

**Creative Edutainment Software for Lenggong Valley using Constructivism
Approach**

BY

BRIAN CHONG ZHAO ZUN

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(Author's signature)

Verified by,

Lee Chen Kang

(Supervisor's signature)

Address:

198, Jalan Perak 10,

Taman Bandar Baru Selatan,

31900 Kampar Perak

Ts Dr Lee Chen Kang

Supervisor's name

Date: 7th September 2022

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ABSTRACT

World heritage sites are places that already existed for a long time in the history and are deemed important in terms of historical significance, cultural significance, scientific significance, and so on. Every single one of the location that was declared as the world heritage site provides huge universal value towards humans. Hence, it is important to preserve these sites as well as providing resources and methods so that people that wish to gain more information related to these sites are able to utilize it and learn more about the sites. Lenggong Valley is a located at Perak, Malaysia and UNESCO declared it as a world heritage site during the date 30th June 2012. Considering that the only way to gain information related to Lenggong Valley currently is by searching at the internet and most of the information comes in the form of text and pictures only, it lacks interactivity and people will feel bored or lazy to read through the text heavy information. Hence, this project is an Edutainment Software that can be used to gain information related to Lenggong Valley by users through interactive ways and it is user centered constructivism approach. This software will be using several elements of multimedia which includes text, graphic, animation, and audio. There will also be 3D navigation as well as augmented reality in the modules of the software. Users will be able to navigate freely through the modules of this software based on their personal preference. The methodology used during this project is ADDIE model which includes Analysis phase, Design phase, Development phase, Implementation phase, and Evaluation phase. The expected outcome of the software will be start menu, main menu, alongside with 5 modules which includes Quiz module, Simulation module, Map Navigation module, AR module, and Timeline module.

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Chapter 1 Introduction

1.1 Introduction

This project is about a creative edutainment software about Lenggong Valley which can be used by users in order to gain more information and knowledge related to Lenggong Valley. There will be five modules in this creative edutainment software which includes Quiz module, Simulation module, Map Navigation module, AR(Augmented Reality) Module, and Timeline Module.

1.2 Background

Lenggong Valley is a place located at Perak, Malaysia with a span of approximately 1.83 million years and it is declared as one of the world heritage site by UNESCO during 30th June 2012. There are various locations in Lenggong Valley which includes lakes, caves, hills, museum and so on. The lakes include Tasik Raban and Chenderoh Lake. The caves include Gua Kajang, Gua Puteri, Gua Harimau, Gua Gunung Runtuh and so on. The hills include Bukit Bunuh and Bukit Changkat Berangan. And lastly the museum is Muzium Arkeologi Lenggong. The oldest human skeleton ever found in Malaysia is being found at Gua Gunung Runtuh in Lenggong Valley and the name given to it is “Perak Man”. It is estimated that Perak Man lived at Lenggong Valley during about 11000 years ago [1].

Constructivism approach is an approach in which it is an interactive and user centered approach where users will construct their own knowledge based on personal experiences and choices [2]. In this approach, the user experience will be different from one another due to the fact that different user has their own different experiences prior to this, hence their choices and actions will also be affected by the previous experiences, and the knowledge constructed will be different.

Currently, this approach is not viable since the only way to gain information related to Lenggong Valley is through searching online and the information that online provides is mostly in picture and text heavy style where users are required to read the information word by word and this might be boring for some users since it is plain and lacks interactivity. However, by using this creative edutainment software where the mix

usage of multimedia elements such as audio, graphic, text, and animation will enhance the learning process by allowing users to interact with the software through the process of learning which is also user centered and unrestricted. Users can gain knowledge based on their preference in terms of what modules do they like to interact with more, what is the pace of their learning, their progress of the learning and so on these are all under the user's control. Through multimedia, the likes of 3D animation and augmented reality can also be implemented into the software, and this can provide a different experience to users during the learning process compared to those who only use online platforms such as websites. Multimedia alongside with traditional educational materials open up more ways to interact and learn about the content hence makes the process of education and its experience become better.

1.3 Problem Statement

The first problem statement is lack of multimedia elements such as graphics, audio, and animation for the information related to Lenggong Valley. During the old days, the most common ways to gain knowledge is learning through face to face teaching where most of the time teacher just spoon feeds knowledge and information to students. Such method results in low or even no interaction between educators and learners since the only thing learners do are to process the information and knowledge that they saw and heard and that's it. However, due to the nature of how human brains function in which it will passively reserve a huge percentage for the purpose of visual information processing, it is way more efficient for learners to process a mix of multimedia elements such as graphics, videos, animations and so on instead of only plain text [3]. Other than that, it is being confirmed that the implementation of adding graphics into plain text studying materials will be able to boost academic performance by at least 55% to as much as 121% in terms of the accuracy of answers proposed by learners to solve certain questions . Images and graphics are crucial factors towards sustaining retention due to the fact that it can make up for the text heavy style that most likely will cause learners to feel overwhelmed and boring by diminishing the side effects of text heavy style materials. Learners can also experience different learning process through simulations which enables them to be able to have visual of different situations which can be observed by eyes instead of being forced to imagine it by reading texts[4]. Through all

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these, learners will also be more motivated to learn since the learning process is no longer text heavy and boring.

The second problem statement is lack of interactive multimedia applications in geography and history learning such as heritage site learning application. Currently there is no software that allows users to learn history related to heritage sites through an interactive and constructivism way. The inconvenience of reading text heavy websites with little pictures being the only way of learning more about heritage sites had been gatekeeping a lot of people since for them, the process of learning is very time consuming and inefficient in this case, they rather just spend time doing other stuff instead. It is discovered through several studies that greater student performance levels and satisfaction will be the result of using interactive teaching [5]. This further incentivize the implementation of interactive edutainment software when it comes to providing a learning software to users. Users can be more actively involved during the learning process and thus gain and remember more knowledge compared to the spoon feeding style of gaining knowledge. The demand of learners towards interactive learning will only go up from time to time since now people are starting to realize that interactive learning is just better than traditional spoon feed learning. But with this creative edutainment software project, the problem mentioned just now is no longer the case since now users are being introduced and provided with a software that emphasizes interaction and constructivism approach. As mentioned in [6], it is more entertaining when the learning process involves interactive educational games, thus leading to better learning processes as well as deeper relationships.

Lastly, the third problem statement is lack of 3D and Augmented Reality (AR) technology for Lenggong Valley learning software. Due to the nature of how human's brain works, experiencing is the most effective and efficient way to learn certain knowledge and information, the closest experience compared to real life experience happens to be 3D experience. Based on a study, it is proven that 3D enhances retention and understanding of learners by positively impacting vital performances such as test, recalling, learning, understanding, and so on [7]. Learning through 3D technology will enable learners to approach and process information differently hence allowing them to

construct new knowledge and skills [8]. AR can also have the similar effect of 3D when being used in education. This is because AR can allow learners to learn and adapt faster and the information will be more memorable for them since it is being experienced by them personally through virtual and hence the experience is different compared to others as well as more interactive [9]. Other than that, AR also provides 2 dimensional information presenting ways instead of the 1 dimensional that is normally being used. This enhances interactions as well as engagements with learner's emotions and feelings and this will result in quicker adaptation of knowledge [10].

1.4 Objectives

The objectives of this project are:

- i. To study the usage of multimedia technology in supporting Lenggong Valley learning application.

Currently, there lack multimedia technology when it comes to Lenggong Valley information. This project will study how well can multimedia technology aid in the learning process of Lenggong Valley related knowledge.

- ii. To develop an interactive creative edutainment software using constructivism approach for Lenggong Valley.

There is no creative edutainment software related to Lenggong Valley that exist currently. Hence, this project aims to develop one in order to help learners to utilize it and learn more about Lenggong Valley through interactive ways.

- iii. To evaluate the effectiveness of creative edutainment software in helping the user during the learning process and enhancing their understanding.

After the software is being developed, analysis will be conducted, and feedback will be collected in order to evaluate the user satisfaction and the effectiveness of this creative edutainment software about the learning process.

1.5 Scope

This project aims to build a creative edutainment software which is able to provide users an interactive constructivism approach learning environment that can be used to gain knowledge and information related to Lenggong Valley.

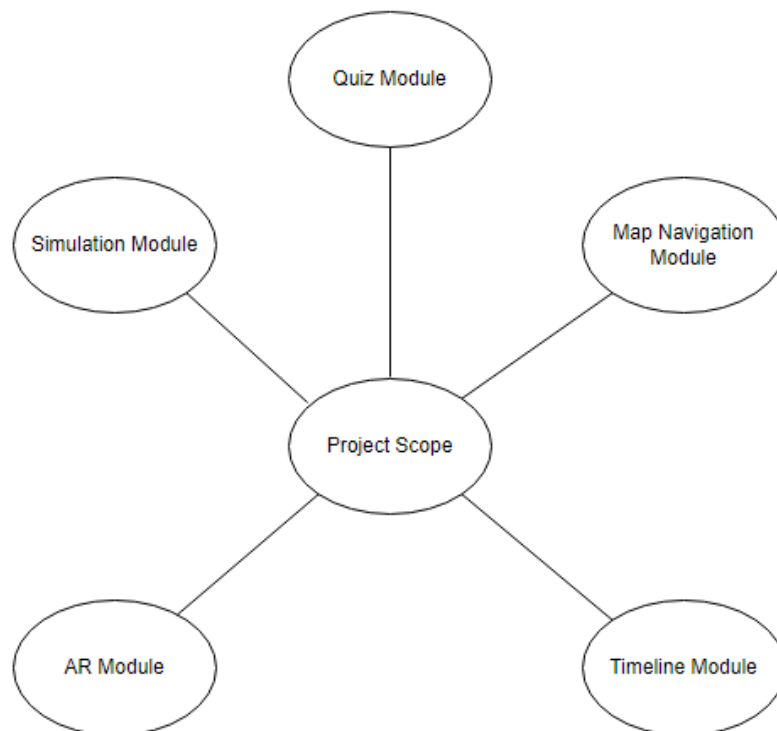


Figure 1.01 Project Scope

The first module is the quiz module. This module will present multiple choice quiz questions to users and users will answer it by clicking on the correct answer among the four choices that is being shown to them to choose from. This module will allow users to test their knowledge related to Lenggong Valley and find out whether their understandings are correct or not.

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The second module is the simulation module. There are two submodules in this module which includes living, and hunting. Users will be presented by several scenarios that can be triggered by clicking them and it will be different actions will be conducted based on user selections. This module will allow users to understand the living style and the hunting style of the ancient people that lives in Lenggong Valley back then.

The third module is the map navigation module. There are three submodules in this module which includes Tasik Raban, Lata Kekabu, and Muzium Arkeologi Lenggong. 3D animation will be implemented in this module and users will be able to navigate the locations in 3D style. This module will allow users to observe and navigate the locations that exist in Lenggong Valley through 3D.

The fourth module is AR module. This module will present the famous Perak Man in Lenggong Valley in AR view. This module will allow users to be able to experience Lenggong Valley in Augmented Reality view.

The fifth module is Timeline module. There are three submodules in this module which includes How Lenggong got its name, Pre-History, and Skeleton Found. Stories alongside with narration and animation will be presented to users. This module will allow users to gain more information about Lenggong Valley through multimedia elements such as graphics, audio, and animation.

1.6 Contribution and Significance

The outcome of this project is a creative edutainment software that is capable of allowing users to learn about the heritage site Lenggong Valley in a way that does not exist prior to this project. By achieving the project objectives, the boons will be fourfold: (a) a new platform is enabled for users to utilize and learn about the history of the heritage site Lenggong Valley; (b) a different approach compared to the existing ones are introduced to users when it comes to history learning; (c) motivates users to learn more about Lenggong Valley hence the knowledge related to the site is preserved and are able to pass to future generations; (d) raise awareness of people about the heritage site Lenggong Valley so that those who never heard about Lenggong Valley can get to know it for the first time by using this software.

1.7 Target Audience

The target audience of this creative edutainment software will be users around the age group of 18-60 years old, the people around this age group are usually the ones that uses electronic devices such as computers and laptops hence this creative edutainment software that needs to be used on a computer will be suitable for them. Besides, the target audience of this creative edutainment software will also be public that are interested on Lenggong Valley. Those individuals that never heard of Lenggong Valley before and wish to learn more about Lenggong Valley as well as those individuals that know the place Lenggong Valley and wish to enhance their understanding and knowledge related to Lenggong Valley are all welcomed as the target audience of this software.

Chapter 2 Literature Review

2.1 Multimedia definition

2.1.1 Linear Multimedia

Multimedia without user interactions or navigation control is called linear multimedia [11]. Some examples of linear multimedia include movies, recorded videos, magazines, books, slideshows and so on. There is one thing in common about these linear multimedia examples which is the information that is being presented are in a fixed sequence in which the beginning points and the end point is already fixed before even being shown to its users. Users cannot change the sequence or the starting and ending point of linear multimedia and are forced to follow the flow or pace designed when using linear multimedia [12]. Linear multimedia is most commonly used in school teaching in which the teachers will prepare teaching materials such as textbooks, lecture slides, lecture notes, and recorded videos which are all linear multimedia and use it to teach students. Students will be forced to follow the constant sequence determined by their teachers during the learning process and this multimedia is more teacher-centered when being used in circumstances such as education.

2.1.2 Interactive Multimedia

According to [13], multimedia that allows user interactions such as control over the contents, navigation as well as having interactivity with the media is called non-linear multimedia or interactive multimedia. Some examples of interactive multimedia include games, interactive CD, simulations, augmented reality in real world and so on. As its name suggests, interactive multimedia emphasizes on interaction with its user. This type of multimedia is fully user centered in which different users may have different experience of using the multimedia due to different choices and preferences such as which module they select, what kind of pace do they prefer when using the multimedia, which one do they want to start first and end last and so on. Interactive multimedia enables users to fully express their creativeness when exploring the multimedia by allowing free navigation for users [14].

2.2 Interactive Multimedia issues

2.2.1 Benefits

The benefit of interactive multimedia includes allowing user to have full control about the content according to their personal preference and demands, they can freely navigate to any point or part of the content without any restrictions like linear multimedia does [15]. This can lead to the creativity of users to being enhanced since the results and experience of interactive multimedia usage will be different from time to time as they gain experience and try out different approaches when interacting with the content. Besides, this can also prevent the issues that exist in linear multimedia which is user will easily get bored due to the plain and fixed content with low interactivity without being able to skip certain contents that they might find boring, the interactivity that interactive multimedia provides will allow users to feel fresh and more involved since the pace of interaction is under the user's control and this will lead to better retention [16]. This ensures two way communication and can generate different data based on different user's interactions in order to find out the preference and style of distinct users. Other than that, the existing interactive multimedia can be enhanced by adding different multimedia elements such as animation, graphics, and videos in order to further add in interactivity of the multimedia.

2.2.2 Limitations

The limitation of interactive multimedia includes forcing users to adapt to the methods of using the interactive multimedia. As example, users must know how to click a mouse and use a keyboard in order to use computer interactive multimedia such as games and websites [17]. Besides, it is hard to find a balance between too little content and too much content for interactive multimedia since different user has different skill level and adaptability in which for some new users, they might find it difficult to navigate through the contents and easy to get lost since for them, the contents are too much and a bit overwhelming but for some experts, they might claim that the contents are no longer enough to satisfy them during the navigation and interaction process and demand for more contents instead. Besides, interactive multimedia might as cause issues such as the organization of it is not well due to developers not being good enough [15].

2.3 Applications of Multimedia

Nowadays, there are a lot of application of multimedia in different industries. This includes multimedia in education, multimedia in commerce, multimedia in journalism, multimedia in interior design, and so on [18].

For multimedia in education, this includes the likes of education games, learning software, edutainment software, and so on. These multimedia applications are mostly used by teachers or learners themselves in order to gain more knowledge, information, and experience towards certain topics by exposing their students or themselves to the applications and explore through it and absorb its contents.

For multimedia in commerce, this is mostly websites or mobile applications such as Shopee, Lazada, Amazon, Taobao, and so on. These websites or mobile applications of E-commerce applies concepts and elements of multimedia such as text, photos, videos, and so on in order to provide users information related to certain products and promotions related to their business.

For multimedia in journalism, newspaper companies benefited a lot from multimedia since back on the days, the most common multimedia element that is being broadly used in journalism is plain text and now, they start to slowly implement other elements of multimedia such as animations, graphics, and video as well and websites, social media platforms, live broadcast platforms are being introduced and used in order to enhance their customer's experience.

For multimedia in interior design, the application of multimedia includes software that allows designers to simulate and design the structures with 3D or even augmented reality technology instead of the old drawing with pen and paper style. This not only saves time for the designer, but also allows more room for error since drag and drop is easier than having to redraw unwanted parts of the design. Besides, this will also allow designer to simulate an interior design that is similar to the real world and be able to view the whole design before the construction even start [19].

2.4 Multimedia in History

The implementation of multimedia in history teaching nowadays are still outdated compared to other fields such as mathematics, biology, physics and so on. This is because other fields all have their own multimedia software such as E-learning software, edutainment software, education game software, and so on that are more towards interactive multimedia. Multimedia in history on the other hand is still the same as years ago, in which the vast majority of multimedia that is being used in history education is linear multimedia such as textbooks, lecture slides, recorded videos and so on [20]. These are very ineffective methods of learning history since the interactivity aspect is lacking and it takes way more effort trying to learn history through interactive multimedia compared to other fields. This is also one of the reason why many people claimed that history learning is boring [21], the history itself is already very text heavy since a lot of details needed to be recorded and taught to learners, to make matter worse, majority of it is taught using linear multimedia which not only did not solve the problem of history subject being boring but make the learning process even plainer and unattractive. However, there are still minority of non-linear multimedia that is being implemented in history education such as online quiz and simulation games. However, the simulation games are something like world war shooting games which is more towards shooting games since the main focus of these simulation games are for users to play first person shooting games and experience being a soldier during world war instead of emphasizing on history learning of world war.

Now, five similar multimedia applications will be selected and reviewed in order to find out their strengths and weaknesses.

System/Application	Strengths	Weaknesses
CYARK [22]	Implements multimedia elements such as text, graphics, video, and animation. Contains guided tour and 3D explorer for uses to explore geographical sites such as heritage sites and popular tourist spots. Has a timeline bar for users to drag on and display locations based on the year such as BCE, and CE. Games related to monumental ideas available for users to interact with.	Only available in website instead of application or software hence forcing users to browse it through browsers. The game module of this website is very lag. No user interface, no background music available.
World Heritage App [23]	Implements multimedia elements such as text, graphics, and animation. 3D Map navigation available for users to search for world heritage map.	Lack of augmented reality. No background music available. No detailed text information related to the locations available.
Kujataa World Heritage [24]	Implements multimedia elements such as text, graphics, and animation. Information such as historical, cultural, scientific information of the locations are available.	Lack of 3D and augmented reality. No background music.
Historic Scotland Visitor App [25]	Implements multimedia elements such as text, graphics, and animation. Interactive map view with filter available.	Lack of augmented reality. No background music available. No detailed text information related to the locations available.
Planet Geo [26]	Implements multimedia elements such as text, graphics, and animation. Consists of interactive games and quizzes that allows users that test their knowledge about UNESCO's World Heritage Sites. Has video that explain details related to locations.	Lack of 3D and augmented reality. No background music.

Table 2.01 Table of Literature Review

2.5 Comparisons of similar multimedia applications

Website / Applications	Multimedia Elements						Augmented Reality(AR)
	Text	Graphic	Video	Audio	Animation		
					2D	3D	
CYARK [22]	✓	✓	✓	X	X	✓	✓
World Heritage App [23]	✓	✓	X	X	X	✓	X
Kujataa World Heritage [24]	✓	✓	X	X	✓	X	X
Historic Scotland Visitor App [25]	✓	✓	X	X	X	✓	X
Planet Geo [26]	✓	✓	✓	X	✓	X	X

Table 2.02 Table of comparison of similar multimedia applications

2.6 Constructivism Approach

Constructivism comes from the word construct and as its name tells, it is an approach which is highly involved with the term construct. In this approach, constructing is being emphasized to its learners in which everything such as knowledge, experiences, understanding, meaning, and so on are all being constructed by the learner themselves [27]. How do they construct those things mentioned above are all depends on themselves instead of being spoon fed and only accepting what other people already constructed beforehand. This approach is usually used to link learner with things that they already knew before this and try to utilize them during the process of learning new stuff.

Constructivism Approach is defined as an approach in which the learners are responsible to generate their own ideas based on previous experiences and knowledge during the process of learning [28]. In other words, people have to discover and understand how they know certain stuff by recalling through previous understandings to act as a catalyst in order to learn or generate new knowledge. Under this approach, learners that are trying to solve certain challenges or problems will actively think about similar scenarios like this that they had faced before and try to link both to discover how those are actually related to each other. Based on the reflection on previous

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experiences, not only they can further enhance those previous experiences as time goes on of them using constructivism approach in which the experiences will only be recalled over and over again during the process, they can also understand deeper for the newly generated or constructed knowledge. This causes different people to have distinct learning experiences due to different decision makings and preferences of an individual when this approach is being applied during the learning process. The meaning of learning is being constructed by the individual himself instead of being guided by other people such as their instructors, this makes sure that the learner are able to deeply remember the experiences since this approach is more about user-centered instead of the traditional education way of teacher-centered. Learners are the one that generate meanings and then understand them instead of being passive learners by passively absorbing everything what the educator tells them about without thinking deeper about it.

2.7 User Requirement Gathering

2.7.1 Survey Questionnaire

Survey questionnaires are defined as an instrument for researching purposes in which the aim of using these survey questionnaires is to gather feedback and information from huge amount of information from a big sample size of respondents [29]. During the year of 1838, questionnaires are invented by London's Statistical Society [30]. In this project, the author will use survey questionnaire in order to collect sample data from target audience. The survey is created by using Google Form and is send to users through platforms such as email, Microsoft Teams, Facebook, Instagram, Twitter, and so on. The process of collecting 30 samples took 1 week, and the process of analyzing data collected took another 1 week.

2.7.2 Data Collection and analysis

Section A: Demographic Profile

1. Age

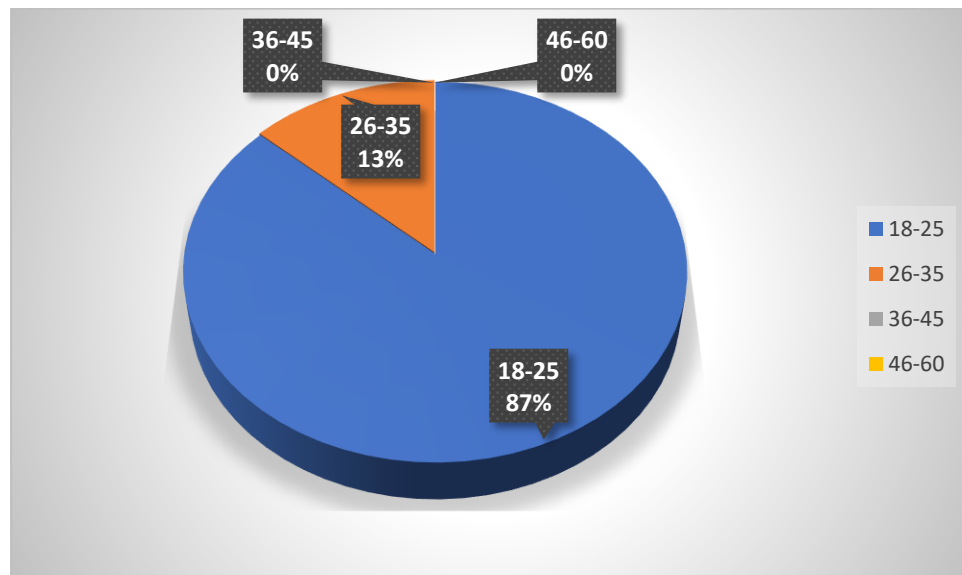


Figure 2.01 Pie chart of age of respondents

The pie chart shows the answers of 30 respondents to the question in the online questionnaire. Most of the respondents in this questionnaire are in the age group of 18-25, account for 86.7% of respondents, followed by the remaining 13.3% which belongs to the 26-35 age group. The total number of respondents in the age group of 18-25 is 26, the total number of respondents in the age group of 26-35 is 4. None of the respondents belongs to the age group of 36-45 and 46-60.

2. Gender

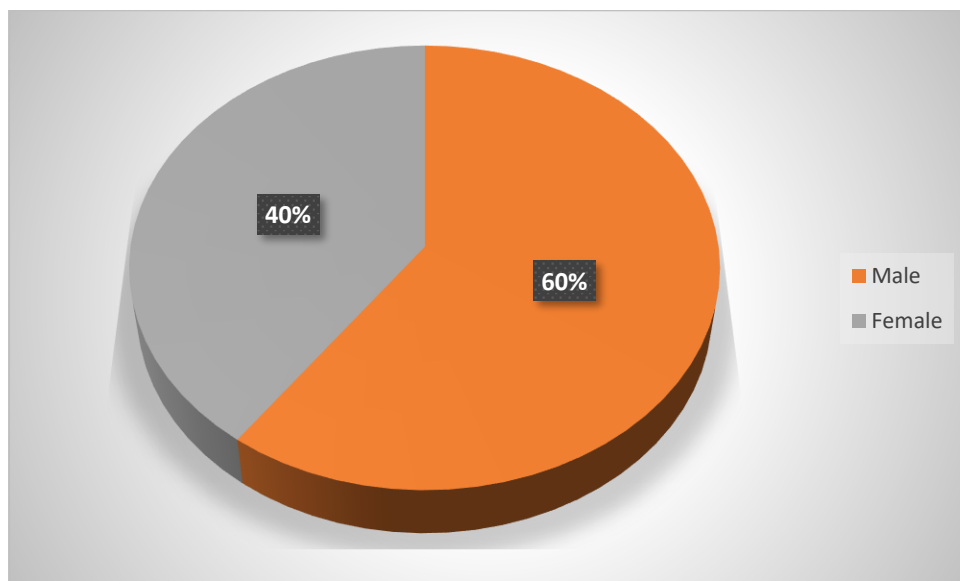


Figure 2.02 Pie chart of gender of respondents

The pie chart shows the answers of 30 respondents to the question in the online questionnaire. Most of the respondents in this questionnaire are male which account for 60% of the respondents while 40% of the respondents are female. The total number of male respondents are 18 while the total number of female respondents are 12.

Section B: User background

3. Do you ever heard of Lenggong Valley before?

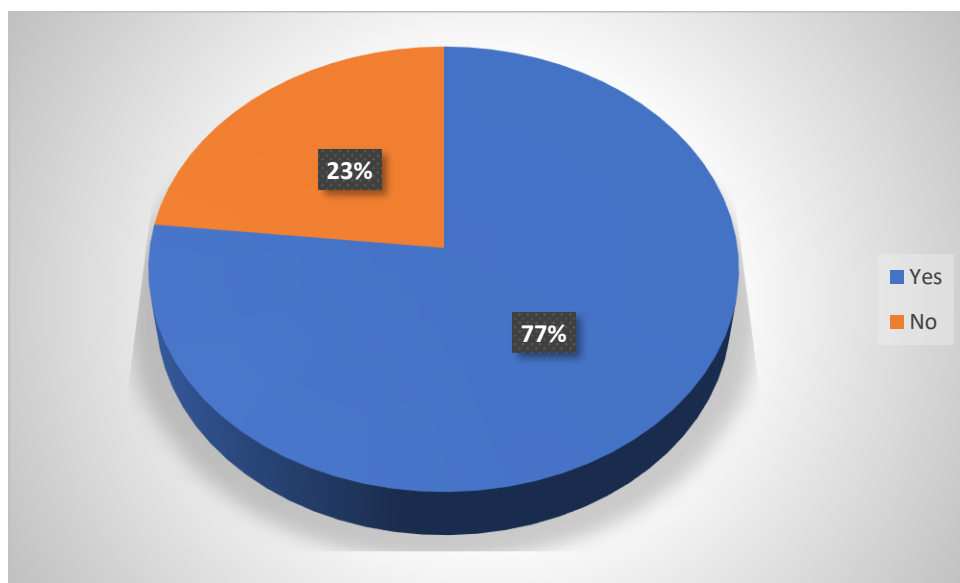


Figure 2.03 Pie chart of ever heard of Lenggong Valley before

The pie chart shows the answers of 30 respondents to the question in the online questionnaire. Majority of respondents in this questionnaire stated that they never heard of Lenggong Valley before, account for 76.7% of respondents. While a minority of them stated that they had heard of Lenggong Valley before, account for only 23.3% of respondents. The total number of respondents that had heard of Lenggong Valley before are 7 out of 30 while the total number of respondents that never heard of Lenggong Valley before are 23 out of 30 respondents.

4. Do you have further intention of knowing more about Lenggong Valley?

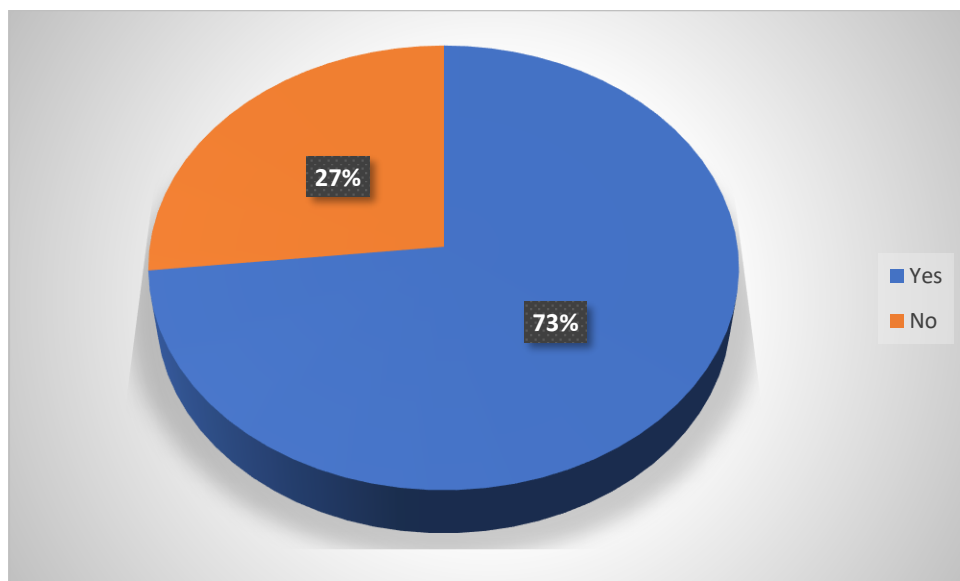


Figure 2.04 Pie Chart of further intention of knowing more about Lenggong Valley

The pie chart shows the answers of 30 respondents to the question in the online questionnaire. Majority of respondents in this questionnaire stated that they have further intention of knowing more about Lenggong Valley, account for 73.3% of respondents. While a minority of them stated that they have no further intention of knowing more about Lenggong Valley, account for 26.7% of respondents. The total number of respondents that have further intention of knowing more about Lenggong Valley is 22 out of 30 respondents while the total number of respondents that have no further intention of knowing more about Lenggong Valley is 8 out of 30 respondents.

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5. If yes, what kind of method do you prefer the most to know more about Lenggong Valley? (Skip if No for last question)

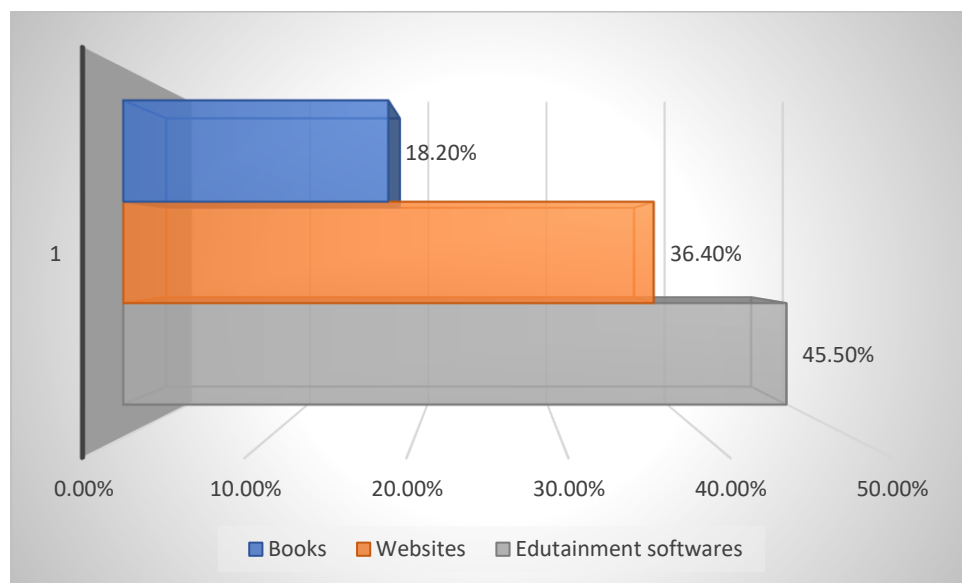


Figure 2.05 Bar chart of most preferred method to know more about Lenggong Valley

The bar chart shows the answers of 22 respondents to the online questionnaire questions. The question is only shown to respondents who answered “yes” to question 4. Out of the 22 respondents, the highest voted method to know more about Lenggong Valley is through Edutainment softwares (45.5%), followed by websites (36.4%), and books (18.2%). The total number of respondents who prefer the method most to know more about Lenggong Valley is 10 for Edutainment softwares, 8 for websites, and 4 for books.

6. Do you use computer software to learn about history/geography?

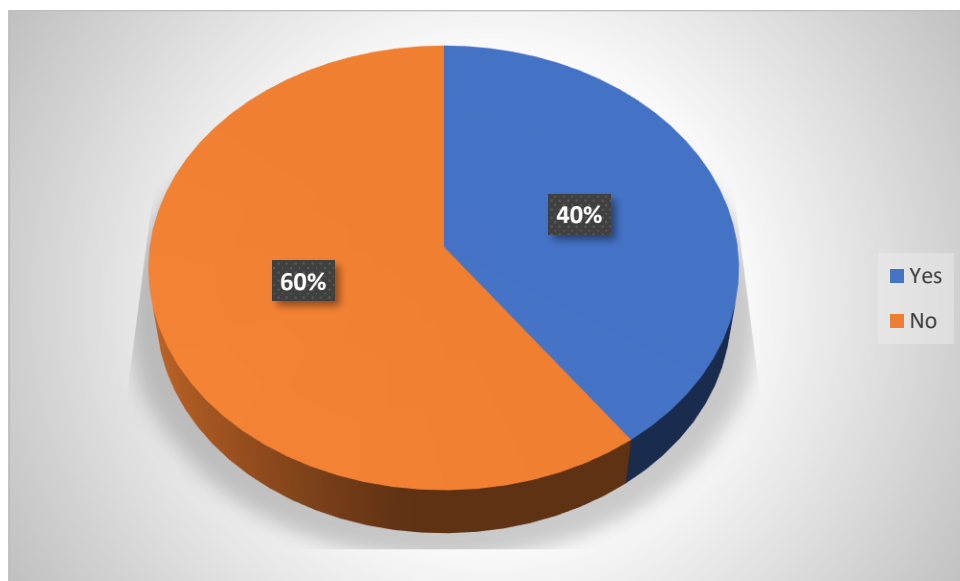


Figure 2.06 Pie chart of usage of computer software to learn history/geography

The pie chart shows the answers of 30 respondents to the question in the online questionnaire. Majority of respondents in this questionnaire stated that they do not use computer software to learn about history/geography, account for 60% of respondents. While 40% of respondents stated that they do use computer software to learn about history/geography. The total number of respondents that do not use computer software to learn about history/geography is 18 out of 30 respondents while the total number of respondents that do use computer software to learn about history/geography is 12 out of 30 respondents.

7. What kind of edutainment you have experienced before?

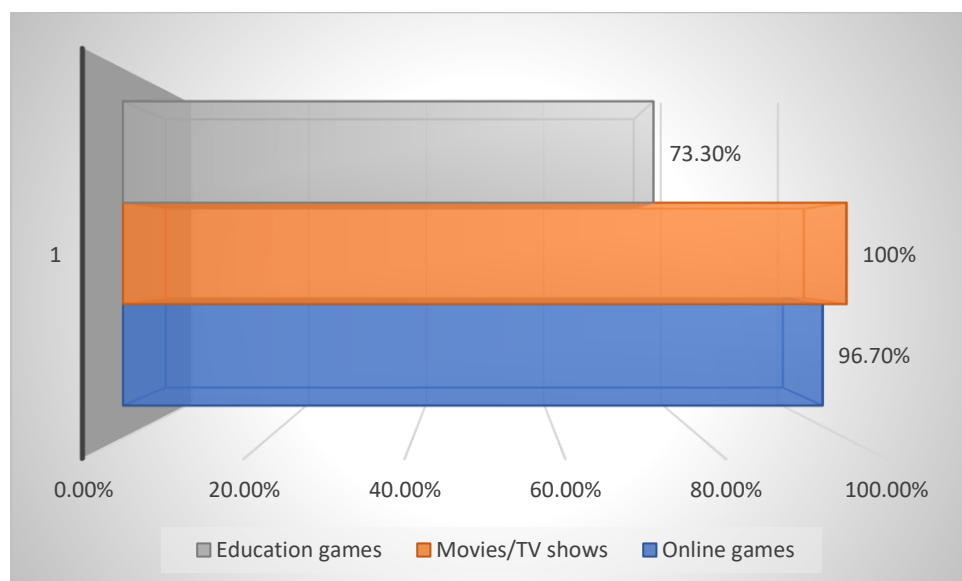


Figure 2.07 Bar chart of edutainment experienced before

The bar chart shows the answers of 30 respondents to the online questionnaire questions. All of the respondents in this questionnaire stated that they have experienced movies/tv shows before, account for 100% of respondents. While 96.7% of respondents stated that they have experienced online games before, and 73.3% of respondents stated that they have experienced education games before. The total number of respondents that experienced movies/tv shows before are 30 out of 30 respondents, the total number of respondents that experienced online games before are 29 out of 30 respondents, and the total number of respondents that experienced education games before are 22 out of 30 respondents.

8. How often do you use them?

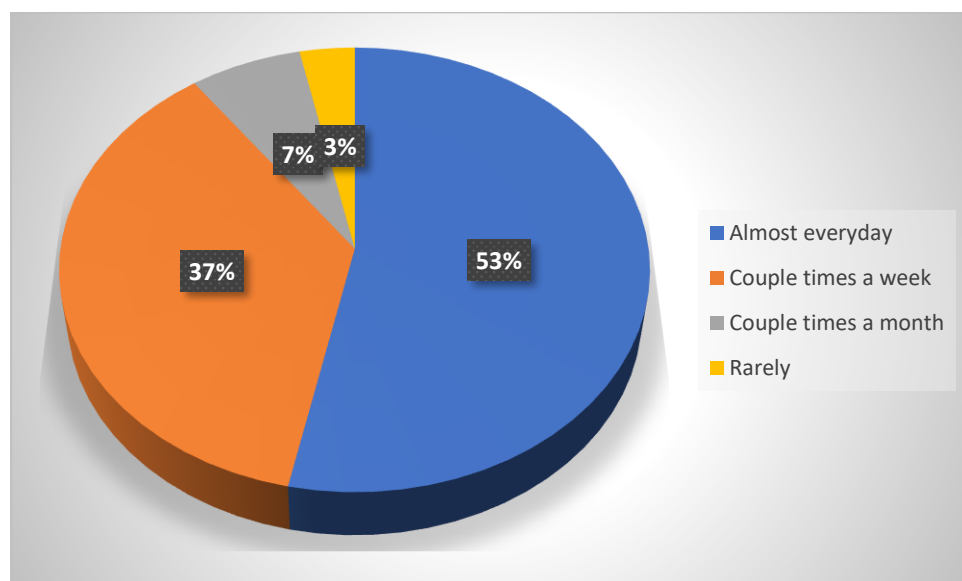


Figure 2.08 Pie chart of frequency of usage of edutainment

The pie chart shows the answers of 30 respondents to the online questionnaire questions. Majority of respondents in this questionnaire stated that they use the edutainments almost everyday, account for 53.3% of respondents, while 36.7% of respondents stated that they use the edutainments couple times a week, and very little of the respondents use the edutainments couple times a month or rarely use them, which is 6.7% and 3.3% of respondents respectively. The total number of respondents that use edutainments almost everyday is 16 out of 30 respondents, while 11 out of 30 respondents use edutainments couple times a week, 2 out of 30 respondents use edutainments couple times a month, and lastly 1 out of 30 respondents rarely use edutainments.

