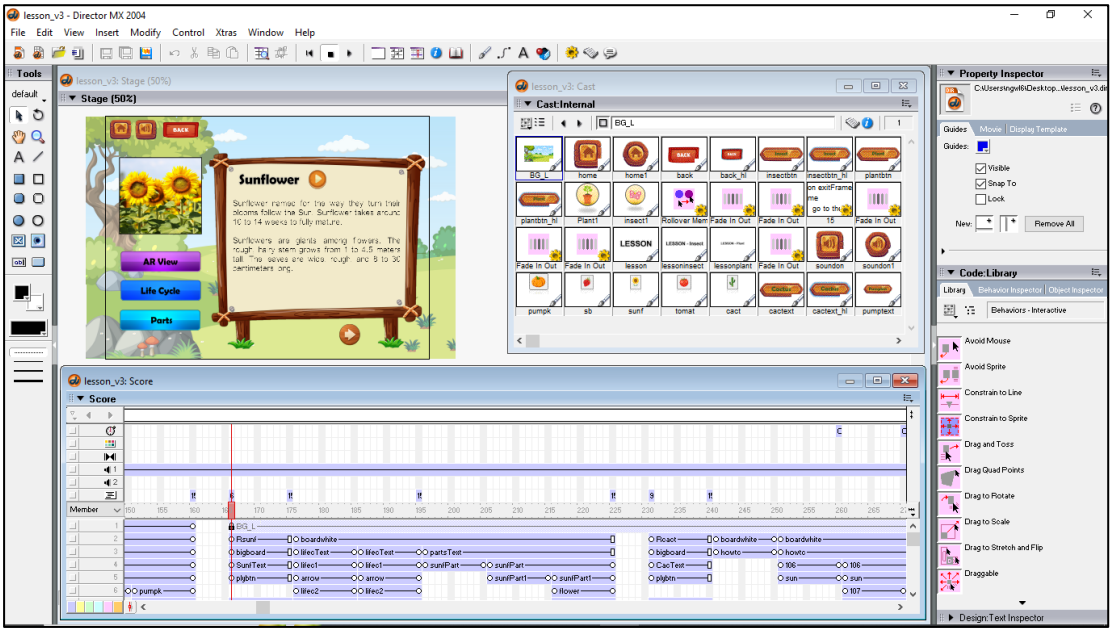


Figure 4.7 Screenshot of Particular Plant Scene Development

Figure 4.7 shows that the screenshot of a particular plant scene development. The button beside the plant's text will play the pronunciation of the text. The button below the big board will display the continuous information text of the plants. Besides, there are three sub-section of the plants which are AR view, life cycle and parts. When users click on AR View button, there will have a pop-up window to show the image target of the object. The other two buttons will navigate to the particular content scene.

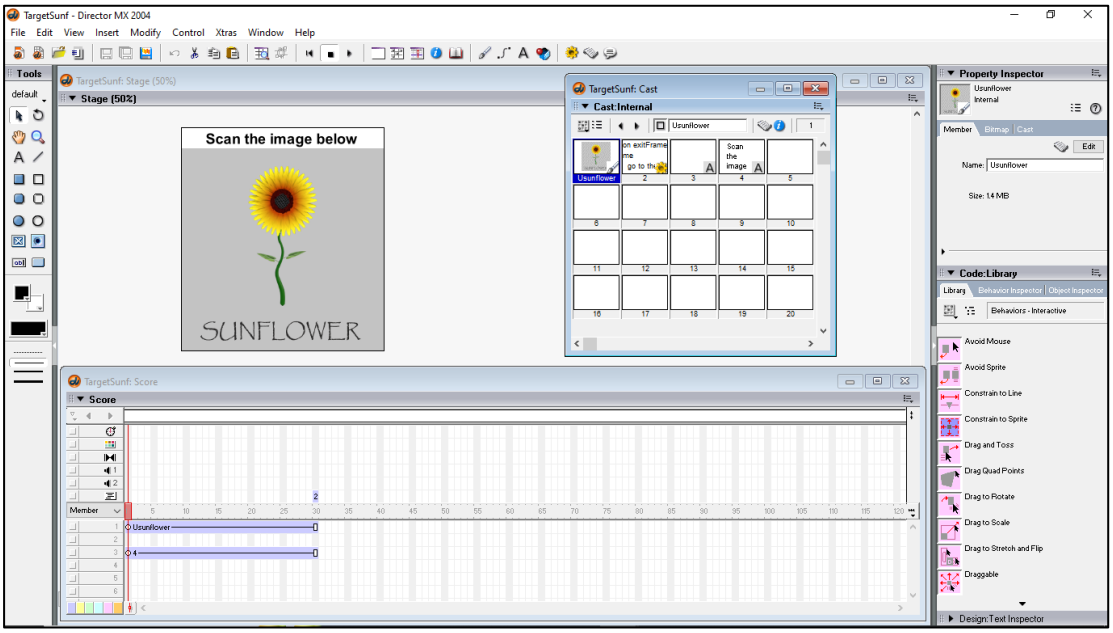


Figure 4.8 Screenshot of Sunflower Image Target Scene Development

Figure 4.8 shows that the screenshot of sunflower image target development. The instruction text and image target will be displayed in this scene. This is a pop-up window to let users scan the image target using the provided mobile application to view the AR view.

Figure 4.9 Screenshot of Sunflower AR View Scene Development

Figure 4.9 shows the screenshot of sunflower AR view scene development. When users scan the image target using provided application, the phone will display the AR view to the users.

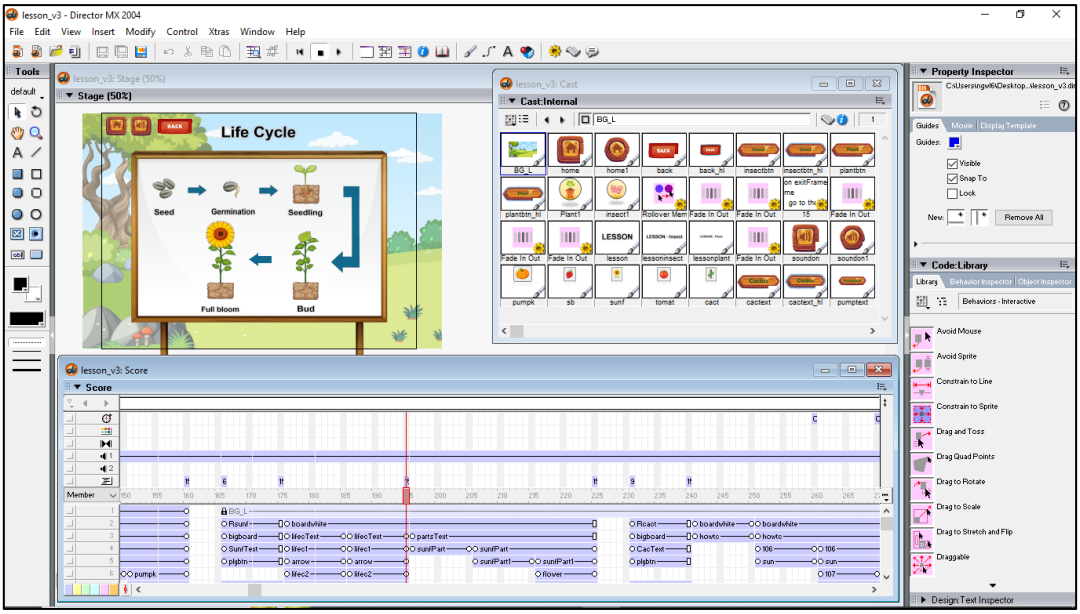


Figure 4.10 Screenshot of Plant's Life Cycle Scene Development

Figure 4.10 shows that the screenshot of plant's life cycle scene development. Each stage will display with the images and text for users. The back button will navigate users to the particular plants' content scene.

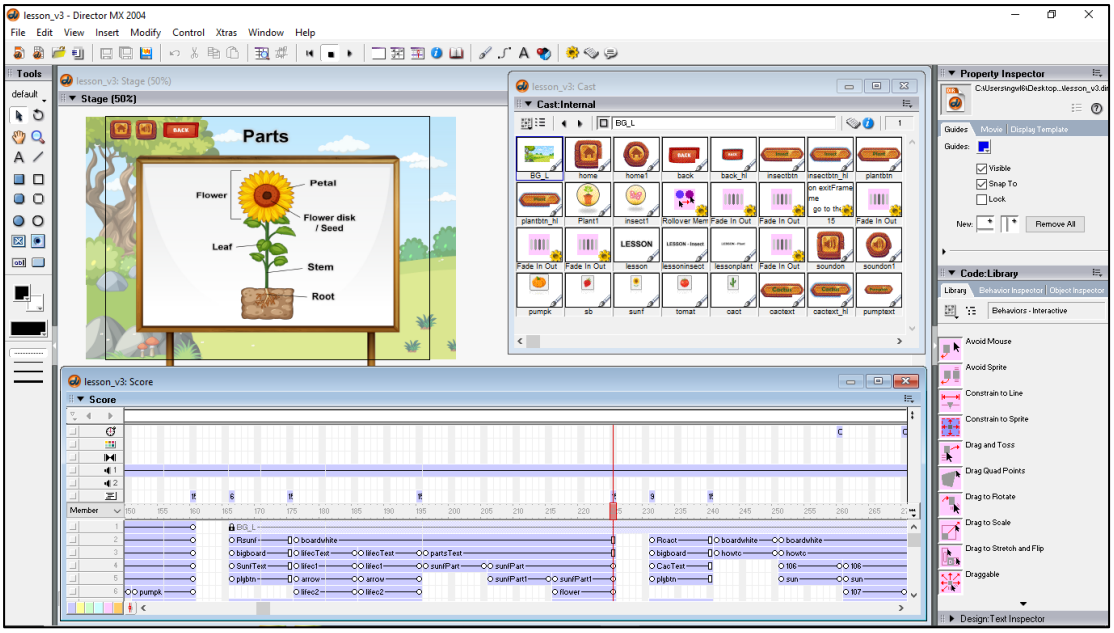


Figure 4.11 Screenshot of Plant's Parts Scene Development

Figure 4.11 shows that the screenshot of plant's parts scene development. Each part of the plants will clearly be directed with the line so that the users can easily understand. When users click on the back button, the scene will change to the particular plant's content.

4.2.2.3 Insect

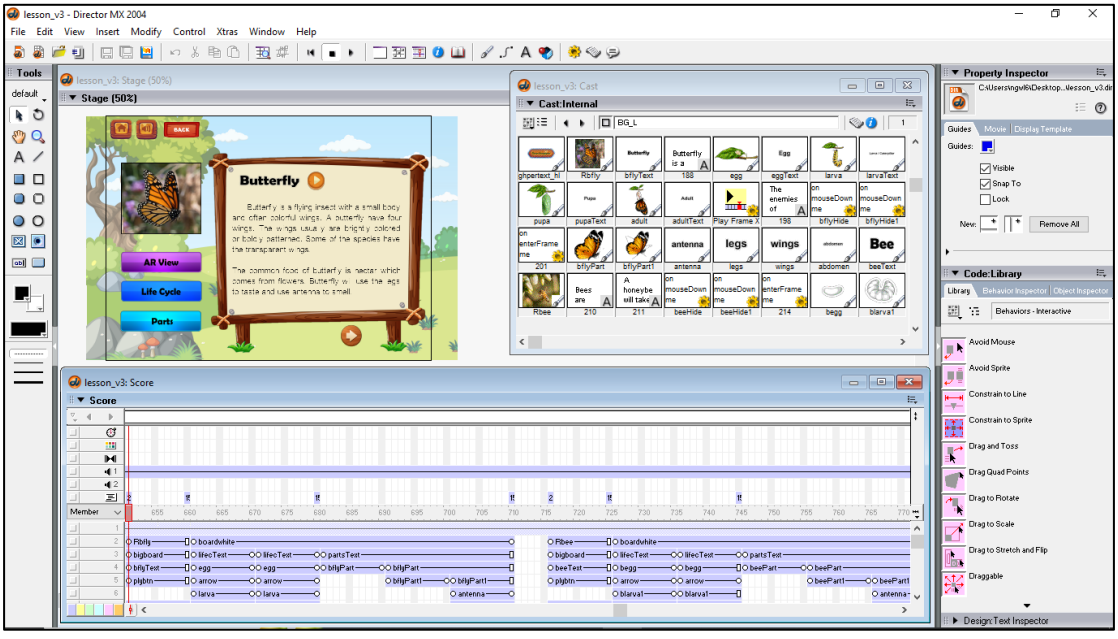


Figure 4.12 Screenshot of Insect's Content Scene Development

Figure 4.12 shows that the screenshot of insect's content scene development. The back button will navigate to the insects' menu selection. The button beside the insect's text will play the pronunciation of the text where the button below the board will show the continuous content of the insect. There are three buttons for insects which are AR view, life cycle and parts. The button for AR view will show a pop-up window where the others will change the scene.

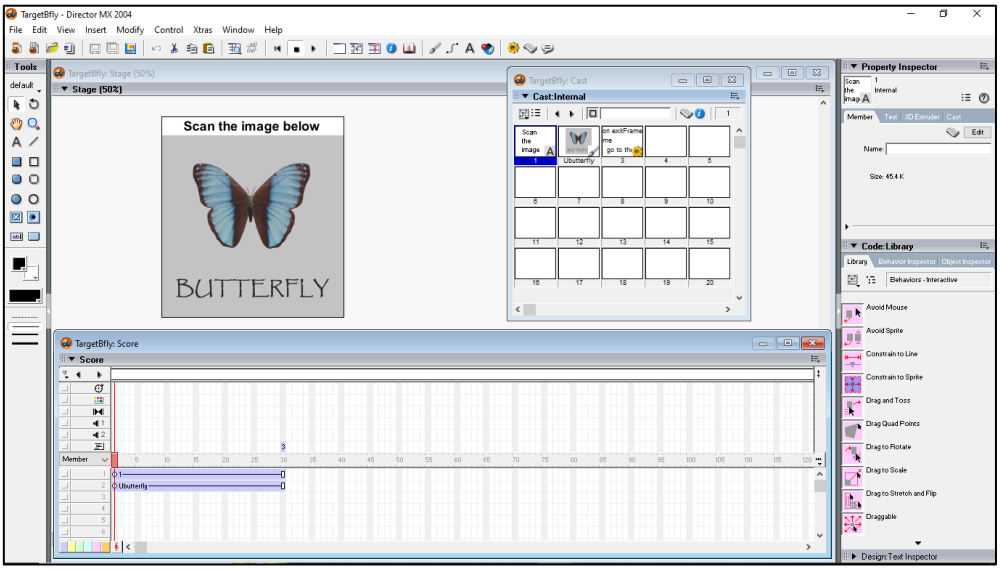


Figure 4.13 Screenshot of Insect's AR View Scene Development

Figure 4.13 shows that the screenshot of AR view scene development. An instruction text and image target of the particular insects will be shown as a pop-up window for the users.

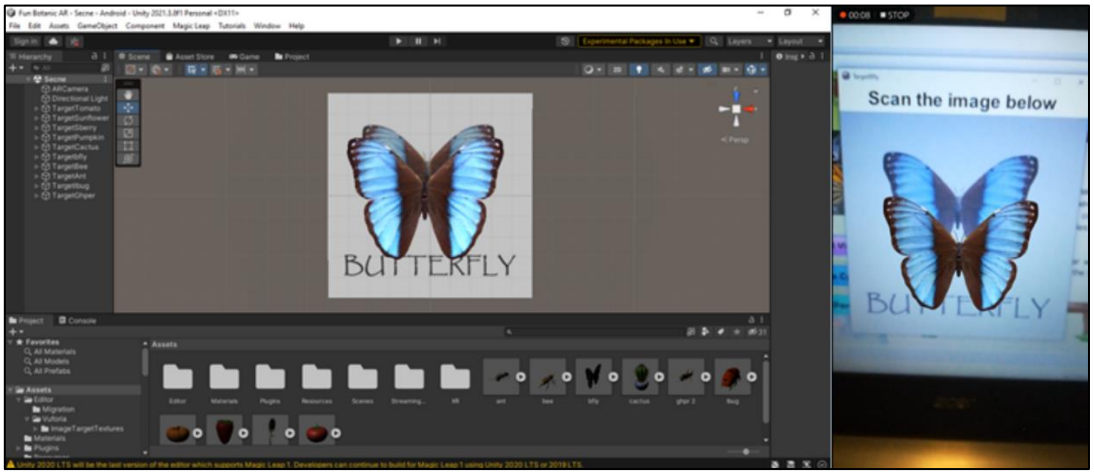


Figure 4.14 Screenshot of Butterfly AR View Scene Development

Figure 4.14 shows the screenshot of butterfly AR view scene development. The AR view will be displayed when users scan the image target shown using the phone.

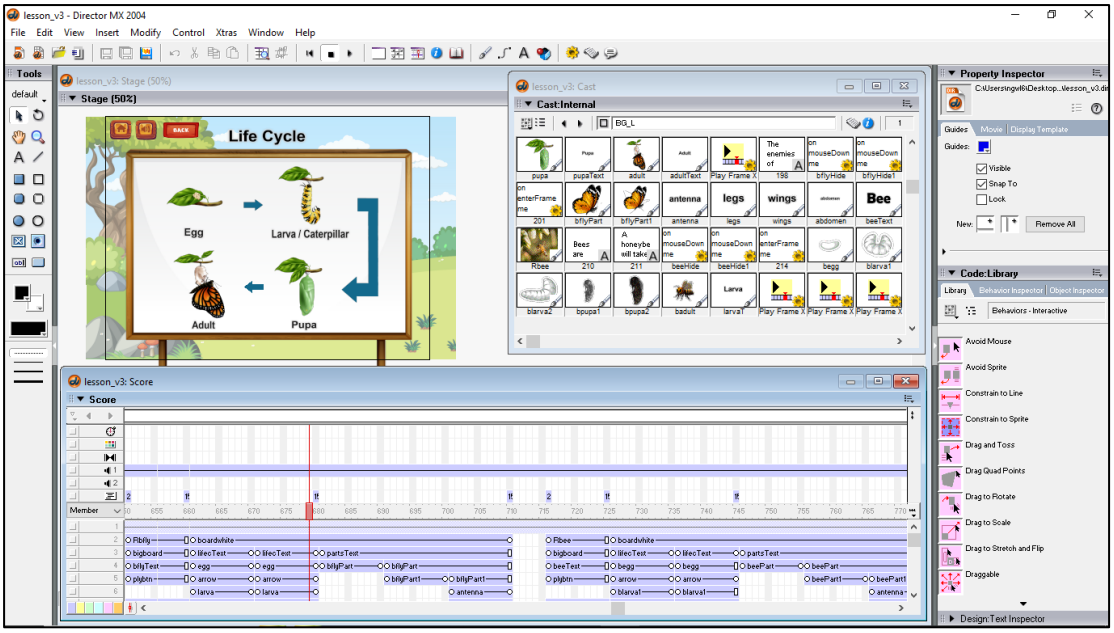


Figure 4.15 Screenshot of Insect's Life Cycle Scene Development

Figure 4.15 shows that the screenshot of insect's life cycle scene development. Each stage will display with the images and text for users. The back button will navigate users to the particular insect' content scene.

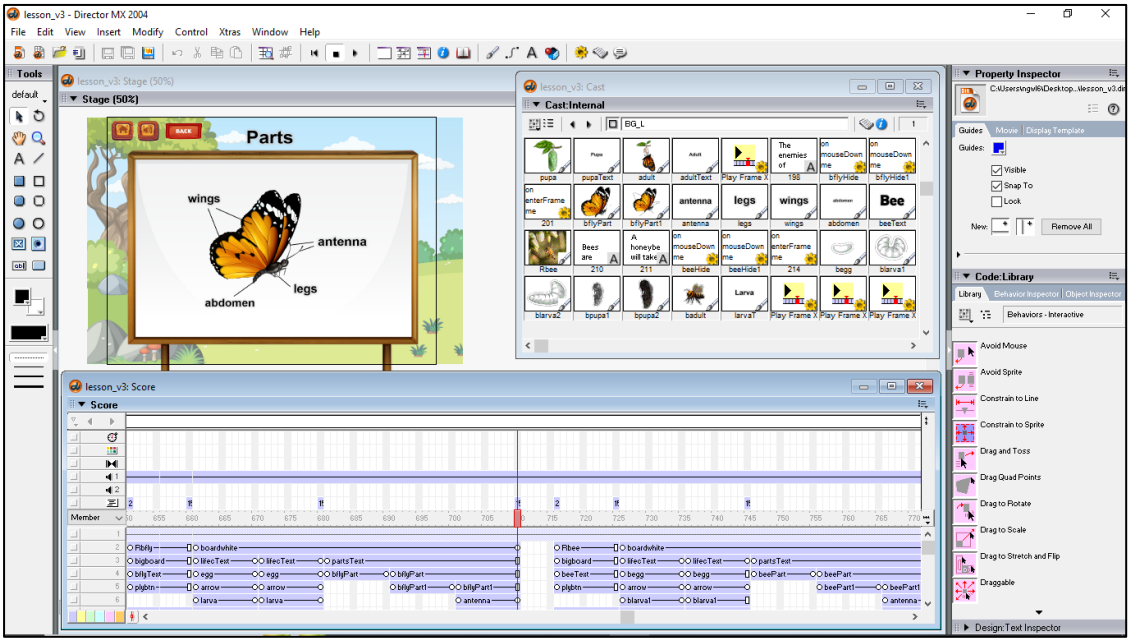


Figure 4.16 Screenshot of Insect's Parts Scene Development

Figure 4.16 shows that the screenshot of insect's parts scene development. Each part will clearly be linked with the image shown so that users can easily understand. The back button will navigate users to the particular insect' content scene.