9. Do you enjoy using them?

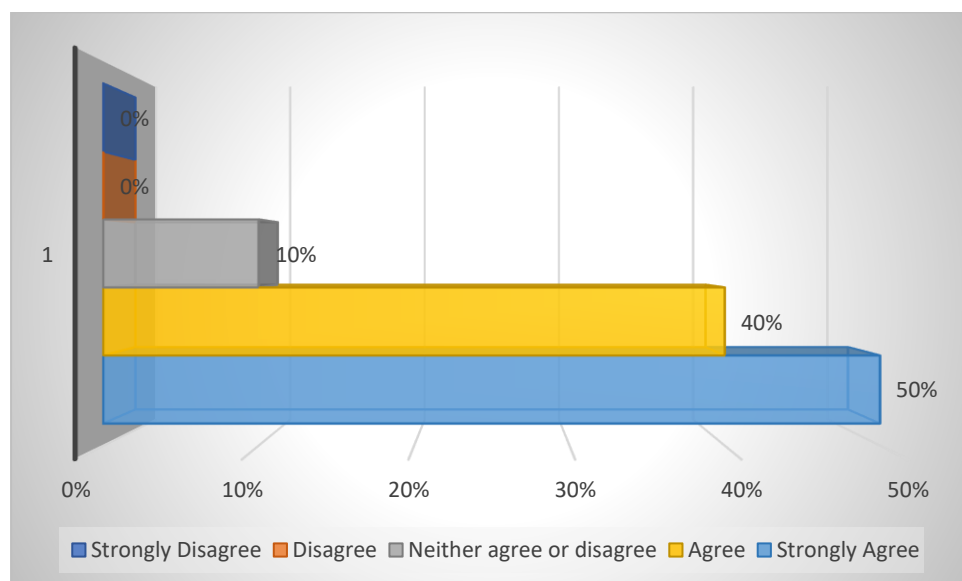


Figure 2.09 Bar chart of satisfaction levels

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly disagree) to 5 (strongly agree). Half of the respondents in this questionnaire strongly agreed that they enjoy using edutainments, account for 50% of the respondents. While 40% of the respondents agreed that they enjoy using edutainments, and only 10% of the respondents are neither agree or disagree towards enjoy using edutainment or not. The total number of respondents that strongly agreed that they enjoy using edutainments are 15 out of 30 respondents, while 12 out of 30 respondents agreed that they enjoy using edutainments, and only 3 out of 30 respondents are neither agree or disagree towards enjoy using edutainment or not.

10. Do you prefer traditional way of education or education through edutainment?

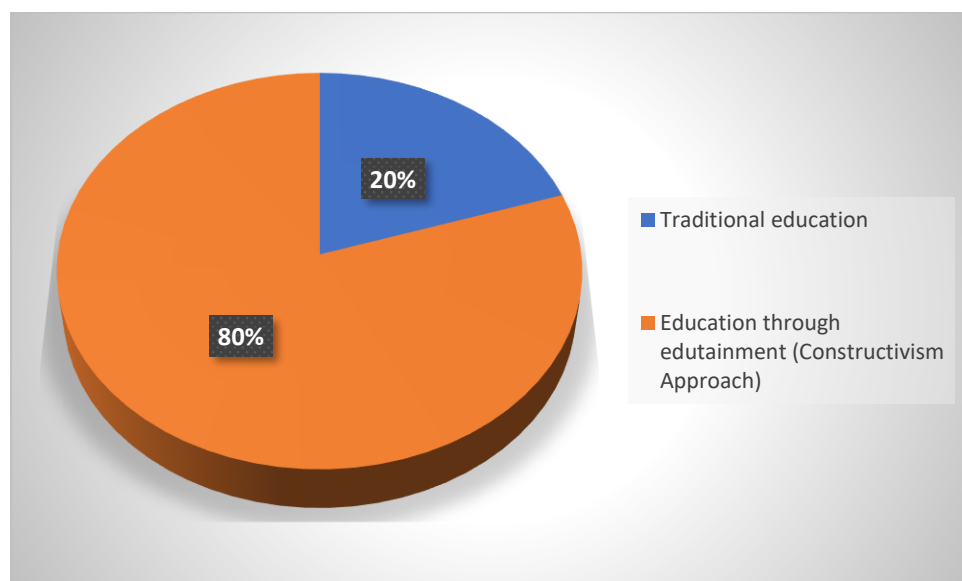


Figure 2.10 Pie chart of education style preference

The pie chart shows the answers of 30 respondents to the question in the online questionnaire. Majority of respondents in this questionnaire stated that they prefer education through edutainment(Constructivism Approach), account for 80% of respondents. While a minority of them stated that they prefer traditional education, account for only 20% of respondents. The total number of respondents that prefer education through edutainment are 24 out of 30 respondents, while the total number of respondents that prefer traditional education are 6 out of 30 respondents.

Section C: User Requirements

11. When navigating around a map, which style do you prefer more?

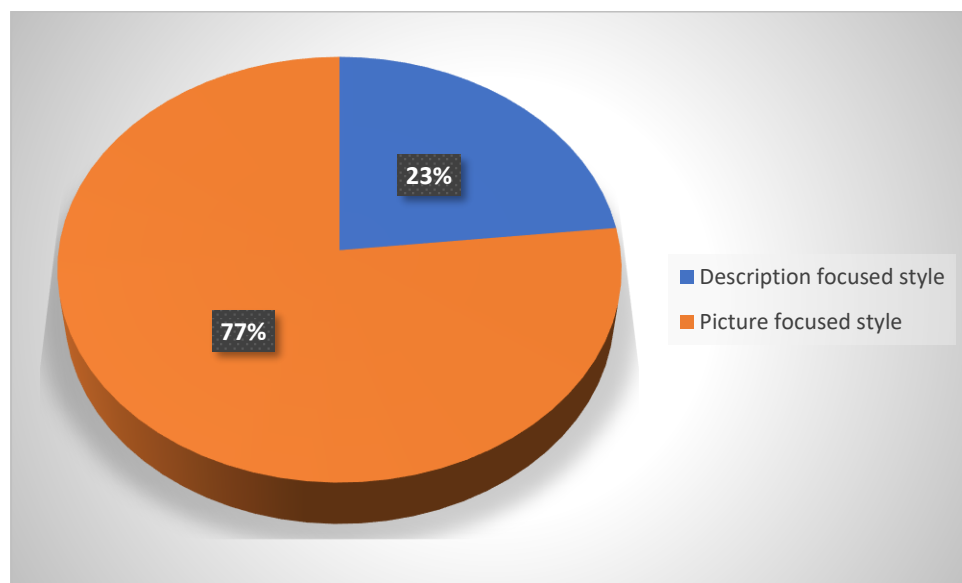


Figure 2.11 Pie chart of map navigation style preference

The pie chart shows the answers of 30 respondents to the question in the online questionnaire. Majority of respondents in this questionnaire stated that they prefer picture focused style where more photo/pictures related to the area are available with short descriptions, account for 76.7% of respondents. While a minority of them stated that they prefer description focused style where detailed descriptions available for each area of the map during navigation, account for only 23.3% of respondents. The total number of respondents that prefer picture focused style where more photo/pictures related to the area are available with short descriptions are 23 out of 30 respondents, while the total number of respondents that prefer description focused style where detailed descriptions available for each area of the map during navigation are 7 out of 30 respondents.

12. What type of quiz do you prefer more?

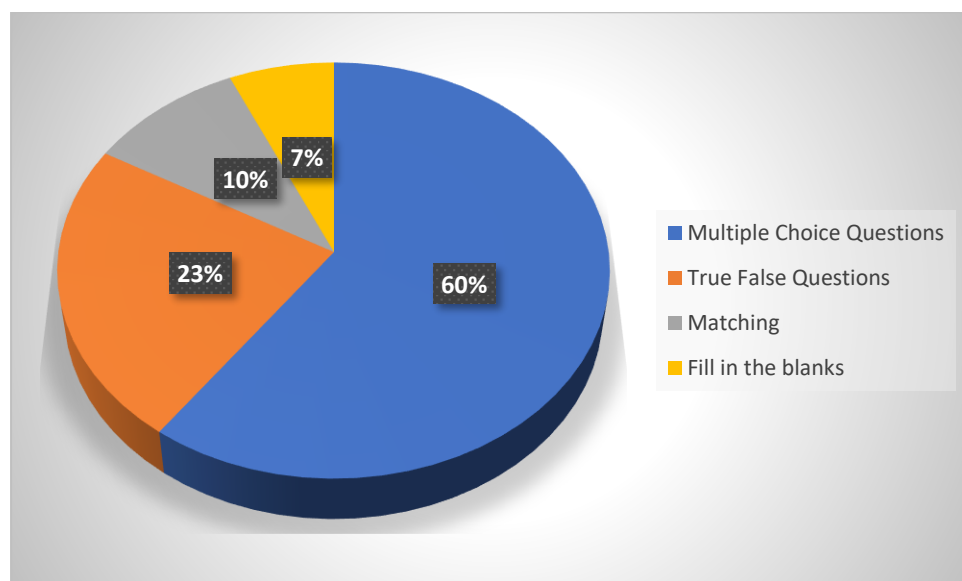


Figure 2.12 Pie chart of quiz type preference

The pie chart shows the answers of 30 respondents to the question in the online questionnaire. Majority of respondents in this questionnaire stated that they prefer multiple choice questions for type of quiz, account for 60% of respondents. While 23.3% of respondents stated that they prefer true false questions for type of quiz, 10% prefer matching for type of quiz, and only 6.7% prefer fill in the blank for type of quiz. The total number of respondents that prefer multiple choice questions are 18 out of 30 respondents, while 7 out of 30 respondents prefer true false questions, 3 out of 30 respondents prefer matching, and only 2 out of 30 respondents prefer fill in the blanks.

13. Which one do you prefer for quiz questions?

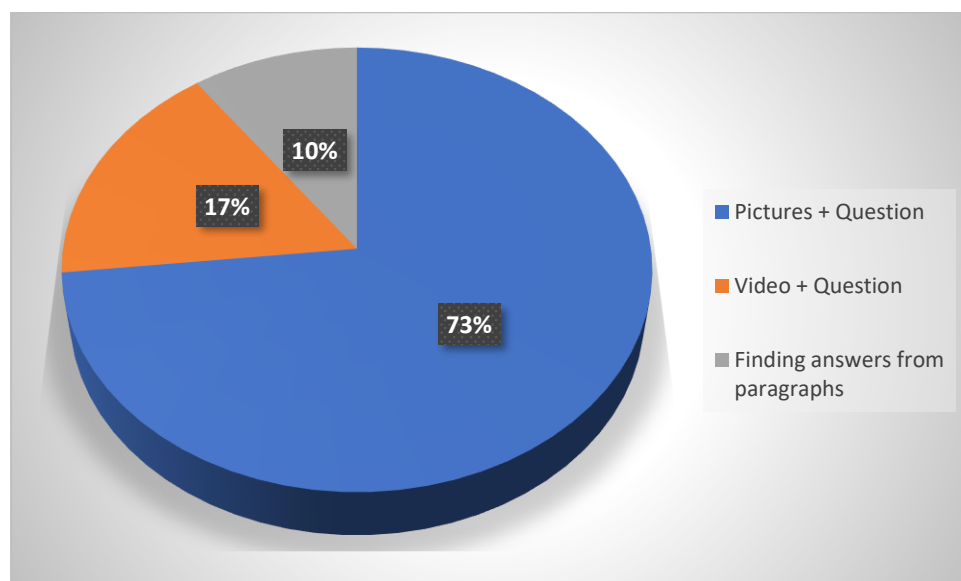


Figure 2.13 Pie chart of quiz style preference

The pie chart shows the answers of 30 respondents to the question in the online questionnaire. Majority of respondents in this questionnaire stated that they prefer pictures + question for quiz questions, account for 73.3% of respondents. While 16.7% of respondents stated that they prefer video + questions for quiz questions, and only 10% prefer finding answers from paragraphs as quiz questions. The total number of respondents that prefer pictures + question for quiz questions are 22 out of 30 respondents, while 5 out of 30 respondents prefer video + question, and only 3 out of 30 respondents prefer finding answers from paragraphs.

14. What type of mini games do you prefer more?

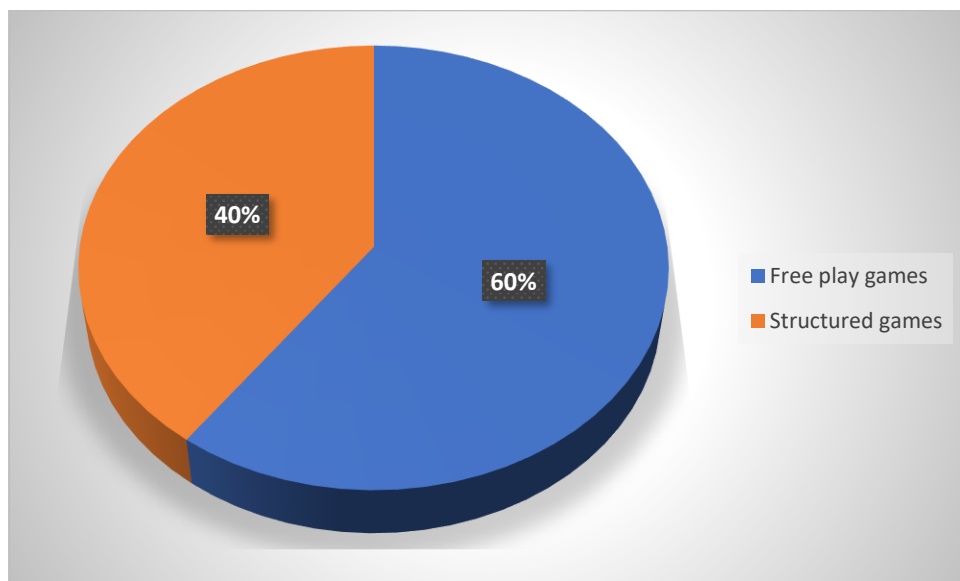


Figure 2.14 Pie chart of mini game type preference

The pie chart shows the answers of 30 respondents to the question in the online questionnaire. Majority of respondents in this questionnaire stated that they prefer free play games for type of mini games, account for 60% of respondents, while 40% of respondent stated that they prefer structured games. The total number of respondents that prefer free play games are 18 out of 30 respondents, while 12 out of 30 respondents prefer structured games.

15. What kind of style do you like for mini games?

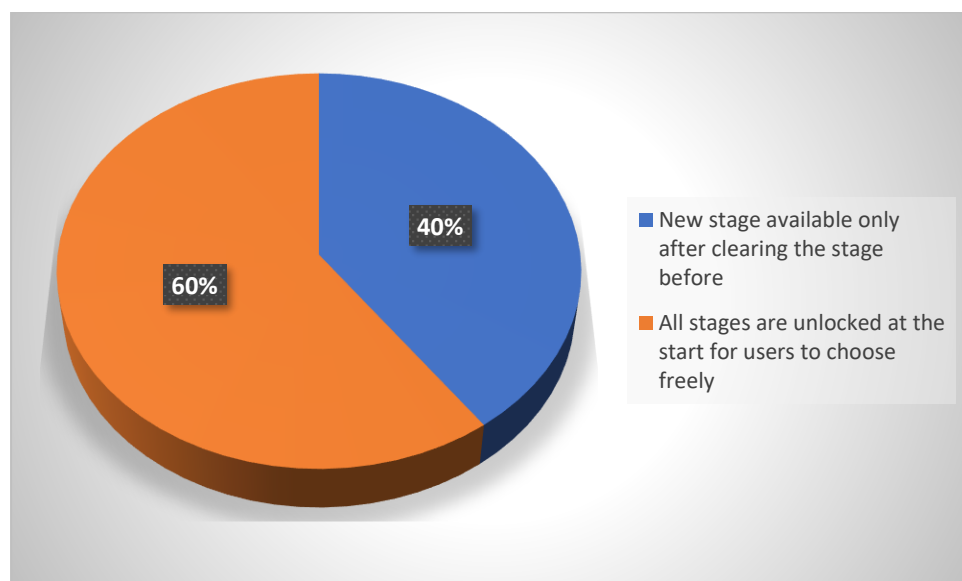


Figure 2.15 Pie chart of mini game style preference

The pie chart shows the answers of 30 respondents to the question in the online questionnaire. Majority of respondents in this questionnaire stated that they prefer all stages are unlocked at the start for users to choose freely, account for 60% of respondents, while 40% of respondents stated that they prefer new stage available only after clearing the stage before. The total number of respondents that prefer all stages are unlocked at the start for users to choose freely are 18 out of 30 respondents, while 12 out of 30 respondents prefer new stage available only after clearing the stage before.

16. Which mini game do you like the most?

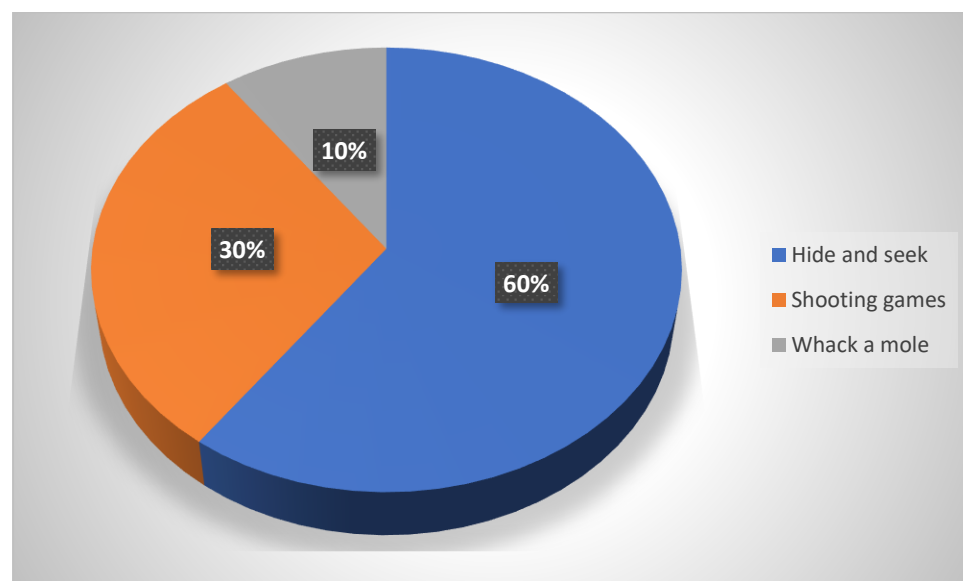


Figure 2.16 Pie chart of mini game preference

The pie chart shows the answers of 30 respondents to the question in the online questionnaire. Majority of respondents in this questionnaire stated that they prefer hide and seek for mini game that they like the most, account for 60% of respondents, while 30% of respondents stated that they prefer shooting games for the mini game that they like the most, and only 10% of respondents stated that they prefer whack a mole for the mini game that they like the most. The total number of respondents that prefer hide and seek are 18 out of 30 respondents, while 9 out of 30 respondents prefer shooting games, and only 3 out of 30 respondents prefer whack a mole.

17. Which style of simulation do you prefer more?

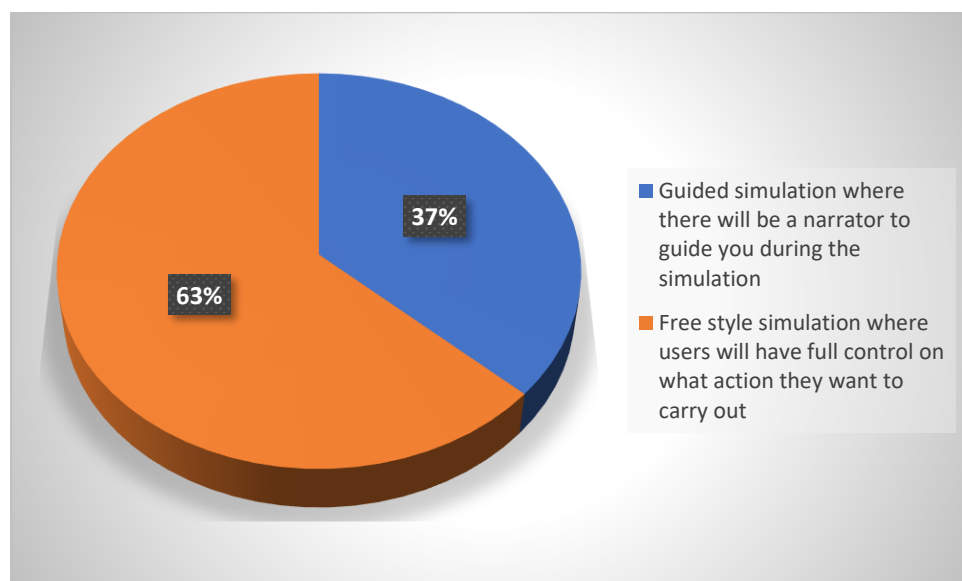


Figure 2.17 Pie chart of simulation style preference

The pie chart shows the answers of 30 respondents to the question in the online questionnaire. Majority of respondents in this questionnaire stated that they prefer free style simulation where users will have full control on what action they want to carry out, account for 63.3% of respondents, while 36.7% of respondents stated that they prefer guided simulation where there will be a narrator to guide you during the simulation. The total number of respondents that prefer free style simulation where users will have full control on what action they want to carry out are 19 out of 30 respondents. While only 11 out of 30 respondents stated that they prefer guided simulation where there will be a narrator to guide you during the simulation.

18. What function do you want on a simulation module?

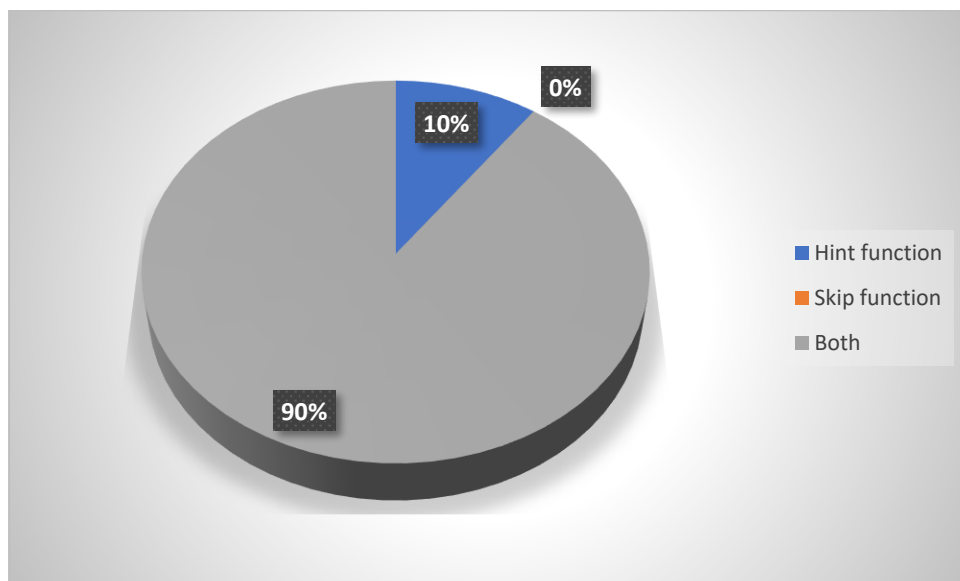


Figure 2.18 Pie chart of simulation function preference

The pie chart shows the answers of 30 respondents to the question in the online questionnaire. Majority of respondents in this questionnaire stated that they prefer both hint function and skip function on a simulation module, account for 90% of respondents, while only 10% of respondents prefer only hint function on a simulation module. The total number of respondents that prefer both hint function and skip function on a simulation module are 27 out of 30 respondents, while only 3 out of 30 respondents stated that they prefer only hint function on a simulation module.

19. Which one do you prefer more for simulation module?

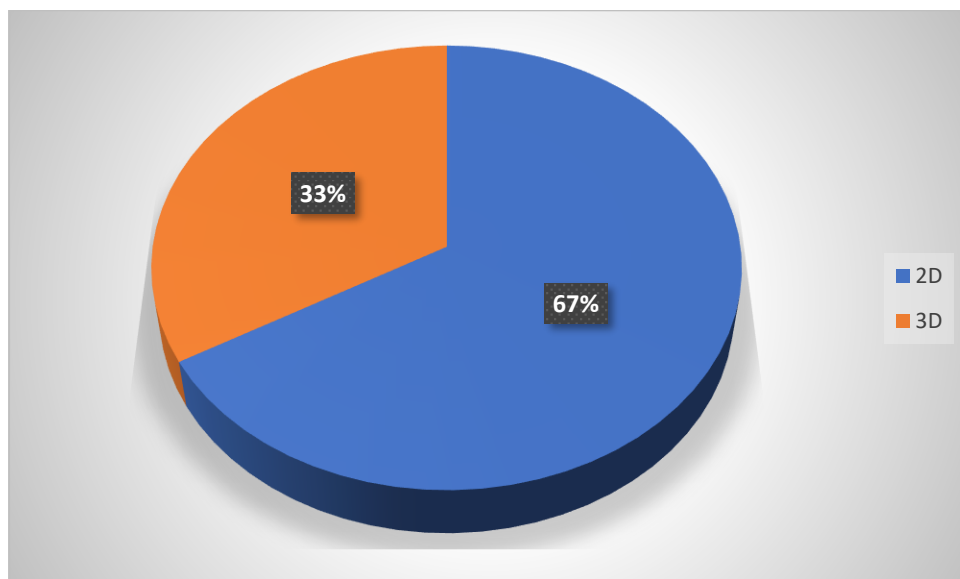


Figure 2.19 Pie chart of simulation animation preference

The pie chart shows the answers of 30 respondents to the question in the online questionnaire. Majority of respondents in this questionnaire stated that they prefer 2D style for simulation module, account for 66.7% of respondents, while only 33.3% of respondents stated that they prefer 3D style for simulation module. The total number of respondents that prefer 2D style for simulation module are 20 out of 30 respondents, while only 10 out of 30 respondents stated that they prefer 3D style for simulation module.

2.7.3 Discussions

Through the data that is being collected from the survey responses, it can be found out that majority of respondents are in the age group of 18-25 years old. The gender however is almost balanced in a 6:4 scale between male and female respondents. Majority of the respondents claimed that they never heard of Lenggong Valley before, but they have further intention and are willing to know more about Lenggong Valley. The methods that they prefer the most to learn more about Lenggong Valley are mostly through edutainment software, and websites followed by a minority of voters that wish to learn from books instead, in this current era, most people prefer using electronic devices like computer or laptop even when it comes to learning stuff and this can be observed through the responds of the respondents for the question. For the usage of computer software to learn about history/geography, some responded yes, and some responded no at a scale of 4:6 for yes and no votes respectively. This is most likely due to secondary school teaching history/geography through the likes of textbooks while university uses computer software more compared to textbooks, hence mixed reviews are received for this question. Every respondent experienced movies/tv shows before and almost every respondent experienced online games before, but some of the respondents responded that they never experienced education games before. Almost every respondent selected either almost everyday or couple times a week as their answer for how often do they use edutainment but there are three outliers in this case that selected couple times a month and rarely. For the satisfaction levels of using edutainment software, 90% of respondents are either satisfied or very satisfied while 10% of them opted for the choice of neutral, this means that no respondents are not satisfied with using edutainment. For education style, majority of respondents prefers education through edutainment(constructivism approach) compared to traditional education at a scale of 8:2. This might be because of people finding education through edutainment funnier and more interactive compared to traditional education. Majority of respondents prefers picture focused style instead of description focused style for map navigation. The reason behind this could be that people prefers looking at pictures instead of bunch of text as description. More than half of the respondents stated that they prefer multiple choice questions as type of quiz while some of them prefers true false questions followed by a very little number of respondents selected matching and

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fill in the blanks as their preferred type of quiz. This is because multiple choice questions and true false questions are more commonly used by the likes of teacher and lecturer to test their students, hence people prefer those more than the other two option. Pictures + Question for quiz question style received more votes than Video + Question and finding answers from paragraphs combined. This shows that people are not willing to spent time to watch video or read paragraphs in order to find answer for the quiz question. For type of mini games that they like, the votes received are fairly even at a 6:4 scale for free play games and structured games respectively. Just like type of mini games, the style of mini games also received votes of 6:4 scale in which 60% of users prefers all stages unlocked at the start while 40% of users prefers new stage available only after clearing previous stage. For mini game preference, more than half of respondents prefers hide and seek while the remaining prefers shooting games and whack a mole. This is because hide and seek is the game that is more often being played by kids hence people like hide and seek more. For simulation style, free style simulation received more votes compared to guided simulation and this result can be predicted as the respondents stated that they prefer free play games hence navigation freedom is a high priority for the respondents. Most of the respondents thinks that both hint function and skip function are suitable for simulation module while a minority of them thinks that skip function is not necessary and only hint function is sufficient. Lastly, 2/3 of respondents prefers 2D simulation module while 1/3 of respondents prefers 3D simulation module. This might be because the respondents are more used to 2D animations such as tv shows, movies, anime, and so on hence more of them have chosen 2D over 3D.

Chapter 3 Methodology and System Design

3.1 Overview

The overview of chapter 3 is the system requirements which includes software requirements and hardware requirements for developers to develop the project, the model that is being used as a standard throughout the project is ADDIE model. As its name suggests, there are 5 steps in ADDIE model which includes analysis, design, development, implementation, and evaluation. ADDIE model helps the likes of developers, designers, lecturers to develop an effective and efficient teaching design [31]. Next, the system flow diagram which will act as a guideline for users when they are trying to use the software to get know of what are menus that are available, what are the modules that are available, what are the submodules that are available, the link between them and so on. Then, the storyboarding design which will act as a guideline for developers in designing the template and the interface of the software [32]. Storyboard will be able to ensure that the flow of a particular page is correct, the functions are being completely implemented into the page without missing anyone of them, what are the multimedia elements such as text, graphic, audio, animation, and video that exist in the page and so on. Lastly, Gantt chart will be used in the project planning topic which will show the dates and progress of both Project 1 and Project 2.

This creative edutainment software for Lenggong Valley consists of 1 start menu, 1 main menu, and 5 modules which includes Quiz Module, Simulation Module, Map Navigation Module, AR Module, and Timeline Module. In some of the modules, there are also submodules. For simulation module, there are two submodules which are Living and Hunting. For map navigation module, there are three submodules which includes Tasik Raban, Lata Kekabu, and Muzium Arkeologi Lenggong. For AR Module, there are two submodules of Vuforia and AR Foundation. For Timeline Module, there are three submodules of How Lenggong got its name, Pre-History, and Skeleton Found.

3.2 System Requirements**3.2.1 Software Requirements**

Elements	Type of software	Description
Text	Notepad	Used for the cutting, copying, and pasting of text elements.
Text	Microsoft Word	Used to edit the text format such as font type, font size, font color, and so on.
Graphics	Adobe Photoshop	Used to edit images obtained from online.
Graphics	Adobe Illustrator	Used to edit vector graphics.
Graphics	Microsoft Power Point	Used to create and design storyboards.
Audio	Adobe Audition	Used to edit audio such as recording of audio and storing as digital audio.
Audio	Sound Forge	Used to combine audio together.
Video	Adobe Premiere	Used to edit video such as cutting and inserting transitions.
Video	Windows Movie Maker	Used to edit video such as cropping it.
Animation	Unity	Used to create augmented reality effects
Animation	Blender	Used to create 3D animation effects
Authoring Tools	Macromedia Director MX 2004	Used to develop cross-platform multimedia presentation, animations, and interaction applications.
Authoring Tools	Adobe Director	Used to create multimedia.

Table 3.01 Table of software requirements

3.2.2 Hardware Requirements

Type of Hardware	Specification
Processor	AMD Ryzen 5 1400 Quad-Core Processor 3.20 GHz
Physical Memory(RAM)	16.0 GB
Hard Disk Drive	1TB
Display & Graphics	Radeon(TM) RX 460 Graphics
Expansion Ports	Three USB 2.0/3.0
Audio	Speakers, Headset
Communication Devices	Wired
System	X64-based processor

Table 3.02 Table of hardware requirements

3.3 ADDIE model

In this part, methodologies of the project will be described. ADDIE model will be used during the development of this project. There are five steps of ADDIE model which includes Analysis, Design, Development, Implementation, and Evaluation. According to [34], the five steps are equally significant but in general Design Phase and Development Phase requires the most effort compared to other three phases are Analysis Phase, Implementation Phase, and Evaluation Phase.

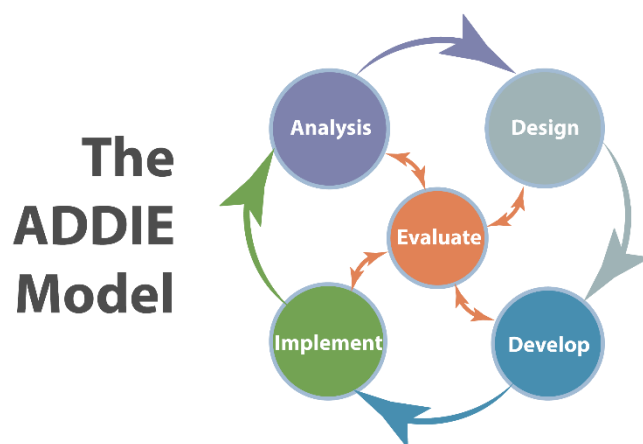


Figure 3.01 ADDIE Model [33]

3.3.1 Analysis Phase

In the analysis phase, everything has to be analyzed such as the current situation that are related to the topic, what are the circumstances that will happen followed by what kind of actions, what needs to be done, what are the things that are required in order to create a good prototype, what are the problem statement of the current existing stuff related to the project, which kind of target audience that are being targeted as potential users of the system, what is the outcome of the project, what tools are needed in terms of software and hardware requirements to be used throughout the project, what are the options that are available to choose from, what are the goals that needs to be achieved, and a lot more analysis to be done during this phase [35]. This phase is the backbone of the model since everything starts from here. The project scope and objectives needs to be defined during this phase after taking into consideration about all the analysis that had been done. A lot of doubts needs to be cleared in this phase before proceeding into the next stage of design phase. Simple ways to analyse is to ask wh questions such as who, what, where, when, why, which, and lastly how [36].

During this phase, the author will carry out literature review, define problem statement, define project scope, define project objectives, survey questionnaire data collection, and data analysis. Then, development tools that will be used are decided after analysis and Gantt chart about time planning will also be done for FYP1 and FYP2. At the end of this phase, expected results are literature review findings, project scope, project objectives, and most importantly the overall plan of the project and acknowledging the needs that are crucial for the project to success.

3.3.2 Design Phase

In the design phase, analysis that had been done during the analysis phase will be used and referred to in order to make good decisions about how to approach the design of the prototype. The instructional, technical, as well as visual design scheme will be documented and finalized during this phase [35]. Storyboards will be designed in order to have a brief idea and concepts about how the menus and modules will look like. After that, further improvements and adjustments will be carried out for the design. Besides, user interface will also be designed in this phase based on user requirements and preferences received through survey feedbacks. Then, the flowchart and flow diagram

will also be created based on the storyboarding designs of each individual storyboard [36].

During this phase, the author will create storyboards to have brief idea and concepts about the creative edutainment software, user interface will be designed as well as detailed descriptions and flow diagram will be added to all storyboards. At the end of this phase, expected results are flowchart, storyboard, storyboard flow diagrams, and overall design of the software.

3.3.3 Development

In the development phase, this is where the building process starts. The developer will utilize data obtained from the analysis phase and design phase in order to create the prototype [35]. At this point, content ideas must be already finalized and the developing process will start in which a prototype will be able to be created in order for users to visualize and use them [36].

During this phase, the author will create and develop the prototype according to the the design and the content ideas of storyboards done during the previous phase. The texts, buttons, background, graphics and so on will be designed and imported into the Macromedia Director MX 2004 and this software will be used to combine all the sources mentioned just now together and lay out the contents visually so that the storyboard design can be observed as the form of prototype. After that, Marcomedia can also be used to enhance the graphics by adding in animations to the graphics. Then, it is time to develop the user interface. In order to create a good user interface, it is crucial to take note on aspects such as font style and size, consistency of the user interface design, size of buttons and graphics, as well as interactivity. As the developing process is going on, testing will also be conducted simultaneously in order to make sure that no error happens during the development process due to factors such as human error. If everything is going smoothly, the whole prototype should be finished during this phase. At the end of this phase, expected results are the entire creative edutainment

software for Lenggong Valley with everything such as start menu, main menu, and all five modules are being done.

3.3.4 Implementation

In the implementation phase, the prototype will be delivered to the target audience in order for them to carry out testing and provide feedback regarding to their opinion towards the prototype. Designers will be constantly analyzing feedback and make adjustments based on it in order to enhance the prototype to improve user satisfaction [35]. There are several ways that can be deliver the prototype such as classroom-based, lab-based, or computer-based. In this case, the approach that will be used is computer-based and developer will be required to monitor closely about the issues that occur during the testing [36].

During this phase, the author will publish the developed system through Macromedia Director MX 2004's publish function. A .exe file will be published and then send to potential target audience for them to observe and test the prototype. Then, the developer will guide the testers with introduction and explanation towards the features and functions that exist in the prototype such as which one is the button, what is its function, how to navigate back and forth of the modules and menus, and so on. Next, users will try it out and experience under the assistance of the developer if needed. Then, testing results will be recorded and used as a reference to how to improve and enhance the prototype. At the end of this phase, expected results are testing results and feedbacks of the software.

3.3.5 Evaluation

For the evaluation phase, there are some misconceptions for this part in which majority will assume that all the phases will go in sequence like analysis phase first, followed by design phase, followed by development phase, followed by implementation phase, then only will evaluation phase start. But this is actually wrong, in fact evaluation phase happens simultaneously throughout every phase. This is because in order to prevent errors, evaluation actually occurs without the developer even noticed it going on. As example, the evaluation of design in which the developer decides that this particular design is not good due to reason such as inconsistent, not user friendly and so on is

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considered as evaluation. So, this phase is ongoing from time to time throughout the whole project and it had reached the final step. The final step is to collect feedback from users through surveys after their testing about factors such as satisfaction levels on using the prototype, what are the weakness that exists that needs to be fixed, what are the aspects that can be enhanced and improve, and so on. All these data will be collected and analyzed by the developer . Lastly, improvements and adjustments will be made according to the data acquired after analyzing them.

During this phase, the author will evaluate the prototype from time to time in order to make sure that no errors will occur. Testing sessions will be conducted in order for users to test the creative edutainment software. Then author will prepare survey questionnaires in order to collect feedback data from users after testing sessions. This will be followed by further evaluation of the software in order to enhance and improve it according to user needs so that at the end an effective and efficient creative edutainment software can be finished. At the end of this phase, expected results are a finalized prototyped which is the final product of this project of creative edutainment software for Lenggong Valley.

3.4 System Flow Diagram

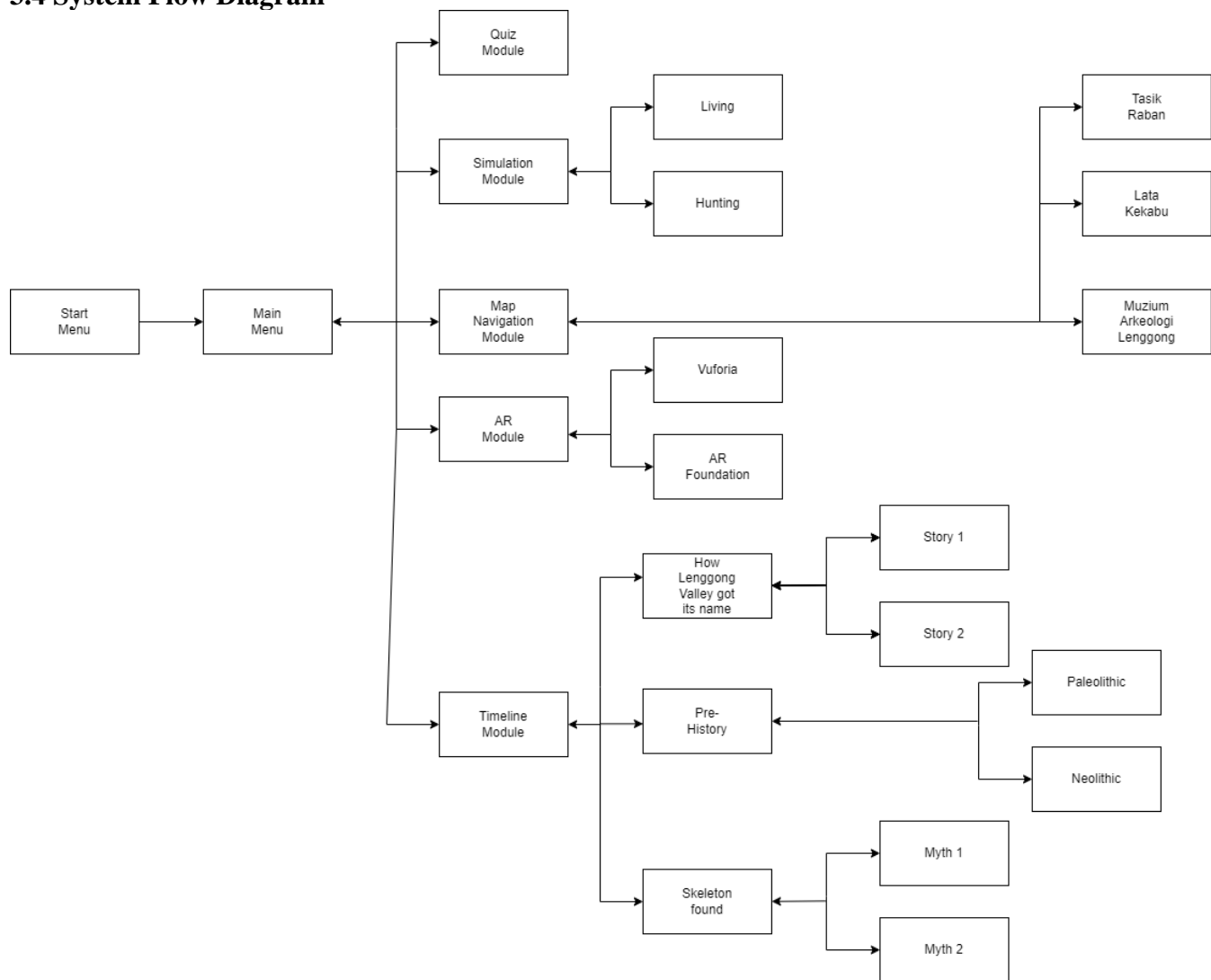


Table 3.02 System Flow Diagram

3.5 Storyboarding Design

Storyboard No: Storyboard 1

Topic: Start Menu

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)



Figure 3.02 Storyboard of start menu

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G1: This is a graphic element. It serves as a background image for start menu.</p> <p>T1: This is a text element. It serves as the title of the system.</p> <p>A1: This is an audio element. It serves as the background music for start menu.</p> <p>B1: This is a button element. It serves as an information button where users can click to gain more information related to the page.</p> <p>B2: This is a button element. It is used to support turn on background music function.</p> <p>B3: This is a button element. It is used to support mute background music function.</p> <p>B4: This is a button element. It is used to navigate user to the main menu.</p> <p>B5: This is a button element. It is used to navigate user to exit the application.</p>	<pre> graph TD Start([Start]) --> Display[Display G1, T1, B1, B2, B3, B4, B5] Display --> Click{Click on the button} Click -- No --> Display Click -- Yes --> Frame[Display the respective frame that use click] Frame --> End([End]) </pre>

Table 3.03 Flow Diagram and Description of Start Menu

Storyboard No: Storyboard 2

Topic: Start Menu Inquiry

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)



Figure 3.03 Storyboard of Start Menu Information

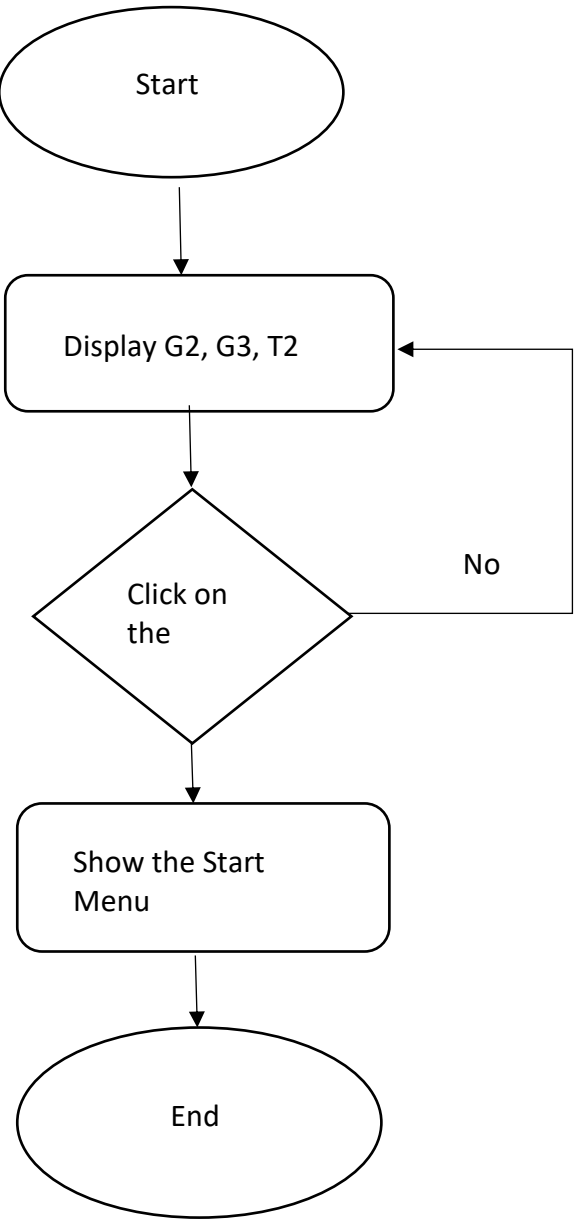
Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G2: This is a graphic element. It serves as a picture of Perak Man.</p> <p>G3: This is a graphic element. It serves as a picture of chat bubble.</p> <p>T2: This is a text element. It serves as the information for the start menu.</p> <p>M1: After the information button (B1) is clicked, G2 will first appear on the screen, followed by G3, and then lastly T2 will slide in from left to right.</p>	 <pre> graph TD Start([Start]) --> Display[Display G2, G3, T2] Display --> Click{Click on the} Click -- No --> Display Click --> Show[Show the Start Menu] Show --> End([End]) </pre> <p>The flowchart illustrates the process of displaying the start menu. It begins with a 'Start' terminal, followed by a process box 'Display G2, G3, T2'. A decision diamond 'Click on the' follows, with a 'No' path looping back to the 'Display' box. The 'Yes' path leads to 'Show the Start Menu', which then leads to the 'End' terminal.</p>

Table 3.04 Flow Diagram and Description of Start Menu Information

Storyboard No: Storyboard 3

Topic: Main Menu

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)



Figure 3.04 Storyboard of Main Menu

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G4: This is a graphic element. It serves as a background image for main menu.</p> <p>T3: This is a text element. It serves as the title of the system.</p> <p>A1: This is an audio element. It serves as the background music for main menu.</p> <p>B1: This is a button element. It serves as an information button where users can click to gain more information related to the page.</p> <p>B2: This is a button element. It is used to support turn on background music function.</p> <p>B3: This is a button element. It is used to support mute background music function.</p> <p>B6: “Quiz” button element which will navigate user to respective interface.</p> <p>B7: “Simulation” button element which will navigate user to respective interface.</p> <p>B8: “Map Navigation” button element which will navigate user to respective interface.</p> <p>B9: “AR” button element which will navigate user to respective interface.</p> <p>B10: “Timeline” button element which will navigate user to respective interface.</p> <p>B11: This is a button element. It is used to navigate the user to exit the application.</p>	<pre> graph TD Start([Start]) --> Display[Display G4, T3, B1, B2, B3, B6, B7, B8, B9, B10, and B11] Display --> ClickB11{Click on B11} Display --> ClickB6_7_8_9_10{Click on B6, B7, B8, B9, B10} ClickB11 -- Yes --> Exit[Exit the application.] ClickB11 -- No --> Display ClickB6_7_8_9_10 -- Yes --> DisplayFrame[Display the respective frame that use click] ClickB6_7_8_9_10 -- No --> Display Exit --> End([End]) DisplayFrame --> End </pre>

Table 3.05 Flow Diagram and Description of Main Menu

Storyboard No: Storyboard 4

Topic: Main Menu Information

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)



Figure 3.05 Storyboard of Main Menu Information

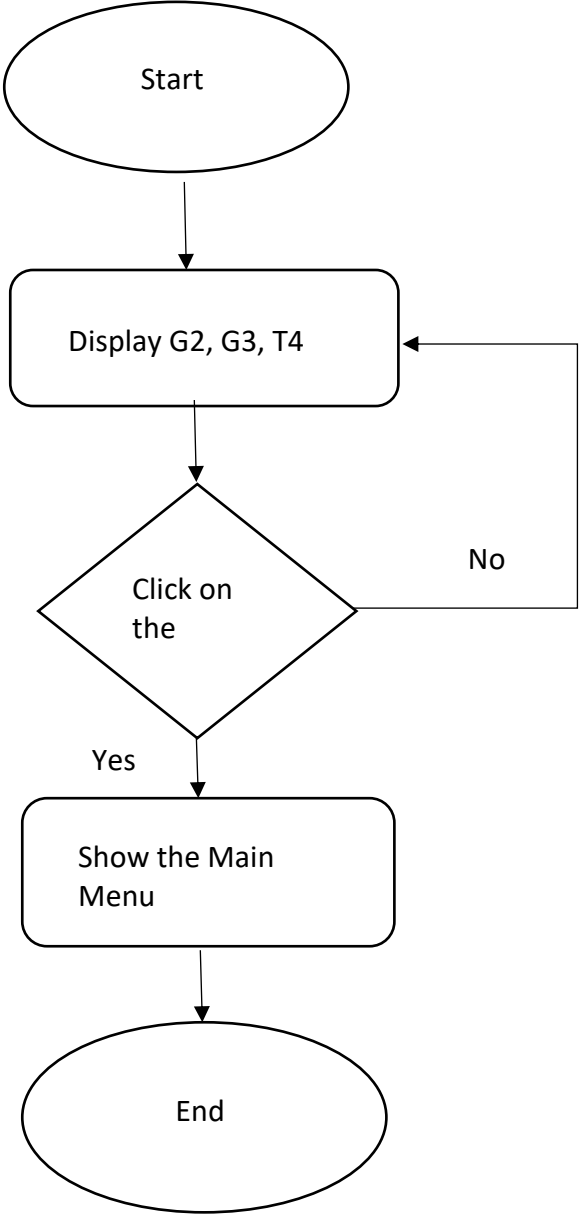
Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G2: This is a graphic element. It serves as a picture of Perak Man.</p> <p>G3: This is a graphic element. It serves as a picture of chat bubble.</p> <p>T4: This is a text element. It serves as the information for the main menu.</p> <p>M2: After the information button (B1) is clicked, G2 will first appear on the screen, followed by G3, and then lastly T4 will slide in from left to right.</p>	 <pre> graph TD Start([Start]) --> Display[Display G2, G3, T4] Display --> Click{Click on the} Click -- No --> Display Click -- Yes --> Show[Show the Main Menu] Show --> End([End]) </pre> <p>The flowchart illustrates the process of displaying the main menu. It begins with a 'Start' terminal, followed by a process box 'Display G2, G3, T4'. A decision diamond 'Click on the' follows. If the user does not click (No), the flow loops back to the 'Display G2, G3, T4' process. If the user clicks (Yes), the flow proceeds to a process box 'Show the Main Menu', which then leads to an 'End' terminal.</p>

Table 3.06 Flow Diagram and Description of Main Menu Information

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Storyboard No: Storyboard 5

Topic: Quiz Module

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)



Figure 3.06 Storyboard of Quiz Module

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G5: This is a graphic element. It serves as a background image for quiz module.</p> <p>G6: This is a graphic element. It serves as a question board.</p> <p>G7: This is a graphic element. It serves as a photo related to the question.</p> <p>T5: This is a text element. It serves as the quiz question.</p> <p>A1: This is an audio element. It serves as the background music for quiz module.</p> <p>B1: This is a button element. It serves as an information button where users can click to gain more information related to the page.</p> <p>B2: This is a button element. It is used to support turn on background music function.</p> <p>B3: This is a button element. It is used to support mute background music function.</p> <p>B12: This is a button element. It is used to navigate user to the main menu.</p> <p>B13: Multiple choice question, “A” option for user to choose the answer. It is a button element for user to click to select the answer.</p> <p>B14: Multiple choice question, “B” option for user to choose the answer. It is a button element for user to click to select the answer.</p> <p>B15: Multiple choice question, “C” option for user to choose the answer. It is a button element for user to click to select the answer.</p> <p>B16: Multiple choice question, “D” option for user to choose the answer. It is a button element for user to click to select the answer.</p>	<pre> graph TD Start([Start]) --> Display[Display G5, G6, G7, T5, B1, B2, B3, B12, B13, B14, B15, B16] Display --> Click{Click on the button} Click -- No --> Display Click -- Yes --> Frame[Display the respective frame that use click] Frame --> End([End]) </pre>

Table 3.07 Flow Diagram and Description of Quiz Module

Storyboard No: Storyboard 6

Topic: Quiz Module Information

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)



Figure 3.07 Storyboard of Quiz Module Information

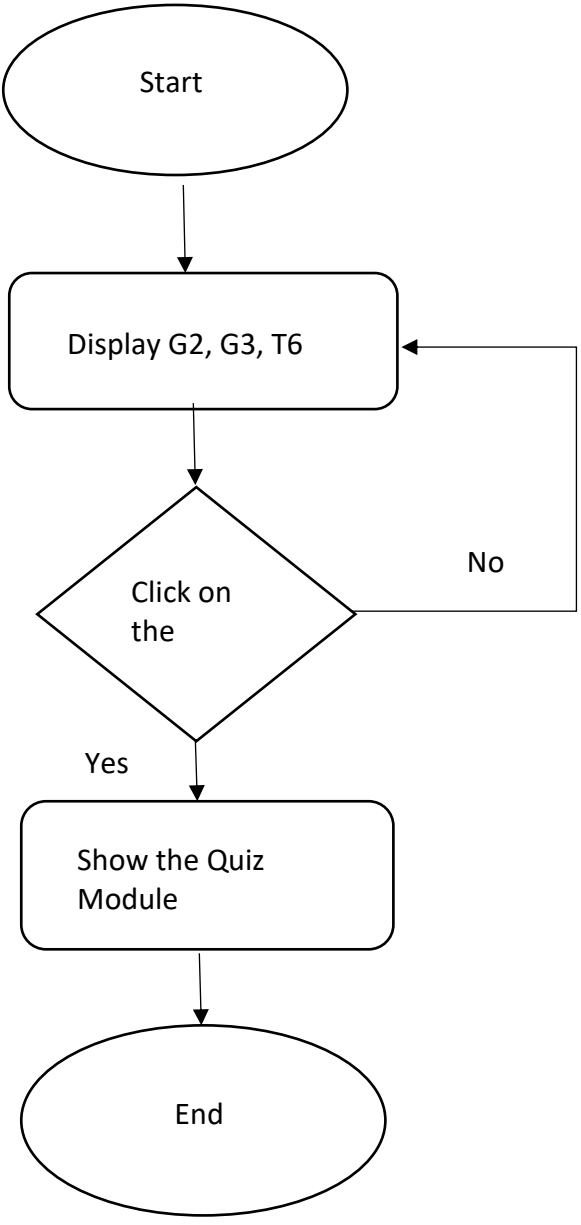
Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G2: This is a graphic element. It serves as a picture of Perak Man.</p> <p>G3: This is a graphic element. It serves as a picture of chat bubble.</p> <p>T6: This is a text element. It serves as the information for the main menu.</p> <p>M3: After the information button (B1) is clicked, G2 will first appear on the screen, followed by G3, and then lastly T6 will slide in from left to right.</p>	 <pre> graph TD Start([Start]) --> Display[Display G2, G3, T6] Display --> Click{Click on the} Click -- No --> Display Click -- Yes --> Show[Show the Quiz Module] Show --> End([End]) </pre> <p>The flowchart illustrates the process of displaying quiz module information. It begins with a 'Start' terminal, leading to a process box 'Display G2, G3, T6'. This is followed by a decision diamond 'Click on the'. If the user does not click (No), the flow loops back to the 'Display G2, G3, T6' process. If the user clicks (Yes), the flow proceeds to a process box 'Show the Quiz Module', which then leads to an 'End' terminal.</p>

Table 3.08 Flow Diagram and Description of Quiz Module Information

Storyboard No: Storyboard 7

Topic: Quiz Sub Module - Correct Answer

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)



Figure 3.08 Storyboard of Quiz Sub Module - Correct Answer

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G8: This is a graphic element. It serves as a picture of a caveman.</p> <p>G9: This is a graphic element. It serves as a picture of chat bubble.</p> <p>G10: This is a graphic element. It serves as a picture of a tick.</p> <p>T7: This is a text element. It serves as the indicator that the user answered the quiz correctly.</p> <p>B17: This is a button element. It serves as a proceed button where user can click to go to the next question.</p> <p>M4: After the correct answer button is clicked, G8 will first appear on the screen, followed by G9, and then lastly T7 will slide in from left to right.</p>	<pre> graph TD Start([Start]) --> Display[Display G8, G9, G10, T7, B17] Display --> Click{Click on the button} Click -- No --> Display Click -- Yes --> Frame[Display the respective frame that use click] Frame --> End([End]) </pre>

Table 3.09 Flow Diagram and Description of Quiz Sub Module - Correct Answer

Storyboard No: Storyboard 8

Topic: Quiz Sub Module - Wrong Answer

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)



Figure 3.09 Storyboard of Quiz Sub Module - Wrong Answer

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G11: This is a graphic element. It serves as a picture of a caveman.</p> <p>G9: This is a graphic element. It serves as a picture of chat bubble.</p> <p>G12: This is a graphic element. It serves as a picture of a cross.</p> <p>T8: This is a text element. It serves as the indicator that the user answered the quiz wrongly.</p> <p>B18: This is a button element. It serves as a restart button where user can click to try the question again.</p> <p>M5: After the wrong answer button is clicked, G11 will first appear on the screen, followed by G9, and then lastly T8 will slide in from left to right.</p>	<pre> graph TD Start([Start]) --> Display[Display G9, G11, G12, T8, B18] Display --> Click{Click on the button} Click -- No --> Display Click -- Yes --> Frame[Display the respective frame that use click] Frame --> End([End]) </pre>

Table 3.10 Flow Diagram and Description of Quiz Sub Module - Wrong Answer

Storyboard No: Storyboard 9

Topic: Simulation Module

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)

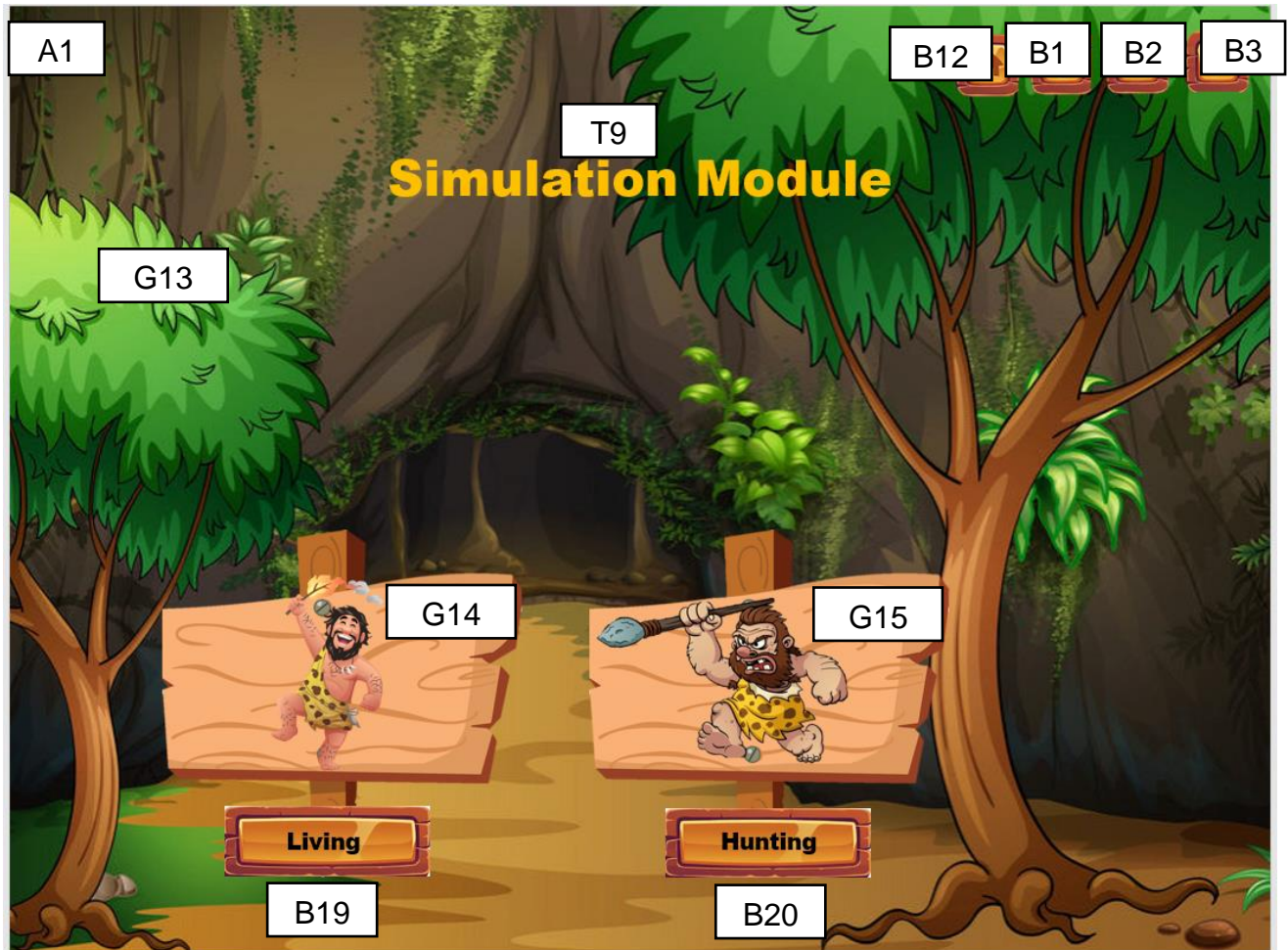


Figure 3.10 Storyboard of Simulation Module

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G13: This is a graphic element. It serves as a background image for simulation module.</p> <p>G14: This is a graphic element. It serves as a signboard with caveman picture on it.</p> <p>G15: This is a graphic element. It serves as a signboard with caveman picture on it.</p> <p>T9: This is a text element. It serves as the title of the system.</p> <p>A1: This is an audio element. It serves as the background music for simulation module.</p> <p>B1: This is a button element. It serves as an information button where users can click to gain more information related to the page.</p> <p>B2: This is a button element. It is used to support turn on background music function.</p> <p>B3: This is a button element. It is used to support mute background music function.</p> <p>B12: This is a button element. It is used to navigate user to the main menu.</p> <p>B19: This is a button element. It is used to navigate user to the Living submodule.</p> <p>B20: This is a button element. It is used to navigate user to the Hunting submodule.</p>	<pre> graph TD Start([Start]) --> Display[Display G5, G6, G7, T5, B1, B2, B3, B12, B13, B14, B15, B16] Display --> Click{Click on the button} Click -- No --> Display Click -- Yes --> Frame[Display the respective frame that use click] Frame --> End([End]) </pre>

Table 3.11 Flow Diagram and Description of Simulation Module

Storyboard No: Storyboard 10

Topic: Simulation Module Information

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)

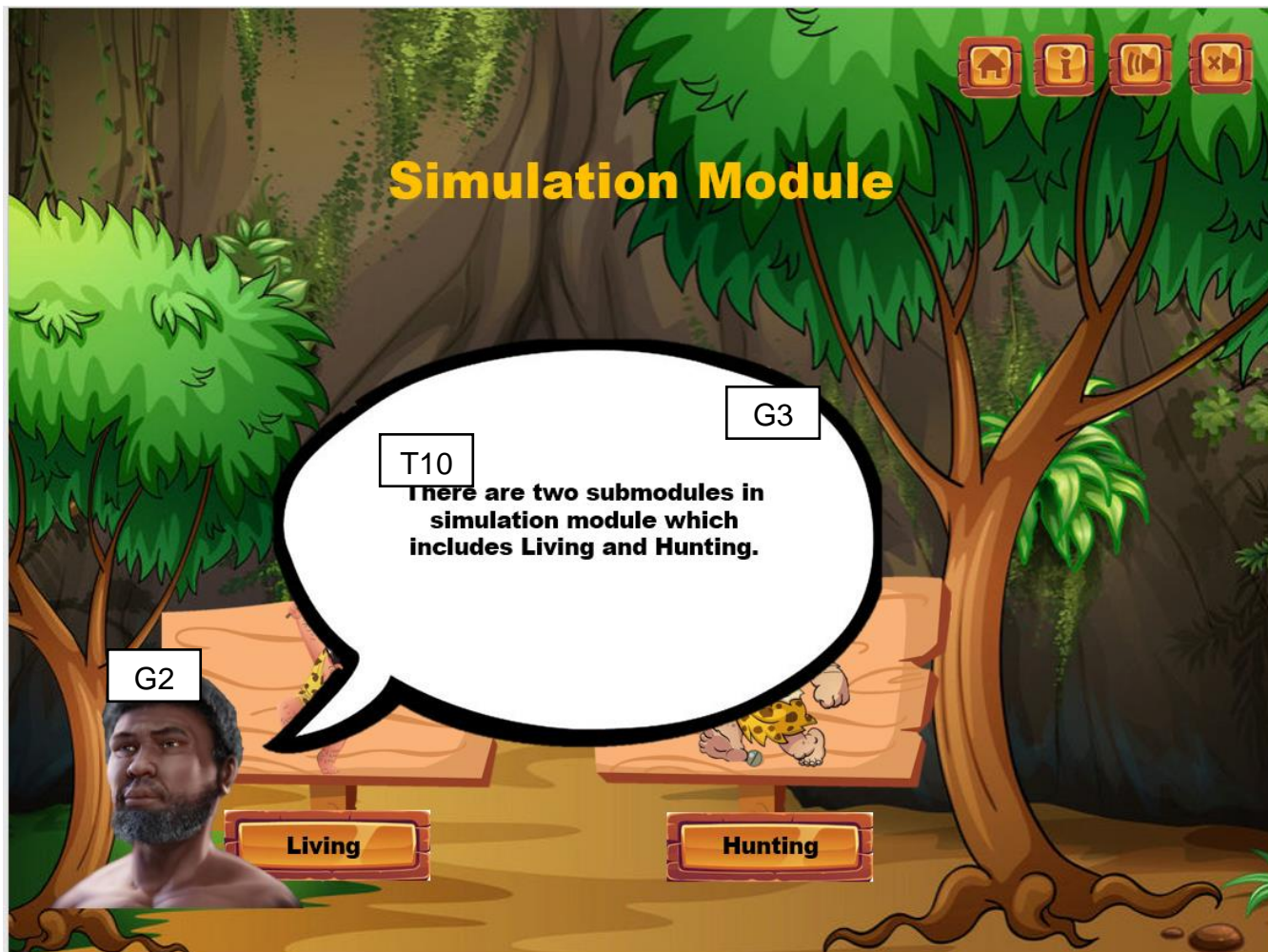


Figure 3.11 Storyboard of Simulation Module Information

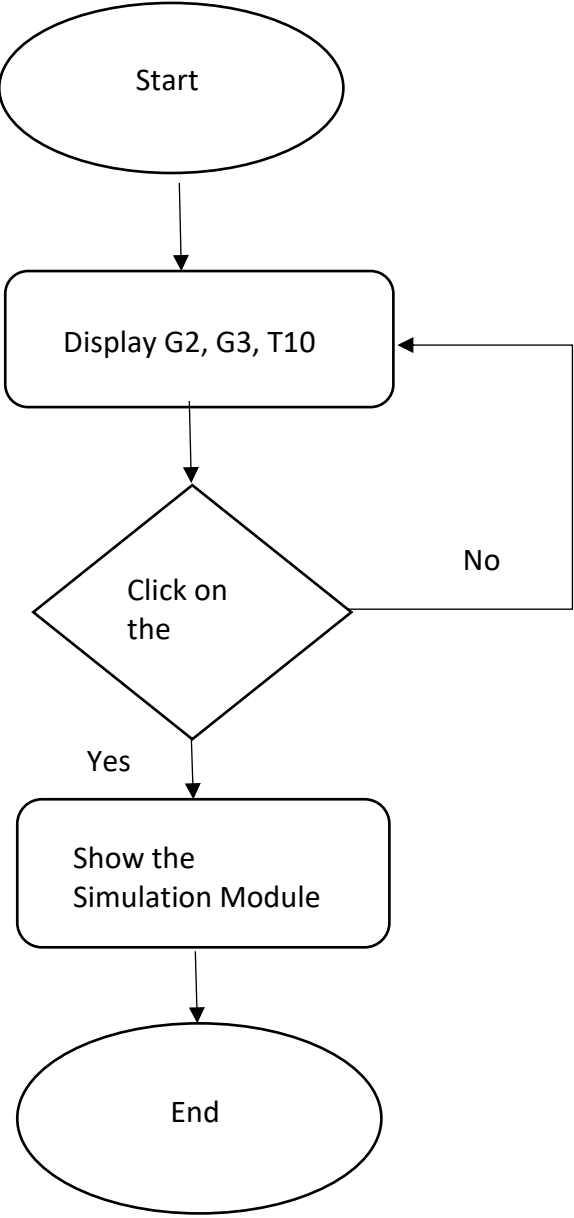
Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G2: This is a graphic element. It serves as a picture of Perak Man.</p> <p>G3: This is a graphic element. It serves as a picture of chat bubble.</p> <p>T10: This is a text element. It serves as the information for the simulation module.</p> <p>M6: After the information button (B1) is clicked, G2 will first appear on the screen, followed by G3, and then lastly T10 will slide in from left to right.</p>	 <pre> graph TD Start([Start]) --> Display[Display G2, G3, T10] Display --> Click{Click on the} Click -- No --> Display Click -- Yes --> Show[Show the Simulation Module] Show --> End([End]) </pre> <p>The flowchart illustrates the process of displaying simulation module information. It begins with a 'Start' terminal, leading to a process box 'Display G2, G3, T10'. This is followed by a decision diamond 'Click on the'. If the user does not click (No), the flow loops back to the 'Display G2, G3, T10' process. If the user clicks (Yes), the flow proceeds to a process box 'Show the Simulation Module', which then leads to an 'End' terminal.</p>

Table 3.12 Flow Diagram and Description of Simulation Module Information

Storyboard No: Storyboard 11

Topic: Simulation Sub Module - Living

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)

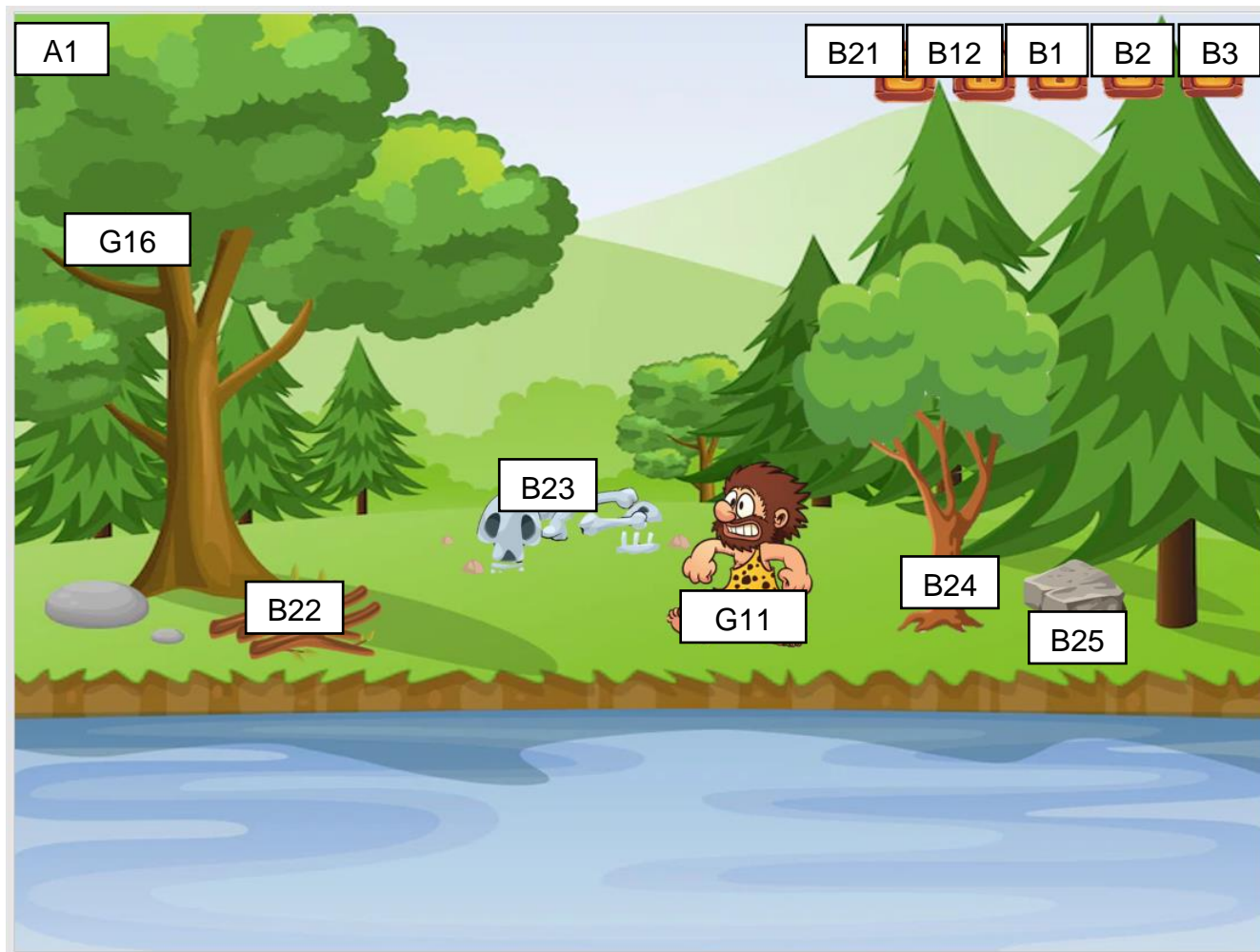


Figure 3.12 Storyboard of Simulation Sub Module - Living

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G11: This is a graphic element. It serves as a picture of a caveman.</p> <p>G16: This is a graphic element. It serves as a background image for Living submodule.</p> <p>A1: This is an audio element. It serves as the background music for Living submodule.</p> <p>B1: This is a button element. It serves as an information button where users can click to gain more information related to the page.</p> <p>B2: This is a button element. It is used to support turn on background music function.</p> <p>B3: This is a button element. It is used to support mute background music function.</p> <p>B12: This is a button element. It is used to navigate user to the main menu.</p> <p>B21: This is a button element. It is used to navigate user to the Simulation Module.</p> <p>B22: This is a button element. It is used to trigger the action of lighting a fire.</p> <p>B23: This is a button element. It is used to trigger the action of building a camp.</p> <p>B24: This is a button element. It is used to trigger the action of chopping a tree.</p> <p>B25: This is a button element. It is used to trigger the action of making a weapon.</p>	<pre> graph TD Start([Start]) --> Display[Display G11, G16, B1, B2, B3, B12, B21, B22, B23, B24, B25] Display --> Click{Click on the button} Click -- No --> Display Click -- Yes --> Frame[Display the respective frame that use click] Frame --> End([End]) </pre>

Table 3.13 Flow Diagram and Description of Simulation Sub Module - Living

Storyboard No: Storyboard 12

Topic: Simulation Sub Module - Living Information

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)



Figure 3.13 Storyboard of Simulation Sub Module - Living Information

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G2: This is a graphic element. It serves as a picture of Perak Man.</p> <p>G3: This is a graphic element. It serves as a picture of chat bubble.</p> <p>T11: This is a text element. It serves as the information for the Living submodule.</p> <p>M7: After the information button (B1) is clicked, G2 will first appear on the screen, followed by G3, and then lastly T11 will slide in from left to right.</p>	<pre> graph TD Start([Start]) --> Display[Display G2, G3, T11] Display --> Click{Click on the} Click -- No --> Display Click -- Yes --> Show[Show the Living submodule] Show --> End([End]) </pre>

Table 3.14 Flow Diagram and Description of Simulation Sub Module - Living Information

Storyboard No: Storyboard 13

Topic: Simulation Sub Module - Hunting

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)