4.2.3 Module 2 - Quiz

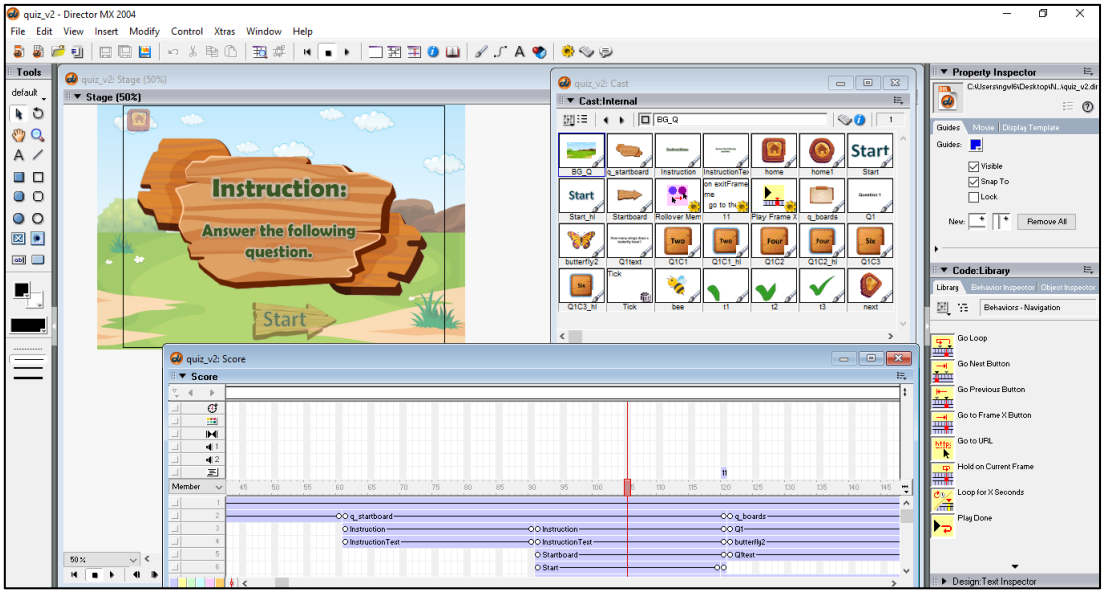


Figure 4.17 Screenshot of Quiz Instruction Development

Figure 4.17 shows the screenshot of quiz instruction development. When entering the quiz module, a board will swipe in and the instruction will fade into the scene. The home and start button will fade in.

4.2.3.1 Question

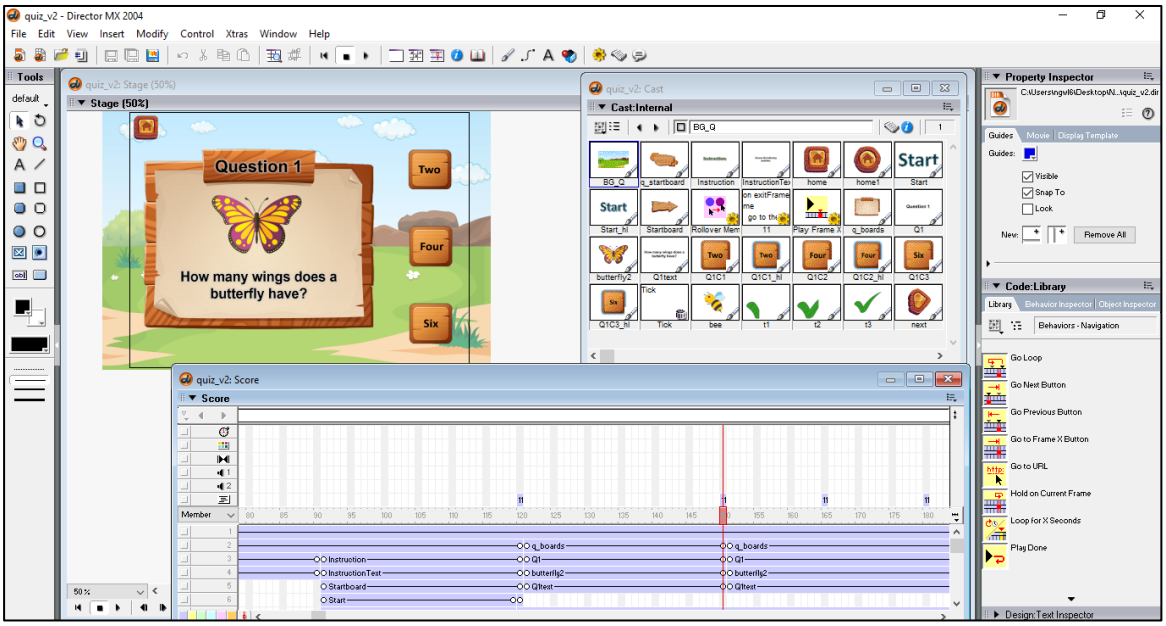


Figure 4.18 Screenshot of Quiz Question Development

Figure 4.18 shows the screenshot of quiz question development. The question board and answer selection will move in from left and right respectively. There is a home button on the top left along the module in order to let users choose to quit module anytime. Different question type will have different animation style to show the scene.

4.2.3.2 Answer Feedback

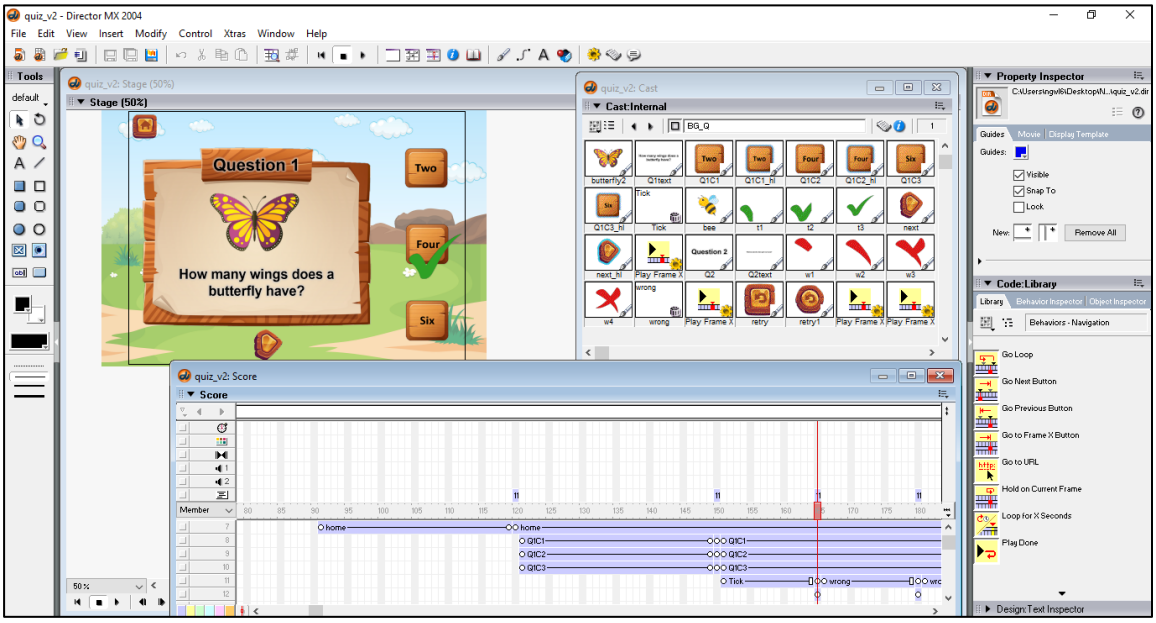


Figure 4.19 Screenshot of Quiz Correct Feedback Development

Figure 4.19 shows the screenshot of quiz correct feedback development. When the users answer correctly, there will have a tick animation occur on the answer board with the sound effect. A continue button will display below the question board to let users continue to next question.

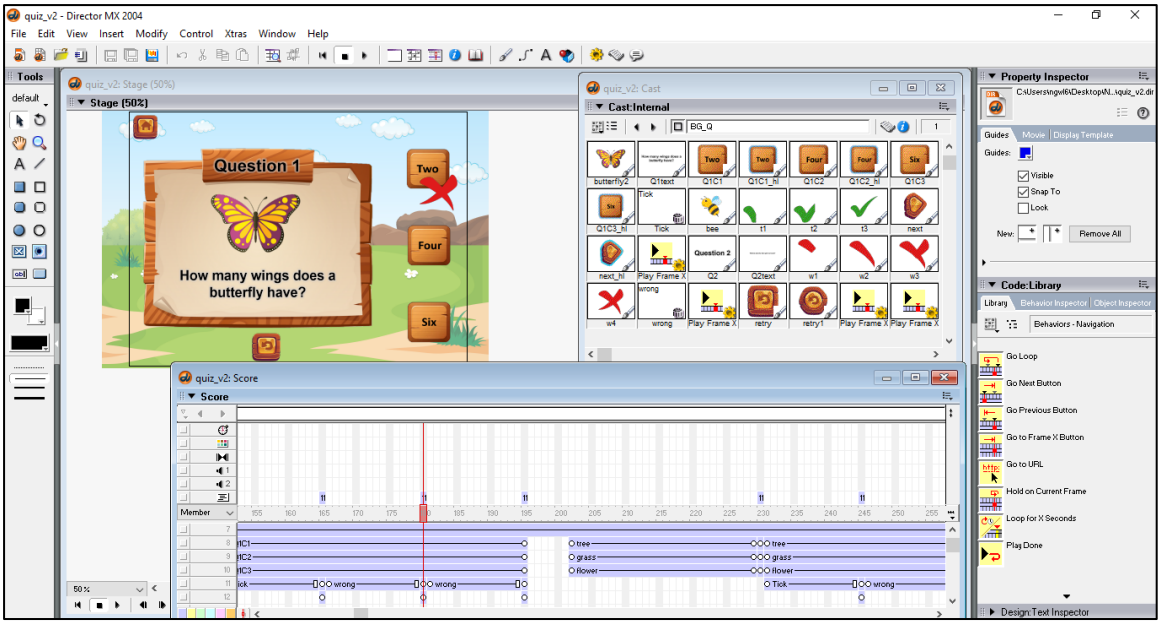


Figure 4.20 Screenshot of Quiz Wrong Feedback Development

Figure 4.20 shows that the screenshot of quiz wrong feedback development. When the users answer wrongly, a cross animation will be shown on the answer board with the sound effect. A retry button will display below the question board to let users retry the question.

4.2.3.3 Module Completed

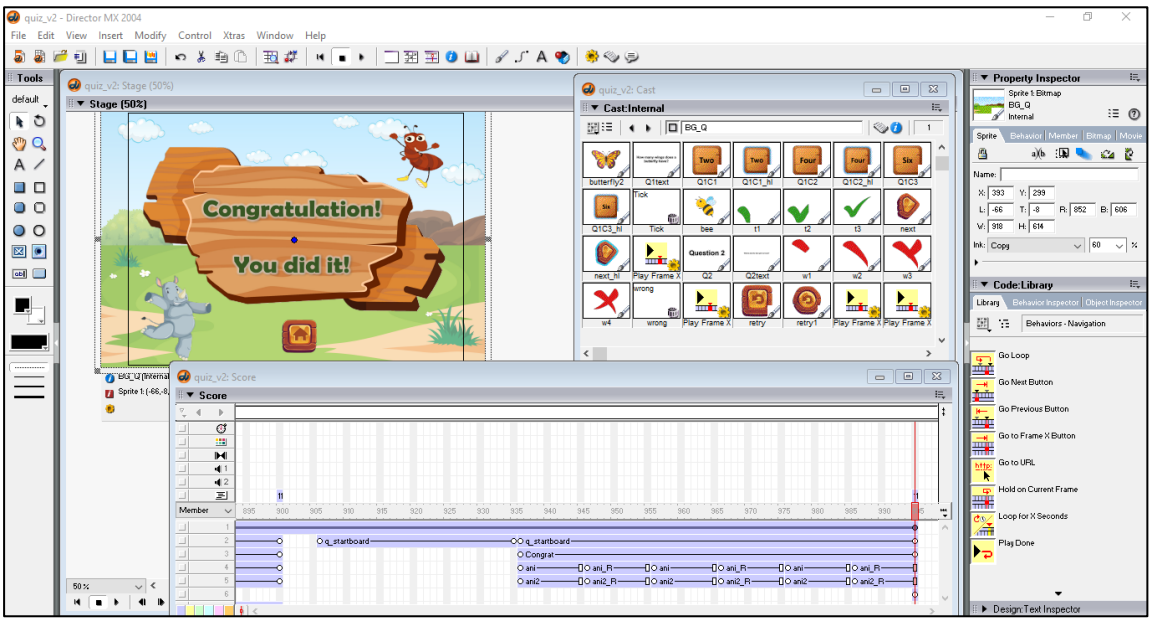


Figure 4.21 Screenshot of Quiz Completed Development

Figure 4.21 shows that the quiz completed development. After the users done all the question, a board will be shown with the congratulation text. At the same time, there will have animation and sound effect in the scene. A home button will display to let users back to the main menu scene.

4.2.4 Module 3 - Spell It

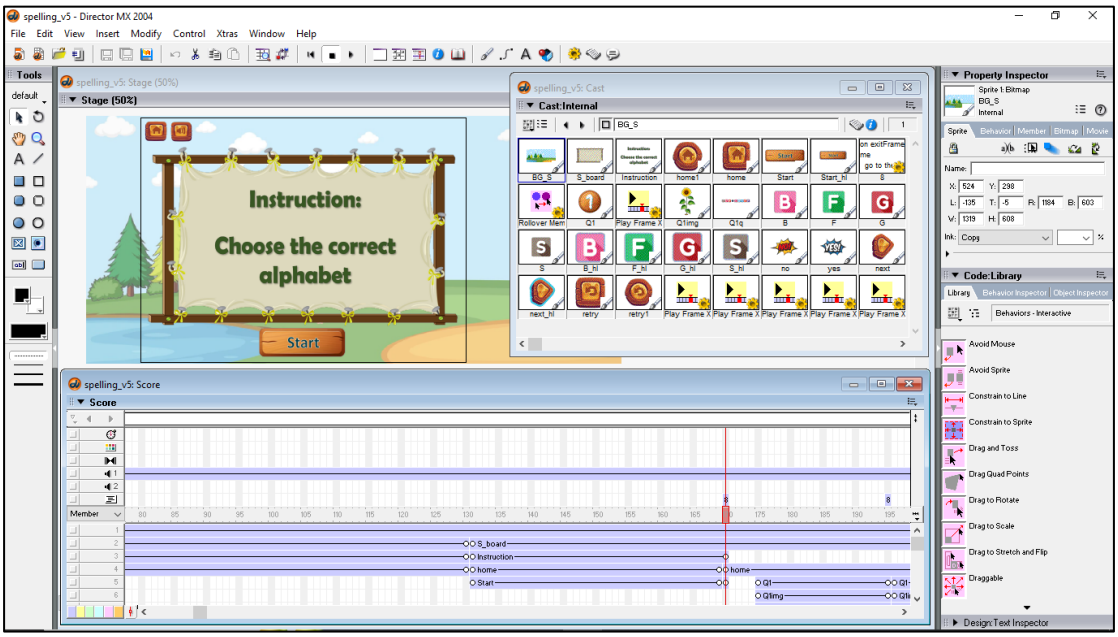


Figure 4.22 Screenshot of Spelling Instruction Development

Figure 4.22 shows that the spelling instruction scene development. The instruction text of this module will be displayed to the users. There are three buttons in this scene which are home, sound control, and start. Home button will navigate to main menu scene; sound control button let users to control the sound of background music; and the start button will navigate to the question scene.

4.2.4.1 Question

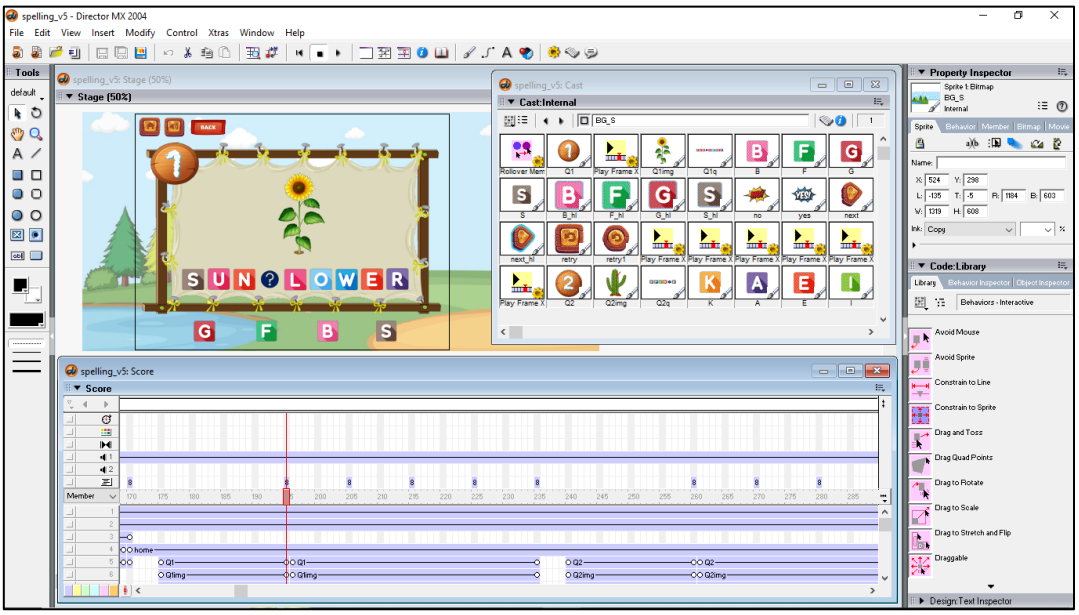


Figure 4.23 Screenshot of Spelling Question Development

Figure 4.23 shows that the spelling question scene development. The question image and alphabets will be shown in this scene. The back button will navigate the users to the instruction scene. There are four alphabet buttons to let users choose. Each button will toggle different feedback which are correct answer or wrong answer.

4.2.4.2 Answer Feedback

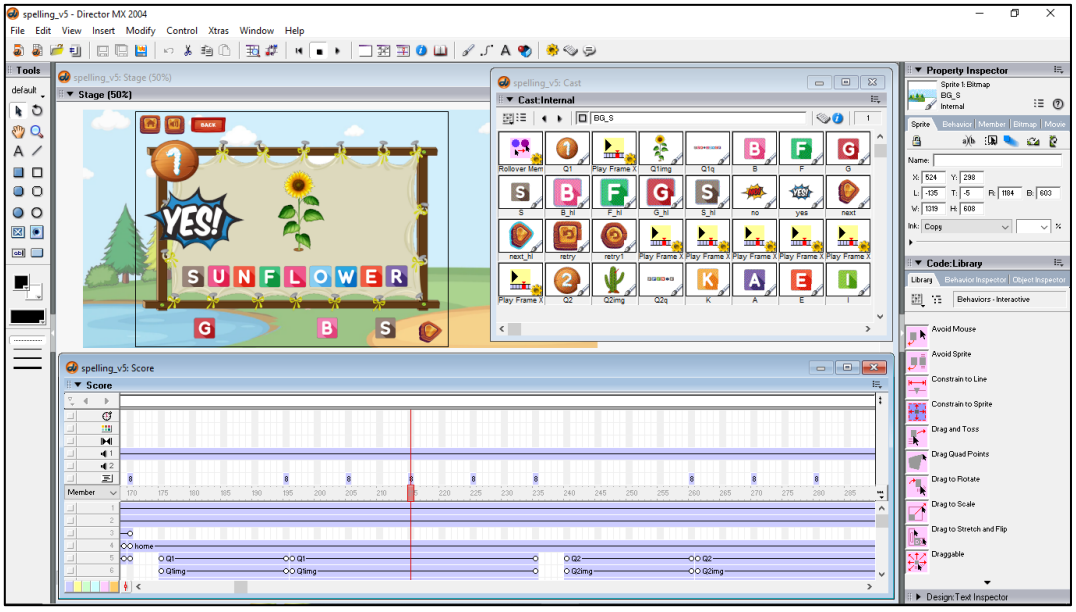


Figure 4.24 Screenshot of Spelling Correct Answer Scene Development

Figure 4.24 shows that the correct answer feedback scene development. The image represented correct will be shown in the scene. Encouraging sound effect also will be played in this scene. There will have a button which will navigate to the next question.

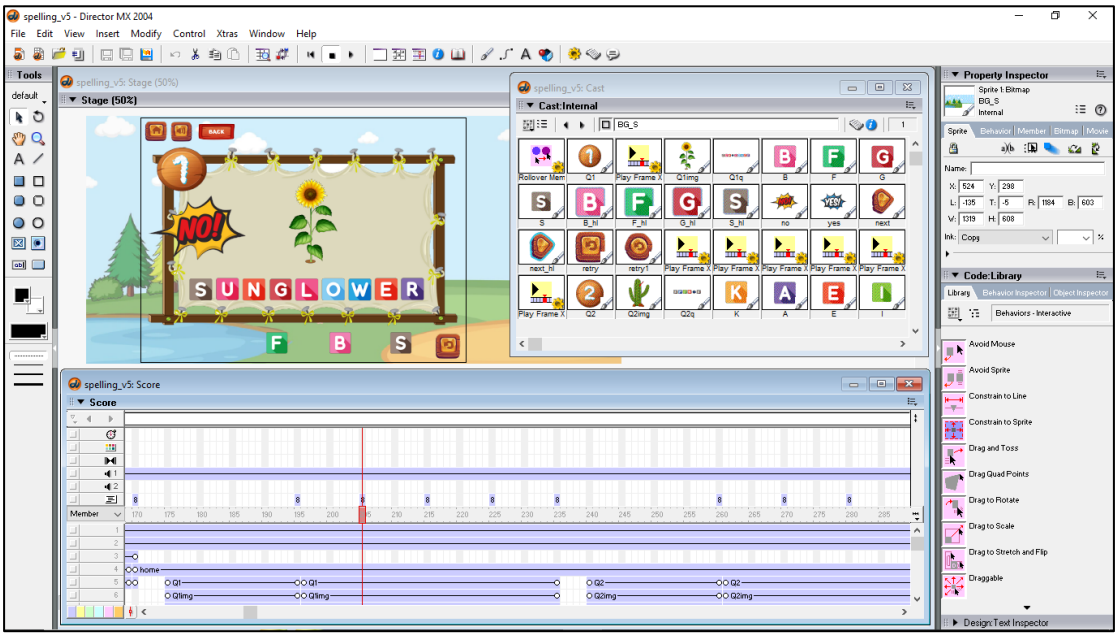


Figure 4.25 Screenshot of Spelling Wrong Answer Scene Development

Figure 4.25 shows that the wrong answer feedback scene development. The image represented wrong will be shown in the scene. Some sound effect also will be played in this scene. There will have a button for users in order to retry the question again.

4.2.4.3 Module Completed

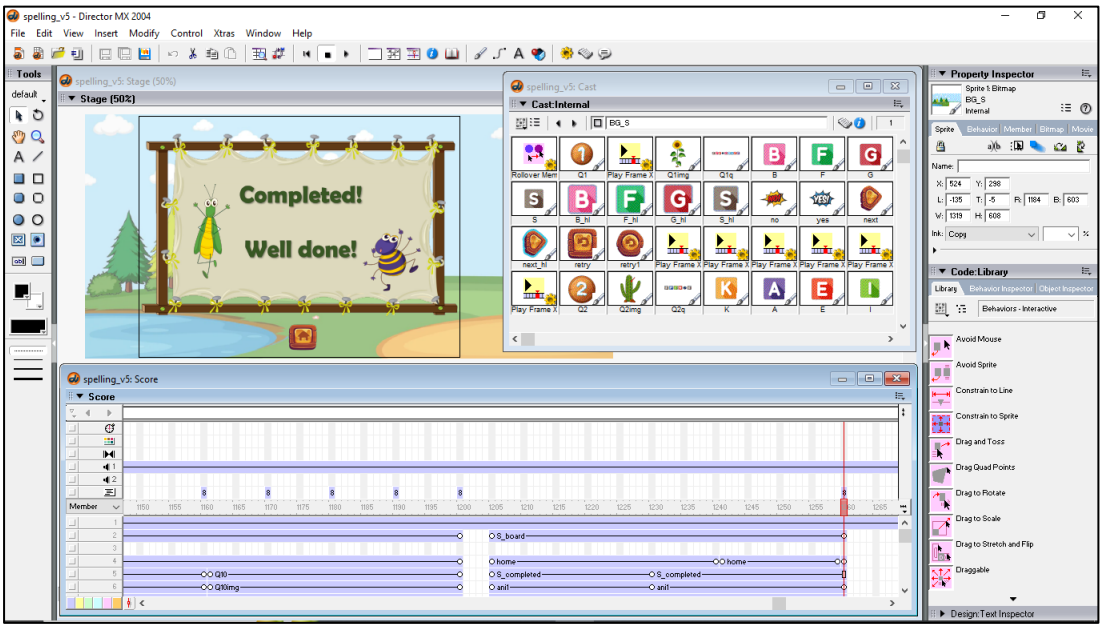


Figure 4.26 Screenshot of Spelling Completed Scene Development

Figure 4.26 shows that the module completed scene development. Encouraging animation and text will be displayed in this scene. A home button will display in the scene in order to let users back to main menu after completed this module.

4.2.5 Module 4 - Discover It

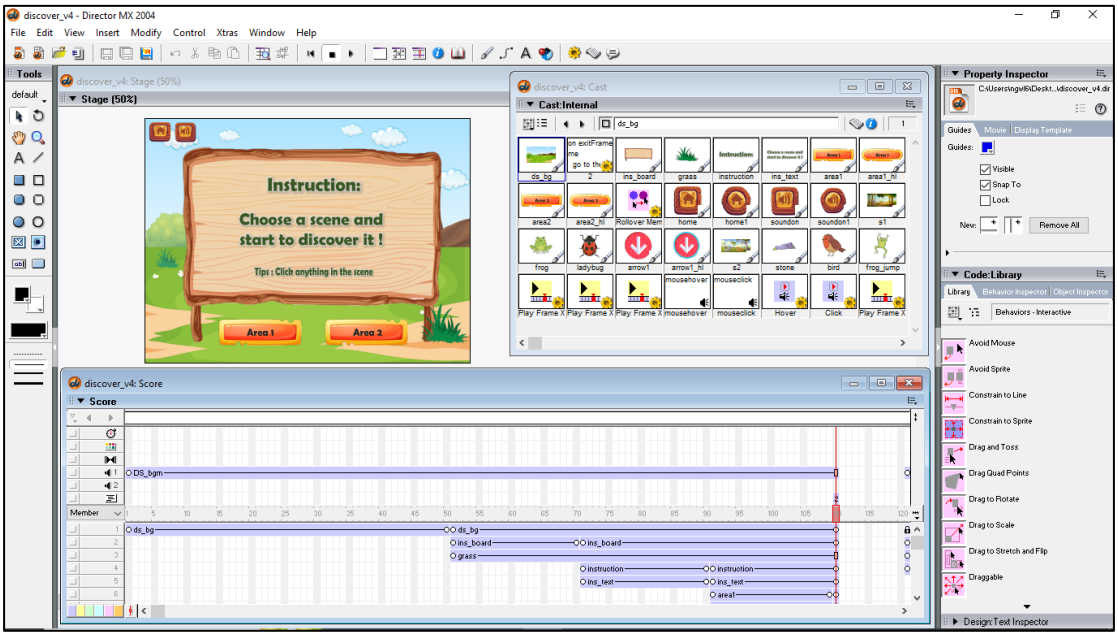


Figure 4.27 Screenshot of Discovery Instruction Scene Development

Figure 4.27 shows that the discovery module's instruction scene development. The instruction text ang simple tips will be shown. There will have four buttons which are home, sound control, area 1 and area 2. The two areas buttons will navigate the users to different scene to experience this module.

4.2.5.1 Area 1

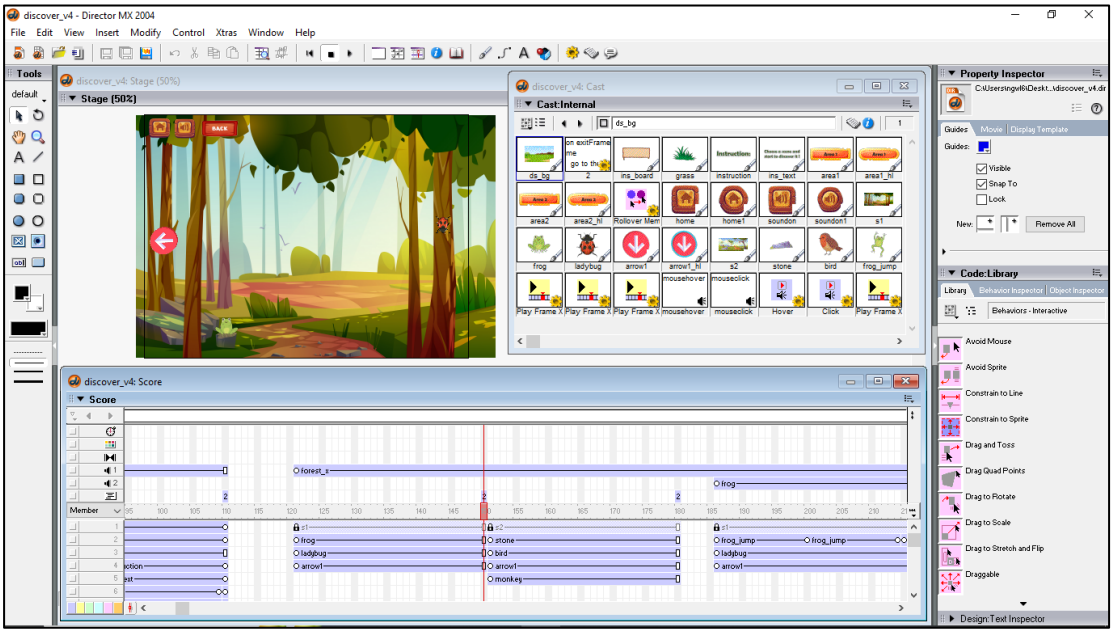


Figure 4.28 Screenshot of Area 1 Scene 1 Development

Figure 4.28 shows that one of the scenes for area 1. There will have back button to let users back to instruction scene and an arrow button for users to change to the other scene. When users click on the frog or ladybug, the different animation will be triggered, and different sound effect will be played.

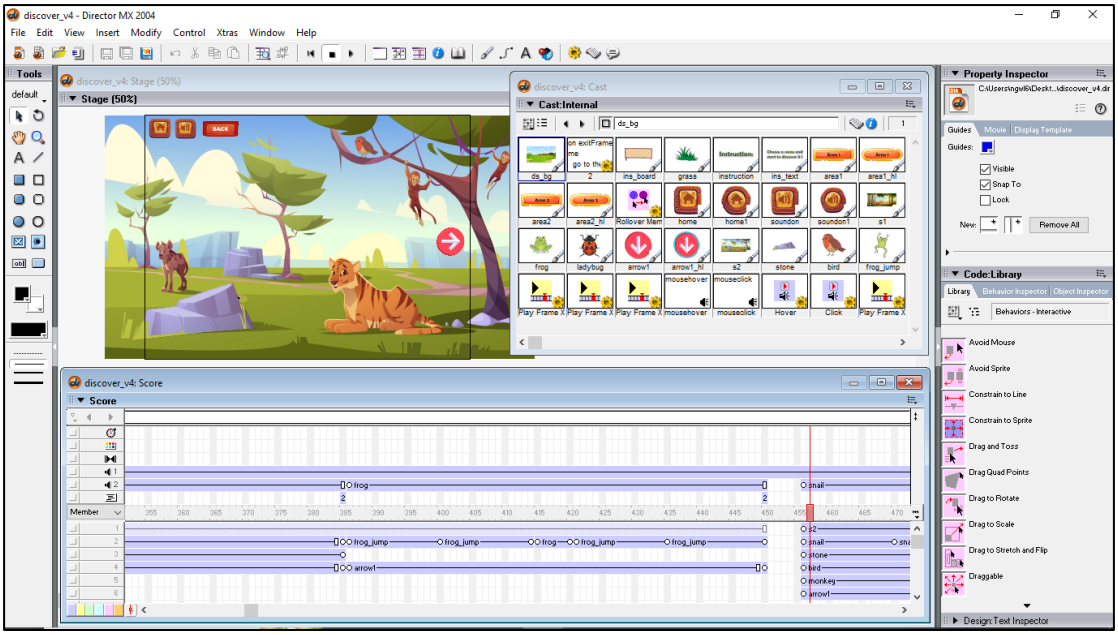


Figure 4.29 Screenshot of Area 1 Scene 2 Development

Figure 4.29 shows that the other scene for area 1. There will have back button to let users back to instruction scene and an arrow button for users to change to the other scene. When users click on the bird, monkey or stone, the different animation will be triggered where different sound effect will be played.

4.2.5.2 Area 2

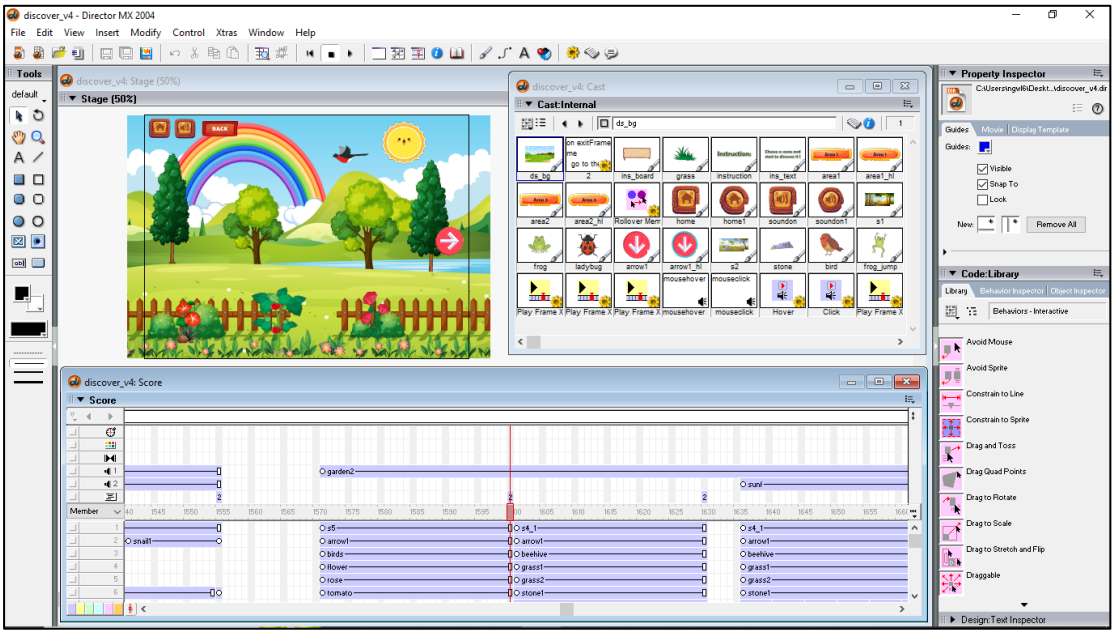


Figure 4.30 Screenshot of Area 2 Scene 1 Development

Figure 4.30 shows that one of the scenes for area 2. There will have back button to let users back to instruction scene and an arrow button for users to change to the other scene. In this scene, there will have four objects that will trigger the animation, which are bird, sun, tomato plant and rose plant. Sound effect also will be played based on the particular objects.

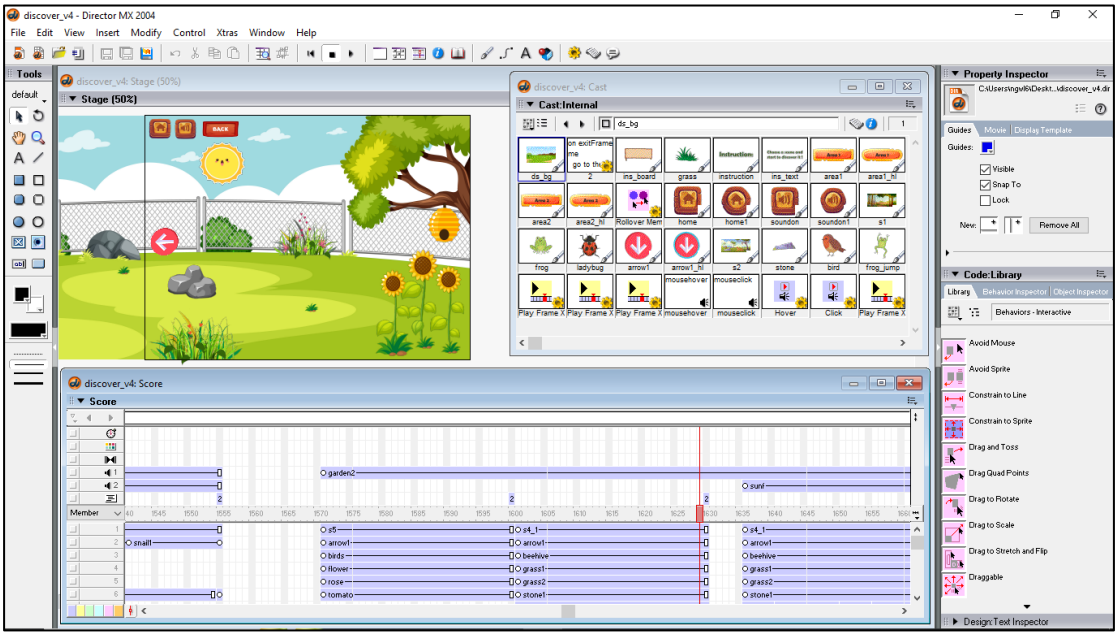


Figure 4.31 Screenshot of Area 2 Scene 2 Development

Figure 4.31 shows that the other scene for area 2. There will have back button to let users back to instruction scene and an arrow button for users to change to the other scene. In this scene, there will have four objects that will trigger the animation, which are sun, stone, sunflower and beehive. Sound effect also will be played based on the particular objects.

4.2.6 Module 5 - Find It

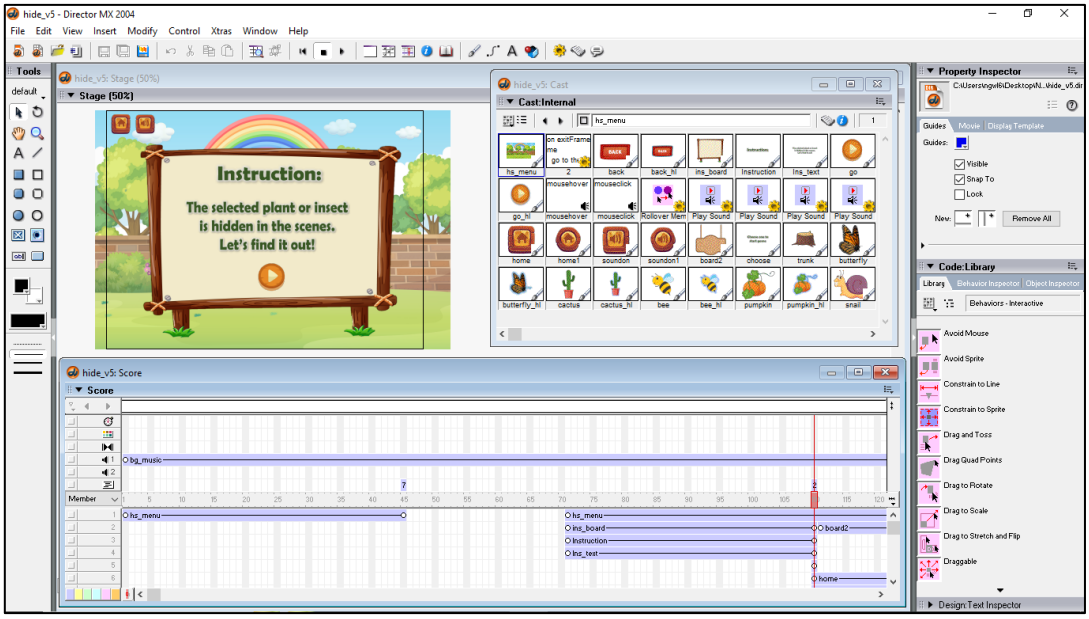


Figure 4.32 Screenshot of Hide and Seek Instruction Scene Development

Figure 4.32 shows that the instruction scene of hide and seek module. The instruction text will be shown in the scene with the next button. The button will navigate users to the menu selection scene.