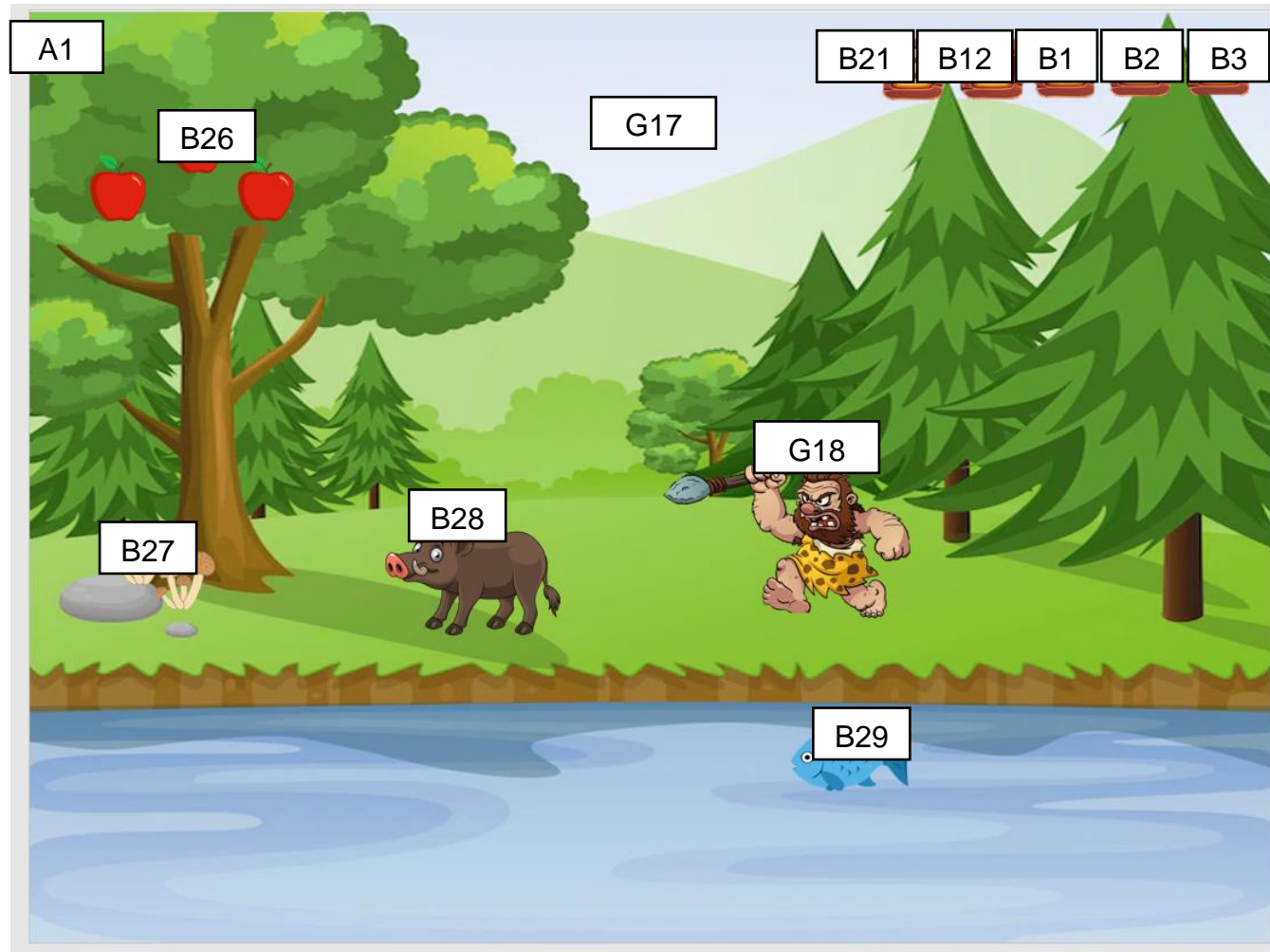


Figure 3.14 Storyboard of Simulation Sub Module - Hunting

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G17: This is a graphic element. It serves as a background image for Hunting submodule.</p> <p>G18: This is a graphic element. It serves as a picture of a caveman with a weapon.</p> <p>A1: This is an audio element. It serves as the background music for Hunting submodule.</p> <p>B1: This is a button element. It serves as an information button where users can click to gain more information related to the page.</p> <p>B2: This is a button element. It is used to support turn on background music function.</p> <p>B3: This is a button element. It is used to support mute background music function.</p> <p>B12: This is a button element. It is used to navigate user to the main menu.</p> <p>B21: This is a button element. It is used to navigate user to the Simulation Module.</p> <p>B26: This is a button element. It is used to trigger the action of getting an apple.</p> <p>B27: This is a button element. It is used to trigger the action of getting mushroom.</p> <p>B28: This is a button element. It is used to trigger the action of hunting the wild boar.</p> <p>B29: This is a button element. It is used to trigger the action of catching a fish.</p>	<pre> graph TD Start([Start]) --> Display[Display G17, G18, B1, B2, B3, B12, B21, B26, B27, B28, B29] Display --> Click{Click on the button} Click -- No --> Display Click -- Yes --> Frame[Display the respective frame that use click] Frame --> End([End]) </pre>

Table 3.15 Flow Diagram and Description of Simulation Sub Module - Hunting

Storyboard No: Storyboard 14

Topic: Simulation Sub Module - Hunting Information

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)

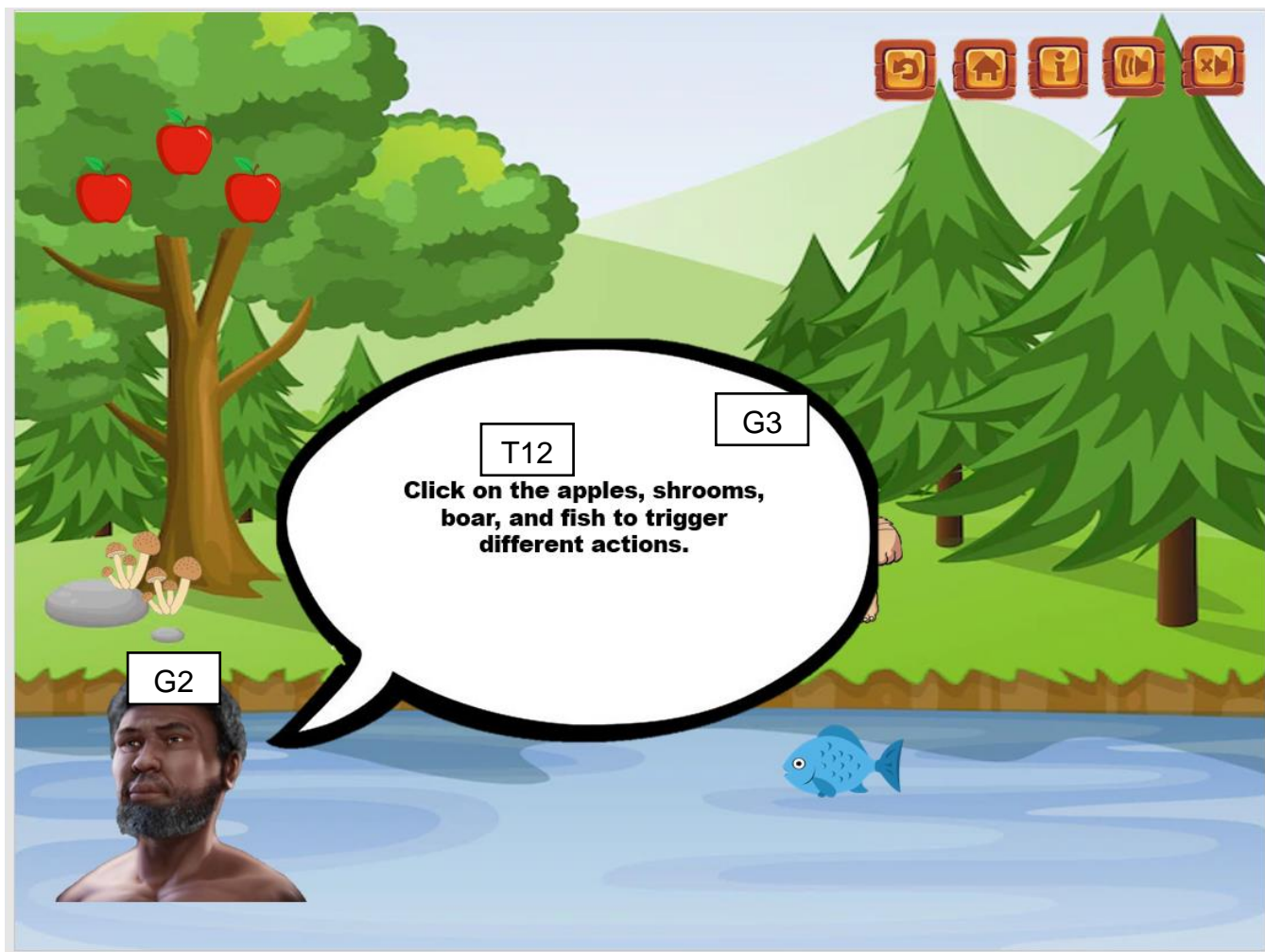


Figure 3.15 Storyboard of Simulation Sub Module - Hunting Information

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G2: This is a graphic element. It serves as a picture of Perak Man.</p> <p>G3: This is a graphic element. It serves as a picture of chat bubble.</p> <p>T12: This is a text element. It serves as the information for the Hunting submodule.</p> <p>M8: After the information button (B1) is clicked, G2 will first appear on the screen, followed by G3, and then lastly T12 will slide in from left to right.</p>	<pre> graph TD Start([Start]) --> Display[Display G2, G3, T12] Display --> Click{Click on the} Click -- No --> Display Click -- Yes --> Show[Show the Hunting submodule] Show --> End([End]) </pre>

Table 3.16 Flow Diagram and Description of Simulation Sub Module - Hunting Information

Storyboard No: Storyboard 15

Topic: Map Navigation Module

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)

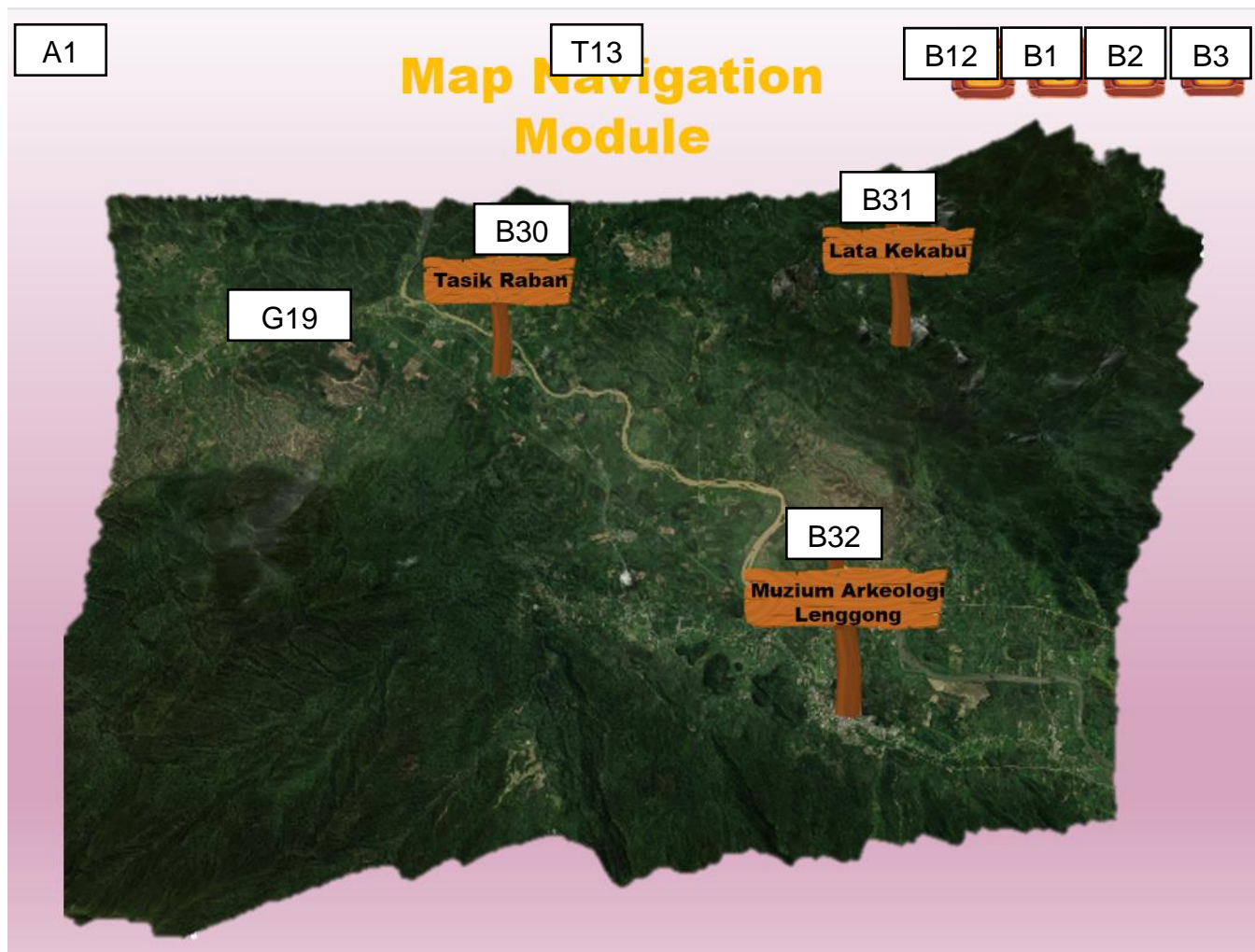


Figure 3.16 Storyboard of Map Navigation Module

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G19: This is a graphic element. It serves as a background image for map navigation module.</p> <p>T13: This is a text element. It serves as the title of the system.</p> <p>A1: This is an audio element. It serves as the background music for Map Navigation module.</p> <p>B1: This is a button element. It serves as an information button where users can click to gain more information related to the page.</p> <p>B2: This is a button element. It is used to support turn on background music function.</p> <p>B3: This is a button element. It is used to support mute background music function.</p> <p>B12: This is a button element. It is used to navigate user to the main menu.</p> <p>B30: This is a button element. It is used to navigate user to the Tasik Raban submodule.</p> <p>B31: This is a button element. It is used to navigate user to the Lata Kekabu submodule.</p> <p>B32: This is a button element. It is used to navigate user to the Muzium Arkeologi Lenggong submodule.</p>	<pre> graph TD Start([Start]) --> Display[Display G19, T13, B1, B2, B3, B12, B30, B31, B32] Display --> Click{Click on the button} Click -- No --> Display Click -- Yes --> DisplayFrame[Display the respective frame that use click] DisplayFrame --> End([End]) </pre>

Table 3.17 Flow Diagram and Description of Map Navigation Module

Storyboard No: Storyboard 16

Topic: Map Navigation Module Information

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)

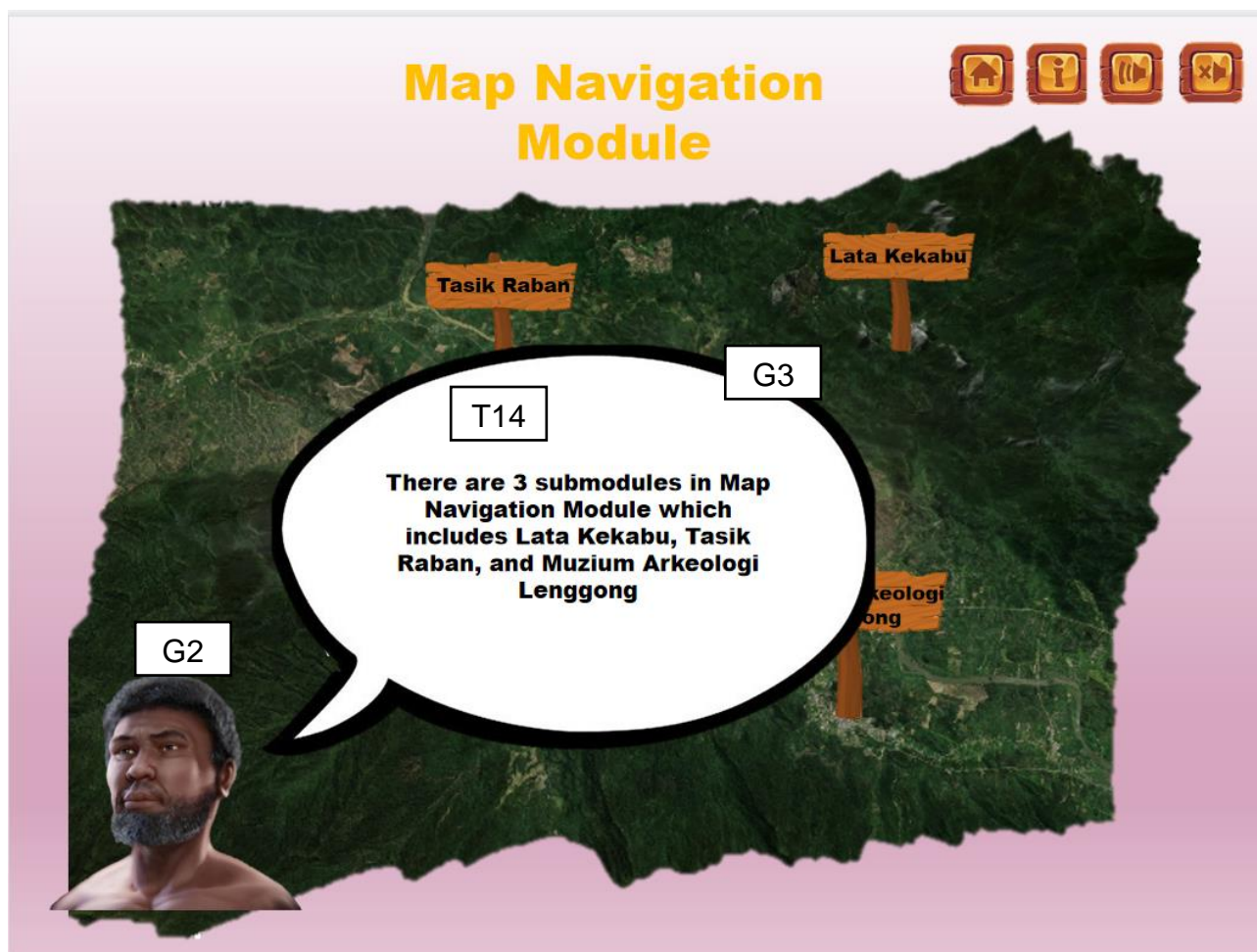


Figure 3.17 Storyboard of Map Navigation Module Information

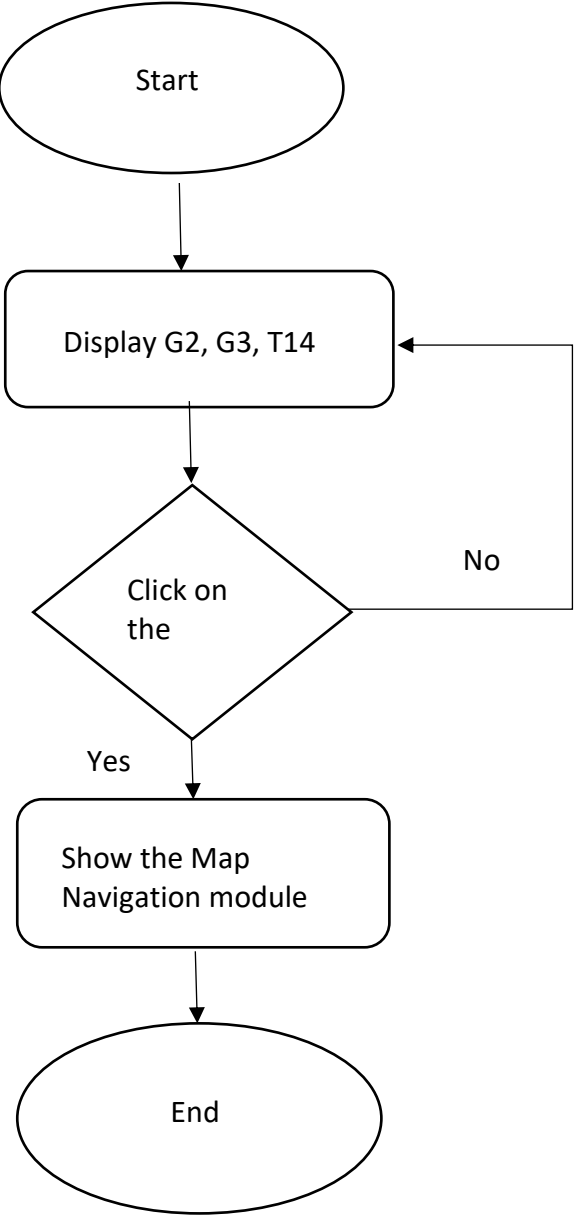
Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G2: This is a graphic element. It serves as a picture of Perak Man.</p> <p>G3: This is a graphic element. It serves as a picture of chat bubble.</p> <p>T14: This is a text element. It serves as the information for the Map Navigation submodule.</p> <p>M9: After the information button (B1) is clicked, G2 will first appear on the screen, followed by G3, and then lastly T14 will slide in from left to right.</p>	 <pre> graph TD Start([Start]) --> Display[Display G2, G3, T14] Display --> Click{Click on the} Click -- No --> Display Click -- Yes --> Show[Show the Map Navigation module] Show --> End([End]) </pre> <p>The flowchart illustrates the process of displaying information for the Map Navigation module. It begins with a 'Start' terminal, leading to a process box 'Display G2, G3, T14'. This is followed by a decision diamond 'Click on the'. If the user does not click (No), the flow loops back to the 'Display G2, G3, T14' process. If the user clicks (Yes), the flow proceeds to a process box 'Show the Map Navigation module', which then leads to an 'End' terminal.</p>

Table 3.18 Flow Diagram and Description of Map Navigation Module Information

Storyboard No: Storyboard 17

Topic: Map Navigation Submodule – Lata Kekabu

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)

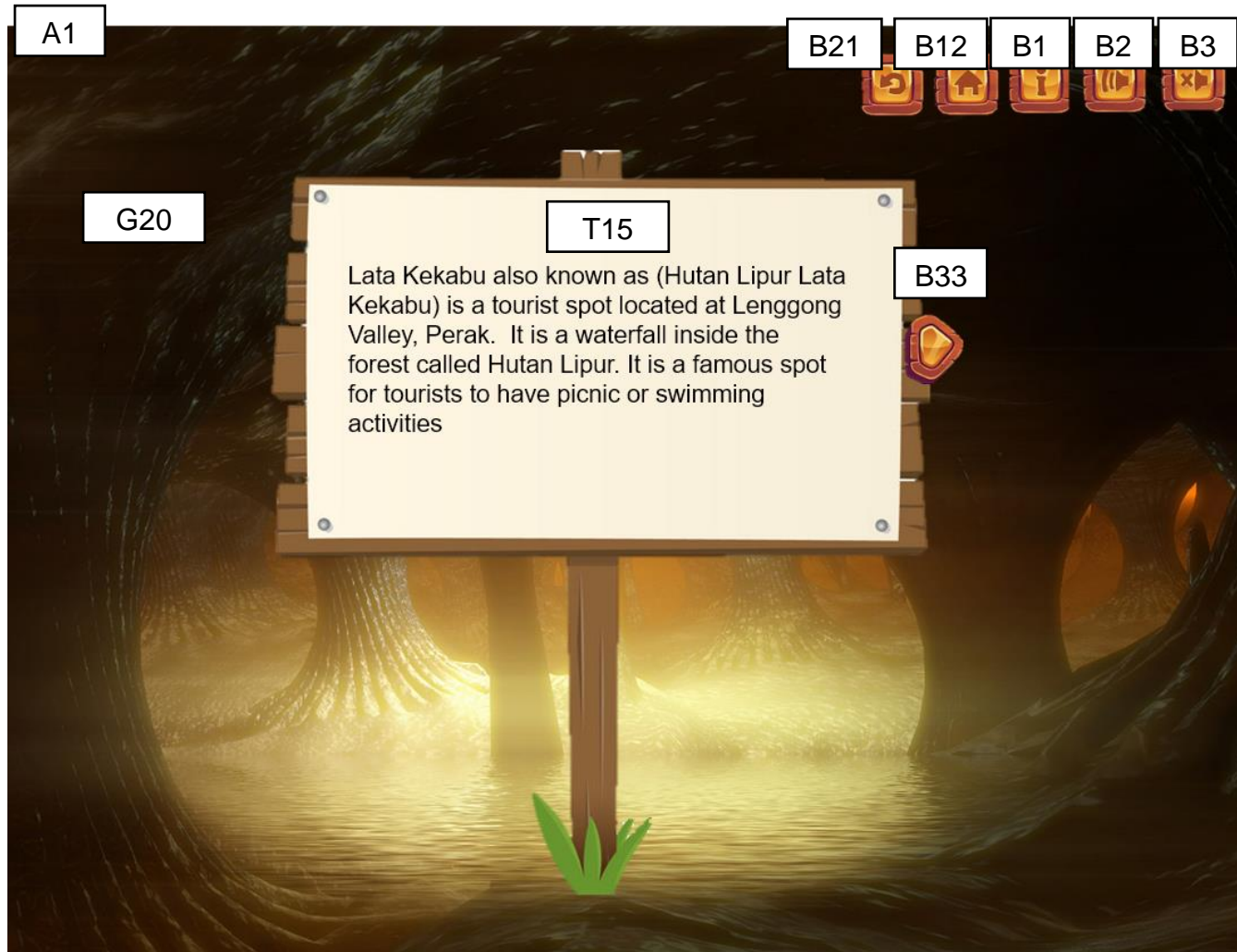


Figure 3.18 Storyboard of Map Navigation Submodule – Lata Kekabu

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G20: This is a graphic element. It serves as a background image for Lata Kekabu submodule.</p> <p>T15: This is a text element. It serves as the description.</p> <p>A1: This is an audio element. It serves as the background music for Lata Kekabu submodule.</p> <p>B1: This is a button element. It serves as an information button where users can click to gain more information related to the page.</p> <p>B2: This is a button element. It is used to support turn on background music function.</p> <p>B3: This is a button element. It is used to support mute background music function.</p> <p>B12: This is a button element. It is used to navigate user to the main menu.</p> <p>B21: This is a button element. It is used to navigate user to the Map Navigation Module.</p> <p>B33: This is a button element. It is used to navigate user to the next page.</p>	<pre> graph TD Start([Start]) --> Display[Display G20, T15, B1, B2, B3, B12, B21, B33] Display --> Click{Click on the button} Click -- No --> Display Click -- Yes --> Frame[Display the respective frame that use click] Frame --> End([End]) </pre>

Table 3.19 Flow Diagram and Description of AR Module

Storyboard No: Storyboard 18

Topic: Map Navigation Submodule – Lata Kekabu

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)

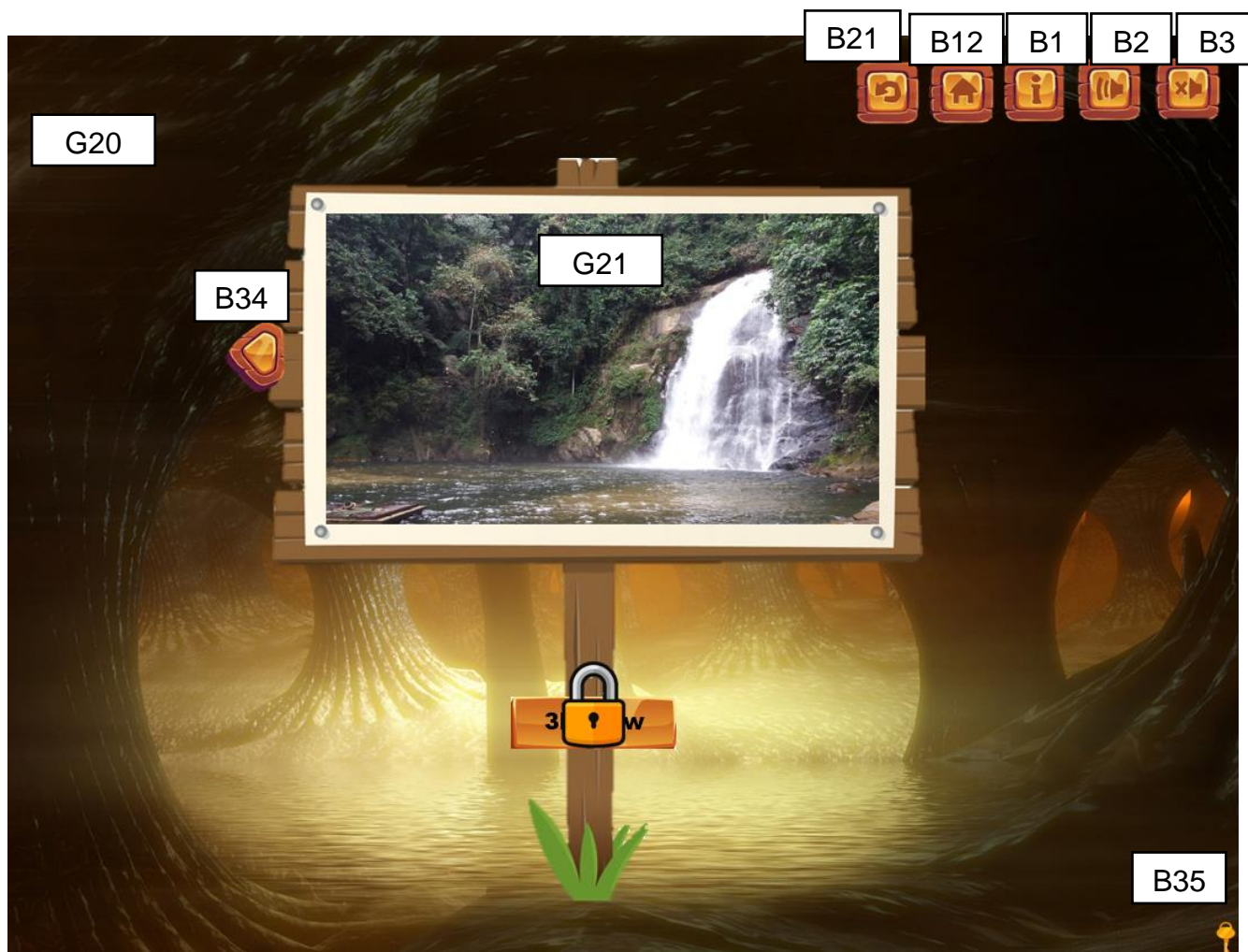


Figure 3.19 Storyboard of Map Navigation Submodule – Lata Kekabu

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G20: This is a graphic element. It serves as a background image for Lata Kekabu submodule.</p> <p>G21: This is a graphic element. It serves as an image of Lata Kekabu.</p> <p>B1: This is a button element. It serves as an information button where users can click to gain more information related to the page.</p> <p>B2: This is a button element. It is used to support turn on background music function.</p> <p>B3: This is a button element. It is used to support mute background music function.</p> <p>B12: This is a button element. It is used to navigate user to the main menu.</p> <p>B21: This is a button element. It is used to navigate user to the Map Navigation Module.</p> <p>B34: This is a button element. It is used to navigate user back to the previous page.</p> <p>B35: This is a button element. It is used to unlock the 3D view</p>	<pre> graph TD Start([Start]) --> Display[Display G20, T15, B1, B2, B3, B12, B21, B34, B35] Display --> Click{Click on the button} Click -- No --> Display Click -- Yes --> Frame[Display the respective frame that use click] Frame --> End([End]) </pre>

Table 3.20 Flow Diagram and Description of AR Module Information

Storyboard No: Storyboard 19

Topic: Timeline Module

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)

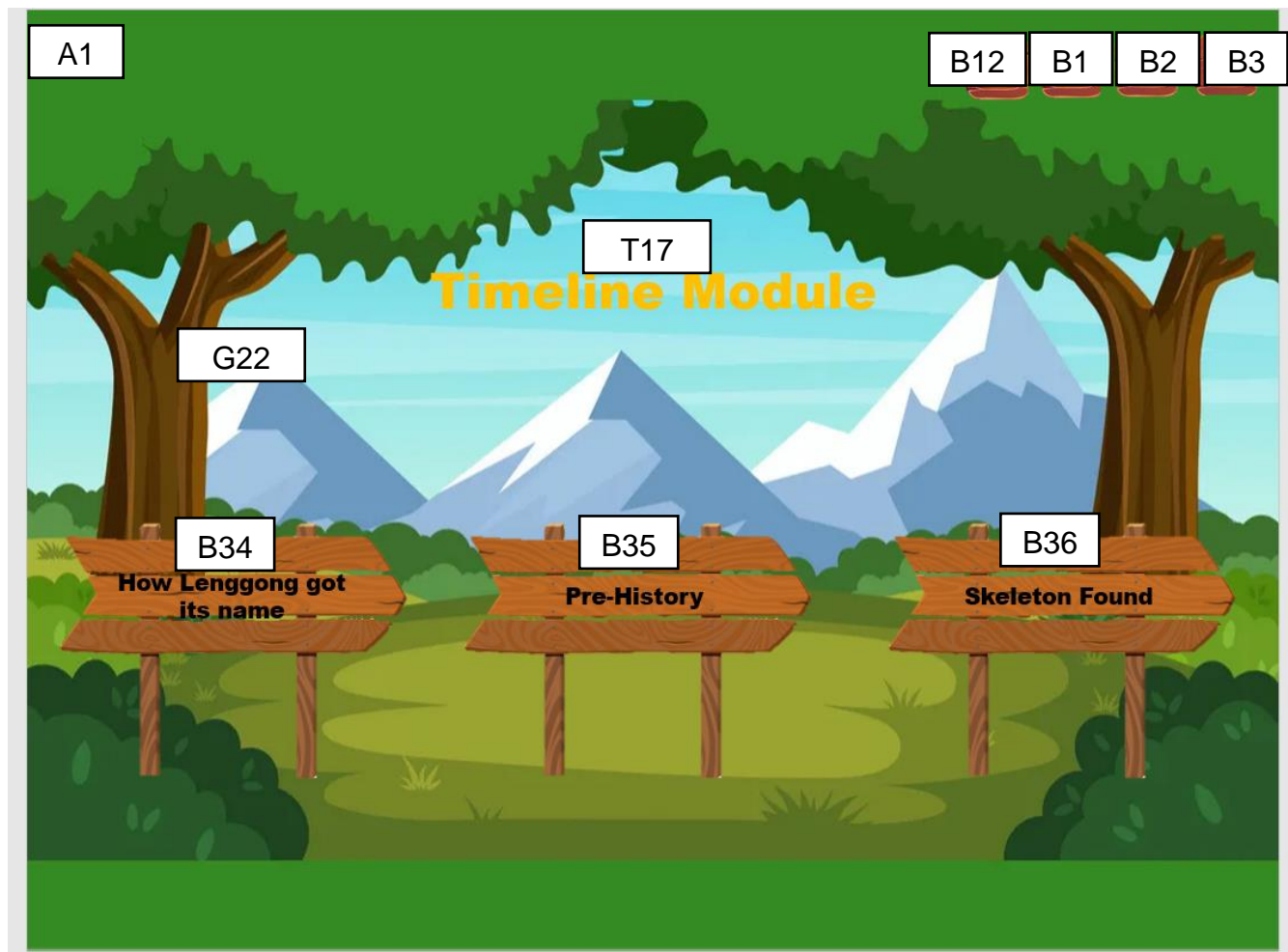


Figure 3.20 Storyboard of Timeline Module

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G22: This is a graphic element. It serves as a background image for Timeline Module.</p> <p>T17: This is a text element. It serves as the title of the system.</p> <p>A1: This is an audio element. It serves as the background music for AR Module.</p> <p>B1: This is a button element. It serves as an information button where users can click to gain more information related to the page.</p> <p>B2: This is a button element. It is used to support turn on background music function.</p> <p>B3: This is a button element. It is used to support mute background music function.</p> <p>B12: This is a button element. It is used to navigate user to the main menu.</p> <p>B34: This is a button element. It is used to navigate user to the How Lenggong got its name submodule.</p> <p>B35: This is a button element. It is used to navigate user to the Pre-History submodule.</p> <p>B36: This is a button element. It is used to navigate user to the How Skeleton Found submodule.</p>	<pre> graph TD Start([Start]) --> Display[Display G22, T17, B1, B2, B3, B12, B34, B35, B36] Display --> Click{Click on the button} Click -- No --> Display Click -- Yes --> Frame[Display the respective frame that use click] Frame --> End([End]) </pre>

Table 3.21 Flow Diagram and Description of Timeline Module

Storyboard No: Storyboard 20

Topic: Timeline Module Information

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)

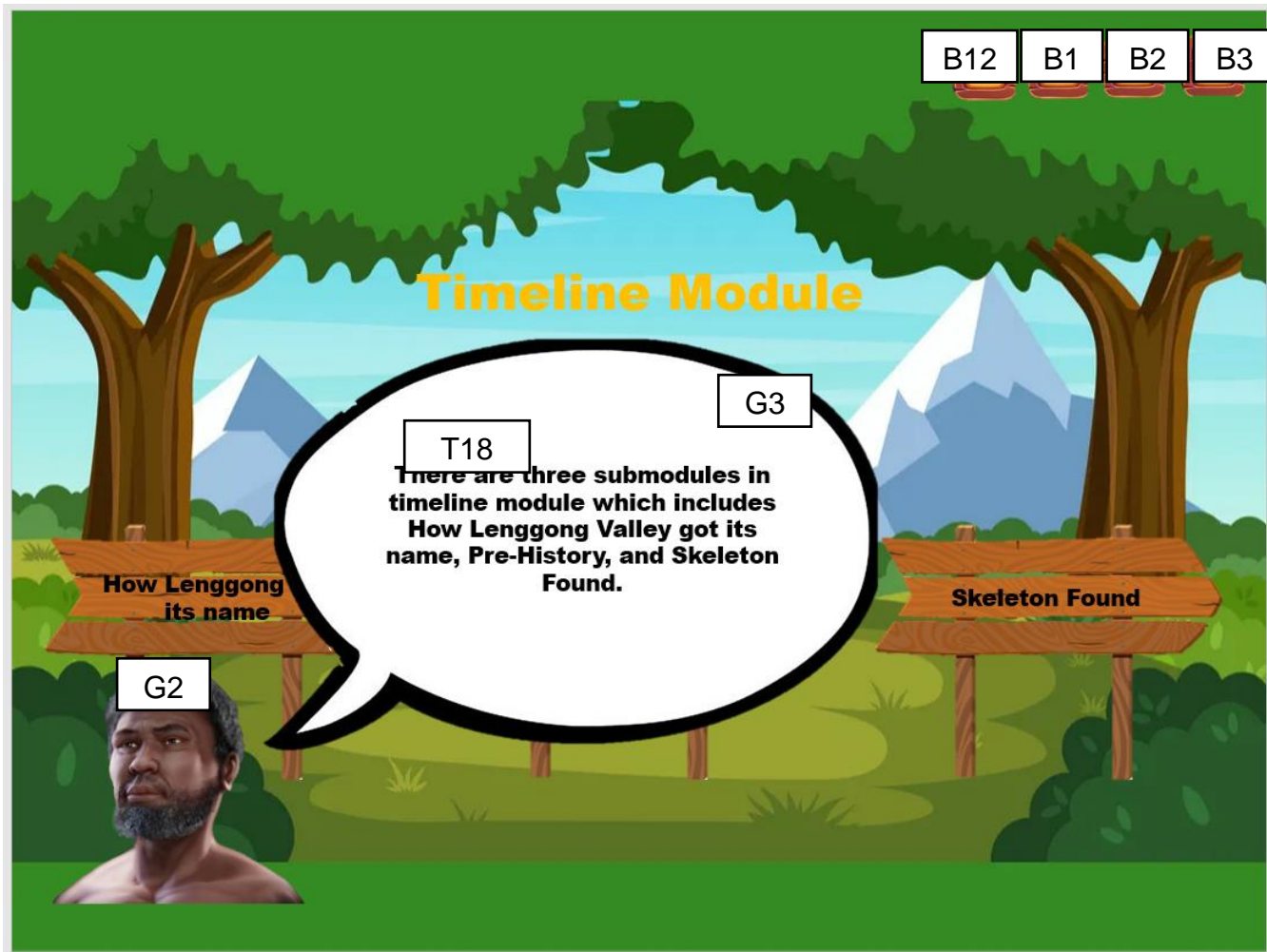


Figure 3.21 Storyboard of Timeline Module Information

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G2: This is a graphic element. It serves as a picture of Perak Man.</p> <p>G3: This is a graphic element. It serves as a picture of chat bubble.</p> <p>T18: This is a text element. It serves as the information for the Timeline module.</p> <p>M11: After the information button (B1) is clicked, G2 will first appear on the screen, followed by G3, and then lastly T18 will slide in from left to right.</p>	<pre> graph TD Start([Start]) --> Display[Display G2, G3, T18] Display --> Click{Click on the} Click -- No --> Display Click -- Yes --> Show[Show the Timeline module] Show --> End([End]) </pre>