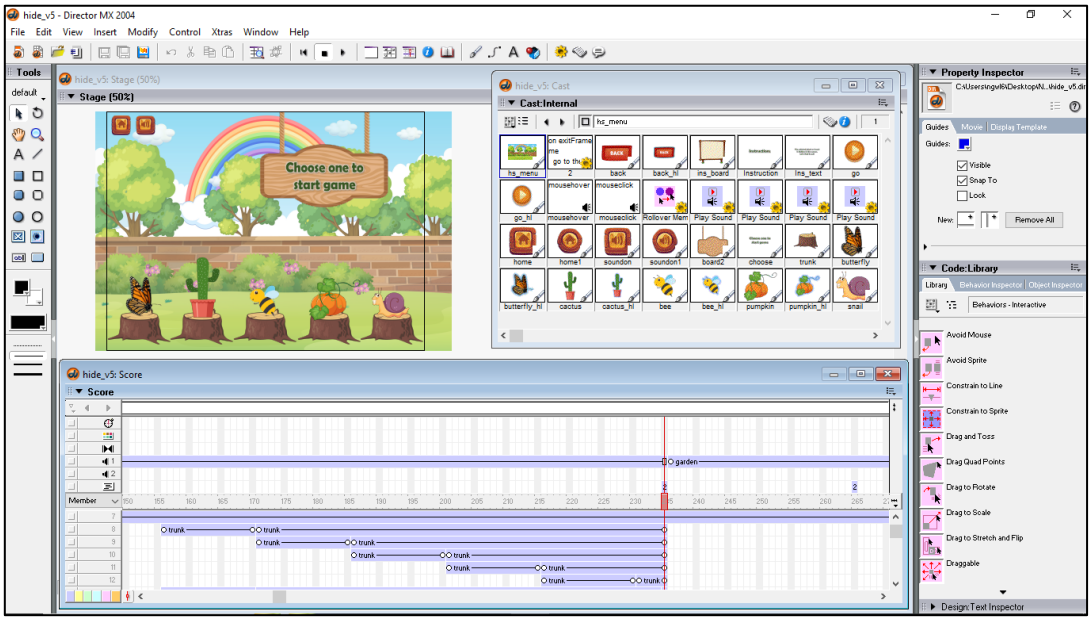


Figure 4.33 Screenshot of Hide and Seek Menu Selection Scene

Figure 4.33 shows that the menu selection scene of hide and seek module. There will have five selection for users to choose in this module which are butterfly, cactus,

bee, pumpkin and snail. Different plants or insects will navigate to different scene for users to enjoy the module.

4.2.6.1 Scene

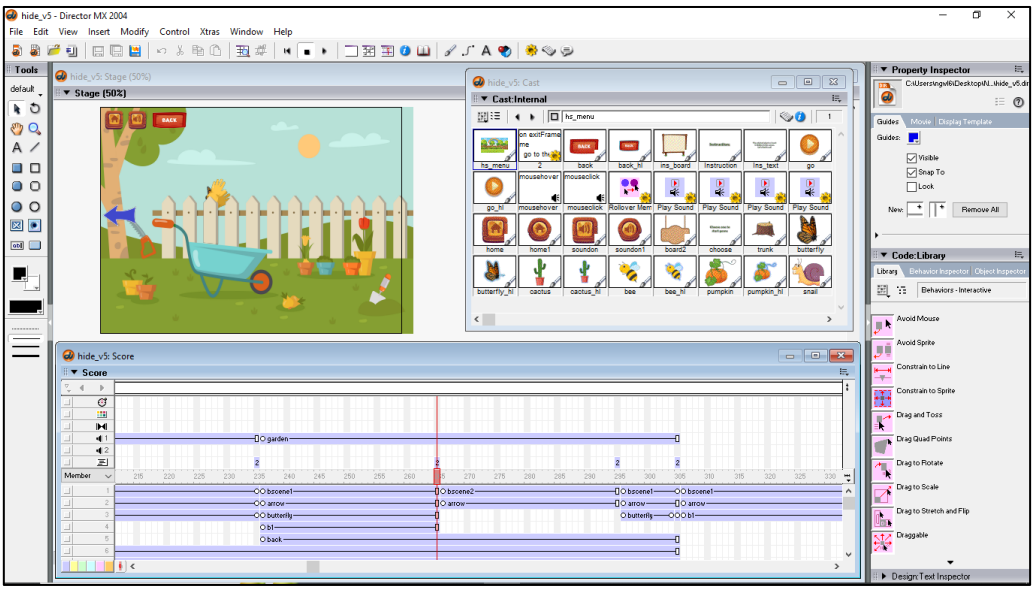


Figure 4.34 Screenshot of Butterfly Scene Development

Figure 4.34 shows that the butterfly scene development. There will have home button, sound control button and back button. The back button will navigate the users to the menu selection scene. In this scene, there will have an arrow button for users to change the scene in order to find the hidden butterfly.

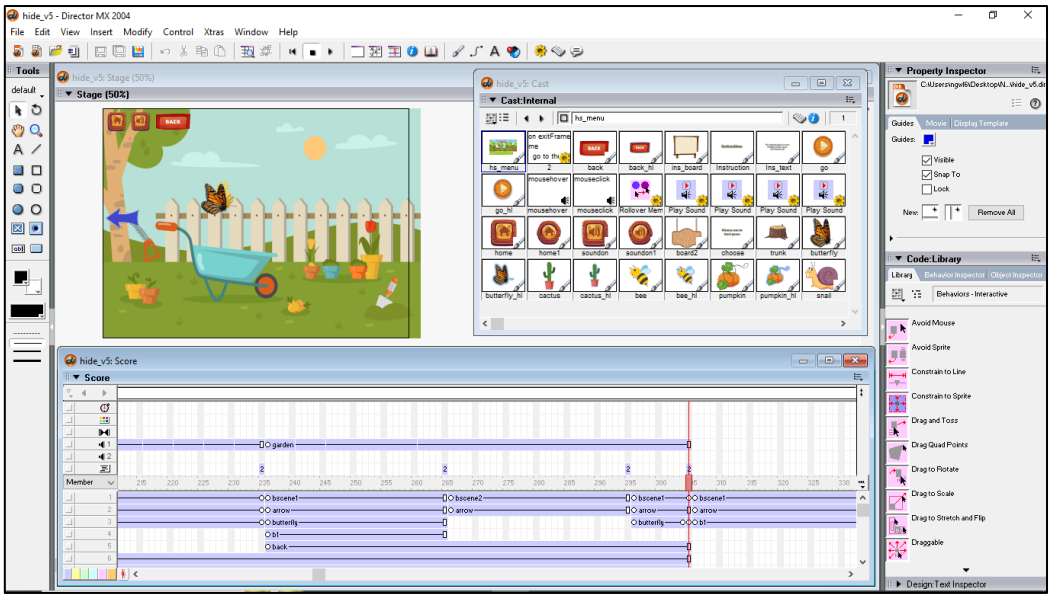


Figure 4.35 Screenshot of Butterfly Found Scene Development

Figure 4.35 shows that the butterfly found scene development. When the users click on the hidden butterfly, the butterfly will clearly appear and become bigger. This will make the experience more enhanced so that the users able to trigger the objects found scene.

4.2.6.2 Found Scene

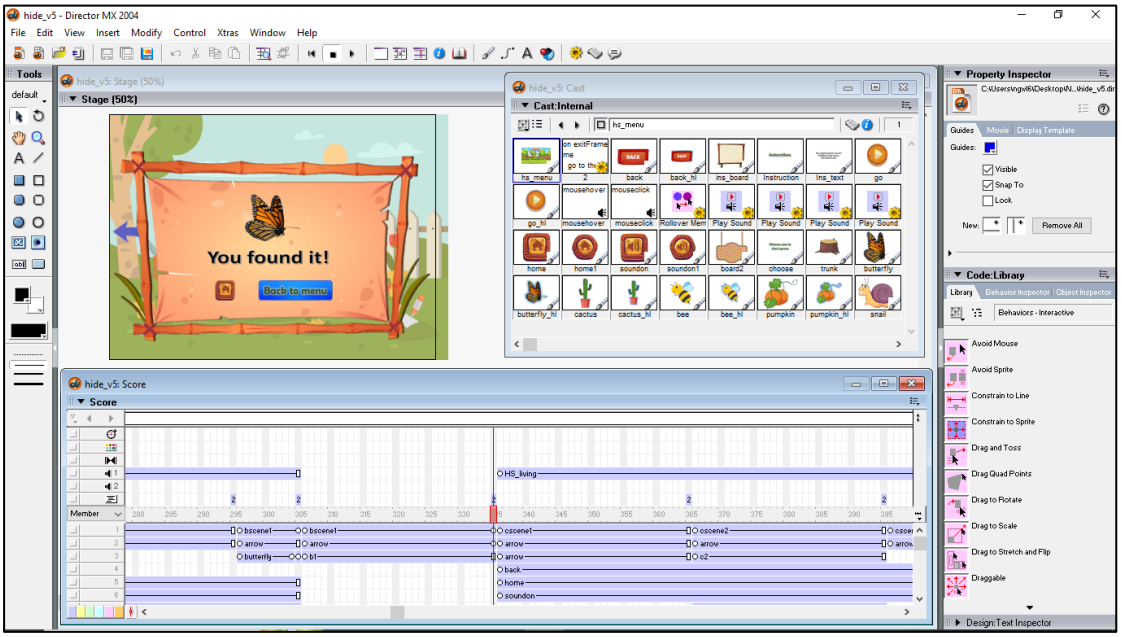


Figure 4.36 Screenshot of Found Scene Development

Figure 4.36 shows that the found scene development. The found object will be animated to the center of the scene. There will have two buttons for users which are home button and menu button. The menu button will navigate the users to the hide and seek menu selection scene so that the users can choose the other objects.

CHAPTER 5: TESTING, RESULT AND DISCUSSION

5.1 Overview

This chapter will include the testing of the proposed system. The methods used to test the system and the analysis will be discussed further. After implementing the system testing, the result will be analysed in order to evaluate the effectiveness of proposed system.

5.2 Method of Testing

Due to the pandemic, the author was difficult to provide the system to the target users for system testing. Hence, the method used to test the system is online survey attached with system video demonstration. The respondents will be the elementary school teachers who are teaching the target users of this project.

The video provided will include the features and functions of the proposed system. Each module including the splash screen, main menu and sub-module will be demonstrated clearly so that the respondents can be virtually experienced the system by watching the video.

In addition, the questions of survey will be based on different set of tools in order to measure the system usability and users' satisfaction. For system usability, the tool used is System Usability Scale, which called as SUS. SUS consists of 10 questions with the scale from strongly disagree to strongly agree. The answers provided by respondents will be scored in order to interpret the system usability.

The second set of questions used in the survey is Post-study System Usability Questionnaire (PSSUQ) which will measure the users' satisfaction towards the system usefulness, quality of information and interface. There are 16 questions with the scaled from strongly disagree to strongly agree. Based on the feedback from respondents, the score can be calculated depends on the different aspects.

The author has spent around 4 to 5 days to collect the response from respondents. For this project, 30 response has been collected through Google Form.

5.3 Testing Analysis

Based on the 30 responses collected, the scores can be calculated from each set of response. For section A which is System Usability Scale (SUS), the scale of strongly disagree to strongly agree will be assigned a point for further calculation. Since there are five option from strongly disagree to strongly agree, the points will be converted from 1 to 5 where 1 indicates strongly disagree and 5 indicates strongly agree.

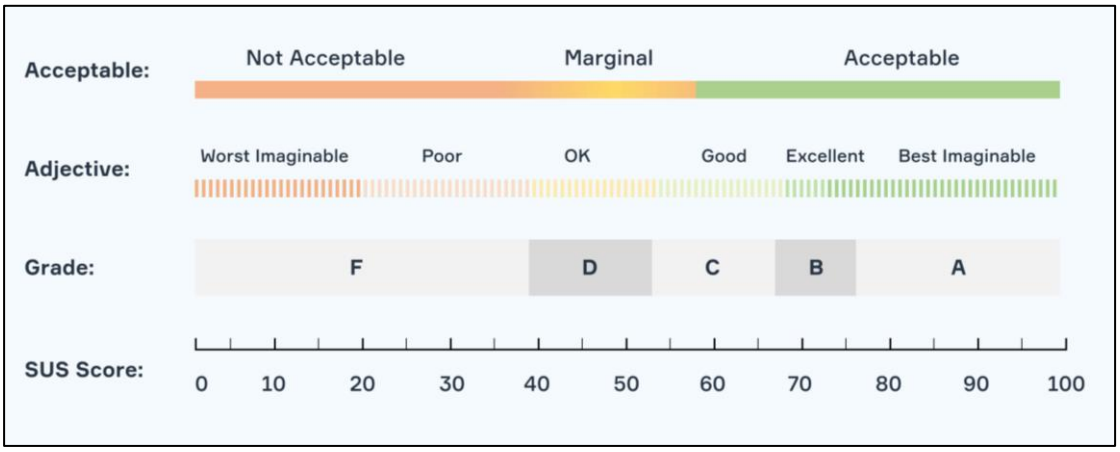


Figure 5.1 SUS Score Acceptability Standard

Figure 5.1 shows that the standard to evaluate the SUS score acceptability. The acceptability is ranged from not acceptable, marginal to acceptable. The SUS score calculated can be categorized as different grade ranged from A to F. The score above 76 categorized as grade A; score between 66 to 76 categorized as grade B; score between 52 and 66 categorized as grade C; score between 40 and 52 categorized as grade D; and score below 40 are grade F.

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
4	1	5	1	4	1	5	2	5	1
4	2	4	1	4	1	5	2	5	1
4	2	4	1	5	1	5	2	5	1
5	1	5	1	5	1	5	1	5	1
4	2	5	1	5	4	5	4	5	1
5	2	4	1	5	2	5	2	5	1
5	2	5	1	5	4	5	4	5	1
3	3	4	1	4	3	4	3	5	1
4	2	4	1	4	2	4	2	5	1
4	2	5	1	5	3	5	3	5	1
5	2	5	1	5	2	5	2	5	1
4	3	4	1	4	3	4	3	4	1
5	1	5	1	5	1	5	1	5	1
3	4	3	2	4	4	4	4	4	1
5	1	5	1	5	1	5	1	5	1
4	1	5	1	5	1	5	1	5	1
5	1	5	1	5	1	5	1	5	1
4	1	5	1	5	2	5	2	5	1
3	1	4	1	4	3	4	2	4	1
4	2	5	1	4	2	4	2	5	1
4	3	5	1	4	2	5	3	5	1
4	3	4	1	4	2	4	3	5	1
4	4	5	1	4	2	4	4	4	1
5	1	5	1	5	2	5	2	5	1
5	1	5	1	5	1	5	1	5	1
4	1	4	1	5	1	5	1	5	1
4	1	5	1	4	1	4	1	4	1
4	1	5	1	5	1	5	1	5	1
4	1	5	1	5	1	5	1	5	1
5	1	5	1	5	1	5	1	5	1

Figure 5.1 SUS Points of Each Question for 30 Responses

The figure 5.1 shows that the points of each question of the 30 responses. After collecting the points, a SUS score can be calculated. SUS score able to evaluate the effectiveness, efficiency and usability of the system. The formula to calculate SUS score is (X+Y)*2.5 where X indicates the total points of odd-numbered questions minus by 5 and Y indicates 25 minus the total points of even-numbered questions.

X	Y	SUS Score	Grade
18	19	92.5	A
17	18	87.5	A
18	18	90	A
20	20	100	A
19	13	80	A
19	17	90	A
20	13	82.5	A
15	14	72.5	B
16	17	82.5	A
19	15	85	A
20	17	92.5	A
15	14	72.5	B
20	20	100	A
13	10	57.5	D
20	20	100	A
19	20	97.5	A
20	20	100	A
19	18	92.5	A
14	17	77.5	B
17	17	85	A
18	15	82.5	A
16	15	77.5	B
16	13	72.5	B
20	18	95	A
20	20	100	A
18	20	95	A
16	20	90	A
19	20	97.5	A
19	20	97.5	A
20	20	100	A
		88.1667	

Figure 5.3 SUS Score for Each Set of Response

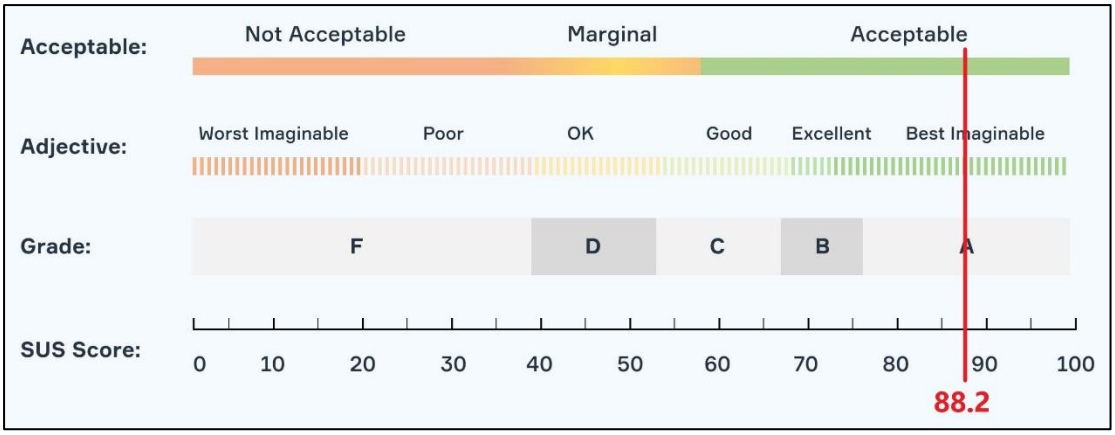


Figure 5.4 Result of SUS Score Acceptability

The figure 5.3 shows the SUS score for each response. Based on the figure shown, there are 24 responses obtain grade A which is excellent; 5 responses obtain grade B as good rating; and 1 response obtain a poor rating which is grade D. In overall, the system receives a score of 88.1667 based on the system usability scale. The figure 5.4 shows the system result of SUS score acceptability. By obtaining the score of 88.2, the system obtains grade A and acceptable in the scale.

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
6	6	6	5	6	6	4	6	5	6	6	6	6	6	5	6
6	7	6	7	7	6	5	5	5	6	6	6	6	5	5	5
6	6	6	5	6	6	4	6	6	7	6	6	7	7	6	6
6	6	6	6	6	6	5	5	6	6	6	6	7	7	6	6
6	6	6	7	7	6	6	6	5	6	5	6	6	6	5	6
6	6	6	6	6	5	5	6	6	6	6	6	6	6	6	6
6	6	6	6	6	6	4	5	6	6	6	7	7	7	6	6
6	7	6	7	7	6	5	5	6	6	6	6	6	6	5	5
6	6	5	6	6	6	3	5	5	5	5	6	6	6	5	5
6	7	6	7	7	6	4	4	6	7	6	7	7	7	6	6
5	5	5	5	5	4	5	5	5	6	5	6	5	5	5	5
5	5	5	5	5	5	5	5	6	6	6	6	7	7	6	6
6	7	6	7	7	6	5	5	5	6	6	7	7	7	6	6
5	4	5	5	5	5	4	4	4	5	5	5	6	6	5	5
6	7	6	7	7	7	5	5	6	6	6	6	6	6	6	6
7	7	6	7	7	5	5	5	6	6	6	6	7	7	6	7
6	7	6	6	7	6	6	6	6	6	6	6	5	5	5	6
6	6	5	6	6	5	5	5	6	6	5	6	6	6	5	6
5	6	5	5	5	5	4	4	4	5	5	5	5	5	5	5
5	6	5	6	6	5	5	5	5	5	5	5	6	6	5	5
6	6	5	6	6	5	5	5	5	5	5	6	6	6	6	6
6	7	6	6	7	5	4	5	5	5	5	6	6	6	6	5
5	5	4	5	5	4	4	4	5	5	4	5	6	6	5	5
6	7	6	7	7	6	6	6	6	7	6	7	5	5	6	6
6	6	6	6	6	5	5	5	6	6	6	6	5	5	5	6
5	5	5	6	6	5	5	5	5	6	5	6	7	7	6	6
5	7	5	6	7	5	5	5	5	5	5	6	6	6	5	6
6	6	6	6	6	6	5	5	5	5	6	6	7	7	6	6
6	7	5	6	7	5	5	5	6	6	5	6	6	6	6	6
7	7	6	7	7	6	5	6	6	6	6	6	7	7	6	7

Figure 5.5 PSSUQ Point of Each Question For 30 Responses

Furthermore, the section B of the survey is the post-study system usability questionnaire, called as PSSUQ. Since there are 7 option ranged from strongly disagree to strongly agree, a point will be given to each option from 1 to 7 where 1 indicates

strongly disagree. The figure 5.3 shows that the points of each questions for the 30 responses.