Table 3.22 Flow Diagram and Description of Timeline Module Information

Storyboard No: Storyboard 21

Topic: Timeline Sub Module - How Lenggong Valley got its name

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)

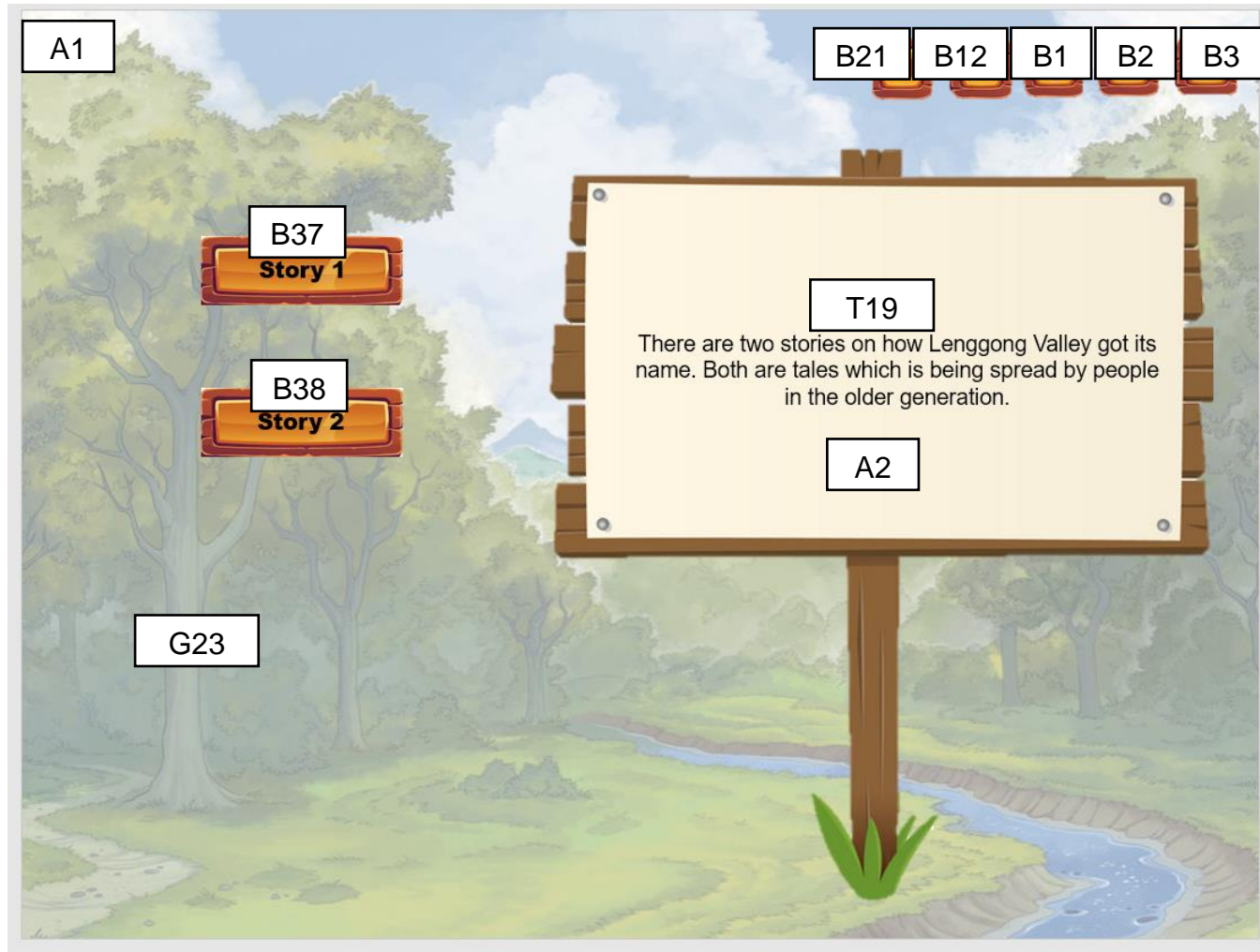


Figure 3.22 Storyboard of Timeline Sub Module - How Lenggong Valley got its name

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G23: This is a graphic element. It serves as a background image for How Lenggong Valley got its name submodule.</p> <p>T19: This is a text element. It serves as the story.</p> <p>A1: This is an audio element. It serves as the background music for How Lenggong Valley got its name submodule.</p> <p>A2: This is an audio element. It serves as a narrator that reads out the text (T19) on the screen.</p> <p>B1: This is a button element. It serves as an information button where users can click to gain more information related to the page.</p> <p>B2: This is a button element. It is used to support turn on background music function.</p> <p>B3: This is a button element. It is used to support mute background music function.</p> <p>B12: This is a button element. It is used to navigate user to the main menu.</p> <p>B21: This is a button element. It is used to navigate user to the Timeline Module.</p> <p>B37: This is a button element. It is used to navigate user to the Story 1 submodule.</p> <p>B38: This is a button element. It is used to navigate user to the Story 2 submodule.</p>	<pre> graph TD Start([Start]) --> Display[Display G23, T19, B1, B2, B3, B12, B21, B37, B38] Display --> Click{Click on the button} Click -- No --> Display Click -- Yes --> Frame[Display the respective frame that use click] Frame --> End([End]) </pre>

Table 3.23 Flow Diagram and Description of Timeline Sub Module - How Lenggong Valley got its name

Storyboard No: Storyboard 22

Topic: Timeline Sub Module - How Lenggong Valley got its name Information

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)

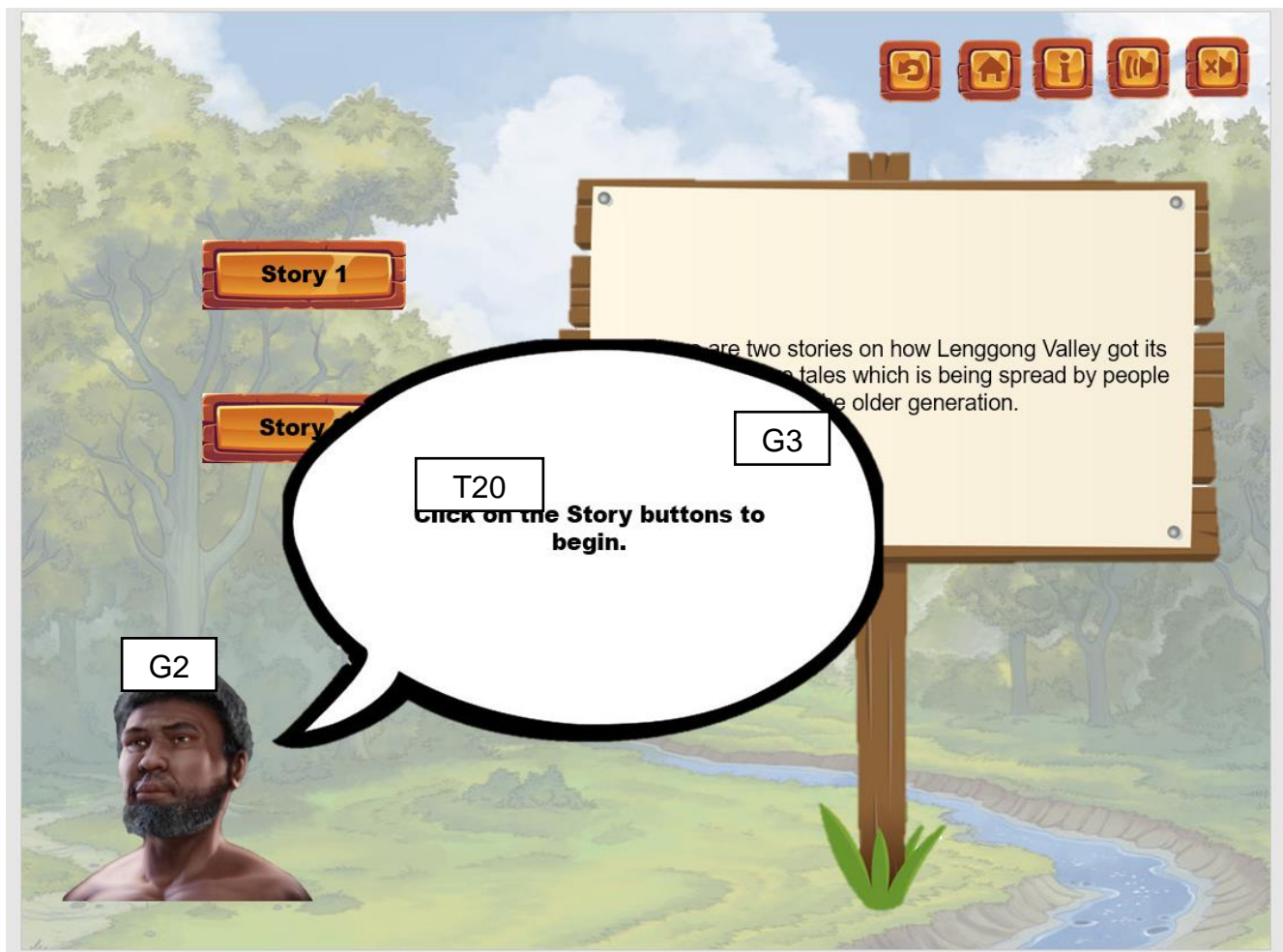


Figure 3.23 Storyboard of Timeline Sub Module - How Lenggong Valley got its name Information

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G2: This is a graphic element. It serves as a picture of Perak Man.</p> <p>G3: This is a graphic element. It serves as a picture of chat bubble.</p> <p>T20: This is a text element. It serves as the information for the - How Lenggong Valley got its name submodule.</p> <p>M12: After the information button (B1) is clicked, G2 will first appear on the screen, followed by G3, and then lastly T20 will slide in from left to right.</p>	<pre> graph TD Start([Start]) --> Display[Display G2, G3, T20] Display --> Click{Click on the} Click -- No --> Display Click -- Yes --> Show[Show the - How Lenggong Valley got its name submodule] Show --> End([End]) </pre>

Table 3.24 Flow Diagram and Description of Timeline Sub Module - How Lenggong Valley got its name Information

Storyboard No: Storyboard 23

Topic: Timeline Sub Module - How Lenggong Valley got its name Information Story

1 Part 1

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)

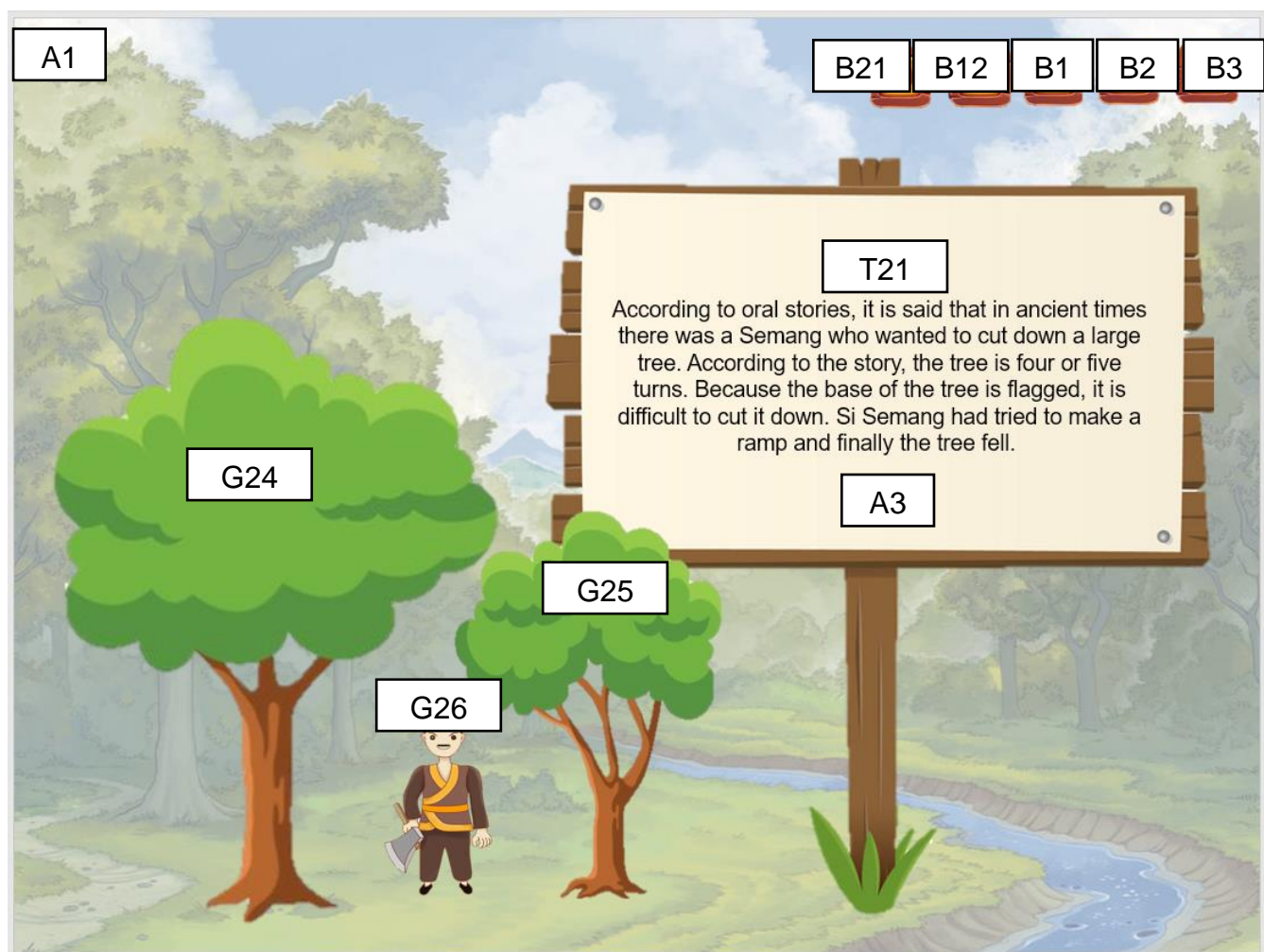


Figure 3.24 Storyboard of Timeline Sub Module - How Lenggong Valley got its name

Story 1 Part 1

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G24: This is a graphic element. It serves as a picture of big tree.</p> <p>G25: This is a graphic element. It serves as a picture of small tree.</p> <p>G26: This is a graphic element. It serves as a picture of Semang.</p> <p>T21: This is a text element. It serves as the story.</p> <p>A1: This is an audio element. It serves as the background music for How Lenggong Valley got its name submodule.</p> <p>A3: This is an audio element. It serves as a narrator that reads out the text (T21) on the screen.</p> <p>B1: This is a button element. It serves as an information button where users can click to gain more information related to the page.</p> <p>B2: This is a button element. It is used to support turn on background music function.</p> <p>B3: This is a button element. It is used to support mute background music function.</p> <p>B12: This is a button element. It is used to navigate user to the main menu.</p> <p>B21: This is a button element. It is used to navigate user to the Timeline Module.</p> <p>M13: As the narrator tells the story (A3), G26 will start moving and chopping G24.</p>	<pre> graph TD Start([Start]) --> Display[Display G24, G25, G26, B1, B2, B3, B12, B21] Display --> Click{Click on the button} Click -- No --> Display Click -- Yes --> Frame[Display the respective frame that use click] Frame --> End([End]) </pre>

Table 3.25 Flow Diagram and Description of Timeline Sub Module - How Lenggong Valley got its name Story 1 Part 1

Storyboard No: Storyboard 24

Topic: Timeline Sub Module - How Lenggong Valley got its name Information Story

1 Part 2

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)

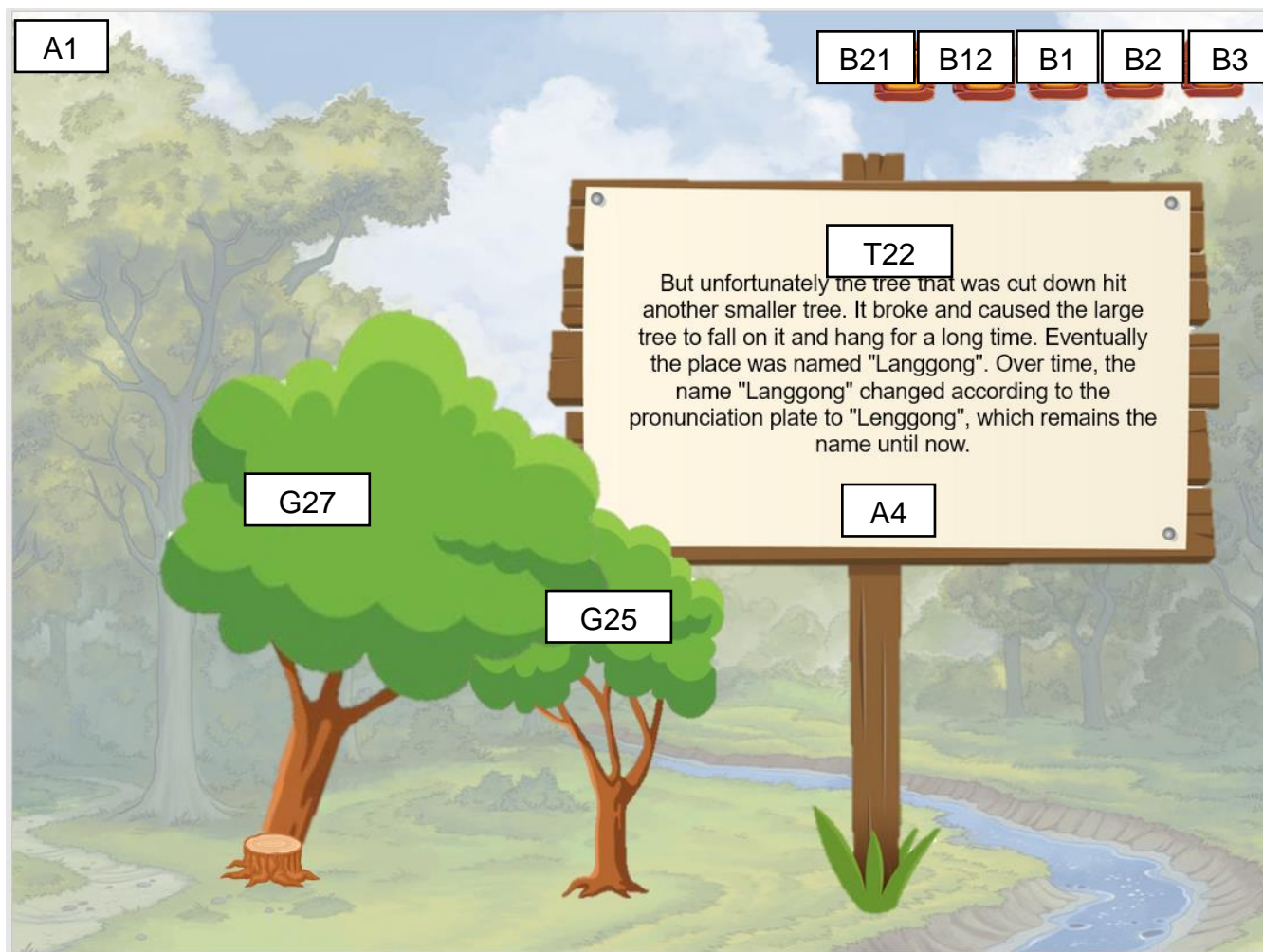


Figure 3.25 Storyboard of Timeline Sub Module - How Lenggong Valley got its name

Story 1 Part 2

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G25: This is a graphic element. It serves as a picture of small tree.</p> <p>G27: This is a graphic element. It serves as a picture of chopped big tree.</p> <p>T22: This is a text element. It serves as the story.</p> <p>A1: This is an audio element. It serves as the background music for How Lenggong Valley got its name submodule.</p> <p>A4: This is an audio element. It serves as a narrator that reads out the text (T22) on the screen.</p> <p>B1: This is a button element. It serves as an information button where users can click to gain more information related to the page.</p> <p>B2: This is a button element. It is used to support turn on background music function.</p> <p>B3: This is a button element. It is used to support mute background music function.</p> <p>B12: This is a button element. It is used to navigate user to the main menu.</p> <p>B21: This is a button element. It is used to navigate user to the Timeline Module.</p> <p>M14: As the narrator tells the story (A4), G27 still start to fall and hang on G25.</p>	<pre> graph TD Start([Start]) --> Display[Display G25, G27, B1, B2, B3, B12, B21] Display --> Click{Click on the button} Click -- No --> Display Click -- Yes --> Frame[Display the respective frame that use click] Frame --> End([End]) </pre>

Table 3.26 Flow Diagram and Description of Timeline Sub Module - How Lenggong Valley got its name Story 1 Part 2

Storyboard No: Storyboard 25

Topic: Timeline Sub Module - How Lenggong Valley got its name Information Story

2

T: (Text), G: (Graphic), A: (Audio), M: (Animation), B (Button)

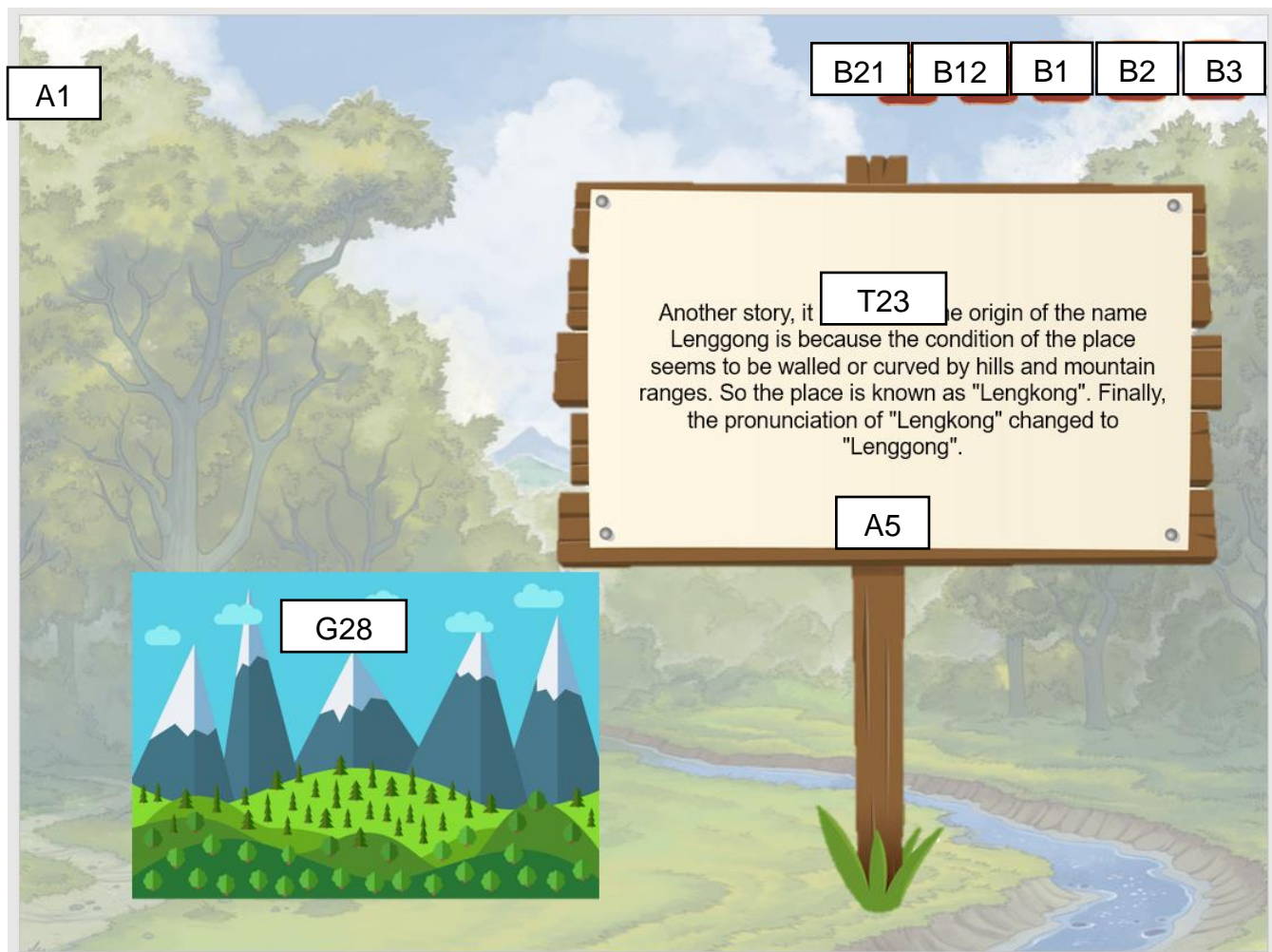


Figure 3.26 Storyboard of Timeline Sub Module - How Lenggong Valley got its name

Story 2

Instruction for Texts, Graphics, Audio, Animation and Button	Flowchart for Texts, Graphics, Audio, Animation and Button
<p>G28: This is a graphic element. It serves as a picture of hills and mountain ranges.</p> <p>T23: This is a text element. It serves as the story.</p> <p>A1: This is an audio element. It serves as the background music for How Lenggong Valley got its name submodule.</p> <p>A5: This is an audio element. It serves as a narrator that reads out the text (T23) on the screen.</p> <p>B1: This is a button element. It serves as an information button where users can click to gain more information related to the page.</p> <p>B2: This is a button element. It is used to support turn on background music function.</p> <p>B3: This is a button element. It is used to support mute background music function.</p> <p>B12: This is a button element. It is used to navigate user to the main menu.</p> <p>B21: This is a button element. It is used to navigate user to the Timeline Module.</p> <p>M15: As the narrator tells the story (A5), G28 will slide in from left to right.</p>	<pre> graph TD Start([Start]) --> Display[Display G28, T23, B1, B2, B3, B12, B21] Display --> Click{Click on the button} Click -- No --> Display Click -- Yes --> Frame[Display the respective frame that use click] Frame --> End([End]) </pre>

Table 3.27 Flow Diagram and Description of Timeline Sub Module - How Lenggong Valley got its name Story 2

3.6 Project Planning

3.6.1 Project 1

Year	2022											
Month	January	February				March				April		
Week	1	2	3	4	5	6	7	8	9	10	11	12
Date	24-30	31-6	7-13	14-20	21-27	28-6	7-13	14-20	21-27	28-3	4-10	11-17
Task												
Planning												
Meeting with supervisor												
Finalise the project title												
Redo IIPSPW report												
Change of supervisor approved												
Analysis												
Design survey questions												
Collect survey feedback												
Identify problem statement												
Identify project objectives												
Identify project scope												
Identify target audience												
Carry out literature review												
Design												
Design storyboard												
Design user interface												
Design text												

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3.6.2 Project 2

Year	2022												
Month	June			July				August				September	
Week	1	2	3	4	5	6	7	8	9	10	11	12	13
Date	13-19	20-26	27-3	4-10	11-17	18-24	25-31	1-7	8-14	15-21	22-28	29-4	5-11
Task													
Development													
Develop module 3													
Combine the multimedia elements with authoring software													
Add in effects such as mouse over cursor change, playsound or playframe when mousedown.													
Develop module 4													
Combine the multimedia elements with authoring software													
Add in effects such as mouse over cursor change, playsound or playframe when mousedown.													
Develop module 5													
Combine the multimedia elements with authoring software													

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Add in effects such as mouse over cursor change, playsound or playframe when mousedown.			█										
Integrate module						█							
Implementation													
Test prototype							█						
Invite target audience								█					
Deliver to target audience								█					
Evaluation													
Deliver to others for testing									█	█			
Receive feedback											█		
Make adjustments and improvements												█	█

Table 3.29 Gantt Chart for FYP2

Chapter 4 Development

4.1 Overview

The overview of chapter 4 is the development process of the creative edutainment software for Lenggong Valley. There are three process which includes pre-authoring process, authoring process, as well as post-authoring process. During the pre-authoring process, creating and editing will be the keywords for this process since the majority of the stuff that is being done during this process is to create and edit multimedia elements such as text, graphics, audio, and animation. For the text element, notepad will be used for the cut, copy, and paste process, Microsoft word will be used to edit the font style and color format of the text, and Microsoft power point will be used to convert the text into image that can be imported into Macromedia Director MX 2004. For the graphics element, Adobe Photoshop, Adobe Illustrator, and Microsoft power points will be used for the editing process such as cropping and background removing of graphics obtained from online sources. For the audio element, lazypy text-to-speech website will be used to create the narrator audio whereas Adobe Audition and Sound Forge will be used for the editing and combining process. Lastly, for the animation element, Macromedia Director MX 2004's cel animation and path animation function will be used to create cel animation and path animation, Blender will be used to create and edit 3D animations, and Unity will be used to create and edit Augmented Reality animations. During the authoring process, the design for 5 of the modules will be done which includes Quiz Module, Simulation Module, Map Navigation Module, AR Module, and Timeline Module. During the post-authoring process, the process of publishing in Macromedia Director MX 2004 will be carried out. The start menu, main menu, alongside with 4 modules of Quiz Module, Simulation Module, Map Navigation Module, and Timeline Module will be integrated and published into an edutainment software in the form of executable(.exe) file to be used on a computer. For the AR module, due to the limitations of Unity in which Augmented Reality cannot be build as an executable file directly on computer and instead requires mobile phone such as Android phone to build the Android Package(APK) on it in order to be able to run the app, this particular module will be integrated and published on an Android phone instead.

4.2 Development Process

4.2.1 Module 1(Quiz Module)

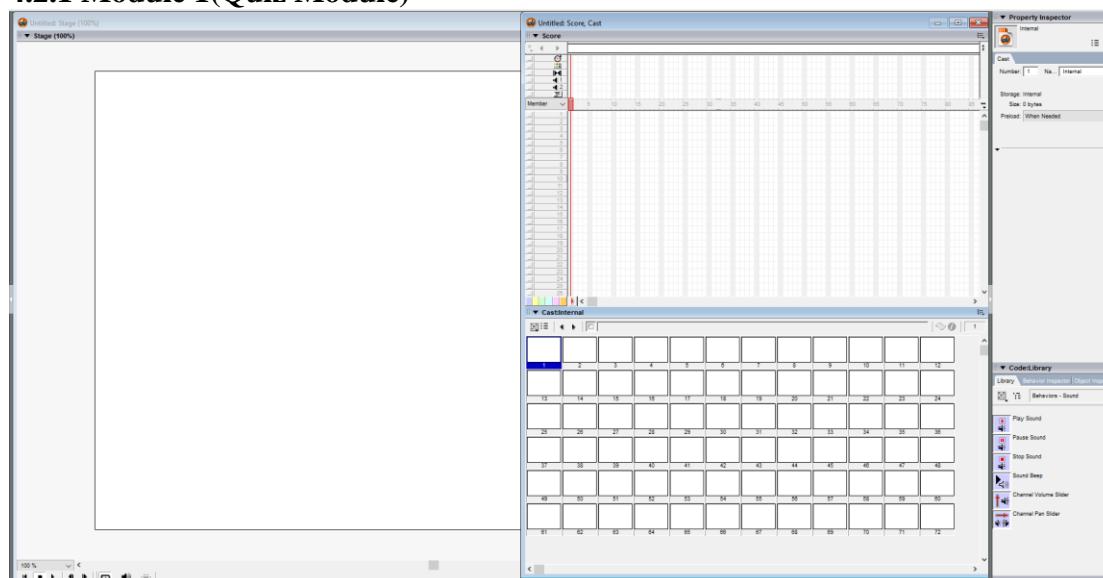


Figure 4.01 Quiz Module Development 1

This is the screen that users will see when they first open Macromedia Director MX 2004. The Stage at the left side is for users to be able to have a preview on how the screen will look like after it is being published, the stage size is defaulted to be 1024 x 768. The cast:internal at middle bottom with bunch of empty columns are where users import external sources such as text, image, graphics, audio, and video into it to be stored there. The Score at middle top is where users are able to put in the elements stored in cast:internal on it. The 6 slots on top are Tempo, Palette, Transition, Sound Channel 1, Sound Channel 2, and lastly Script. The Tempo is used to adjust the tempo such as the frame per second(fps), wait time before ending the frame, wait for mouse click or key press and so on. The Palette is used to adjust the color themes. The Transition is used to add transitions when moving to other frames from one frame. The Sound Channel 1 and 2 is used to put in audio such as background music, narration and so on. Lastly, the Script is used to type in Lingo Scripts such as go to the frame, go to frame one, and halt. The Property Inspector at the right side is used to check the properties for an element and the Code:Library below it is used to add in stuff such as play sound, stop sound, play frame X, play movie X, rollover cursor change, and so on.

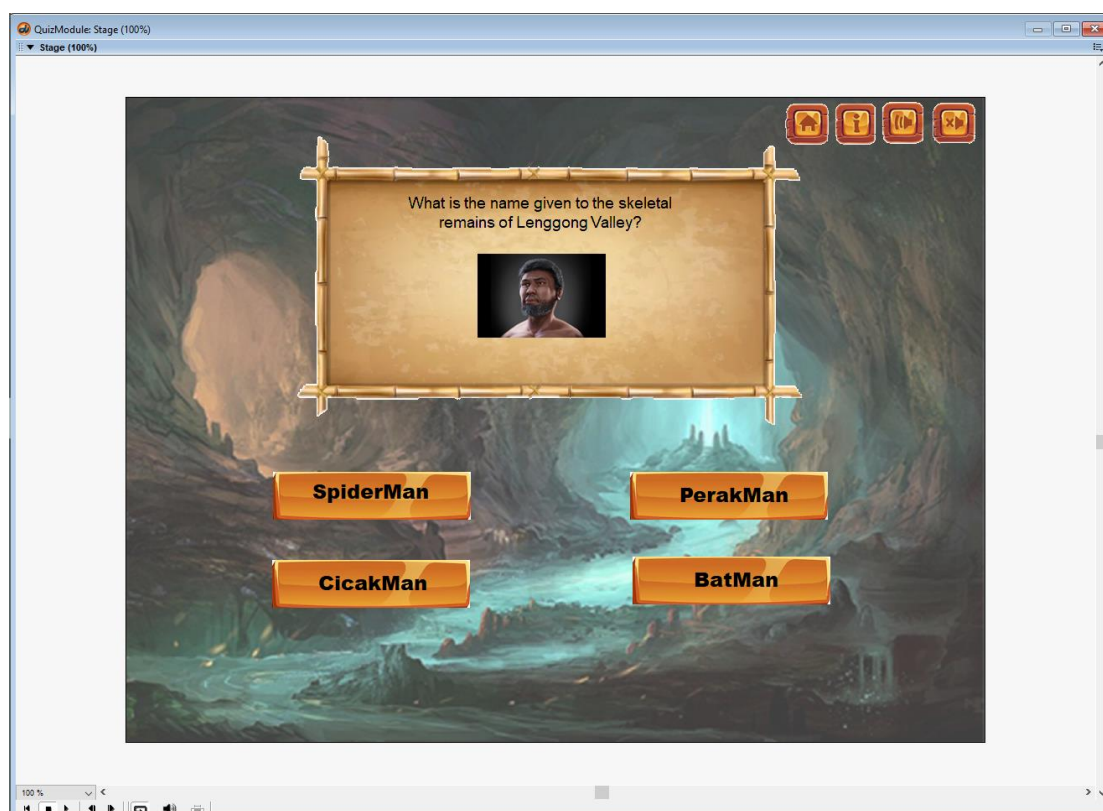


Figure 4.02 Quiz Module Development 2

After clicking on the Quiz button on the main menu, this is the first thing that the user will see which is the first question of the Quiz Module. The background image, signboard image, Perak Man image, and the 4 top buttons image are all obtained from the online sources and edited and cropped by using snipping tools to be imported into Macromedia Director MX 2004. For the text on the signboard, it is created using Microsoft word and then imported. Lastly, the 4 buttons which acts as choices of answer for users are combined using Microsoft power point where initially there is no text inside the buttons and a text box is added on top of the button image and then both of the elements are combined into a single image before being imported. For the audio such as background music, mouse hover sound, mouse click sound, it is all

obtained from online sources and will be imported directly into it.

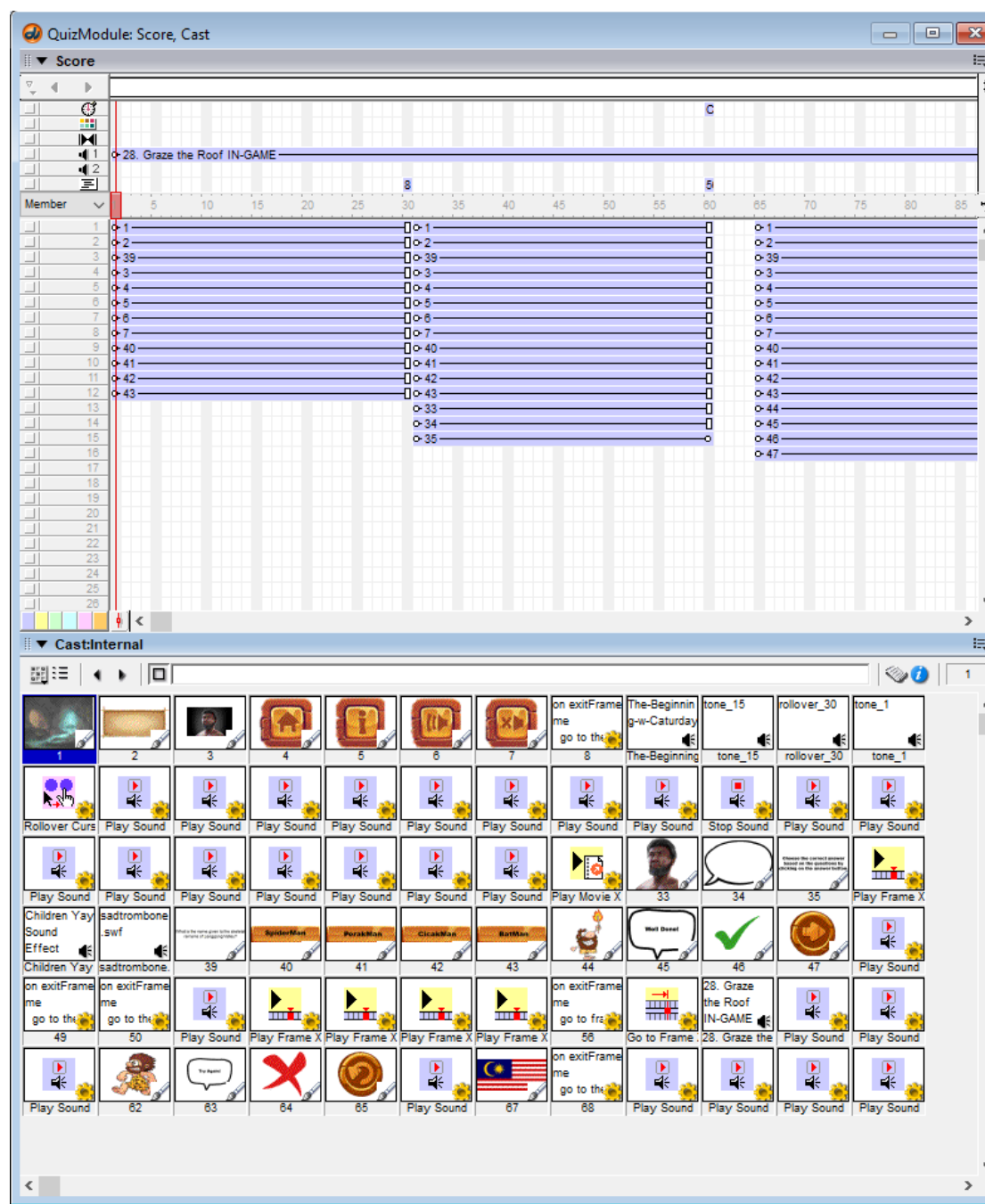


Figure 4.03 Quiz Module Development 3

The columns under Cast:Internal will be where the imported elements are being stored at. Then, the elements can be dragged as a 30 frame bar into the Member and its placements can be adjusted accordingly on the Stage. The background music will be dragged into the 1 sound channel slot.