The 16 questions of PSSUQ consists of the 3 sub-scales to evaluate the system usefulness, information quality and interface quality. Besides the overall score, PSSUQ are able to calculate the score of system usefulness, information quality and interface quality. For system usefulness, the score will be the average points of question 1 to 6 where question 7 to 12 will be the information quality, and question 13 to 15 is for interface quality.

Overall	System Usefulness	Information Quality	Interface Quality
5.6875	5.8333	5.5000	5.6667
5.8125	6.5000	5.5000	5.3333
6.0000	5.8333	5.8333	6.6667
6.0000	6.0000	5.6667	6.6667
5.9375	6.3333	5.6667	5.6667
5.8750	5.8333	5.8333	6.0000
6.0000	6.0000	5.6667	6.6667
5.9375	6.5000	5.6667	5.6667
5.3750	5.8333	4.8333	5.6667
6.1875	6.5000	5.6667	6.6667
5.0625	4.8333	5.3333	5.0000
5.6250	5.0000	5.6667	6.6667
6.1875	6.5000	5.6667	6.6667
4.8750	4.8333	4.5000	5.6667
6.1250	6.6667	5.6667	6.0000
6.2500	6.5000	5.6667	6.6667
5.9375	6.3333	6.0000	5.0000
5.6250	5.6667	5.5000	5.6667
4.8750	5.1667	4.5000	5.0000
5.3125	5.5000	5.0000	5.6667
5.5625	5.6667	5.1667	6.0000
5.6250	6.1667	5.0000	6.0000
4.8125	4.6667	4.5000	5.6667
6.1875	6.5000	6.3333	5.3333
5.6250	5.8333	5.6667	5.0000
5.6250	5.3333	5.3333	6.6667
5.5625	5.8333	5.1667	5.6667
5.8750	6.0000	5.3333	6.6667
5.8125	6.0000	5.5000	6.0000
6.3750	6.6667	5.8333	6.6667
5.7250	**5.8944**	**5.4389**	**5.9444**

Figure 5.6 Different Average Scores of PSSUQ

Figure 5.4 shows that the overall score and average score for 3 sub-scales. Based of the result, the system obtains an average score of 5.725 out of 7. The average score for system usefulness is 5.8944 out of 7, score for information quality is 5.4389 out of 7 and score for interface quality is 5.9444 out of 7. Since the scores are above than 4, the scores that obtained by the system can be defined as good rating.

5.4 Result and Discussion

Besides than observing the score, the questions which asking for ease of use are receiving good responses. Majority of the respondents also gave the excellent rating on the interface of the system. However, majority of the respondents gave the moderate response on the error message given by the system. A small number of respondents thought that the system has some inconsistency.

As a result, the system perceived a SUS score of 88.1667 and an overall PSSUQ score of 5.725 out of 7. For sub-scale of PSSUQ, the system perceived an average score of 5.8944 on system usefulness, 5.4389 on information quality and 5.9444 on interface quality. Based on the scores obtained, the score of information quality is the lowest score which means that the information provided in the system should be enhanced.

CHAPTER 6 CONSLUSION

6.1 Overview

This chapter will summarize the overall project in different aspect. Firstly, the research findings regarding this proposed project will be discussed. Some experiences will be discussed further such as problems faced, and knowledge gained while completing the proposed project. Besides, the proposed system will consist some weaknesses that will affect the effectiveness of system. Some suggestion will be discussed in this chapter so that the further enhancement can be made in order to improve the proposed system.

6.2 Research Finding

While developing the system, there are some findings on the project to be discussed. The system has provided the clear instruction in each module. The information in lesson module has clearly stated so that the users are able to understand easily. Based on the testing analysis, the system perceived the information quality score of 5.44 out of 7 which is 77% and SUS score of 88.2 out of 100. The result shows that the system is able to solve the first problem statement which is unclear guidance and information for users.

Besides, the system provided different interactive activity for users to interact. For instance, the users can interact with the plants or insects in the discovery module and hide and seek module. This feature has solved the lack of interactivity problem. The last problem statement is the inappropriate content and user interface. Hence, an augmented reality view has also developed in the lesson module. The system has developed with the attractive interface to grab user attention. The testing result shows that the system obtains the interface quality score of 5.944 out of 7 which is 84%. This verified that the system able to solve the stated problem statement by providing a creative environment for learning.

In addition, the project was fully achieved the first objective which is studying the usage of multimedia technology in supporting elementary education. Augmented reality view has developed in the project in order to help the target users in learning.

Besides the learning module such as quiz and spelling module, the system has provided the mini games module in order to help the users enhancing the knowledge. The second project objective that is fully achieved is to design the creative multimedia application using exploratory approach. Hence, the system has developed the discovery module and hide and seek module. The modules provide the scenarios to the users to discover the objects by themselves.

The last objective is to evaluate the effectiveness of application in learning support. Since the system has not tested by the target users physically, the system has partially achieved the objective. A system video demonstration and online survey were developed to the elementary school teacher. The result of the survey has been evaluated by the author in order to evaluate the system effectiveness. For system usability scale, the score obtained by the system is 88.2 out of 100 which is grade A in the score acceptability.

6.3 Problem Faced

There are some problems faced by the author during the development of the proposed system. Firstly, the author faced some technical problem while using Unity software integrating with Vuforia engine. The setting problem of webcam caused the debugging progress was not successful. The author has also faced problems while using the Vuforia engine. Since the engine required to create license and database, the images are not successfully uploaded to the database. This problem causes the AR view unable to display in Unity simulation .

Besides, there was compilation error when combining the different module using the authoring tool, Macromedia Director MX 2004. The system that firstly published did not show the text content appropriately. This is due to the publish setting did not set up correctly in the authoring tool. In overall, the author was lack of understanding on the operation of the software used since it was lack of time to learn and familiar with it.

6.4 Knowledge Gained

While developing the system, the author had gained different type of knowledge and information. The author had acquainted the plants and insects that were taught in the lesson module. This is to ensure the knowledge and information provided are detailed and accurate so that the users will be beneficial from the system. Besides, the author had obtained a new skill which is to create the 3D objects using Blender. This advantage may be helpful in the future work since the 3D objects are useful in different situation.

Besides, the author had learnt and get familiar with the different types of software. For instance, the author had utilized the features of the authoring software to develop the proposed system. By using the 3D computer graphic software and 3D development platform, the augmented reality view can be implemented in the proposed system.

6.5 Limitation

The first weakness of the proposed system is the 3D objects in the lesson module did not presented in more details. For instance, the 3D object of bee presented in an overall colour instead of presented the hairy characteristic. This might affect the experience of users while viewing the augmented reality view.

In addition, the presentation of quiz and spelling module is simple and not stimulating. There have no challenges occurred in these two modules because the users are only answering the question by question. This may not stimulate the users' learning potential since the module is presented in relaxing way.

Besides, the delivery method of the application and AR view are not consistent. For the main system, the delivery method is using the executable application where the AR view is using the mobile application. This would make the users feel inconvenient while using the system. Lastly, the information delivered in the system are limited. Since there were only five plants and insects taught in the lesson module, the users might not enough knowledge to gain from the system.

6.6 Future Enhancement

Based on the limitation stated, there are further improvements can be made in order to improve the proposed system. The system can be refined from different aspect in order to improve the users' experience. For instance, the details of 3D objects in the lesson module can be enhanced by adding rigging and animation. The other way to improve the system is to increase the interactivity between the users and system so that the users are more enjoyable while using the system.

In addition, the quiz and spelling module can be added some features that will increase the challenges. As an example, the difficulty level such as easy, medium and hard can be developed in the modules. This will provide the flexibility to the users so that they are able to choose the level based on their preferences. For advanced level, the feature of time limit can be added in the module. This will restrict the users to complete the module within the time given.

Besides, it is beneficial to provide the consistent delivery platform and environment for the system. Since the augmented reality view are currently not supported for executable file format, the system can be developed in mobile application form so that the delivery platform is consistency. In addition, the content of lesson module can be further added by providing extra knowledge as well as creating more plants and insect in the module. This will ensure the system efficiency and effectiveness so that the users can be continuously use the system for educational purpose.

BIBLIOGRAPHY

[1]A. Pavithra, M. Aathilingam and S. Prakash, "Multimedia and its Applicairons", 2018. [Online]. Available:https://www.researchgate.net/publication/329417059_ MULTIMEDIA_AND_ITS_APPLICATIONS. [Accessed: 30- Mar- 2022].

[2]A. Septiani and T. Rejekiningsih, "Development of Interactive Multimedia Learning Courseware to Strengthen Students' Character", European Journal of Educational Research, vol. 9, no. 3, pp. 1267-1279, 2020. Available: 10.12973/eu-jer.9.3.1267 [Accessed 8 April 2022].

[3]A. Syawaludin, Gunarhadi and P. Rintayati, "Development of Augmented Reality-Based Interactive Multimedia to Improve Critical Thinking Skills in Science Learning", International Journal of Instruction, vol. 12, no. 4, pp. 331-344, 2019. Available: 10.29333/iji.2019.12421a [Accessed 11 April 2022].

[4]D. Murali, "Exploratory Learning", Slideshare.net, 2018. [Online]. Available: https://www.slideshare.net/suryalekshmi2018/exploratory-learning. [Accessed: 05- Apr- 2022].

[5]E. Dale and N. Bruce, "Cone of learning", 1960. [Online]. Available: http://mcdn.nazwa.pl/MCDN_19/PROJEKTY/SIEC/EN/S3A3.pdf. [Accessed: 07- Apr- 2022].

[6]F. L. Tan, "Multimedia-based courseware for learning mathematics", 2020. [Online]. Available: http://eprints.utar.edu.my/id/eprint/3822. [Accessed: 09- Apr- 2022].

[7]G. Consulta, "The Addie Model", Slide Share, 2008. [Online]. Available: https://www.slideshare.net/consgp/the-addie-model-presentation. [Accessed: 11- Apr- 2022].

[8]J. Cook, "Importance of Teaching Science in Elementary School", Classroom.synonym.com. [Online]. Available: https://classroom.synonym.com/importance-teaching-science-elementary-school-5810234.html. [Accessed: 06- Apr- 2022].

[9]K. Dalacosta, M. Kamariotaki-Paparrigopoulou, J. Palyvos and N. Spyrellis, "Multimedia application with animated cartoons for teaching science in elementary education", Computers & Education, vol. 52, no. 4, pp. 741-748, 2009. Available: 10.1016/j.compedu.2008.11.018 [Accessed 6 April 2022].

[10]“Kids Science True False”, HeGoDev, 2019.

[11]“Learning Games for Kids”, Learning Games For Kids Website, nd. [Online]. Available: https://www.jstor.org/stable/43604312.

[12]M. Antonioli, C. Blake and K. Sparks, "Augmented Reality Applications in Education", 2014. [Online]. Available: https://www.jstor.org/stable/43604312. [Accessed: 11- Apr- 2022].

[13] “Science Kids Learning”, NutBolt Games, 2018.

[14]“Science Lab Experiment”, Bibubi Productions, 2017.

[15]“Science Learning Worksheet”, NutGenix Games, 2019.

[16]S. McGloughlin, “Multimedia – Concept and Practice. Prentice Hall”, 2001. [Accessed: 30- Mar- 2022].

[17]S. Nusir, I. Alsmadi, M. Al-Kabi and F. Shardqah, "Designing an interactive multimedia learning system for the children of primary schools in Jordan", Ieeexplore.ieee.org, 2011. [Online]. Available: https://ieeexplore.ieee.org/abstract/document/5773111. [Accessed: 27- Jan- 2022].

[18]S. Shilpa and M. Sunita, "Positive Influence of the Multimedia in Primary Education", International Journal of Indian Psychology, vol. 3, no. 2, 2016. Available: 10.25215/0302.094 [Accessed 6 April 2022].

[19]R. Rachmadtullah, Z. Ms and M. Sumantri, "Development of computer-based interactive multimedia: study on learning in elementary education", 2018. [Online]. Available: https://www.researchgate.net/publication/327477020_Development_of_computer-based_interactive_multimedia_Study_on_learning_in_elementary_education. DOI:10.14419/ijet.v7i4.16384 [Accessed: 31- Mar- 2022].

[20]S. Wirawan, D. Agushinta, F. Muhammad, L. Saifudin and M. Ibrahim, "Analysis of Child Computer Interaction in Edutainment and Simulation Games Application on Android Platform in Indonesia", The Science and Information (SAI), 2013. [Online]. Available: http://dx.doi.org/10.14569/IJACSA.2013.040724. [Accessed: 24- Jan- 2022].

[21]V. Kasinathan, A. Al-Sharafi, A. Zamnah, N. Appadurai, V. Thiruchelvam and A. Mustapha, "Augmented reality in ocean's secrets: educational application with attached book for students", Linguistics and Culture Review, 2021. [Online]. Available: https://doi.org/10.37028/lingcure.v5nS1.1498. [Accessed: 23- Jan- 2022].

[22]"What is Exploratory Learning | IGI Global", Igi-global.com. [Online]. Available: https://www.igi-global.com/dictionary/exploratory-learning/10617. [Accessed: 05- Apr- 2022].

[23]W. He, "The effects of applying multimedia in primary English language teaching in China", Parahikma Journal of Education and Integrated Sciences, 2021. [Online]. Available: http://journal.parahikma.ac.id/pjeis/article/view/46. [Accessed: 06- Apr- 2022].

[24]Z. Kazanci and Z. Okan, "Evaluating English Language Teaching Software for Kids: Education or Entertainment or Both?", 2009. [Online]. Available: https://eric.ed.gov/?id=EJ859490. [Accessed: 20- Jan- 2022].

[25]Z. Muda and I. Basiron, "Multimedia Adventure Game As Edutainment Application", Ieeexplore.ieee.org, 2005. [Online]. Available: https://ieeexplore.ieee.org/abstract/document/1631517. [Accessed: 20- Jan- 2022].

Appendices

Appendices A - Testing Survey Questions

Multimedia Learning Application Testing Questionnaire

Dear Respondents,

I am the final year undergraduate student who are currently pursuing Bachelor of Information Systems (HONS) Business Information Systems from Universiti Tunku Abdul Rahman (UTAR). I am conducting a survey for my final year project to collect the testing survey regarding the developed multimedia learning application. The purpose of this survey is to collect the respondents' feedback on the developed multimedia learning application.

This survey consists of two sections which are section A and section B. The respondents are required to answer ALL the question in this survey based on own perception. The questions are the rating questions from strongly disagree to strongly agree. Before answering, the respondents have to watch the video provided regarding system demo provided. This survey may be taking 30 minutes to complete.

Please be assured that all the personal data and information will remain private and confidential. For any inquiry, feel free to email me at ngwl6800@1utar.my.

Your participation is highly appreciated. Thank you in advance.

Regards,
Ng Wei Li
ngwl6800@1utar.my

* Required

System Video Demonstration Link

Before continue the survey, kindly view the video demonstration here.

Section A

1 indicates strongly disagree
5 indicates strongly agree

1. I think that I would like to use this system frequently. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

2. I found the system unnecessarily complex. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

3. I thought the system was easy to use. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

4. I think that I would need the support of a technical person to be able to use this system. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

5. I found the various functions in this system were well integrated. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

6. I thought there was too much inconsistency in this system. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

7. I would imagine that most people would learn to use this system very quickly. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

8. I found the system very cumbersome to use. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

9. I felt very confident using the system. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

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

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

Section B

1 indicates strongly disagree
7 indicates strongly agree

11. Overall, I am satisfied with how easy it is to use this system. *

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly Disagree	◯	◯	◯	◯	◯	◯	◯	Strongly Agree

12. It was simple to use this system. *

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly Disagree	◯	◯	◯	◯	◯	◯	◯	Strongly Agree

13. I was able to complete the tasks and scenarios quickly using this system. *

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly Disagree	◯	◯	◯	◯	◯	◯	◯	Strongly Agree

14. I felt comfortable using this system. *

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly Disagree	◯	◯	◯	◯	◯	◯	◯	Strongly Agree

15. It was easy to learn to use this system. *

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly Disagree	◯	◯	◯	◯	◯	◯	◯	Strongly Agree

16. I believe I could become productive quickly using this system. *

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly Disagree	◯	◯	◯	◯	◯	◯	◯	Strongly Agree

17. The system gave error messages that clearly told me how to fix problems. *

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly Disagree	◯	◯	◯	◯	◯	◯	◯	Strongly Agree

18. Whenever I made a mistake using the system, I could recover easily and quickly. *

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly Disagree	◯	◯	◯	◯	◯	◯	◯	Strongly Agree

19. The information (such as online help, on-screen messages, and other documentation) provided with this system was clear. *

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly Disagree	◯	◯	◯	◯	◯	◯	◯	Strongly Agree

20. It was easy to find the information I needed. *

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly Disagree	◯	◯	◯	◯	◯	◯	◯	Strongly Agree

21. The information was effective in helping me complete the tasks and scenarios. *

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly Disagree	◯	◯	◯	◯	◯	◯	◯	Strongly Agree

22. The organization of information on the system screens was clear. *

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly Disagree	◯	◯	◯	◯	◯	◯	◯	Strongly Agree

23. The interface of this system was pleasant. *

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly Disagree	◯	◯	◯	◯	◯	◯	◯	Strongly Agree

24. I liked using the interface of this system. *

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly Disagree	◯	◯	◯	◯	◯	◯	◯	Strongly Agree

25. This system has all the functions and capabilities I expect it to have. *

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly Disagree	◯	◯	◯	◯	◯	◯	◯	Strongly Agree

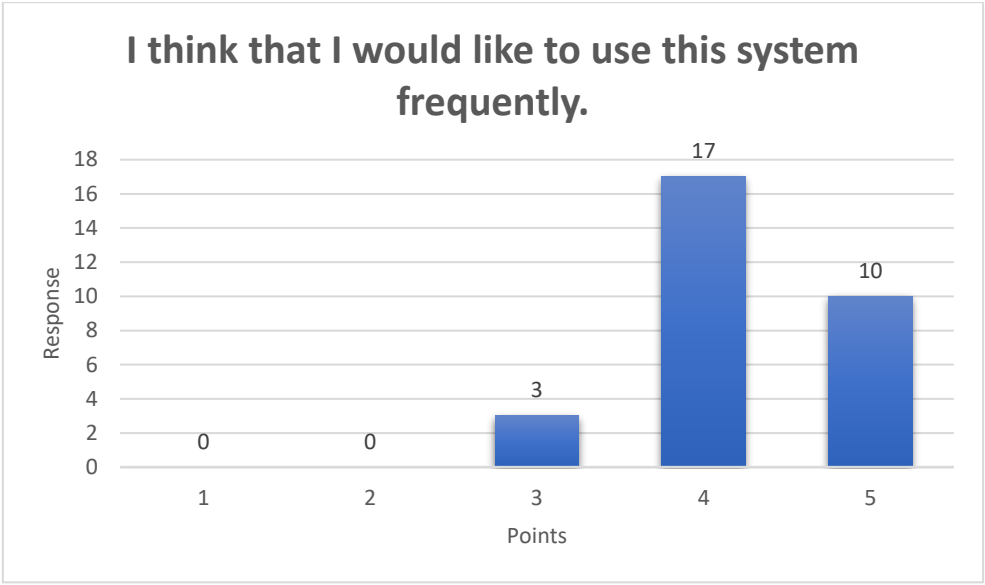
26. Overall, I am satisfied with this system. *

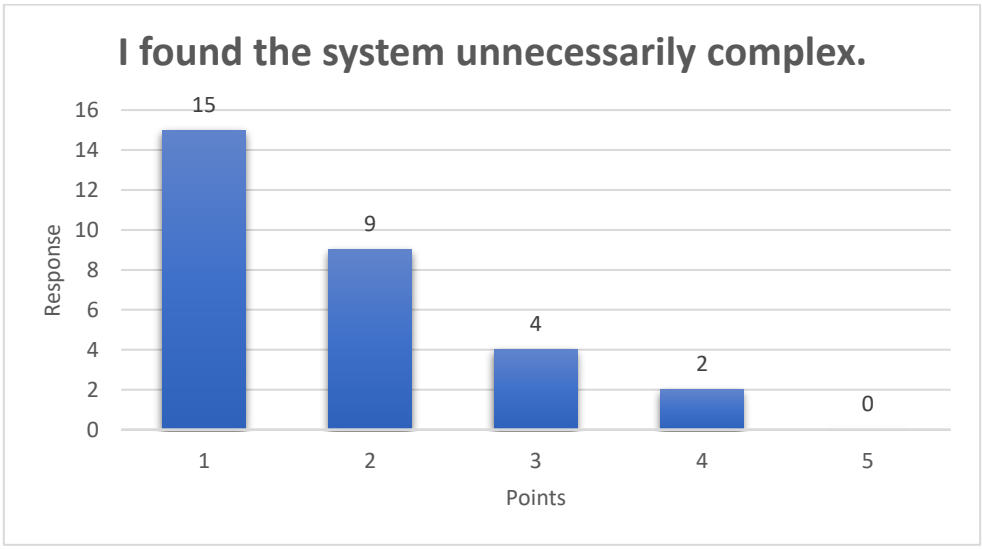
Mark only one oval.