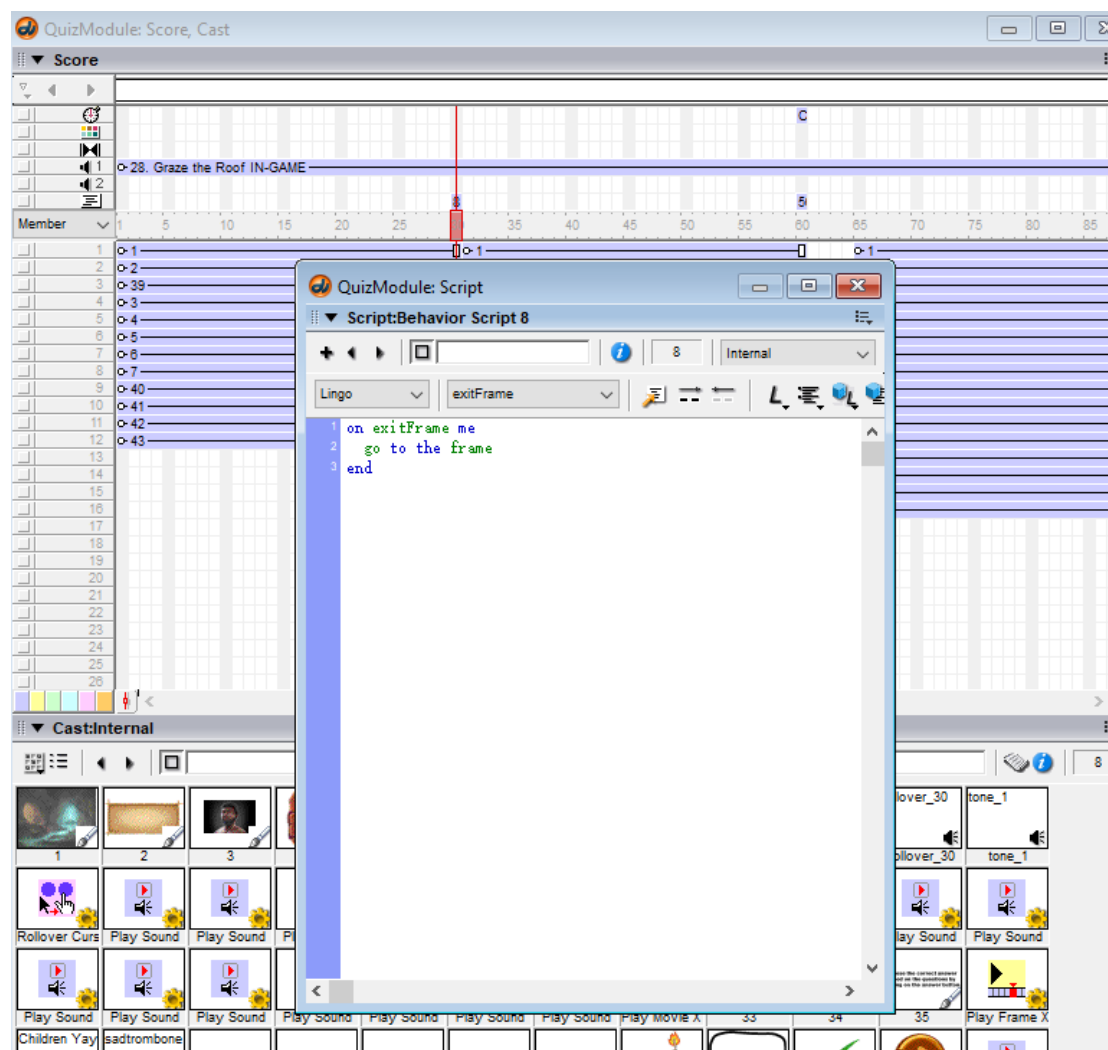


Figure 4.04 Quiz Module Development 4

Next, we click on the script on the last frame of the 30 frame bar and type in go to the frame. By doing so, this allows the frame to stop on the last frame instead of ending after reaching it. Add this on every last frame of 30 frame bar except for those with wait for keypress.

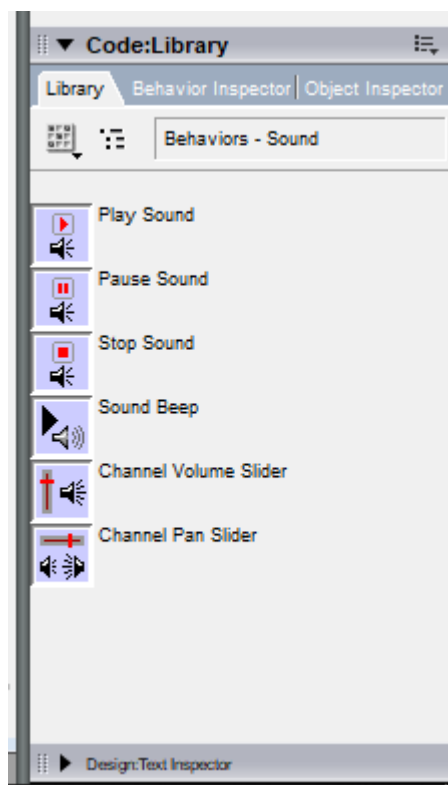


Figure 4.05 Quiz Module Development 5

Next, the Code:Library at the bottom right will be used to add Play Sound, Rollover Cursor Change and Navigation such as Play Frame X, Play Movie X. These will be added to the buttons in which when users move mouse over or click, sounds will be played for them to know that this is a button and they are clicking on a button. Next, play movie X will be added to the main menu button and the return button so that users will be redirected back to the page when clicking on it, play frame X will be added to the information button, play background music will be added to the on sound button and stop background music will be added to the off sound button.

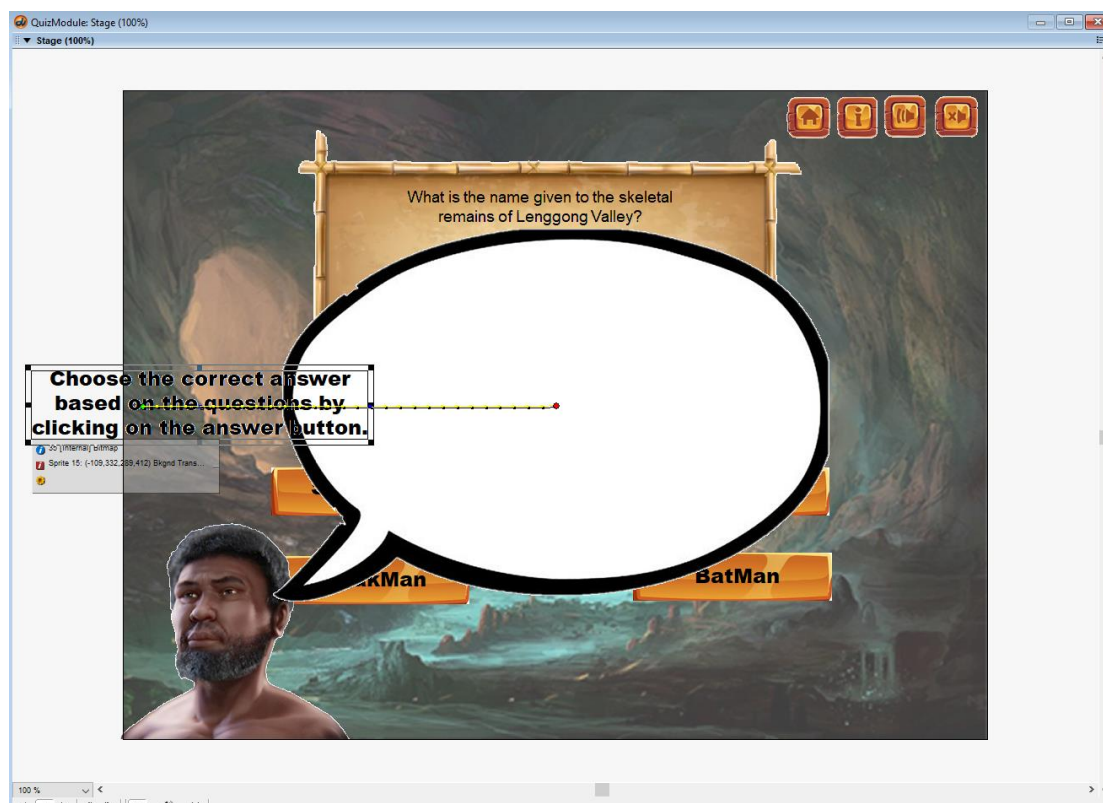


Figure 4.06 Quiz Module Development 6

All the bar on frame 1-30 will be copied and pasted into frame 31-60 and three things will be added on frame 31-60 which is Perak Man, chat bubble, and text with path animation added by putting it on the left side and then drag the line on the middle to right side. Add play frame X to the information button so that this frame plays when users click on the information button. Every screen with an information button will be done like this in order to add in the information related to current screen for users to read.

CHAPTER 4 DEVELOPMENT

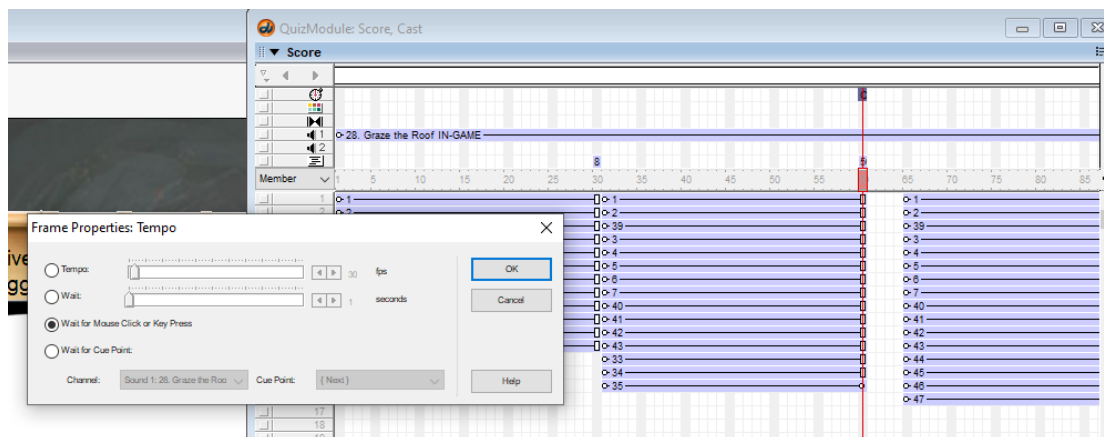


Figure 4.07 Quiz Module Development 7

Wait for Mouse Click or Key Press will be enabled on Frame Properties: Tempo so that the last frame pauses until users click on the screen.

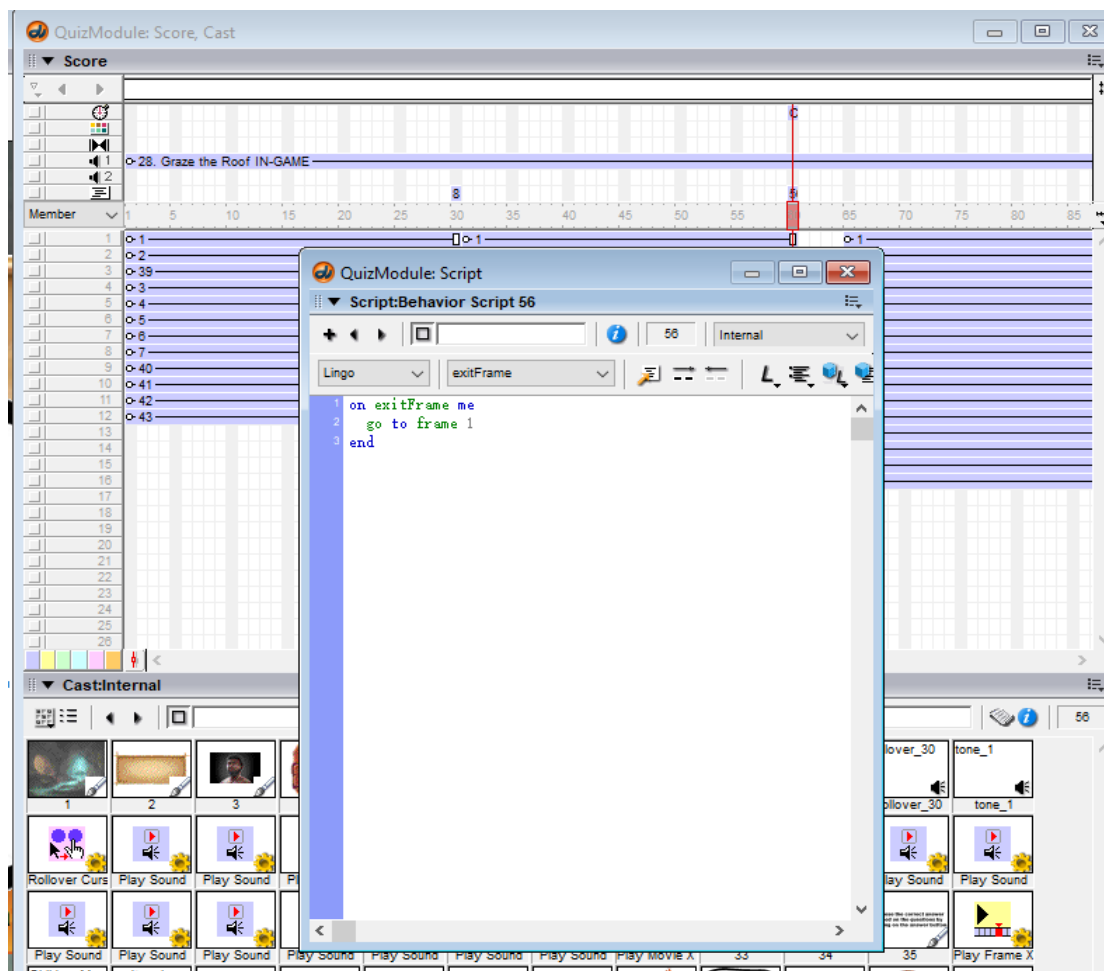


Figure 4.08 Quiz Module Development 8

CHAPTER 4 DEVELOPMENT

Then, open up the Script for last frame and type in go to frame 1 so that when users click on the screen, frame 1 will reappear.

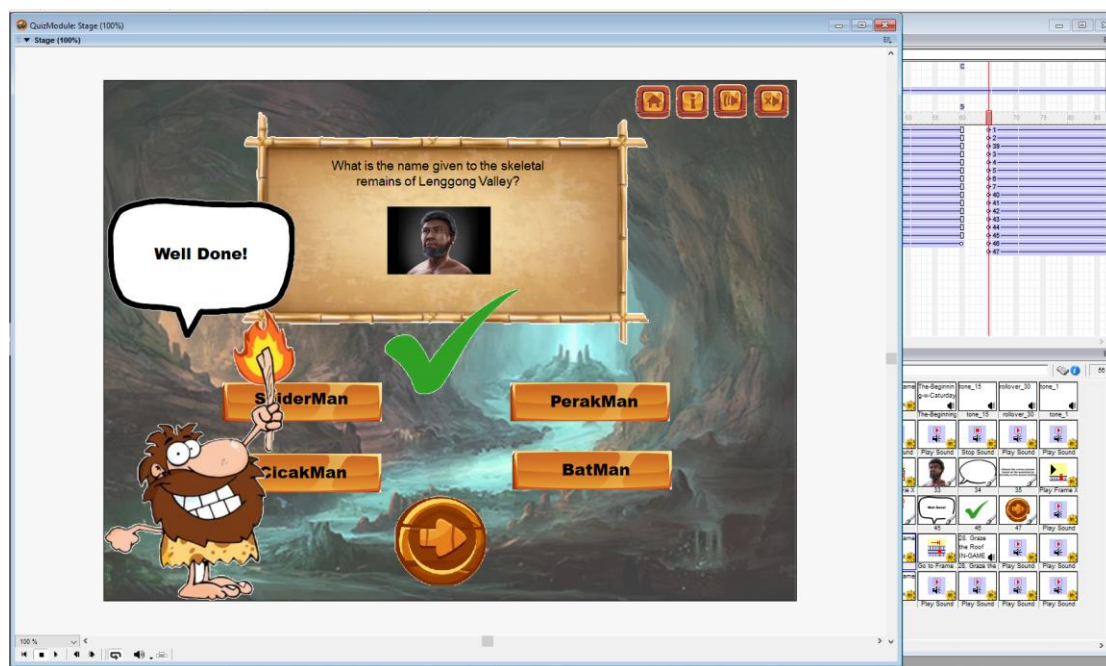


Figure 4.09 Quiz Module Development 9

Next, create another 30 frame this time with a tick, a man, a text bubble with Well Done!, and proceed button added into it. Add play frame X onto the correct answer so that this frame will be played when users click on the correct answer. Add sound cues of celebrate in order for users to feel like they are being rewarded for answering correctly. Add play frame X to the proceed button so that the frame of next question will be displayed after users click on the proceed button.

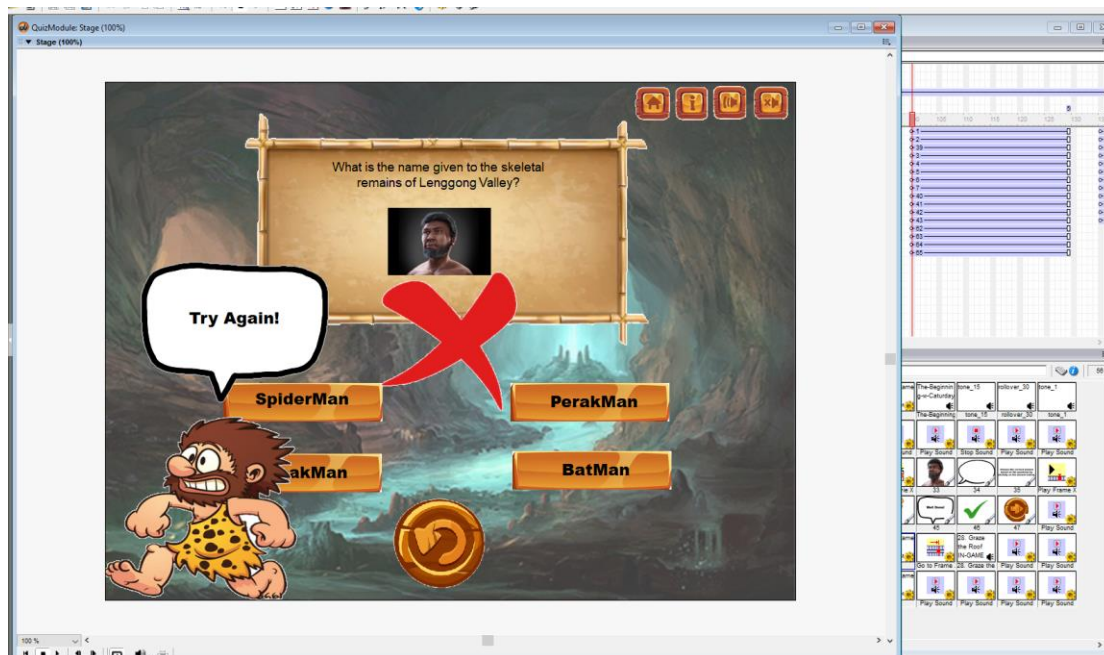


Figure 4.10 Quiz Module Development 10

Next, create another 30 frame this time with a cross, a man, a text bubble with Try Again!, and retry button added into it. Add play frame X onto the three wrong answers so that this frame will be played when users click on either of the wrong answers. Add sound cues of error in order for users to know that they have selected the wrong answer. Add play frame X to the retry button so that the frame of the same question will be displayed for users to try the question again.

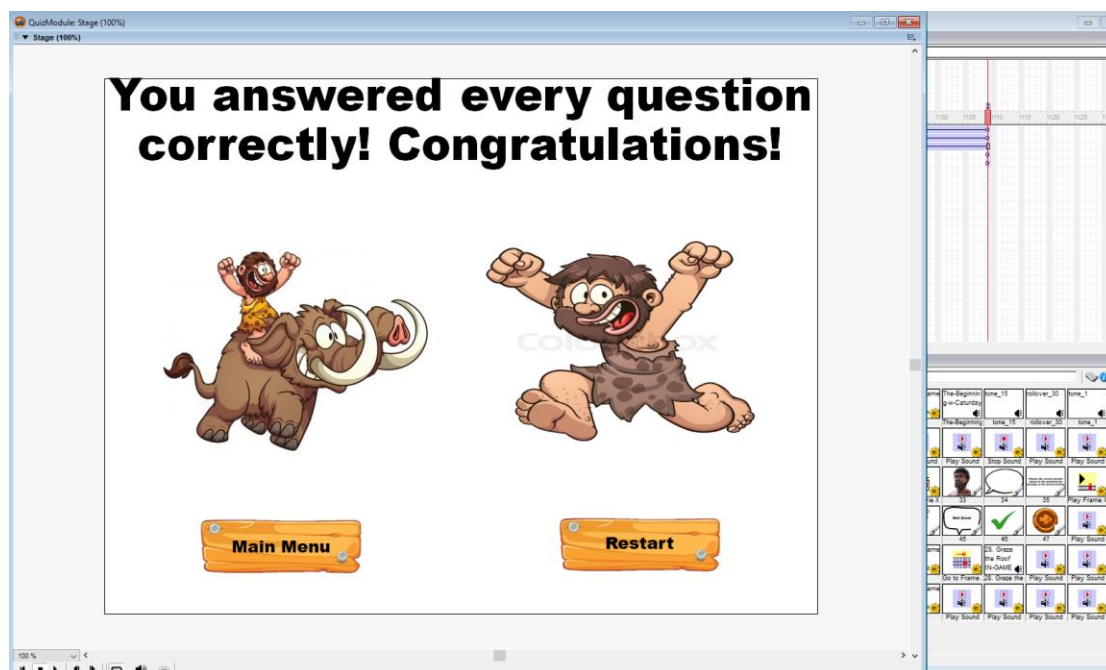


Figure 4.11 Quiz Module Development 11

Repeat the steps to create question 2-8 and at the end of the correct screen for last question, the proceed button will lead to this screen where applause sound will be added, and the two man will have path animation one from left one from right both approaching the middle. Add play movie X on main menu button and add play frame X on the restart button for users to navigate to where they want based on what buttons they clicked whether it is back to main menu or back to question 1.

With that being done, the Quiz Module is completed.

4.2.2 Module 2 (Simulation Module)

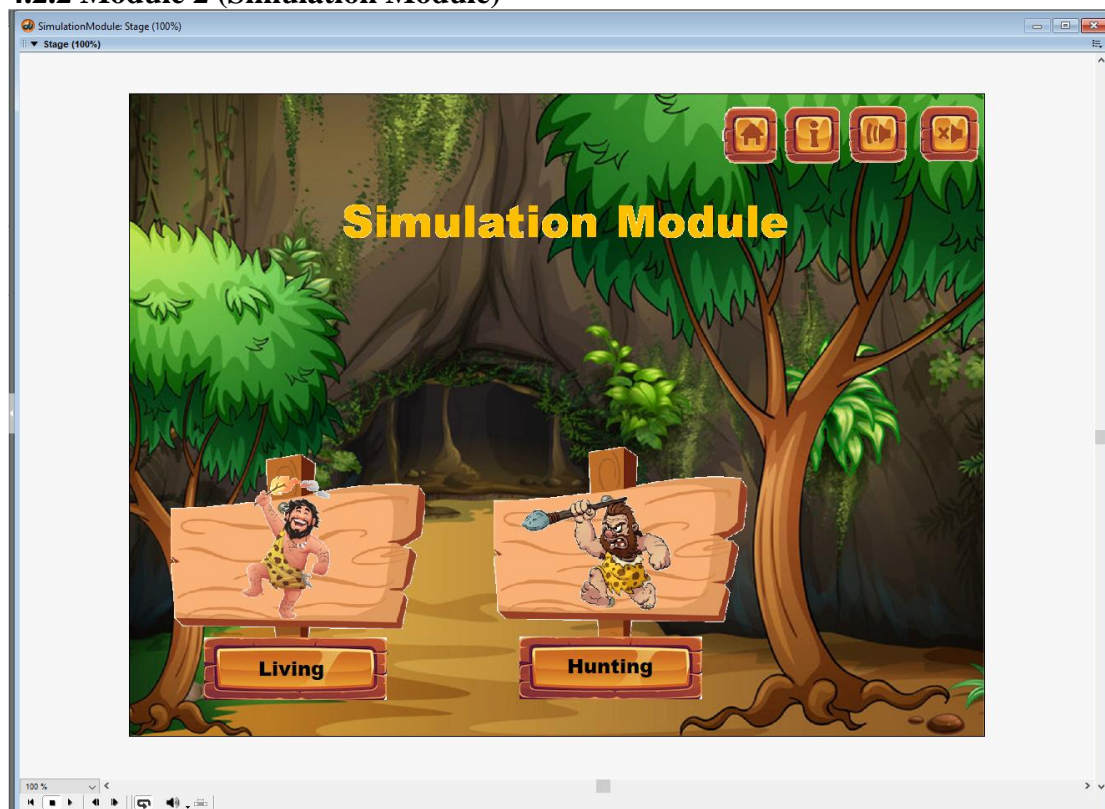


Figure 4.12 Simulation Module Development 1

The users will be on this page after they click on the Simulation button on the main menu. Add play movie X to Living and Hunting button so that users can navigate to the submodules after clicking the button.

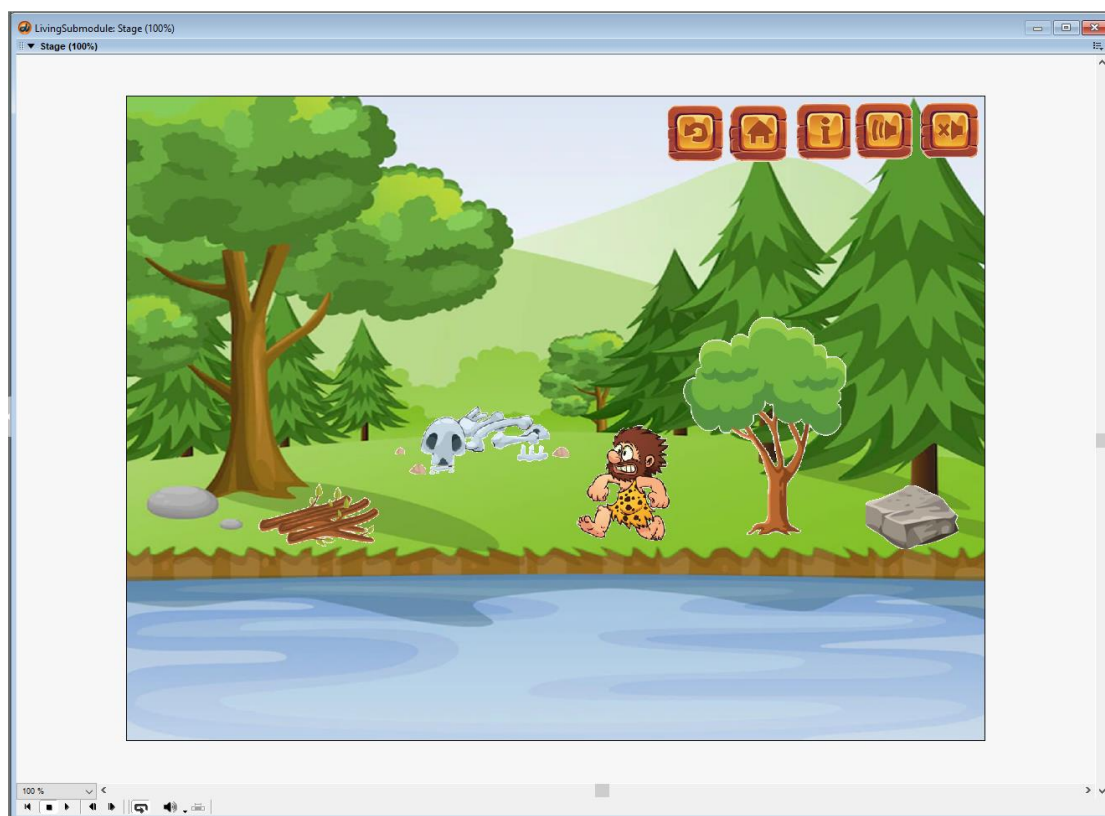


Figure 4.13 Simulation Module Development 2

This will be the screen for the Living Submodule, add play sound for click and mouse rollover, add rollover cursor change for mouse to become finger to the all the clickable buttons including those graphics such as branches, bones, man, tree, and stone. Add play movie X on the return button on the top right to link it to the Simulation module page.

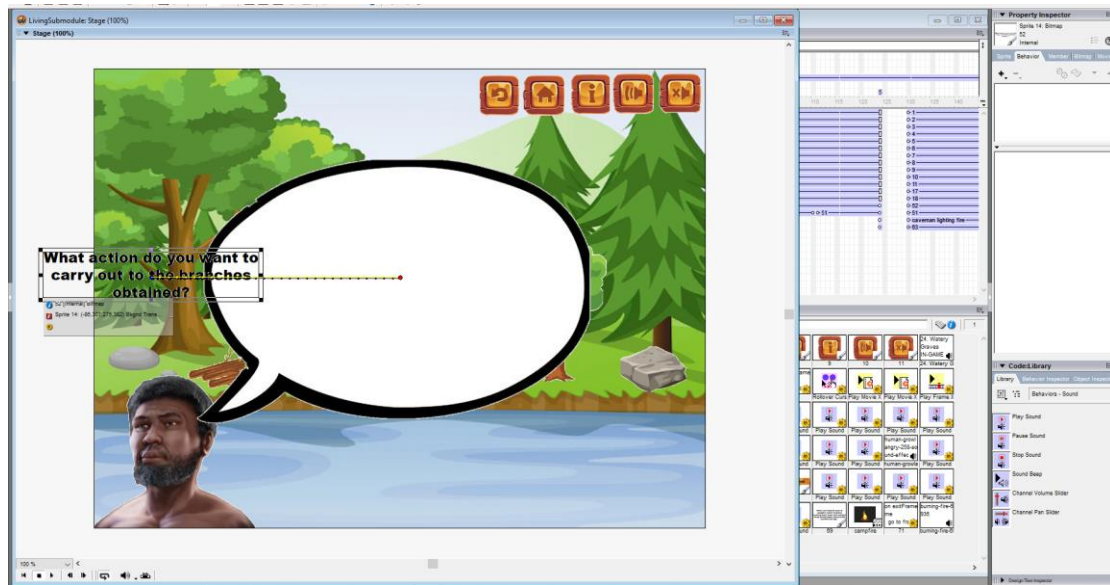


Figure 4.14 Simulation Module Development 3

When users click on any of the clickable graphics, play frame X will be added to it so that it will lead to this screen with text of what action do you want to carry out to the selected graphic based on which graphic users click on.

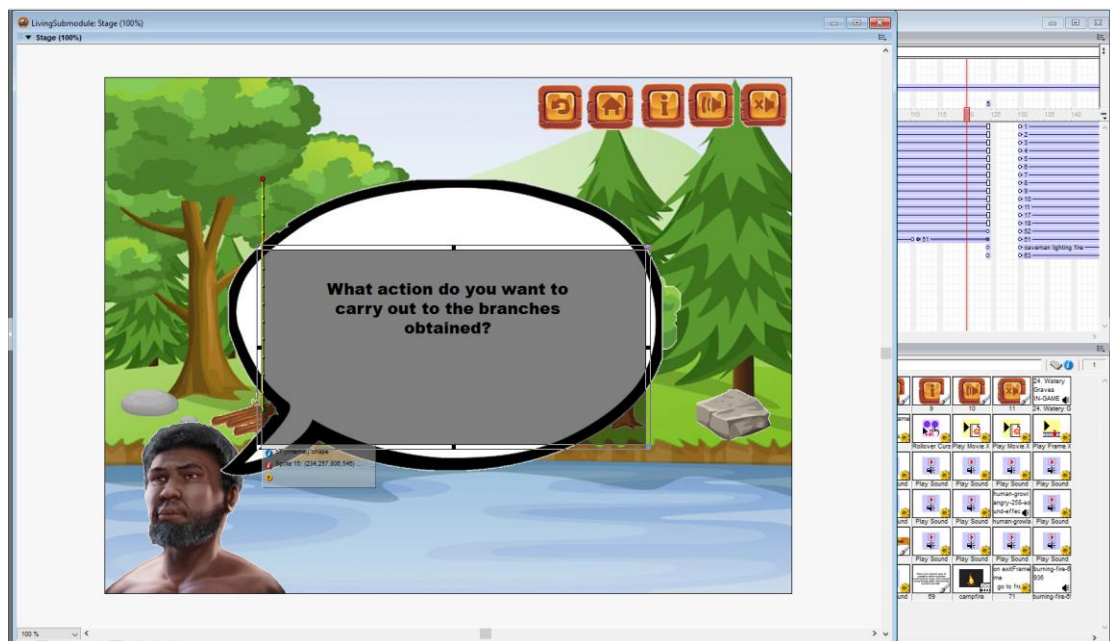


Figure 4.15 Simulation Module Development 4

CHAPTER 4 DEVELOPMENT

Next, a transparent black box will appear first in a small size then expanded to the right side and then upwards by using path animation.

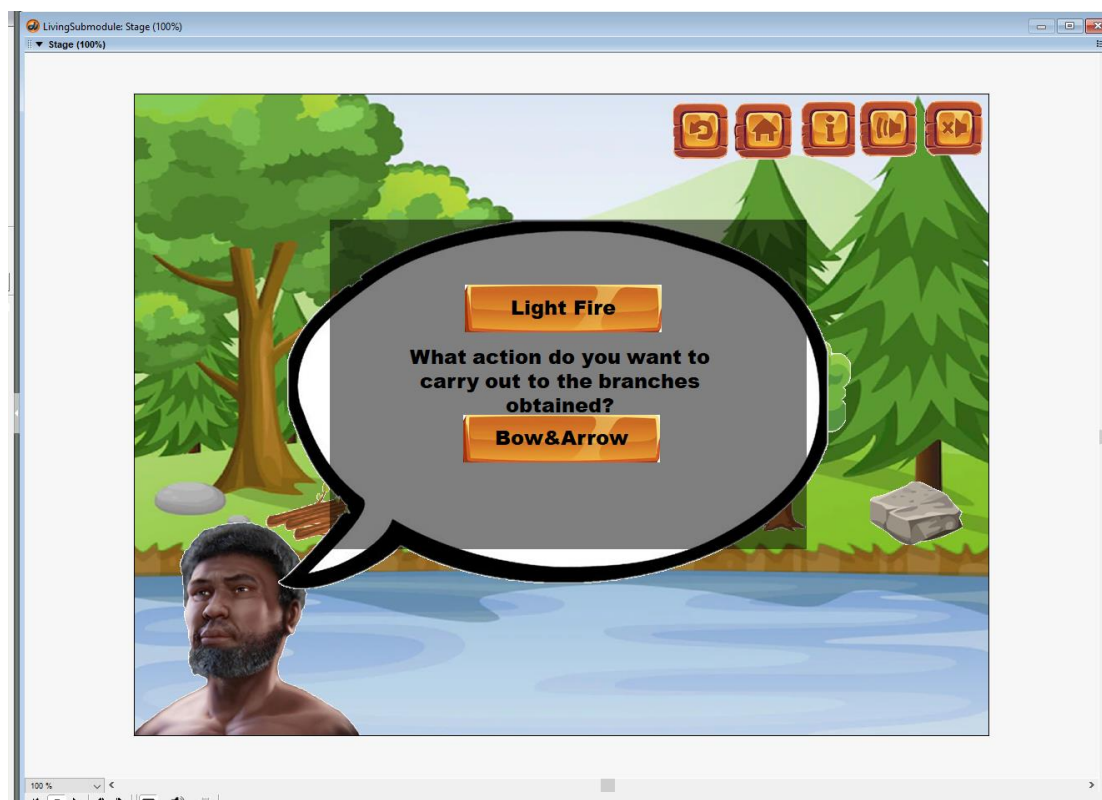


Figure 4.16 Simulation Module Development 5

Then, 2 buttons of actions related to the graphic that users clicked on will be available for users to choose from by clicking on it through play frame X

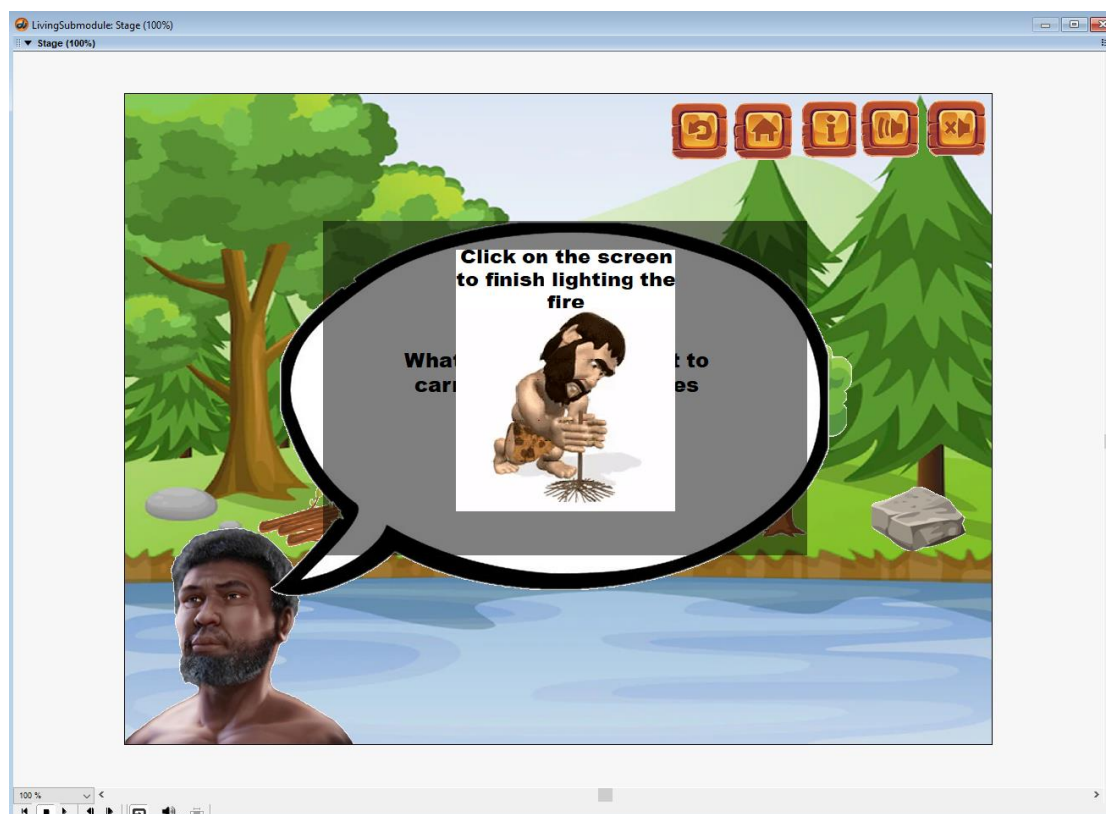


Figure 4.17 Simulation Module Development 6

After clicking on the button text with animations will be shown for users to view it and then they can click on anywhere on the screen to proceed to the next screen through play frame X with the action.