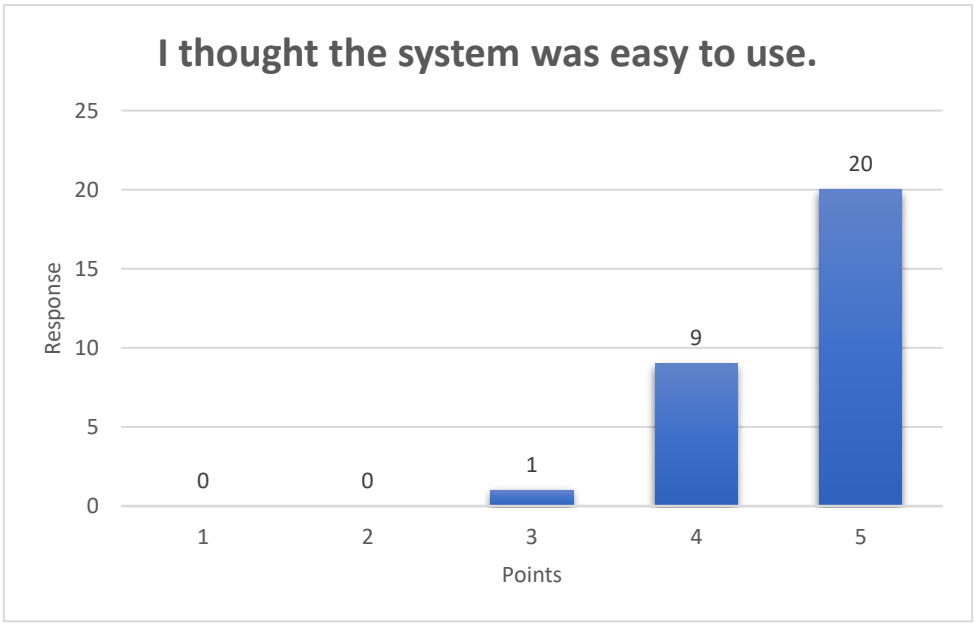
	1	2	3	4	5	6	7	
Strongly Disagree	◯	◯	◯	◯	◯	◯	◯	Strongly Agree

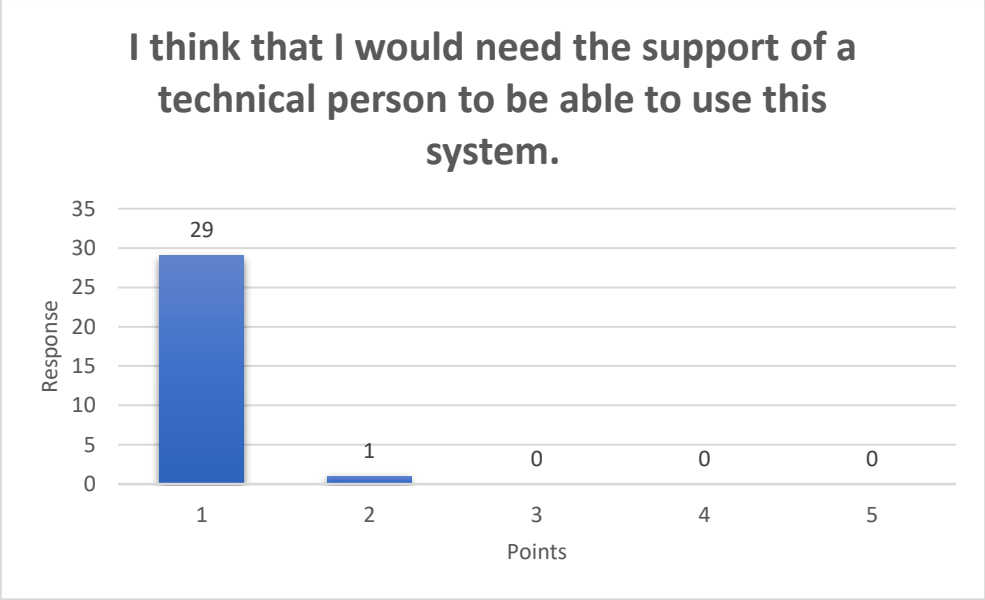
End of Survey

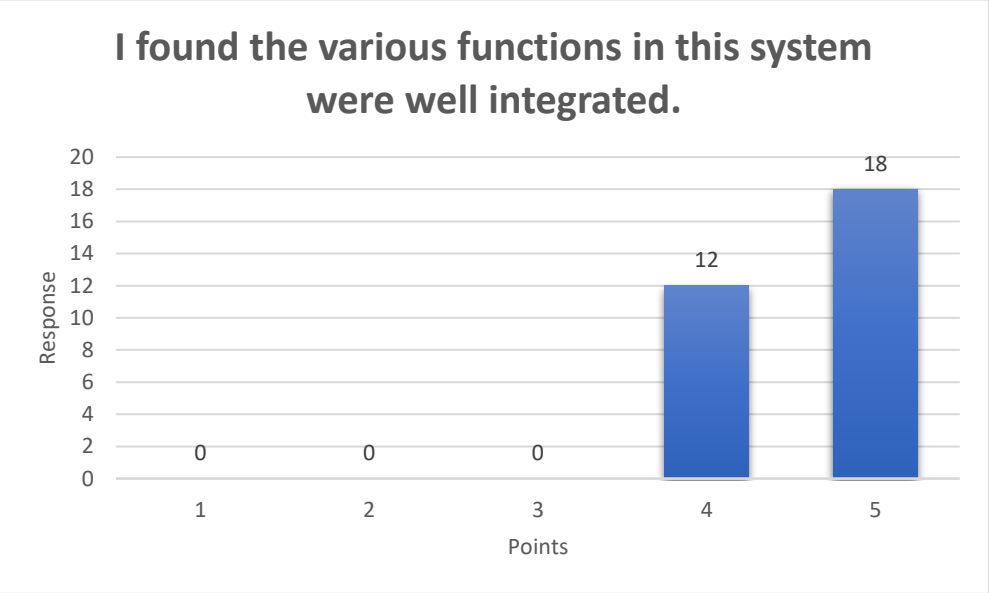
Appendices B - Testing Survey Result Graphs

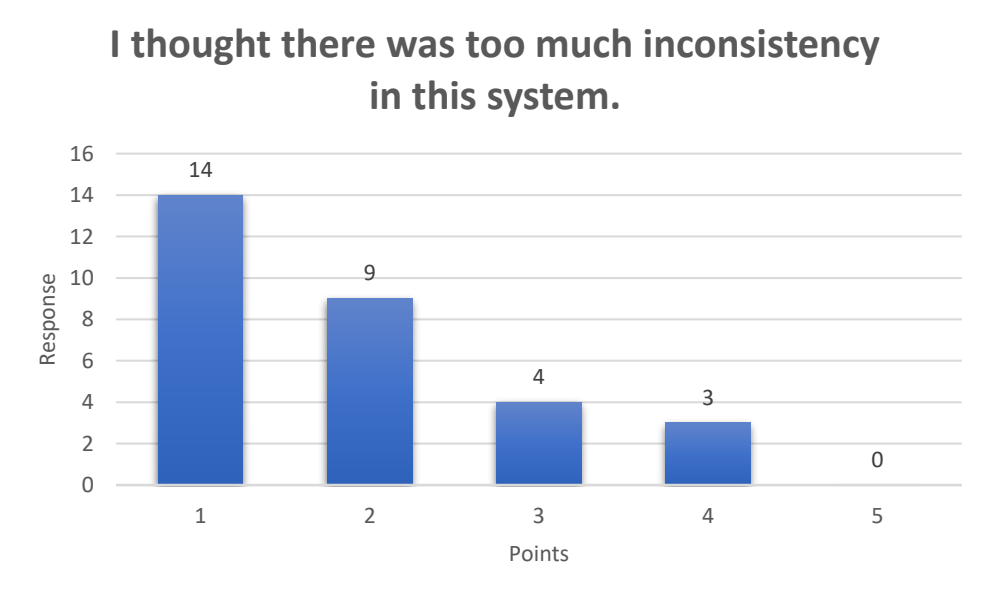


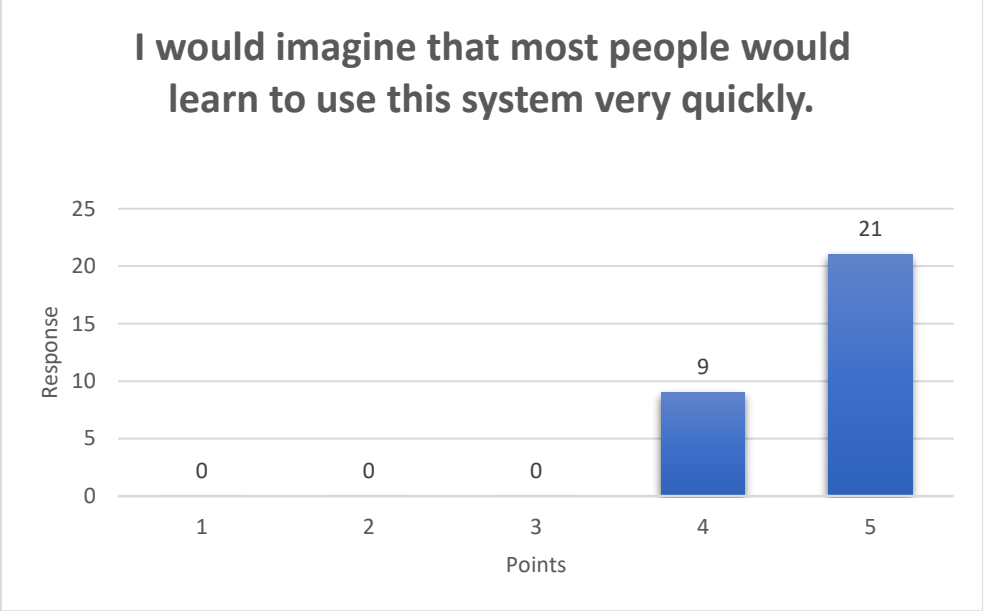


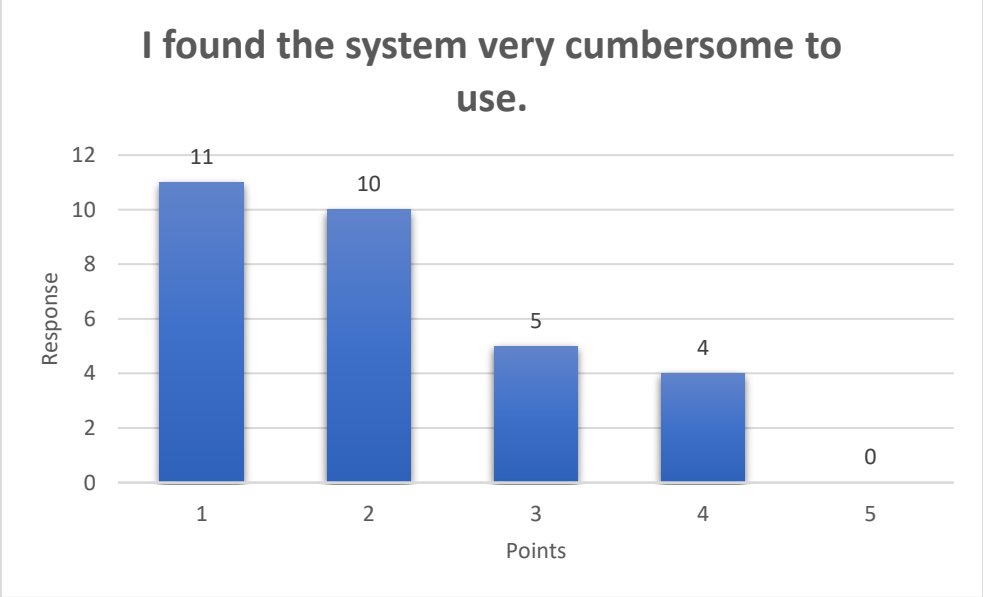


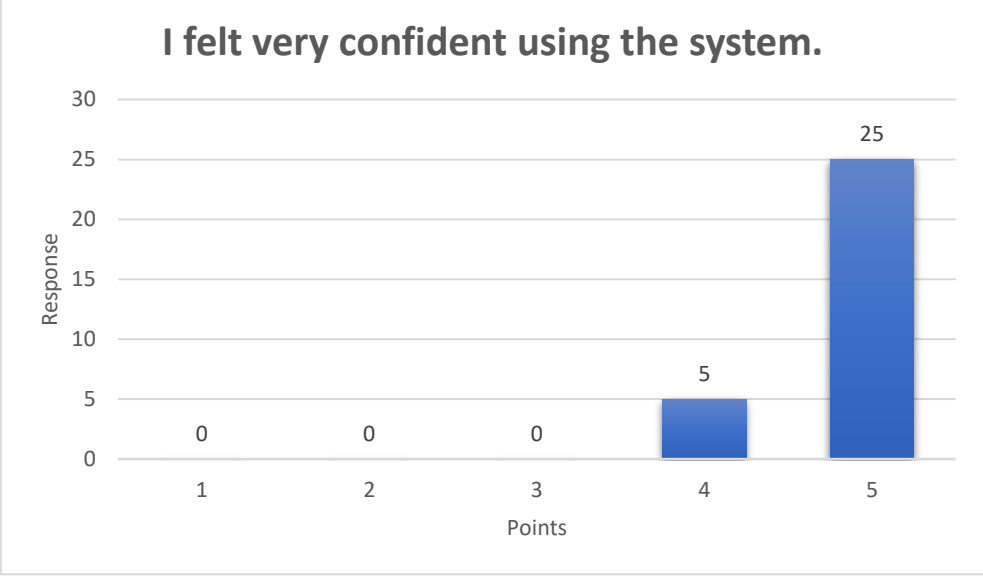

I think that I would need the support of a technical person to be able to use this system.
Response
35
30
25
20
15
10
5
0
29
1
0
0
0
1
2
3
4
5
Points

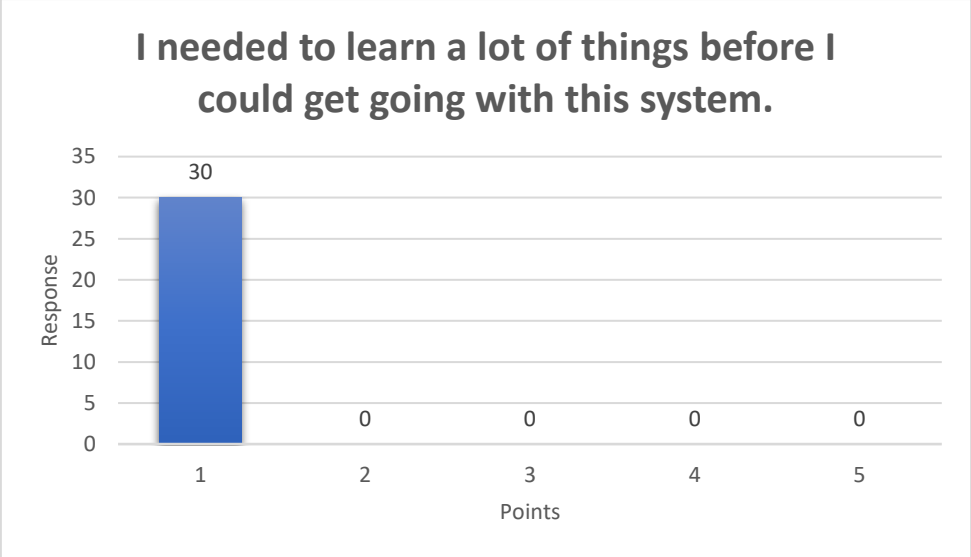

I found the various functions in this system were well integrated.
Response
20
18
16
14
12
10
8
6
4
2
0
0
0
0
12
18
1
2
3
4
5
Points

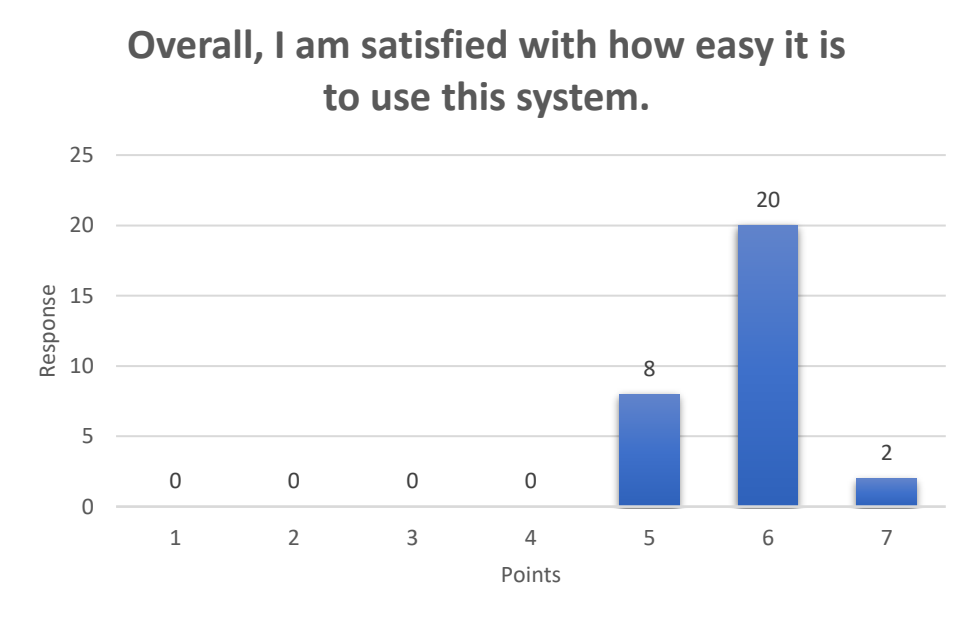

I thought there was too much inconsistency in this system.
Response
16
14
12
10
8
6
4
2
0
14
9
4
3
0
1
2
3
4
5
Points

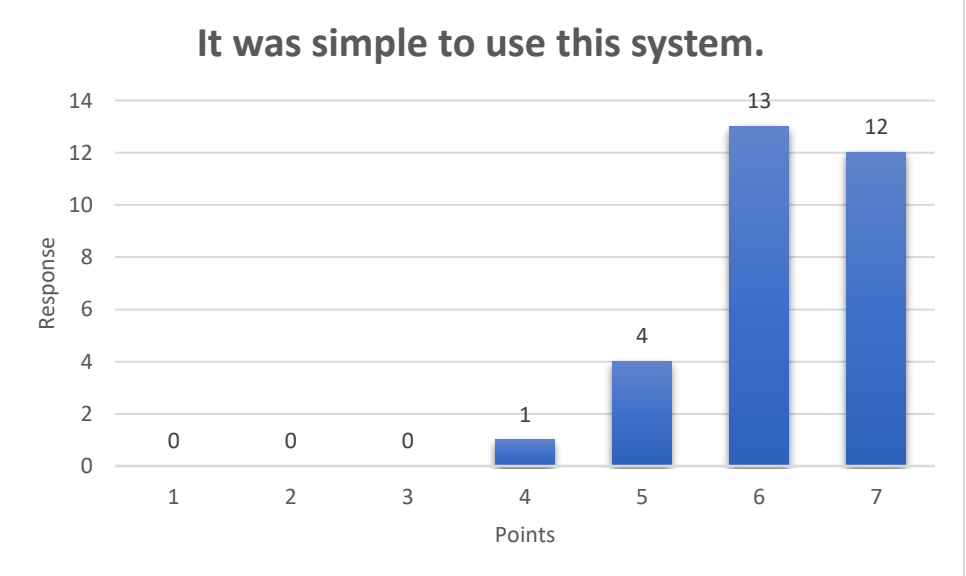

I would imagine that most people would learn to use this system very quickly.
Response
25
20
15
10
5
0
0
0
0
9
21
1
2
3
4
5
Points