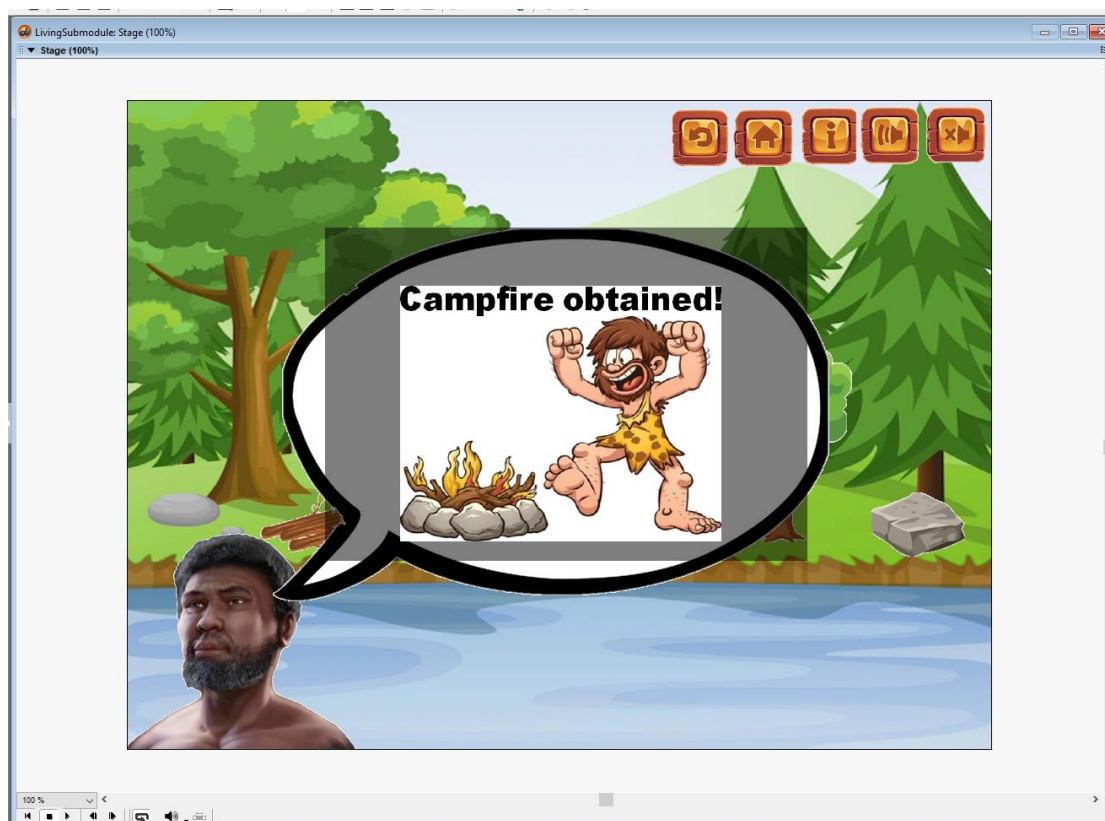


Figure 4.18 Simulation Module Development 7

After users click on the screen from the last screen, they are going to proceed and being told about what he achieved with the item and action that they selected before. They can click on the screen again to proceed to the next screen.



Figure 4.19 Simulation Module Development 8

This is the last screen of the action and users will be given some text and graphics/animations to let them know what is the use of the item that they created through selecting the item and then selection what action to be taken to that item. Lastly, users can click anywhere on the screen and go back to the main screen of Living Submodule for them to click on other items or carry out other actions such as back to main menu.

Repeat the steps for other 3 items and the other submodule, Hunting submodule and the Simulation Module is done.

4.2.3 Module 3(Map Navigation Module)

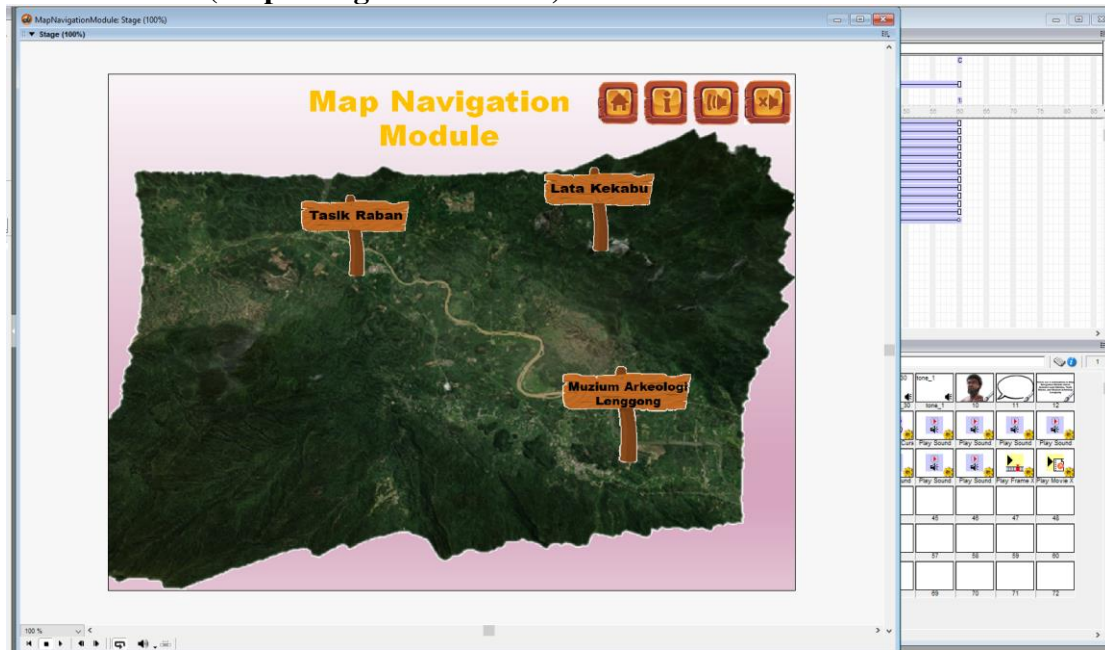


Figure 4.20 Map Navigation Module Development 1

The users will be on this page after they click on the Map Navigation button on the main menu. Add play movie X to Tasik Raban, Lata Kekabu, and Muzium Arkeologi Lenggong button so that users can navigate to the submodules after clicking the button.

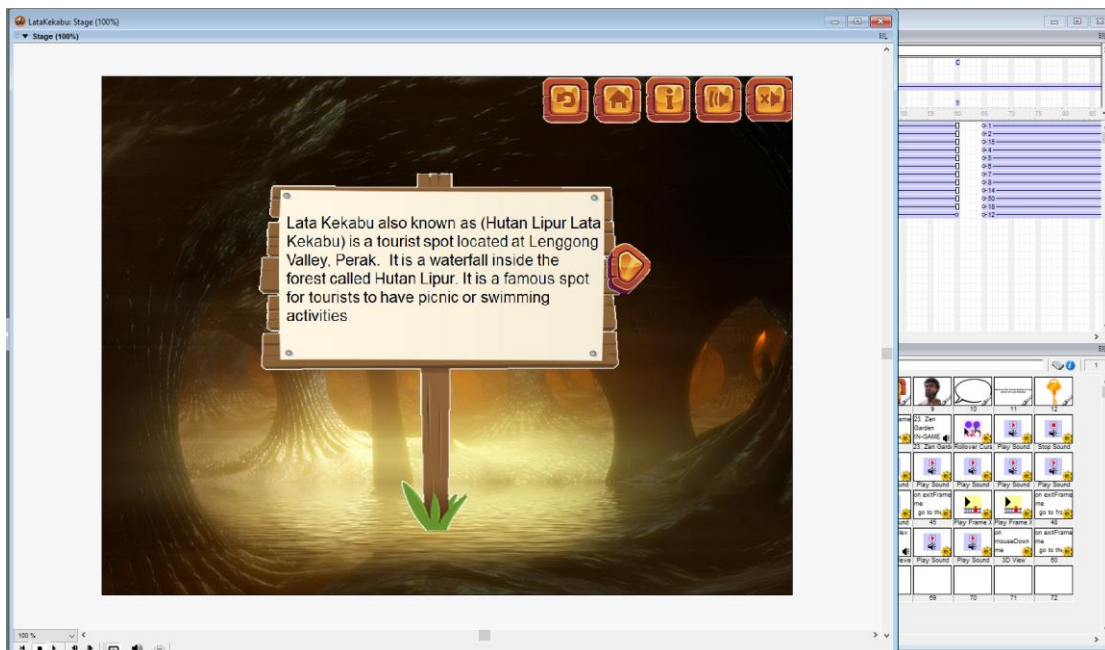


Figure 4.21 Map Navigation Module Development 2

CHAPTER 4 DEVELOPMENT

This is the screen that users will see after clicking on the Lata Kekabu button, add play frame X to the arrow button to go to next screen.

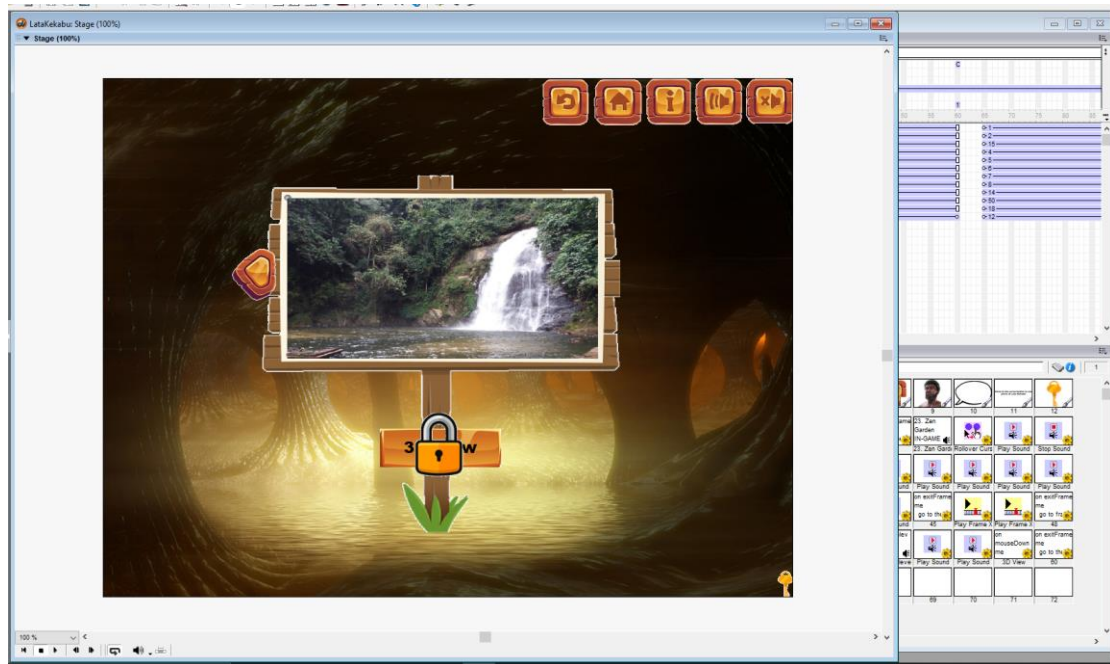


Figure 4.21 Map Navigation Module Development 2

Next, add play frame X to the arrow for users to go back to the previous screen and add a small key button with play frame X added to go to the frame that unlocks 3D View button.

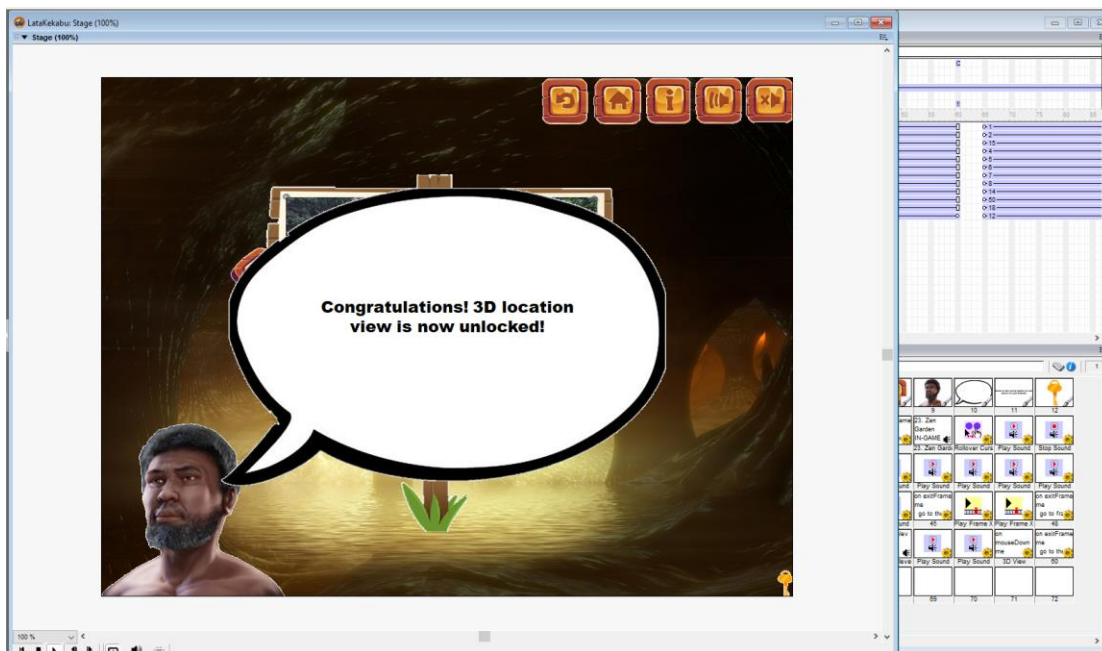


Figure 4.22 Map Navigation Module Development 3

Transition of 3D View being unlocked, add wait for mouse click and play frame X so that users can proceed after clicking on the screen.

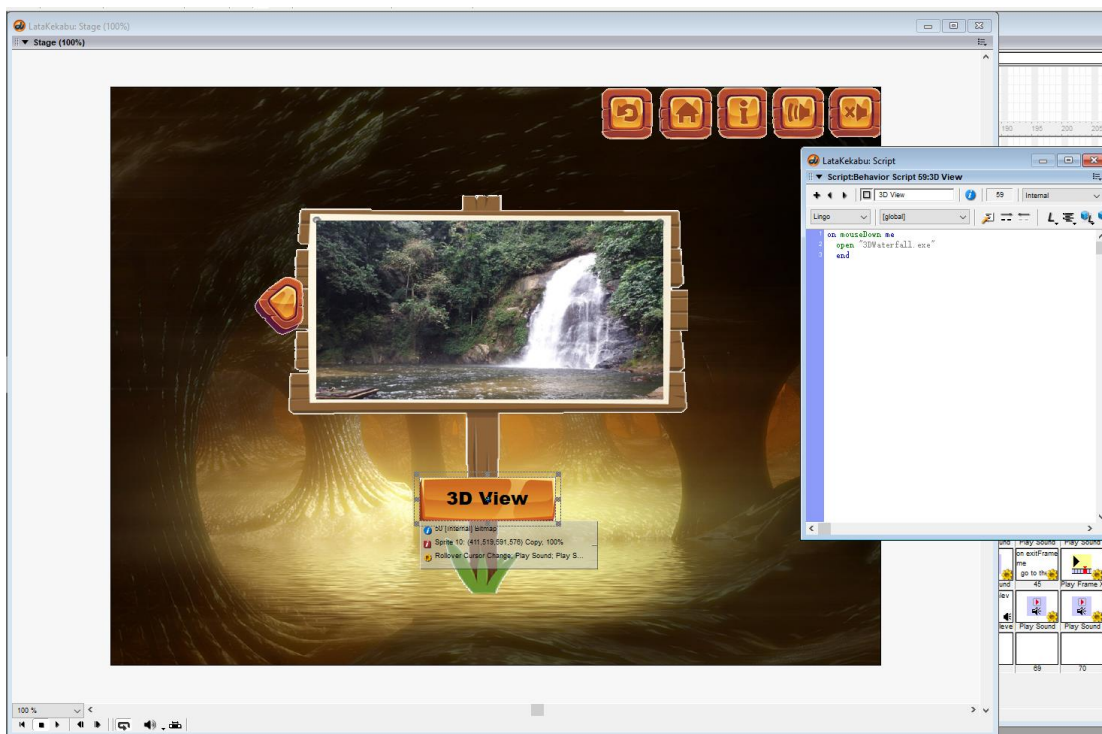


Figure 4.23 Map Navigation Module Development 4

CHAPTER 4 DEVELOPMENT

Now 3D View is unlocked and in the script for the 3D View button, type in open “.exe” to link it to external file since 3D View exe file needs to be done by using Unity and linked to Macromedia Director MX 2004.

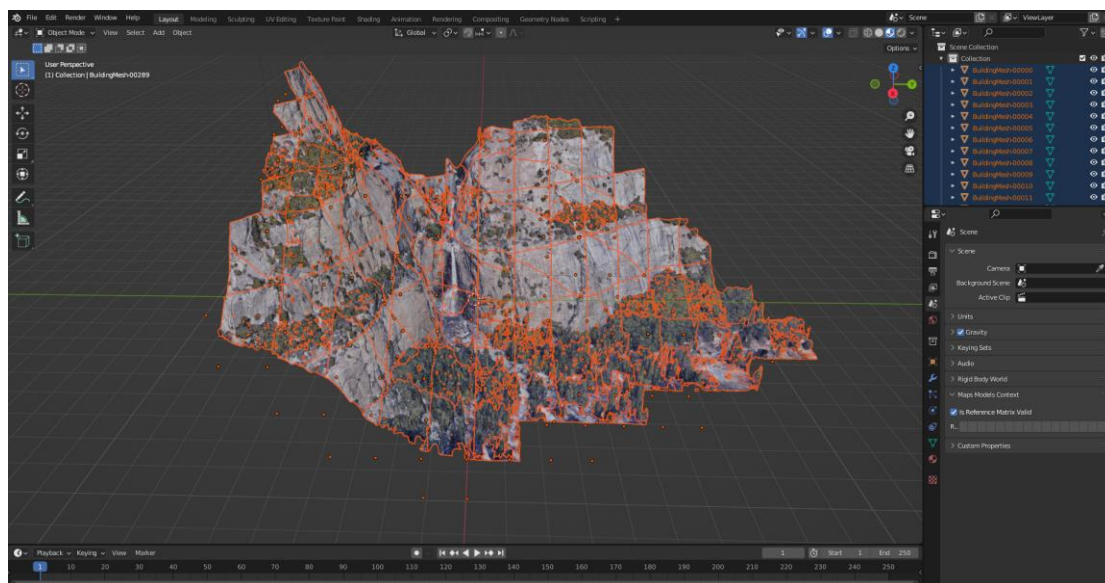


Figure 4.24 Map Navigation Module Development 5

For the 3D View, we will first use Blender to draw out the 3D location view from scratch , then we will find materials from online sources in order to render it. This is the final completed version of the Lata Kekabu waterfall location 3D view. Next, save it as .fbx file and put it into the Unity asset folder in order to import this into Unity.

CHAPTER 4 DEVELOPMENT



Figure 4.25 Map Navigation Module Development 6

This will be shown after the import from Blender into Unity is successful. Put the 3D model into the middle of the screen.

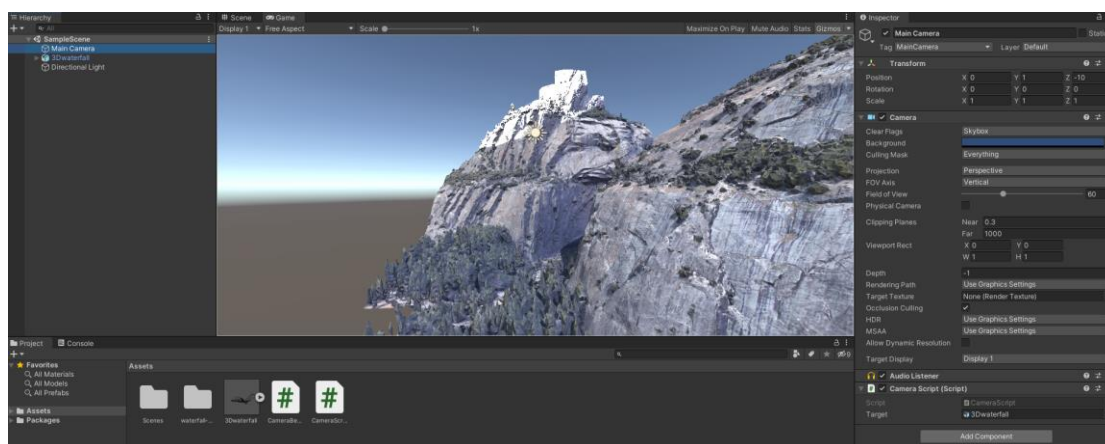
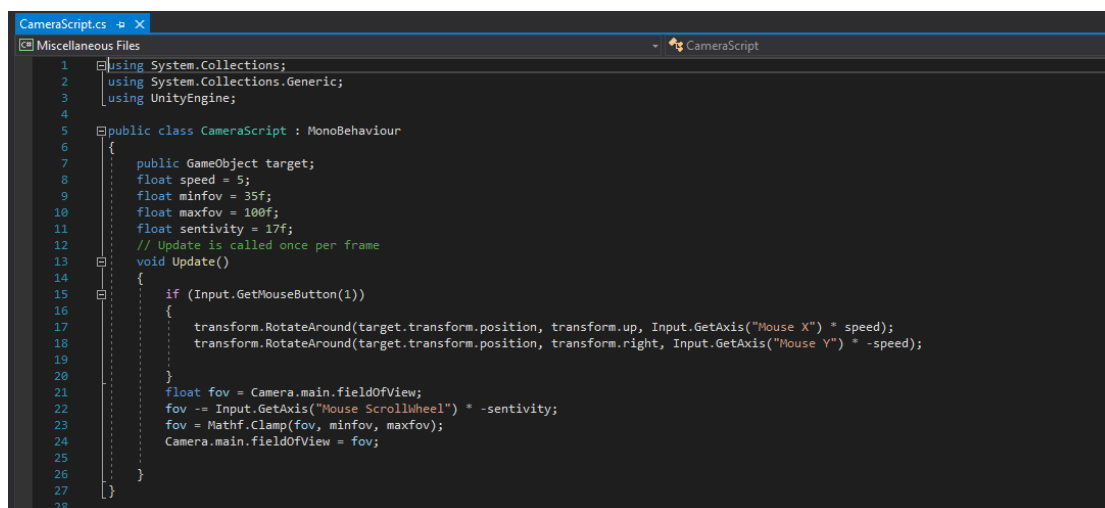


Figure 4.26 Map Navigation Module Development 7

Next, click on the main camera and then click Add Component on the bottom right in order to add camera script. Add 3D model into the target slot and add C# script into the script slot.

CHAPTER 4 DEVELOPMENT



```
1 using System.Collections;
2 using System.Collections.Generic;
3 using UnityEngine;
4
5 public class CameraScript : MonoBehaviour
6 {
7     public GameObject target;
8     float speed = 5;
9     float minfov = 35f;
10    float maxfov = 100f;
11    float sensitivity = 17f;
12    // Update is called once per frame
13    void Update()
14    {
15        if (Input.GetMouseButton(1))
16        {
17            transform.RotateAround(target.transform.position, transform.up, Input.GetAxis("Mouse X") * speed);
18            transform.RotateAround(target.transform.position, transform.right, Input.GetAxis("Mouse Y") * -speed);
19        }
20        float fov = Camera.main.fieldOfView;
21        fov -= Input.GetAxis("Mouse Scrollwheel") * -sensitivity;
22        fov = Mathf.Clamp(fov, minfov, maxfov);
23        Camera.main.fieldOfView = fov;
24    }
25 }
26
27
28
```

Figure 4.27 Map Navigation Module Development 8

This will be the C# script that is being used in order to add controls such as rotate and zoom in zoom out for the 3D model.

CHAPTER 4 DEVELOPMENT

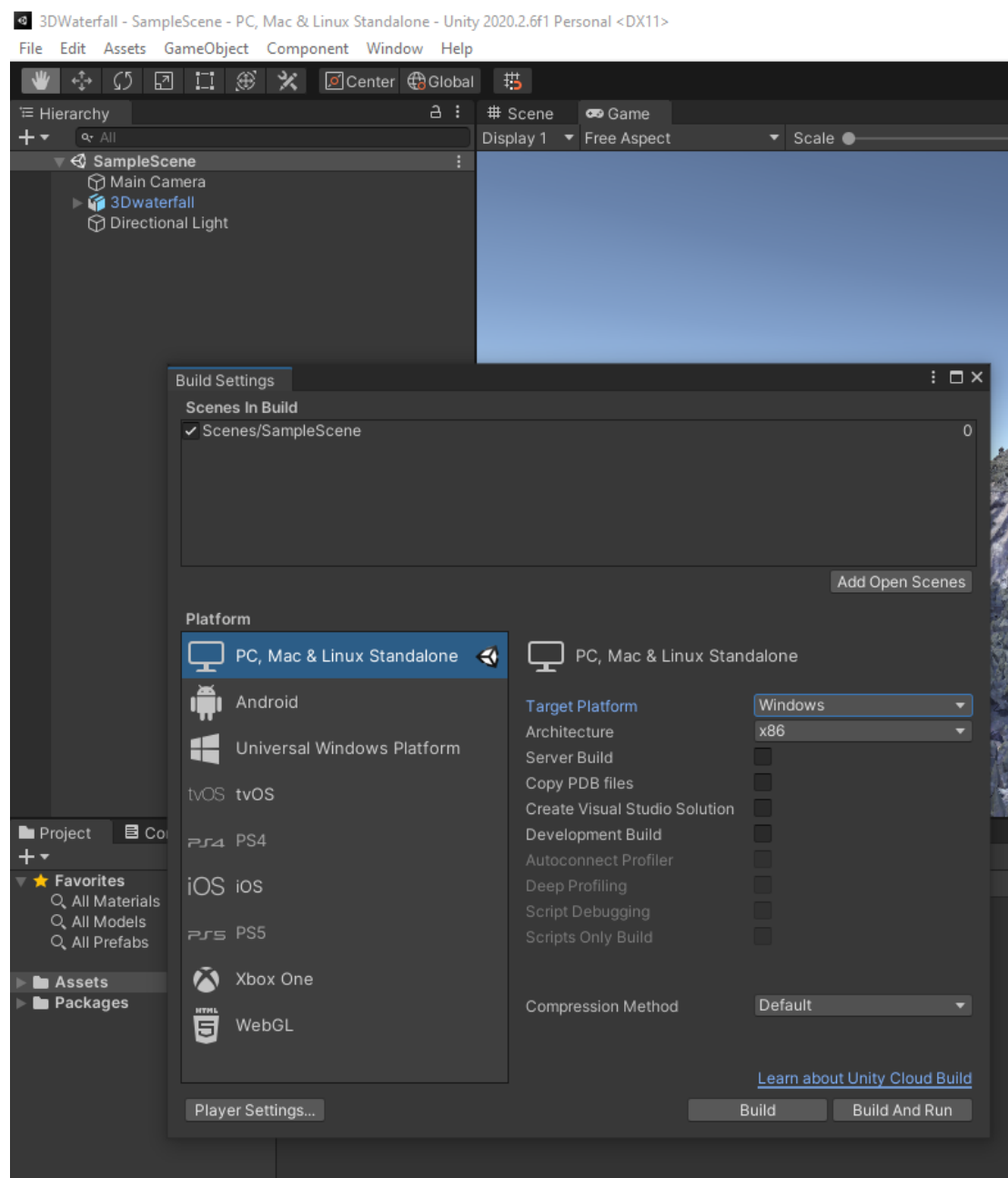


Figure 4.28 Map Navigation Module Development 9

Next, click File > Build Settings > Build And Run with PC, Mac & Linux Standalone selected in order to build an .exe file.

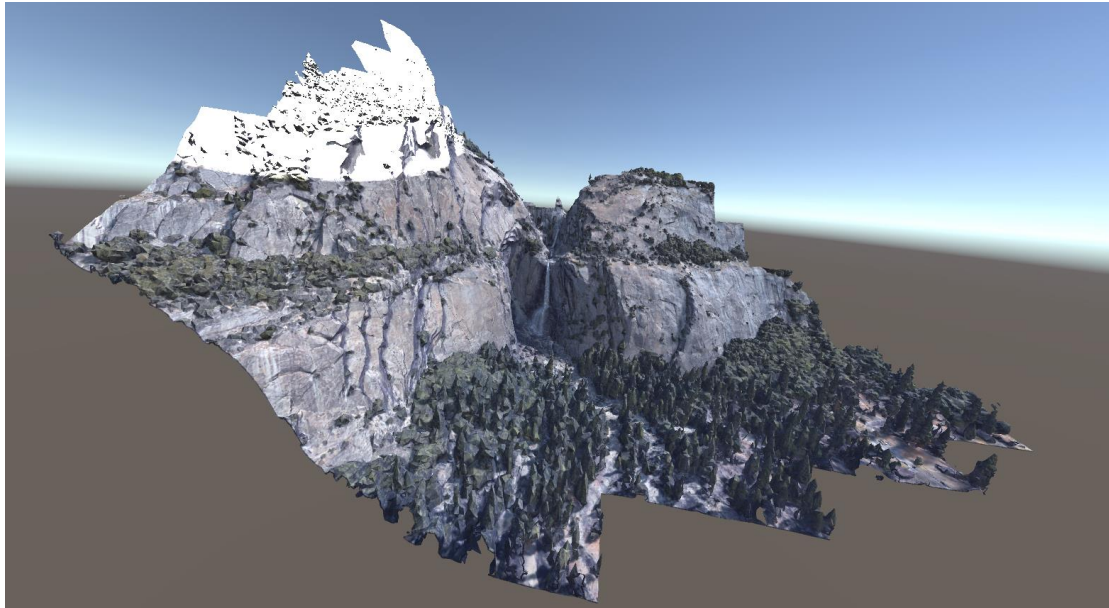


Figure 4.29 Map Navigation Module Development 10

Now, the 3D model .exe file is created, and it can be linked to Macromedia Director MX 2004 through open “.exe” Lingo Script. Repeat the steps for other 2 submodules and the Map Navigation Module is finished.

4.2.4 Module 4(AR Module)

For AR Module, there will be 2 submodules which is AR Foundation and Vuforia.

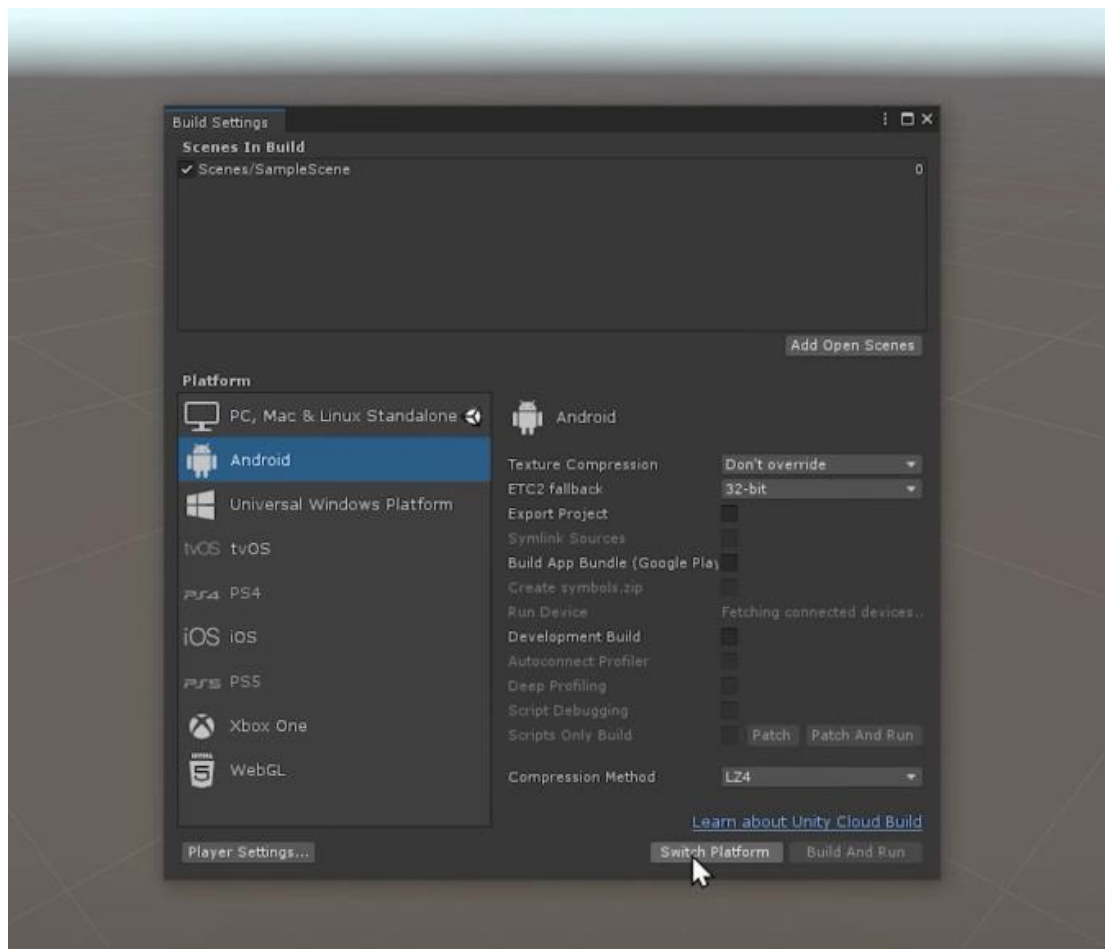


Figure 4.30 AR Module Development 1

First, at the build settings of Unity, click on Android and click switch platform. This is necessary due to the nature of Unity Augmented Reality unable to be build on pc and instead forces users to build them on mobile devices in order to be able to use them.

CHAPTER 4 DEVELOPMENT

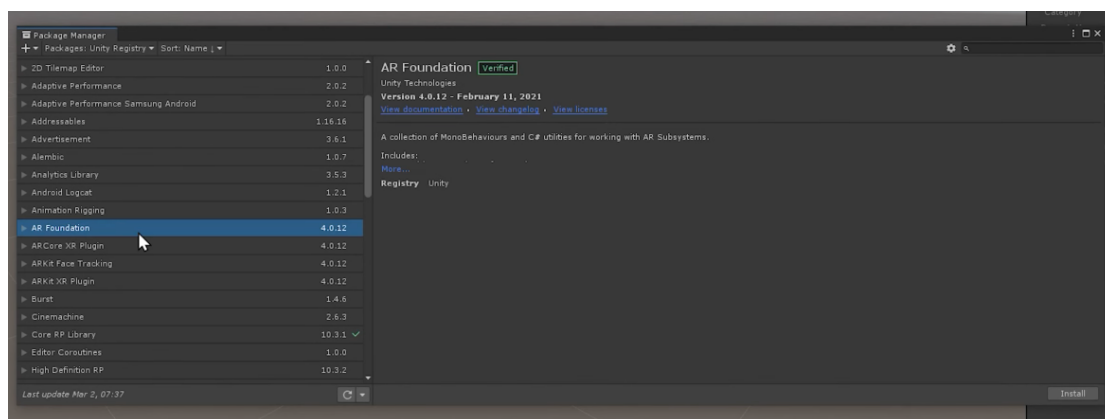


Figure 4.31 AR Module Development 2

Next, go to the package manager and install AR Foundation and ARCore XR Plugin.

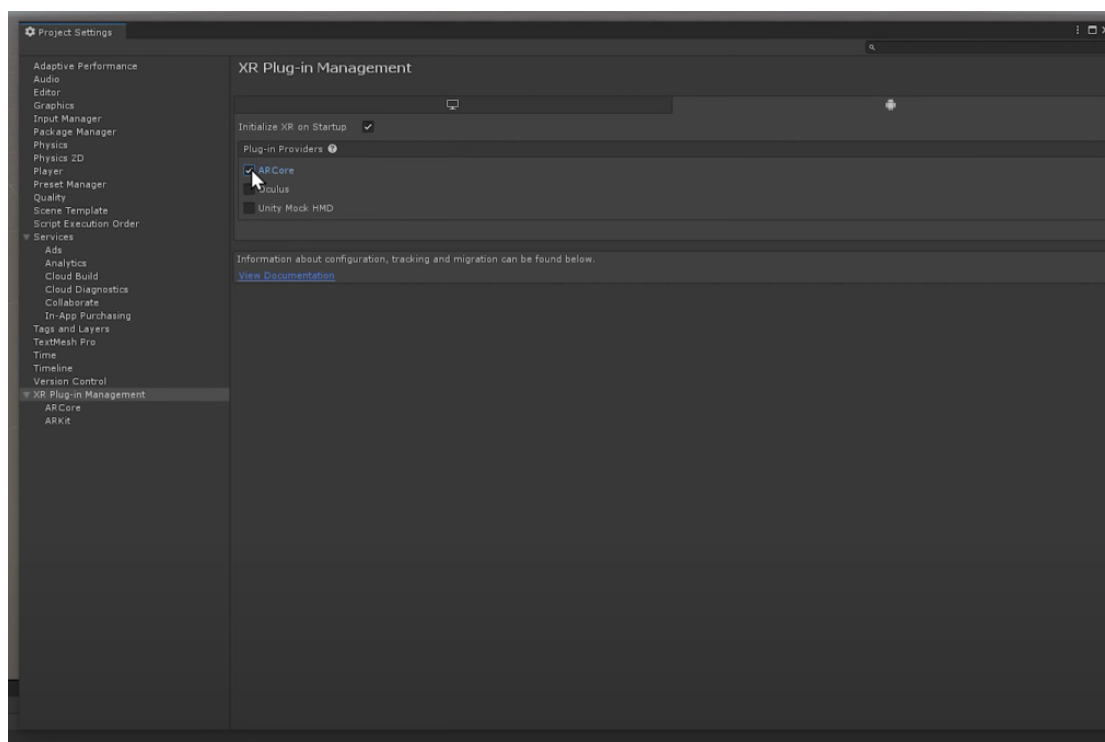


Figure 4.32 AR Module Development 3

Go to project settings, click on XR Plug-in Management, click on the Android logo and tick AR Core.