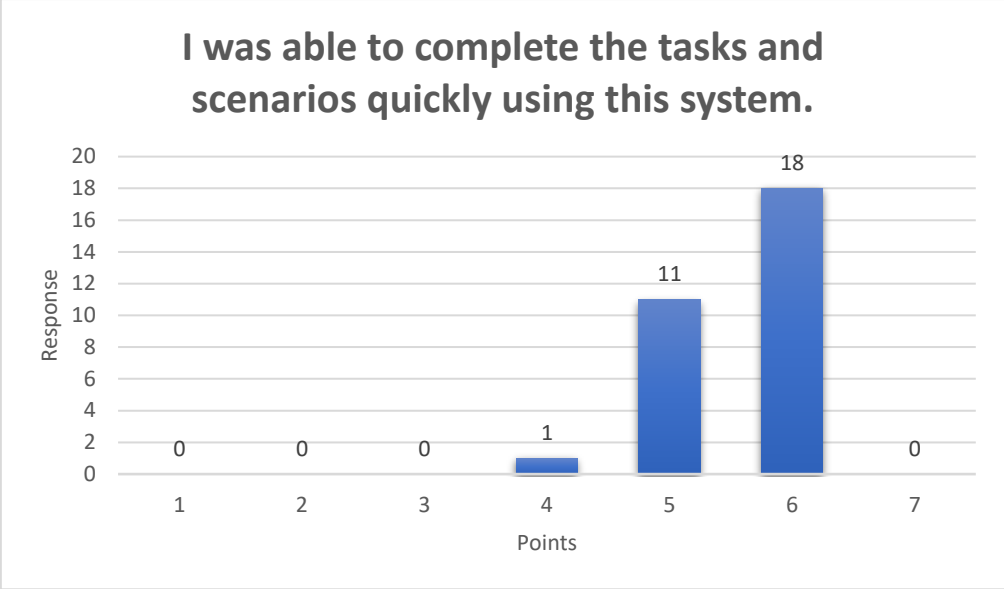

I found the system very cumbersome to use.
Response
12
10
8
6
4
2
0
11
10
5
4
0
1
2
3
4
5
Points

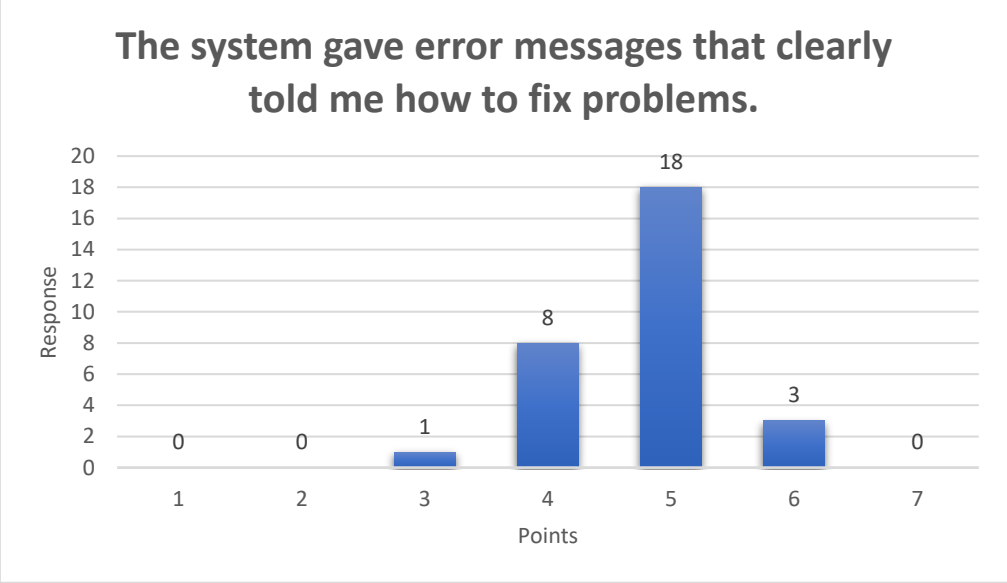

I felt very confident using the system.
Response
30
25
20
15
10
5
0
0
0
0
5
25
1
2
3
4
5
Points

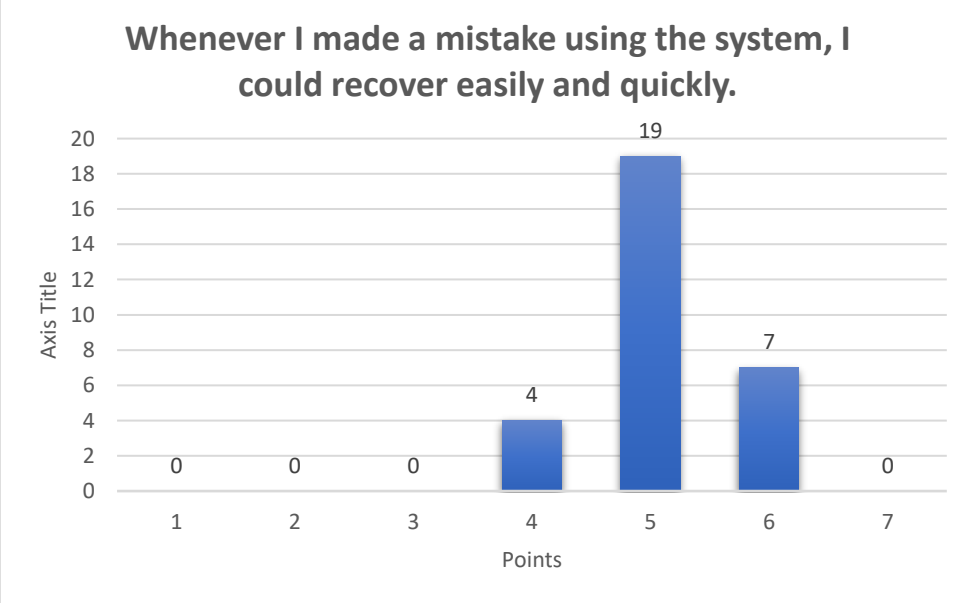

I needed to learn a lot of things before I could get going with this system.
Response
35
30
25
20
15
10
5
0
30
0
0
0
0
1
2
3
4
5
Points

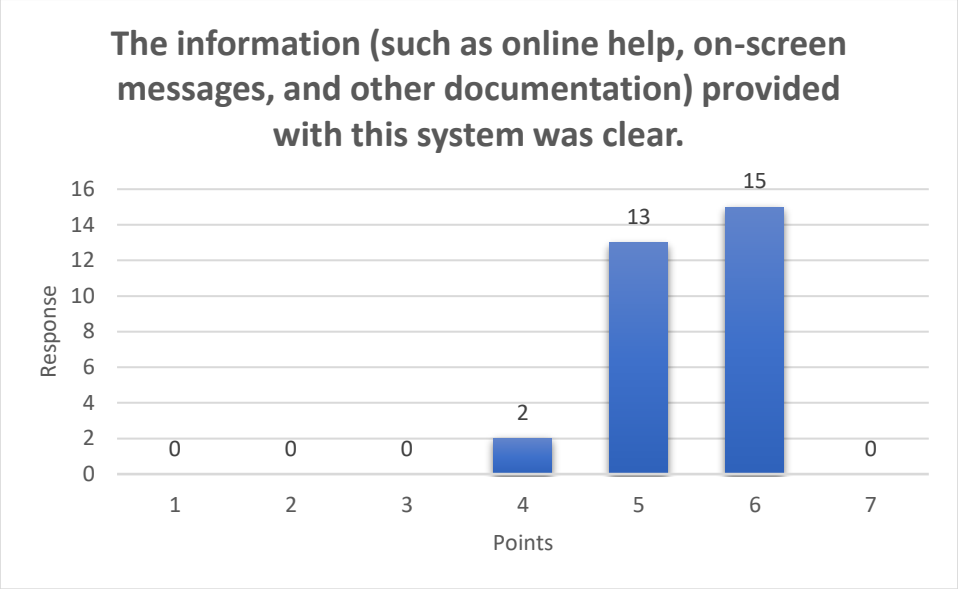

Overall, I am satisfied with how easy it is to use this system.
Response
25
20
15
10
5
0
0
0
0
0
8
20
2
1
2
3
4
5
6
7
Points

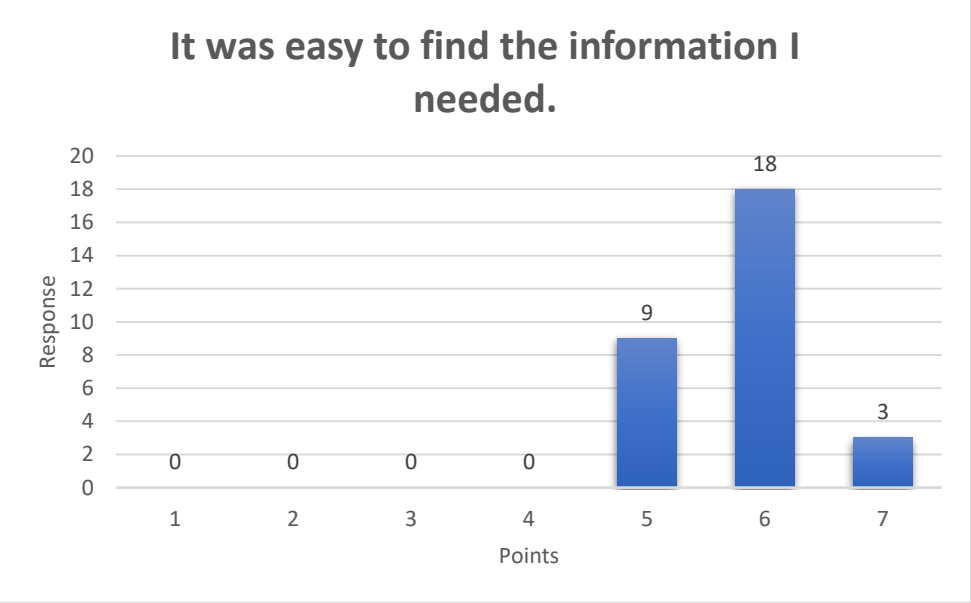

It was simple to use this system.
Response
14
12
10
8
6
4
2
0
0
0
0
1
4
13
12
1
2
3
4
5
6
7
Points

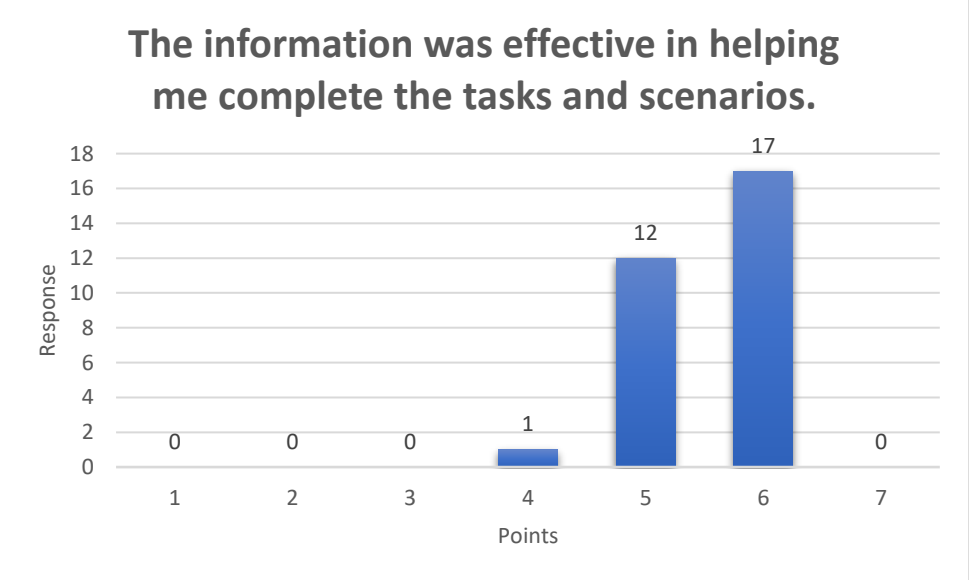

I was able to complete the tasks and scenarios quickly using this system.
Response
Points
0
0
0
1
11
18
0
1
2
3
4
5
6
7

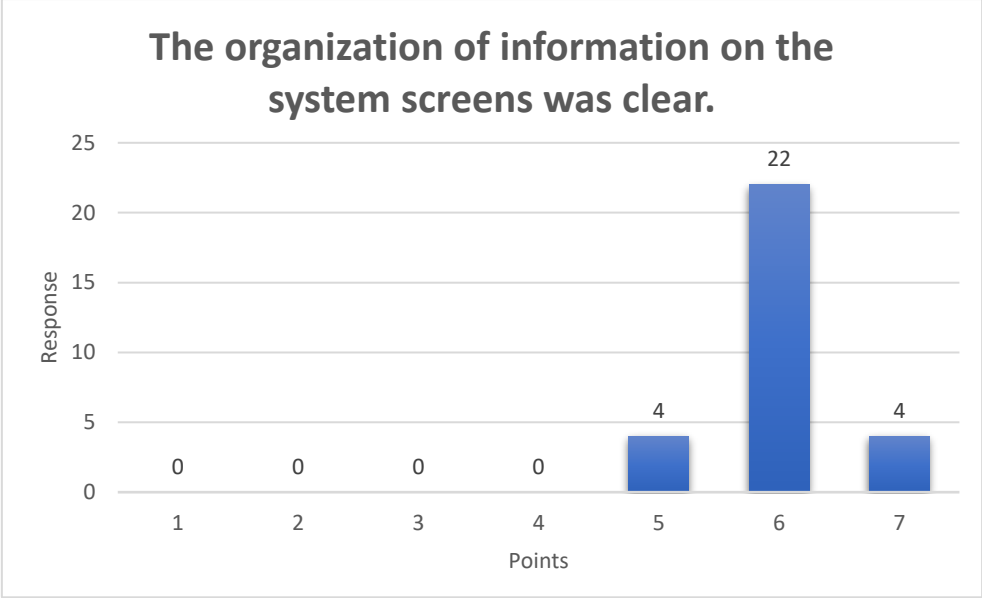

The system gave error messages that clearly told me how to fix problems.
Response
Points
0
0
1
8
18
3
0
1
2
3
4
5
6
7

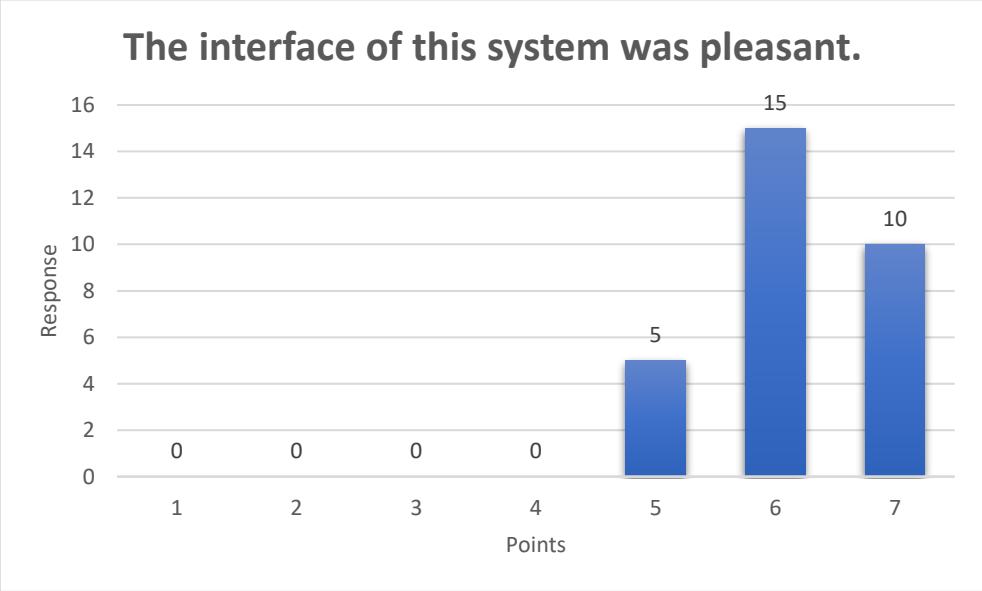

Whenever I made a mistake using the system, I could recover easily and quickly.
Axis Title
Points
0
0
0
4
19
7
0
1
2
3
4
5
6
7

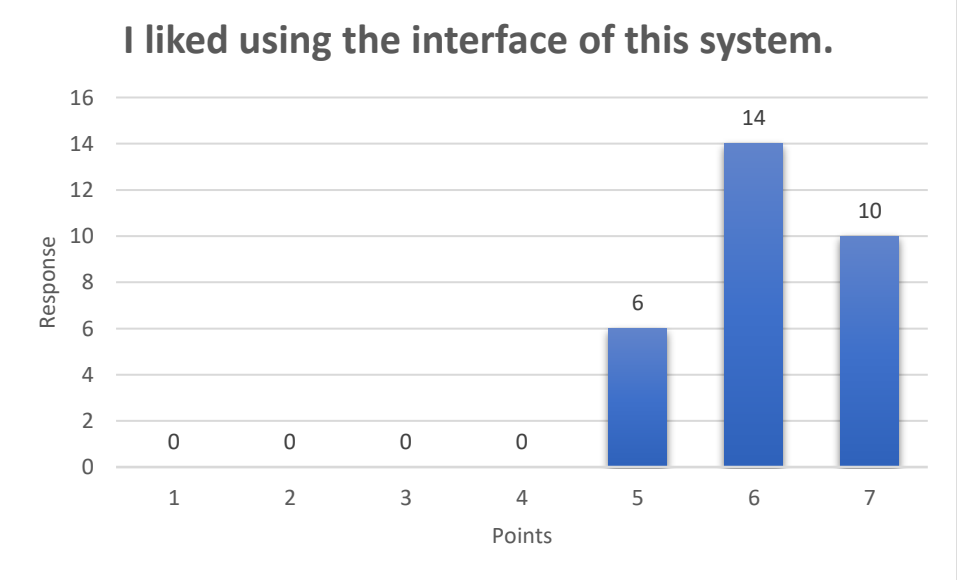

The information (such as online help, on-screen messages, and other documentation) provided with this system was clear.
Response
Points
0
0
0
2
13
15
0
1
2
3
4
5
6
7

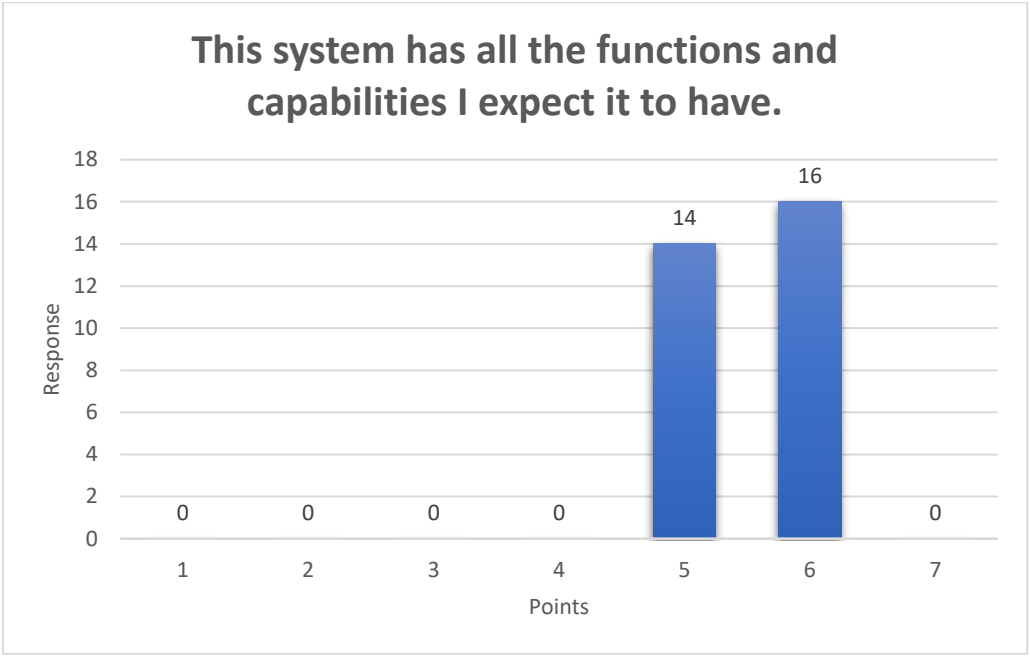

It was easy to find the information I needed.
Response
Points
0
0
0
0
9
18
3
1
2
3
4
5
6
7


The information was effective in helping me complete the tasks and scenarios.
Response
Points
0
0
0
1
12
17
0
1
2
3
4
5
6
7


The organization of information on the system screens was clear.
Response
25
20
15
10
5
0
0
0
0
0
4
22
4
1
2
3
4
5
6
7
Points


The interface of this system was pleasant.
Response
16
14
12
10
8
6
4
2
0
0
0
0
0
5
15
10
1
2
3
4
5
6
7
Points


I liked using the interface of this system.
Response
16
14
12
10
8
6
4
2
0
0
0
0
0
6
14
10
1
2
3
4
5
6
7
Points


This system has all the functions and capabilities I expect it to have.
Response
Points
18
16
14
12
10
8
6
4
2
0
0
0
0
0
14
16
0
1
2
3
4
5
6
7

Appendices C - Poster

Creative Edutainment Learning Application for Elementary Students Using Exploratory Approach

Ng Wei Li 1803423

Introduction

Multimedia is important for elementary students in order to help them improve their capabilities of communication, thinking and understanding. For traditional learning style, students will use textbook for learning together with the explanation from the teachers. This way of learning is flat and bored for the students. Hence, multimedia learning application provide a different way of learning for the students. Compared to traditional learning, multimedia application is more attractive and interesting.

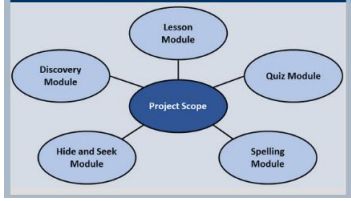
Problem Statement

- Unclear guidance and information for users to refer
- Lack of interactivity feature for users to interact
- Content and user interface of application is inappropriate

Project Objective

- To study the usage of multimedia technology in supporting elementary education
- To design a creative multimedia application using exploratory approach
- To evaluate the effectiveness of multimedia application to support learning

Project Scope

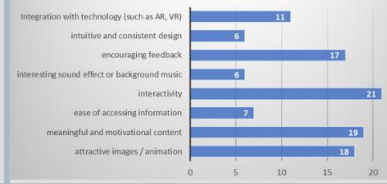


Literature Review

Features	Science Kids Learning	Learning Games for Kids	Science Learning Worksheet	Kids Science True False	Science Lab Experiment	Proposed Application
Available on PC or laptop		√				
Available on tablet or mobile device	√	√	√	√	√	√
Lessons or further information provided	√	√			√	√
Quizzes or practices provided		√		√		√
Games provided	√	√	√		√	√
Background music provided					√	√
Feedback provided	√		√	√	√	√
Required to download	√		√	√	√	√

User Requirement

Respondents' Perception on Criteria of Multimedia Learning Applicaiton

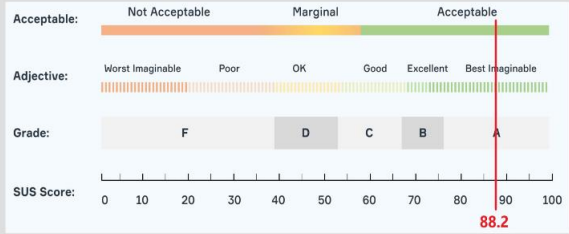


ADDIE Model

System Display

Testing Analysis

System Usability Scale (SUS) Score



Post-Study System Usability Questionnaire (PSSUQ) Score

PSSUQ - System Usefulness Score

PSSUQ - Information Quality Score

PSSUQ - Information Quality Score

Appendices D- Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y4T1	**Study week no.:** 1
Student Name & ID: NG WEI LI 18ACB03423	
Supervisor: Ts Dr Lee Chen Kang	
Project Title: Creative Edutainment Learning Application for Elementary Students Using Exploratory Approach	

1. WORK DONE

- Editing multimedia elements needed
- Modifying works done in FYP1

2. WORK TO BE DONE

- Continue editing elements
- Develop hide and seek module

3. PROBLEMS ENCOUNTERED

- No

4. SELF EVALUATION OF THE PROGRESS

- In progress

Lee Chen Kang

Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y4T1	**Study week no.:** 2
Student Name & ID: NG WEI LI 18ACB03423	
Supervisor: Ts Dr Lee Chen Kang	
Project Title: Creative Edutainment Learning Application for Elementary Students Using Exploratory Approach	

1. WORK DONE

- Prepared multimedia elements such as graphics and texts

2. WORK TO BE DONE

- Develop hide and seek module
  - Instruction Scene
  - Question Scene

3. PROBLEMS ENCOUNTERED

- No

4. SELF EVALUATION OF THE PROGRESS

- Fair and in progress

_____ *Lee Chen Kang* _____
Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y4T1	**Study week no.:** 3
Student Name & ID: NG WEI LI 18ACB03423	
Supervisor: Ts Dr Lee Chen Kang	
Project Title: Creative Edutainment Learning Application for Elementary Students Using Exploratory Approach	

1. WORK DONE

- Developed hide and seek module
  - Instruction Scene
  - Some Question Scene

2. WORK TO BE DONE

- Continue develop hide and seek module

3. PROBLEMS ENCOUNTERED

- No

4. SELF EVALUATION OF THE PROGRESS

- Fair and in progress

_____ *Lee Chen Kang* _____
Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y4T1	**Study week no.:** 4
Student Name & ID: NG WEI LI 18ACB03423	
Supervisor: Ts Dr Lee Chen Kang	
Project Title: Creative Edutainment Learning Application for Elementary Students Using Exploratory Approach	

1. WORK DONE

- Develop hide and seek module
  - Question Scene
- Meeting with supervisor

2. WORK TO BE DONE

- Continue developing hide and seek module

3. PROBLEMS ENCOUNTERED

- No

4. SELF EVALUATION OF THE PROGRESS

- Fair and in progress

_____ *Lee Chen Kang*_____
Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y4T1	**Study week no.:** 5
Student Name & ID: NG WEI LI 18ACB03423	
Supervisor: Ts Dr Lee Chen Kang	
Project Title: Creative Edutainment Learning Application for Elementary Students Using Exploratory Approach	

1. WORK DONE

- Developed hide and seek module

2. WORK TO BE DONE

- Search suitable elements to be used
- Complete hide and seek module

3. PROBLEMS ENCOUNTERED

- Some found elements are not suitable used in the module

4. SELF EVALUATION OF THE PROGRESS

- Fair

_____ *Lee Chen Kang* _____
Supervisor's signature


Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project I)

Trimester, Year: Y3T3	**Study week no.:** 6
Student Name & ID: NG WEI LI 18ACB03423	
Supervisor: Ts Dr Lee Chen Kang	
Project Title: Creative Edutainment Learning Application for Elementary Students Using Exploratory Approach	

1. WORK DONE

- Completed development of hide and seek module
- Meeting with supervisor

2. WORK TO BE DONE

- Develop discovery module
  - Instruction Scene
  - Area 1 Scene
- Modification based on supervisor's advise

3. PROBLEMS ENCOUNTERED

- No

4. SELF EVALUATION OF THE PROGRESS

- Fair

____ *Lee Chen Kang* _____

Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y4T1	**Study week no.:** 7
Student Name & ID: NG WEI LI 18ACB03423	
Supervisor: Ts Dr Lee Chen Kang	
Project Title: Creative Edutainment Learning Application for Elementary Students Using Exploratory Approach	

1. WORK DONE

- Develop discovery module
  - Instruction Scene
  - Area Selection Scene

2. WORK TO BE DONE

- Continue develop discovery module
  - Area 1 Scene

3. PROBLEMS ENCOUNTERED

- No

4. SELF EVALUATION OF THE PROGRESS

- In Progress

_____ *Lee Chen Kang* _____
Supervisor's signature


Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y4T1	**Study week no.:** 8
Student Name & ID: NG WEI LI 18ACB03423	
Supervisor: Ts Dr Lee Chen Kang	
Project Title: Creative Edutainment Learning Application for Elementary Students Using Exploratory Approach	

1. WORK DONE

- Develop discovery module
  - Area 1 and 2
- Meeting with supervisor for progress checking

2. WORK TO BE DONE

- Develop lesson module

3. PROBLEMS ENCOUNTERED

- No

4. SELF EVALUATION OF THE PROGRESS

- Fair and in progress

_____ *Lee Chen Kang* _____
Supervisor's signature


Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y4T1	**Study week no.:** 9
Student Name & ID: NG WEI LI 18ACB03423	
Supervisor: Ts Dr Lee Chen Kang	
Project Title: Creative Edutainment Learning Application for Elementary Students Using Exploratory Approach	

1. WORK DONE

- Developed lesson module
  - Menu selection
  - Plants and Insects

2. WORK TO BE DONE

- Create 3D objects for AR view
- Develop AR environment

3. PROBLEMS ENCOUNTERED

- Unexpected technical problems during AR development

4. SELF EVALUATION OF THE PROGRESS

- Progress slower than expectation

_____ *Lee Chen Kang* _____
Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y4T1	**Study week no.:** 10
Student Name & ID: NG WEI LI 18ACB03423	
Supervisor: Ts Dr Lee Chen Kang	
Project Title: Creative Edutainment Learning Application for Elementary Students Using Exploratory Approach	

1. WORK DONE

- Developed AR environment
- Meeting with supervisor

2. WORK TO BE DONE

- System finalized and published
- System testing

3. PROBLEMS ENCOUNTERED

- No

4. SELF EVALUATION OF THE PROGRESS

- Progress slower than expectation

_____ *Lee Chen Kang* ___
Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y4T1	**Study week no.:** 11
Student Name & ID: NG WEI LI 18ACB03423	
Supervisor: Ts Dr Lee Chen Kang	
Project Title: Creative Edutainment Learning Application for Elementary Students Using Exploratory Approach	

1. WORK DONE

- System published
- Created testing video demonstration and questionnaire
- Meeting with supervisor

2. WORK TO BE DONE

- Testing results analyze
- Reporting

3. PROBLEMS ENCOUNTERED

- No

4. SELF EVALUATION OF THE PROGRESS

- Progress slower than expectation

Lee Chen Kang

Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project I)

Trimester, Year: Y4T1	**Study week no.:** 12
Student Name & ID: NG WEI LI 18ACB03423	
Supervisor: Ts Dr Lee Chen Kang	
Project Title: Creative Edutainment Learning Application for Elementary Students Using Exploratory Approach	

1. WORK DONE

- Testing Analyze and Discussion
- Reporting
- Draft checking

2. WORK TO BE DONE

- Reporting
- Report Finalized

3. PROBLEMS ENCOUNTERED

- No

4. SELF EVALUATION OF THE PROGRESS

- Fair

Lee Chen Kang

Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y4T1	**Study week no.:** 13
Student Name & ID: NG WEI LI 18ACB03423	
Supervisor: Ts Dr Lee Chen Kang	
Project Title: Creative Edutainment Learning Application for Elementary Students Using Exploratory Approach	

1. WORK DONE

- Report finalized
- Poster

2. WORK TO BE DONE

- Report submission

3. PROBLEMS ENCOUNTERED

- No

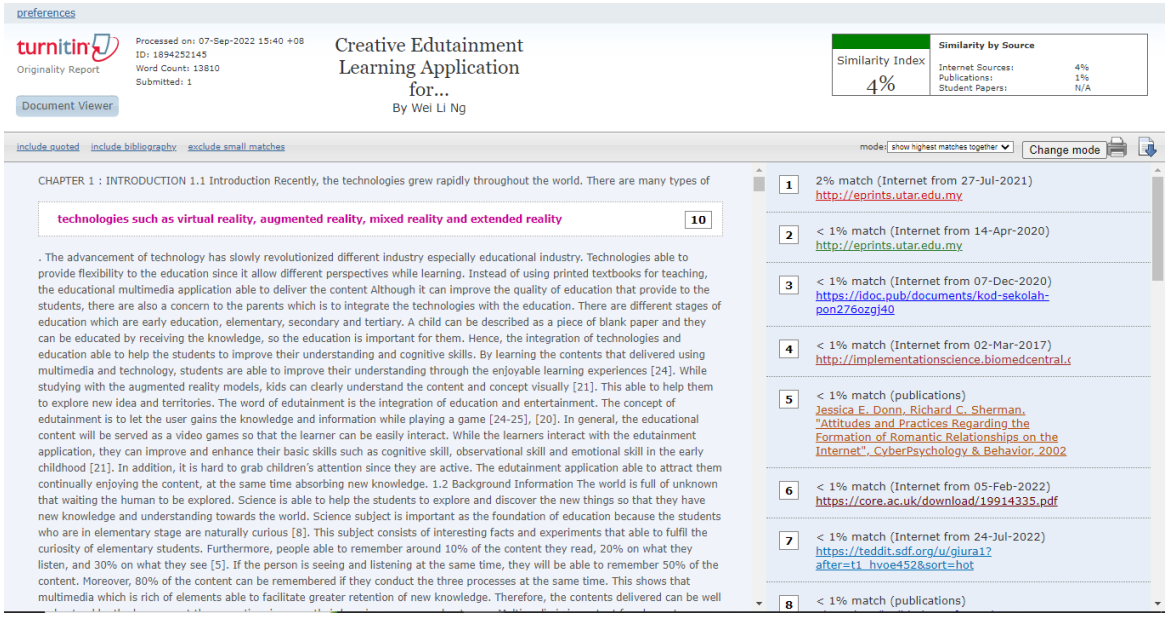
4. SELF EVALUATION OF THE PROGRESS

- Fair

Lee Chen Kang
Supervisor's signature


Student's signature

Plagiarism Check Result



preferences

turnitin Originality Report

Processed on: 07-Sep-2022 15:40 +08
ID: 1894252145
Word Count: 13810
Submitted: 1

Document Viewer

Creative Edutainment Learning Application for...
By Wei Li Ng

Similarity Index 4%

Similarity by Source
Internet Sources: 4%
Publications: 1%
Student Papers: N/A

include quoted include bibliography exclude small matches

mode: show highest matches together Change mode

CHAPTER 1 : INTRODUCTION 1.1 Introduction Recently, the technologies grew rapidly throughout the world. There are many types of

technologies such as virtual reality, augmented reality, mixed reality and extended reality 10

. The advancement of technology has slowly revolutionized different industry especially educational industry. Technologies able to provide flexibility to the education since it allow different perspectives while learning. Instead of using printed textbooks for teaching, the educational multimedia application able to deliver the content Although it can improve the quality of education that provide to the students, there are also a concern to the parents which is to integrate the technologies with the education. There are different stages of education which are early education, elementary, secondary and tertiary. A child can be described as a piece of blank paper and they can be educated by receiving the knowledge, so the education is important for them. Hence, the integration of technologies and education able to help the students to improve their understanding and cognitive skills. By learning the contents that delivered using multimedia and technology, students are able to improve their understanding through the enjoyable learning experiences [24]. While studying with the augmented reality models, kids can clearly understand the content and concept visually [21]. This able to help them to explore new idea and territories. The word of edutainment is the integration of education and entertainment. The concept of edutainment is to let the user gains the knowledge and information while playing a game [24-25], [20]. In general, the educational content will be served as a video games so that the learner can be easily interact. While the learners interact with the edutainment application, they can improve and enhance their basic skills such as cognitive skill, observational skill and emotional skill in the early childhood [21]. In addition, it is hard to grab children's attention since they are active. The edutainment application able to attract them continually enjoying the content, at the same time absorbing new knowledge. 1.2 Background Information The world is full of unknown that waiting the human to be explored. Science is able to help the students to explore and discover the new things so that they have new knowledge and understanding towards the world. Science subject is important as the foundation of education because the students who are in elementary stage are naturally curious [8]. This subject consists of interesting facts and experiments that able to fulfil the curiosity of elementary students. Furthermore, people able to remember around 10% of the content they read, 20% on what they listen, and 30% on what they see [5]. If the person is seeing and listening at the same time, they will be able to remember 50% of the content. Moreover, 80% of the content can be remembered if they conduct the three processes at the same time. This shows that multimedia which is rich of elements able to facilitate greater retention of new knowledge. Therefore, the contents delivered can be well

1 2% match (Internet from 27-Jul-2021)
http://eprints.utar.edu.my

2 < 1% match (Internet from 14-Apr-2020)
http://eprints.utar.edu.my

3 < 1% match (Internet from 07-Dec-2020)
https://idoc.pub/documents/kod-sekolah-pon276ozgj40

4 < 1% match (Internet from 02-Mar-2017)
http://implementationscience.biomedcentral.c

5 < 1% match (publications)
Jessica E. Donn, Richard C. Sherman, "Attitudes and Practices Regarding the Formation of Romantic Relationships on the Internet", CyberPsychology & Behavior, 2002

6 < 1% match (Internet from 05-Feb-2022)
https://core.ac.uk/download/19914335.pdf

7 < 1% match (Internet from 24-Jul-2022)
https://teddit.sdf.org/u/giura1?after=t1_hvoe452&sort=hot

8 < 1% match (publications)

APPENDICES E - PLAGIARISM CHECK RESULT

Universiti Tunku Abdul Rahman			
Form Title : Supervisor's Comments on Originality Report Generated by Turnitin for Submission of Final Year Project Report (for Undergraduate Programmes)			
Form Number: FM-IAD-005	Rev No.: 0	Effective Date: 01/10/2013	Page No.: 1of 1

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

Full Name(s) of Candidate(s)	NG WEI LI
ID Number(s)	18ACB03423
Programme / Course	BACHELOR OF INFORMATION SYSTEMS (HONOURS) BUSINESS INFORMATION SYSTEMS
Title of Final Year Project	Creative Edutainment Learning Application for Elementary Students Using Exploratory Approach

Similarity	**Supervisor's Comments (Compulsory if parameters of originality exceeds the limits approved by UTAR)**
Overall similarity index: 4 % **Similarity by source** Internet Sources: 4 % Publications: 1 % Student Papers: N/A %	
Number of individual sources listed of more than 3% similarity: 0	
Parameters of originality required and limits approved by UTAR are as Follows: **(i) Overall similarity index is 20% and below, and** **(ii) Matching of individual sources listed must be less than 3% each, and** **(iii) Matching texts in continuous block must not exceed 8 words** ***Note: Parameters (i) – (ii) shall exclude quotes, bibliography and text matches which are less than 8 words.***	

Note Supervisor/Candidate(s) is/are required to provide softcopy of full set of the originality report to Faculty/Institute

Based on the above results, I hereby declare that I am satisfied with the originality of the Final Year Project Report submitted by my student(s) as named above.

Lee Chen Kang

Signature of Supervisor

Name: Ts Dr Lee Chen Kang

Date: 7/9/2022

Signature of Co-Supervisor

Name: _____

Date: _____

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY (KAMPAR CAMPUS)

CHECKLIST FOR FYP2 THESIS SUBMISSION

Student Id	18ACB03423
Student Name	NG WEI LI
Supervisor Name	Ts Dr Lee Chen Kang

TICK (√)	DOCUMENT ITEMS Your report must include all the items below. Put a tick on the left column after you have checked your report with respect to the corresponding item.
-	Front Plastic Cover (for hardcopy)
√	Title Page
√	Signed Report Status Declaration Form
√	Signed FYP Thesis Submission Form
√	Signed form of the Declaration of Originality
√	Acknowledgement
√	Abstract
√	Table of Contents
√	List of Figures (if applicable)
√	List of Tables (if applicable)
-	List of Symbols (if applicable)
-	List of Abbreviations (if applicable)
√	Chapters / Content
√	Bibliography (or References)
√	All references in bibliography are cited in the thesis, especially in the chapter of literature review
√	Appendices (if applicable)
√	Weekly Log
√	Poster
√	Signed Turnitin Report (Plagiarism Check Result - Form Number: FM-IAD-005)
√	I agree 5 marks will be deducted due to incorrect format, declare wrongly the ticked of these items, and/or any dispute happening for these items in this report.

*Include this form (checklist) in the thesis (Bind together as the last page)

I, the author, have checked and confirmed all the items listed in the table are included in my report.

(Signature of Student)
Date: 7 September 2022