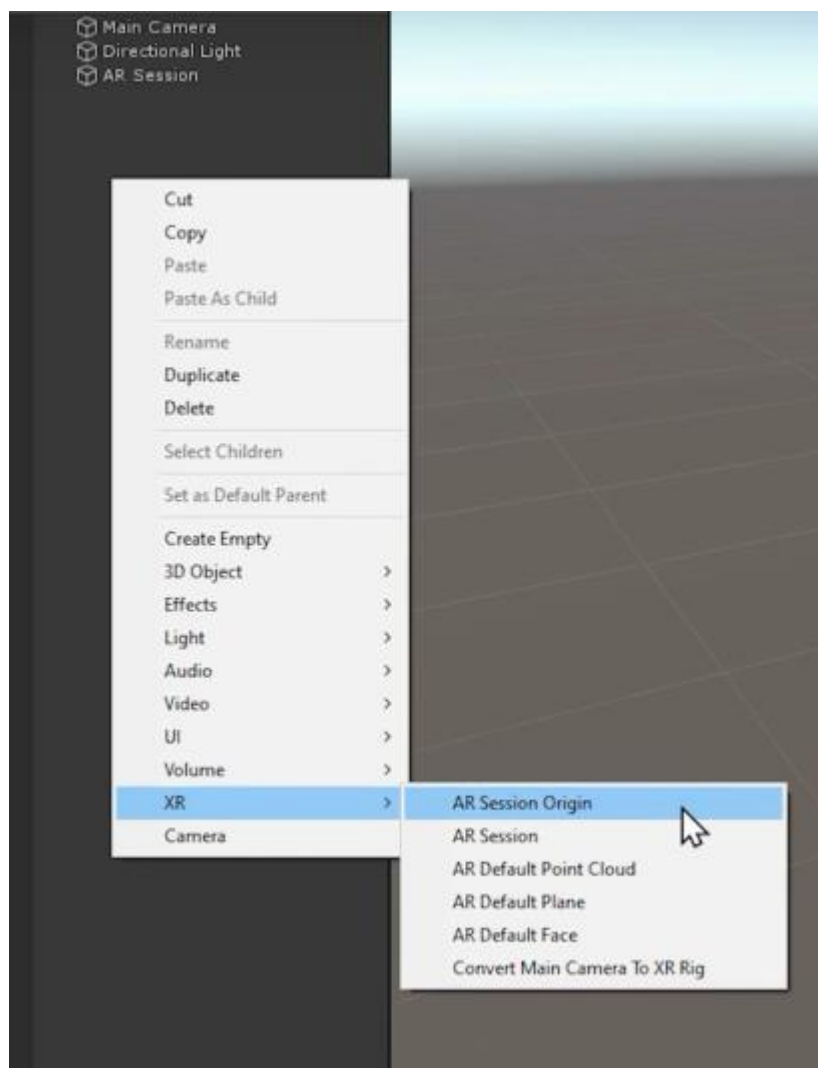


Figure 4.33 AR Module Development 4

Next, right click on the left black space and add both AR Session, AR Session Origin and AR Default Plane.

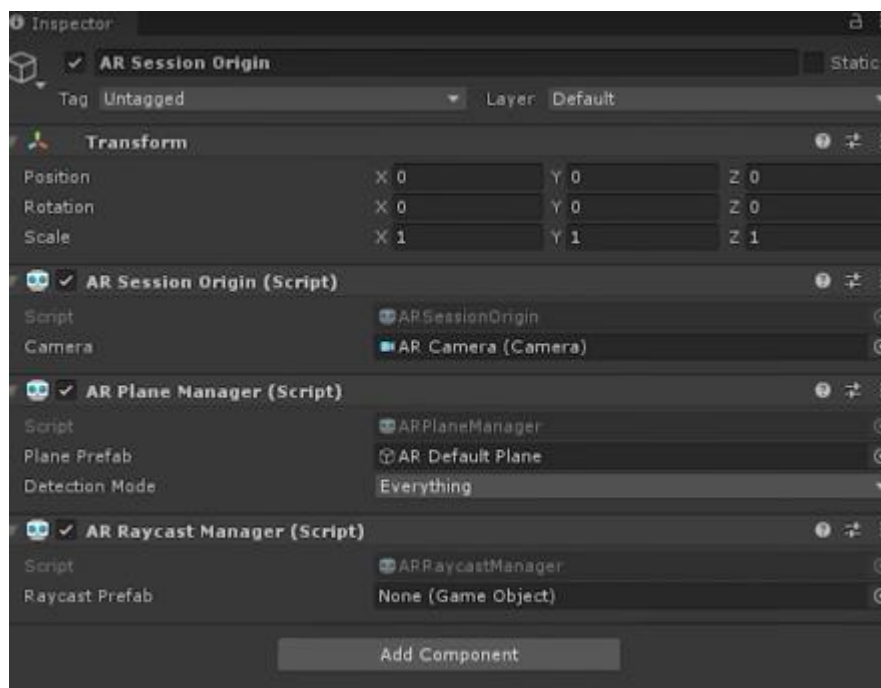


Figure 4.34 AR Module Development 5

Click Add Component on AR Session Origin and add AR Plane Manager, drag AR Default plane into the Plane Prefab. Then, add AR Raycast Manager.



Figure 4.35 AR Module Development 6

Next, create an empty GameObject and name it AR Cursor, add a cursor image as a child of AR Cursor.

CHAPTER 4 DEVELOPMENT

```
1 using System.Collections;
2 using System.Collections.Generic;
3 using UnityEngine;
4 using UnityEngine.XR.ARFoundation;
5
6 public class ARCursor : MonoBehaviour
7 {
8     public GameObject cursorChildObject;
9     public GameObject objectToPlace;
10    public ARRaycastManager raycastManager;
11
12    public bool useCursor = true;
13
14    // Start is called before the first frame update
15    void Start()
16    {
17        cursorChildObject.SetActive(useCursor);
18    }
19
20    // Update is called once per frame
21    void Update()
22    {
23        if (useCursor)
24        {
25            UpdateCursor();
26        }
27
28        if (Input.touchCount > 0 && Input.GetTouch(0).phase == TouchPhase.Began)
29        {
30            if (useCursor)
31            {
32                GameObject.Instantiate(objectToPlace, transform.position, transform.rotation);
33            }
34            else
35            {
36                List<ARRaycastHit> hits = new List<ARRaycastHit>();
37                raycastManager.Raycast(Input.GetTouch(0).position, hits, UnityEngine.XR.ARSubsystems.TrackableType.Planes);
38                if (hits.Count > 0)
39                {
40                    GameObject.Instantiate(objectToPlace, hits[0].pose.position, hits[0].pose.rotation);
41                }
42            }
43        }
44    }
45
46    void UpdateCursor()
47    {
48        Vector2 screenPosition = Camera.main.ViewportToScreenPoint(new Vector2(0.5f, 0.5f));
49        List<ARRaycastHit> hits = new List<ARRaycastHit>();
50        raycastManager.Raycast(screenPosition, hits, UnityEngine.XR.ARSubsystems.TrackableType.Planes);
51
52        if (hits.Count > 0)
53        {
54            transform.position = hits[0].pose.position;
55            transform.rotation = hits[0].pose.rotation;
56        }
57    }
58 }
59
```

Figure 4.36 AR Module Development 7

Add C# script into AR Cursor in order to show the AR Cursor image on the screen after plane is being detected. When users touch the screen, the 3D AR will be displayed on top of the AR Cursor image.

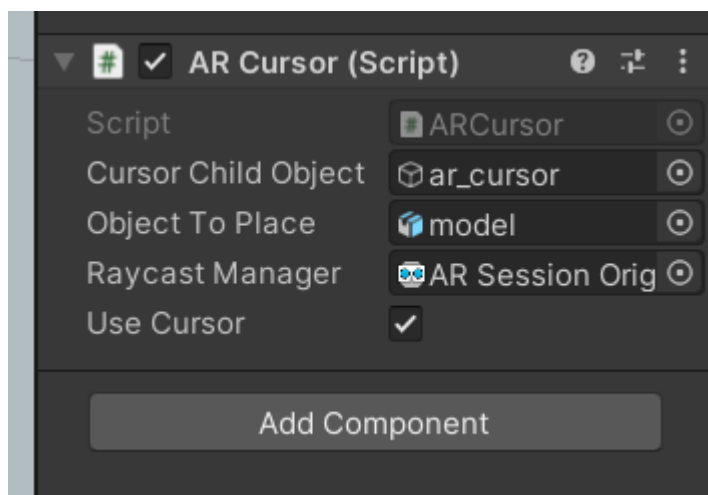


Figure 4.37 AR Module Development 8

Lastly, at the AR Cursor script, drag in cursor image as Cursor Child Object, the 3D model as Object To Place, and AR Session Origin as Raycast Manager.

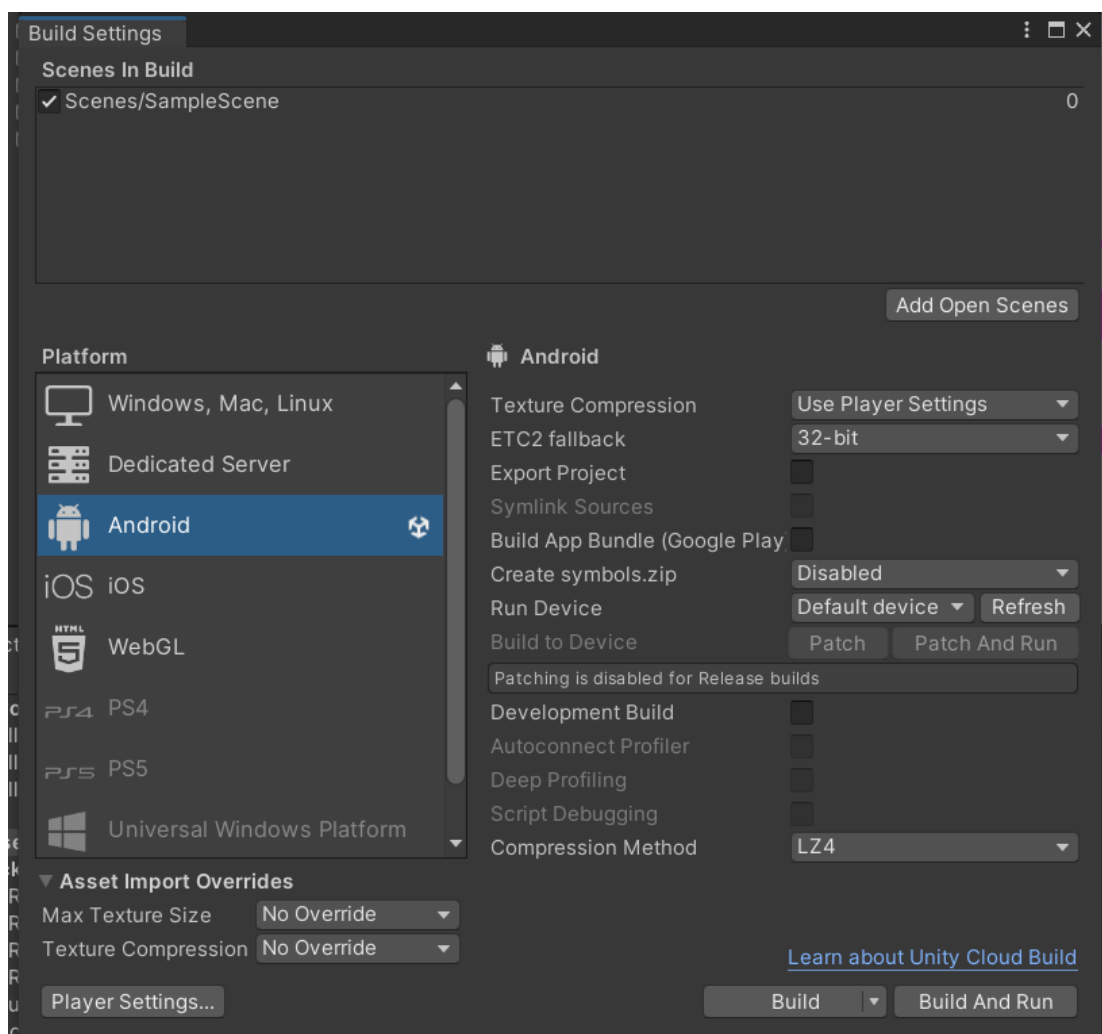


Figure 4.38 AR Module Development 9

Then, plug in Android phone that supports ARCore and build the apk into the phone. The first submodule of AR Foundation is completed.

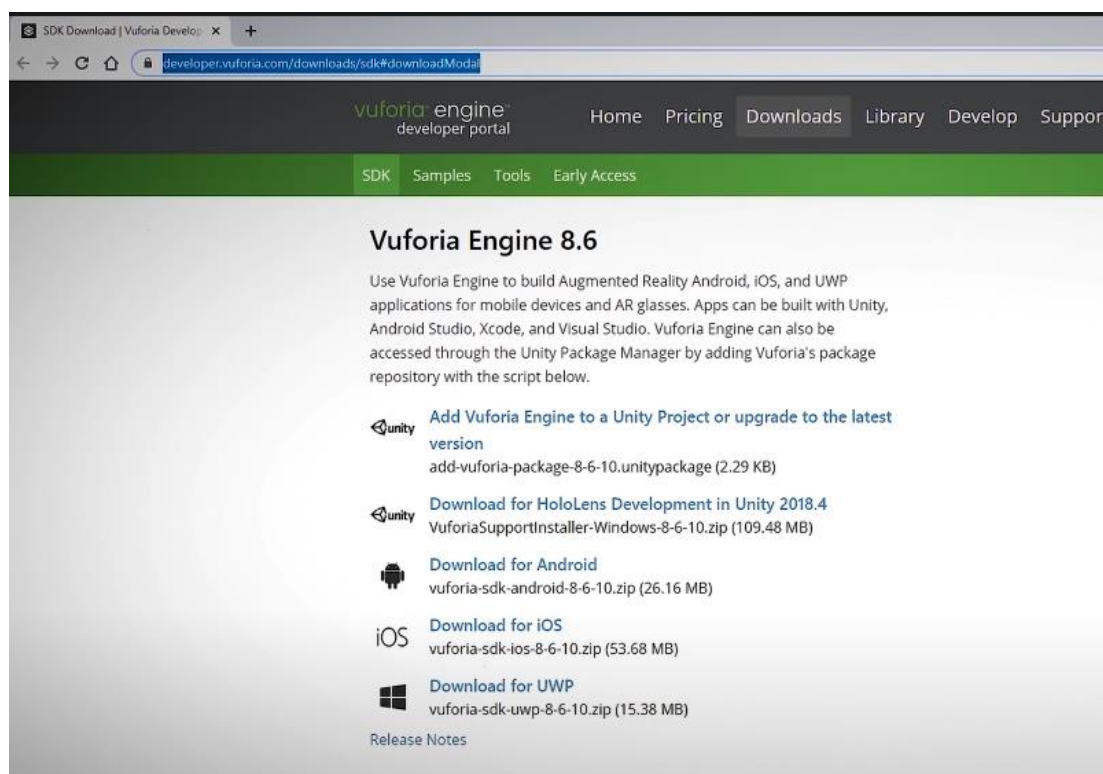


Figure 4.39 AR Module Development 10

Install Vuforia Engine from the website and import it into Unity.

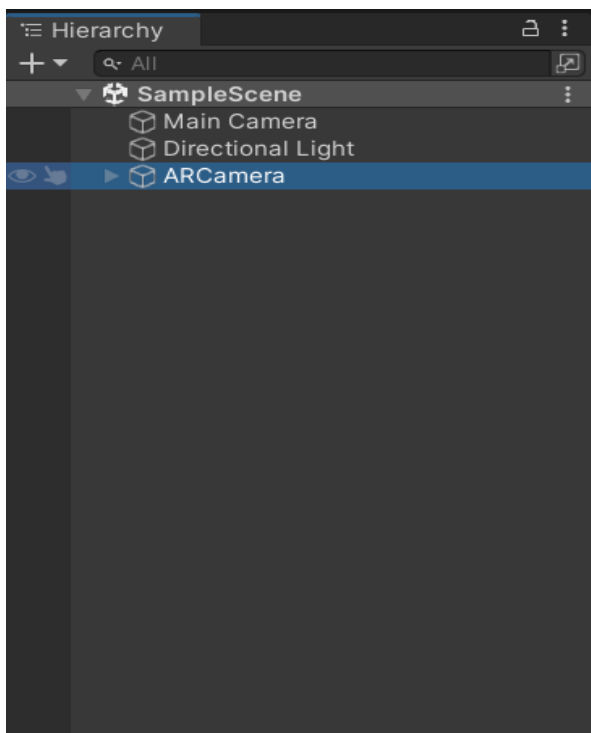


Figure 4.40 AR Module Development 11

Add ARCamera from Vuforia Engine to the sample scene.

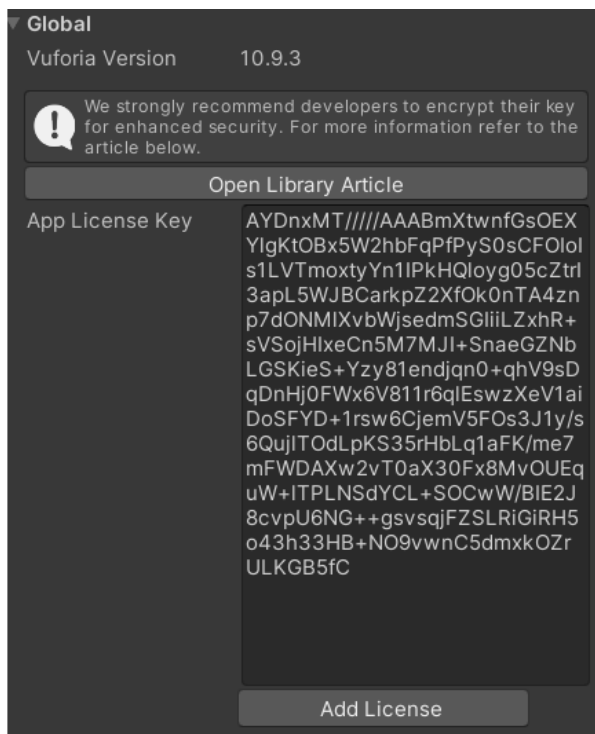


Figure 4.41 AR Module Development 12

Copy paste App License Key obtained from Vuforia website into the App License Key column.

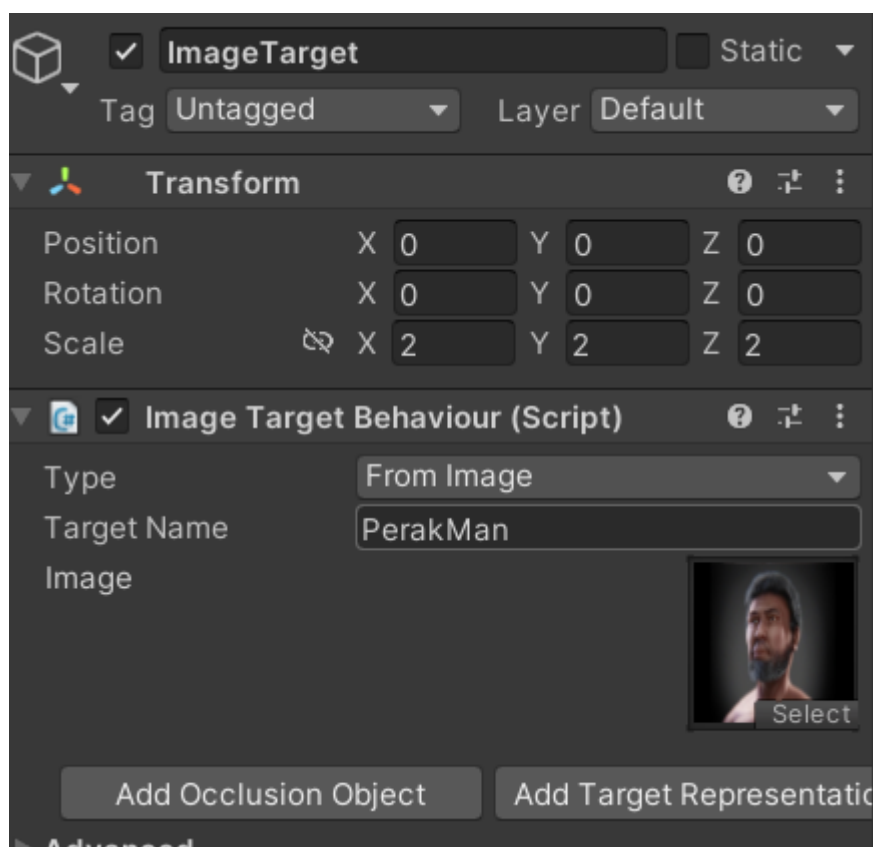


Figure 4.42 AR Module Development 13

Next, add ImageTarget as a child of ARCamera. Drag an image into the image slot provided under Image Target Behavior Script.

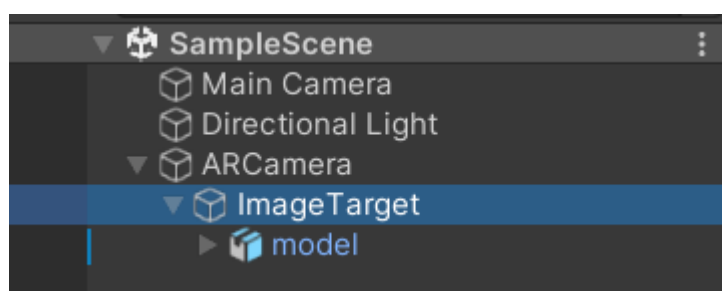


Figure 4.43 AR Module Development 14

Then, add the 3D model as a child of ImageTarget.

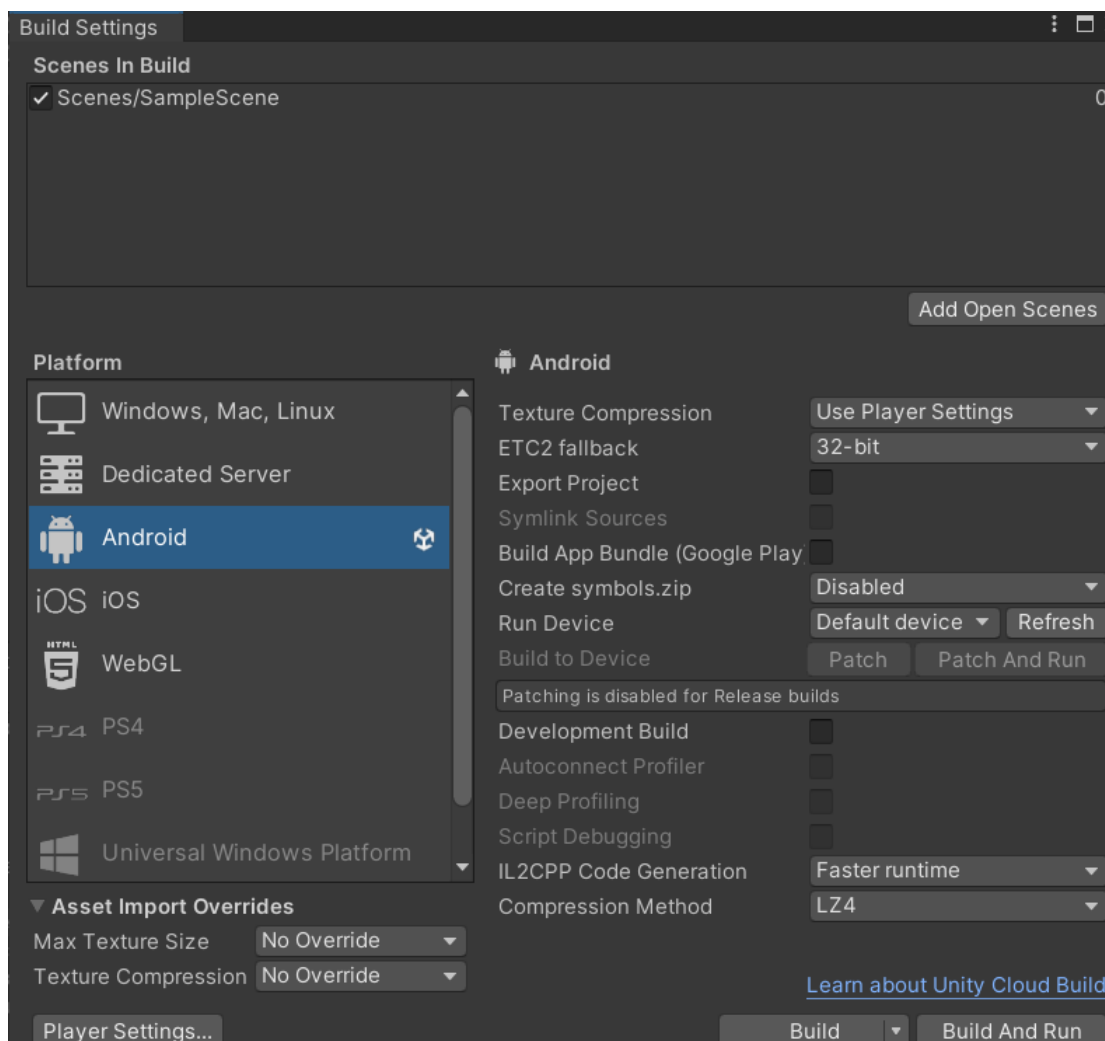


Figure 4.44 AR Module Development 15

Lastly, plug in Android phone that supports ARCore and build the apk into the phone. The second submodule of Vuforia is completed.

4.2.5 Module 5(Timeline Module)

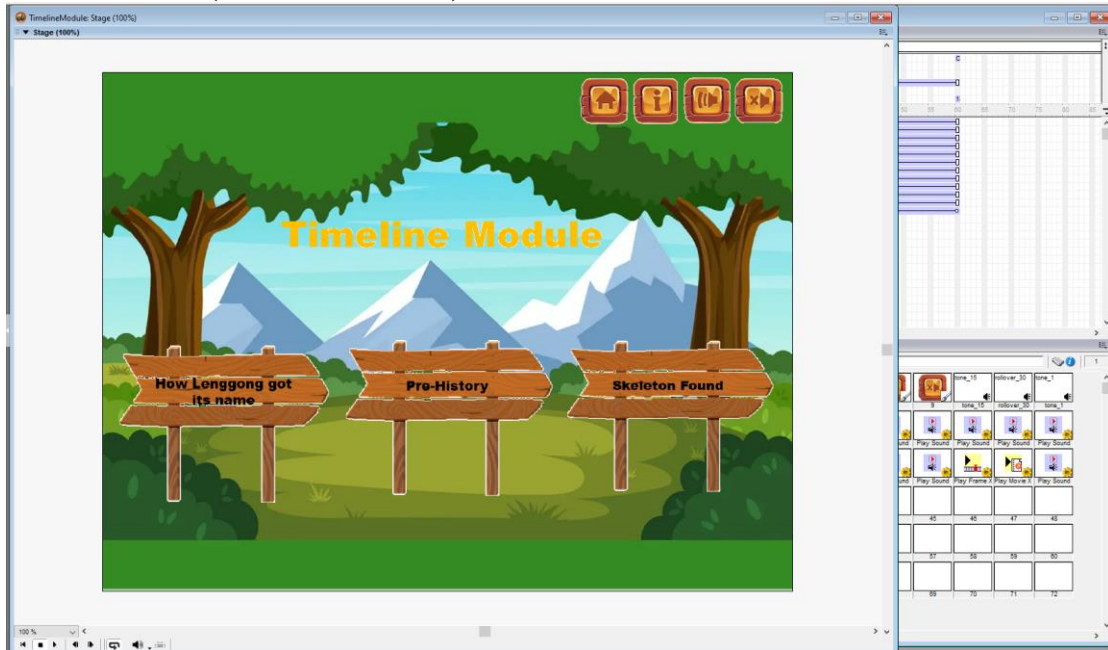


Figure 4.45 Timeline Module Development 1

The users will be on this page after they click on the Timeline button on the main menu. Add play movie X to How Lenggong got its name, Pre-History, and Skeleton Found button so that users can navigate to the submodules after clicking the button.

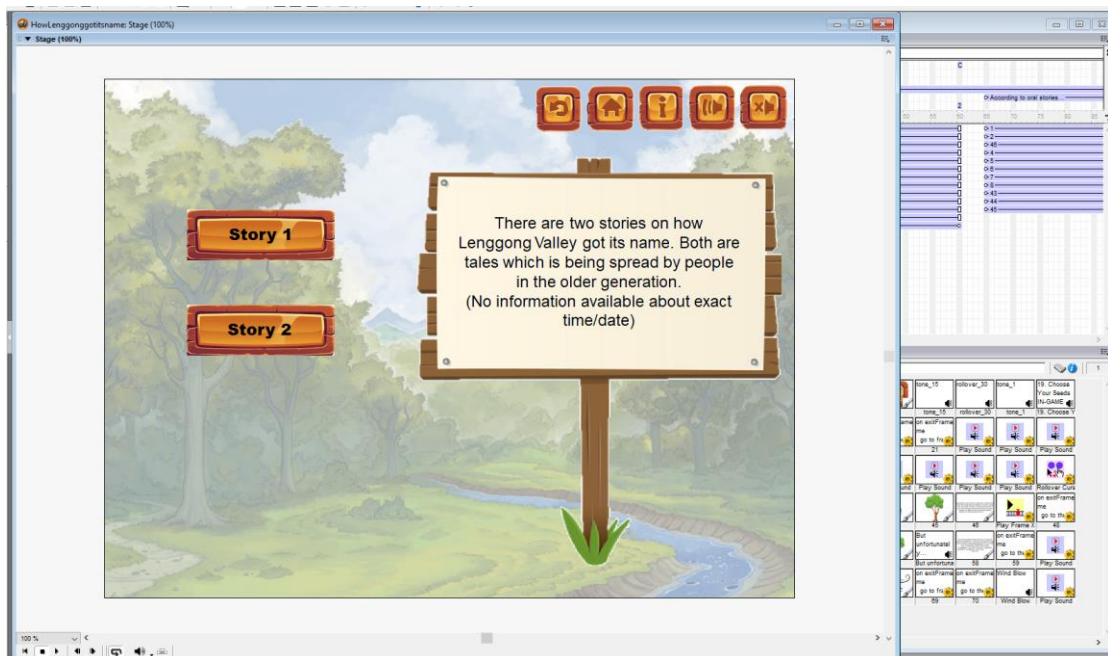


Figure 4.46 Timeline Module Development 2

This is the screen that user will see after clicking How Lenggonng got its name button. Add play frame X to Story 1 and Story 2 button so that users can navigate to the stories.

The narration is created by using lazyppy website and is dragged onto the Sound Channel 2.

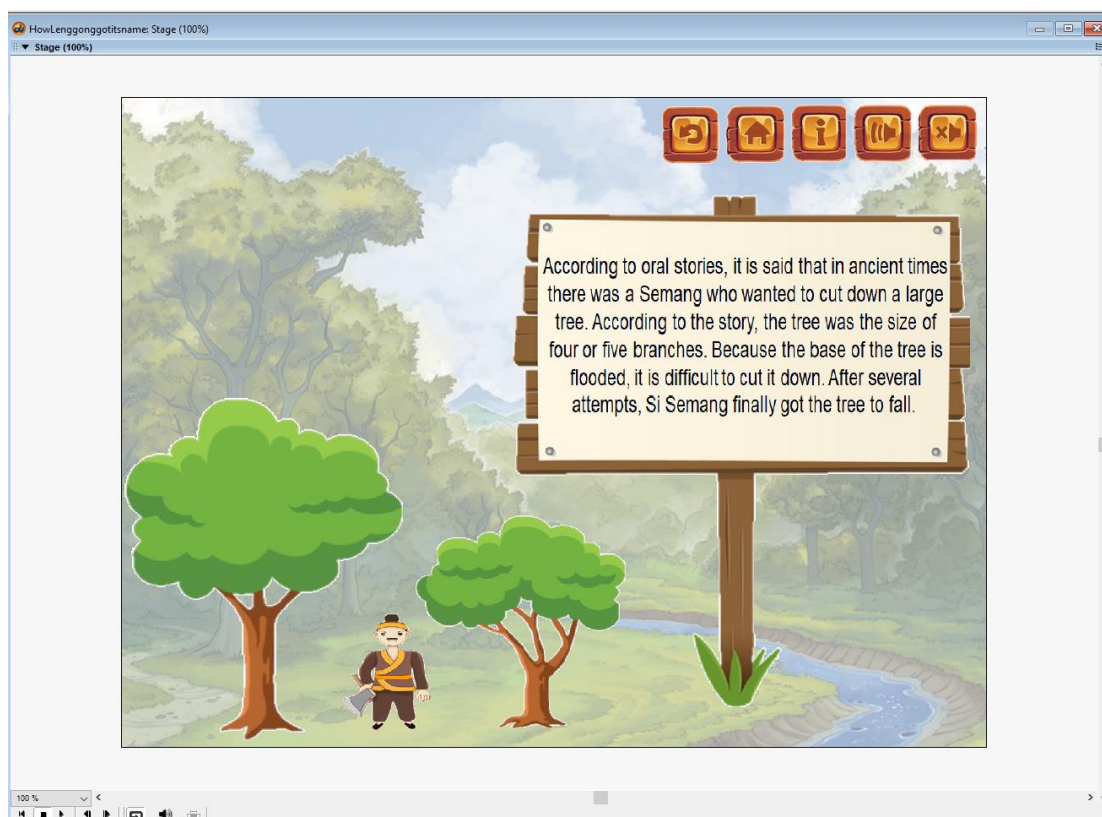


Figure 4.47 Timeline Module Development 3

Add graphics and animations and play frame X so that users will be able to interact with it and trigger actions by clicks.

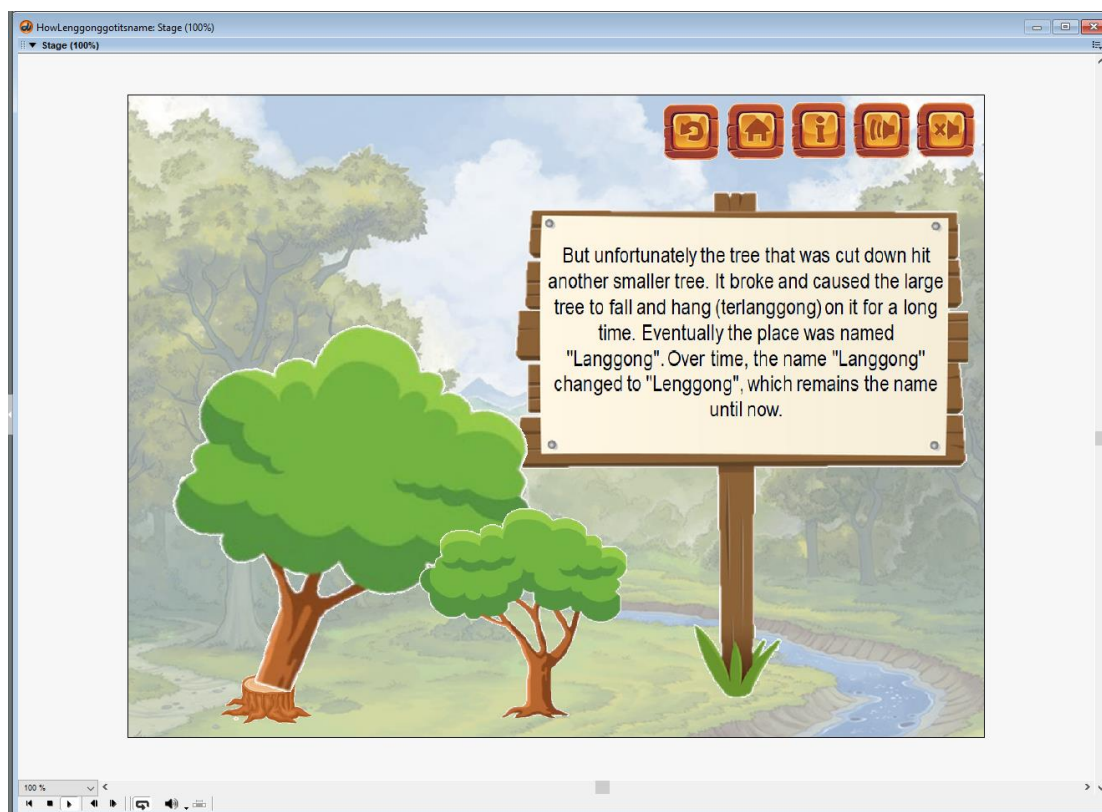


Figure 4.48 Timeline Module Development 4

Animations will be played after mouse clicks alongside with narrations for storytelling and visuals. Repeat the same steps for story 2 as well as the other 4 stories on Pre-History submodule and Skeleton Found submodule and the Timeline Module is finished.

Chapter 5 Testing, Results & Discussion

5.1 Overview

The overview of chapter 5 is the method of testing which is to record the demo of the whole prototype and then send the recorded video to respondents through online platforms. After respondents have watched the demo video, a google form survey will be sent for them to fill in their feedback and opinion towards the prototype. There are 26 questions in the survey questionnaire which includes 10 System Usability Scale (SUS) questions and 16 Post-Study System Usability Questionnaire (PSSUQ) questions. The selections provided to answer the 10 SUS questions are on the scale of 1 to 5 which is 1 for strongly disagree, 2 for disagree, 3 for neither agree or disagree, 4 for agree, and lastly 5 for strongly agree, meanwhile the 16 PSSUQ questions are on the scale of 1 to 7 which is 1 for strongly agree and 7 for strongly disagree. By providing answers in the form of scale, users are able to accurately express how their opinion are towards the particular question instead of only having yes or no as answer options. The target responses for this survey are 30 responses, which is the perfect number for System Usability Scale questions since SUS are most suitable to be used on small sample sizes and reliable results will be provided since the questions are designed in a way such that it can easily determine whether a system is usable or not [37]. Combined with Post-Study System Usability Questionnaire questions which are mainly used for the purpose of determining user satisfaction levels towards a system [38], we can safely conclude how the system performs based on user's answers for both set of questions. After that, testing analysis will be conducted. The answers for each question will be converted into a bar chart in order to have a better view to compare the percentage of each answers selected by users. Lastly, results and discussion will be done in order to find out how respondents think about the creative edutainment software based on their answer towards the 26 questions on the survey questionnaire whether that they are satisfied with this software or not.

5.2 Method of Testing

The method of testing to be used to test out this software is through recording a full demo video of demoing every aspect of the creative edutainment software. After that, the recorded video will be sent to respondents alongside with a google form survey questionnaire. Survey questionnaires are defined as an instrument for researching purposes in which the aim of using these survey questionnaires is to gather feedback and information from huge amount of information from a big sample size of respondents [29]. During the year of 1838, questionnaires are invented by London's Statistical Society [30]. In this project, the author will use survey questionnaire in order to collect sample data from target audience. The survey is created by using Google Form and is send to users through platforms such as email, Microsoft Teams, Facebook, Instagram, Twitter, and so on. The process of collecting 30 samples took 1 week, and the process of analyzing data collected took another 1 week. The questions used in the survey questionnaire will be 10 System Usability Scale (SUS) questions and 16 Post-Study System Usability Questionnaire (PSSUQ) questions. For the SUS questions, there is a way in order to calculate the SUS score based on user's answers from the scale of 1(strongly disagree) to 5(strongly agree) which is minus one from user's answer if the question is odd number questions and minus the user's answer from 5 if the question is even number questions. Lastly, add up the final value and multiply it by 2.5. The value will fall in between 1-100, 68 is the average score which means if the score obtained is 68 or above, then the system is considered to be useable [39]. For PSSUQ questions, it is more straight forward but the opposite of SUS score since 1 for PSSUQ stands for strongly agree and 7 stands for strongly disagree. It offers a reliable way to obtain user evaluation of satisfaction [40]. Hence, the lower the marks combined the more satisfied users are towards the system, then it can be further broken down into several sections in which for question 1-16, it is for the overall score of the system, for question 1-6, it is for the system usefulness(SYSUSE) score of the system, for question 7-12, it is for the information quality(INFOQUAL) score of the system, and lastly, for question 13-15, it is for the interface quality(INTERQUAL) score of the system.

5.3 Testing Analysis

Section A: System Usability Scale(SUS)

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

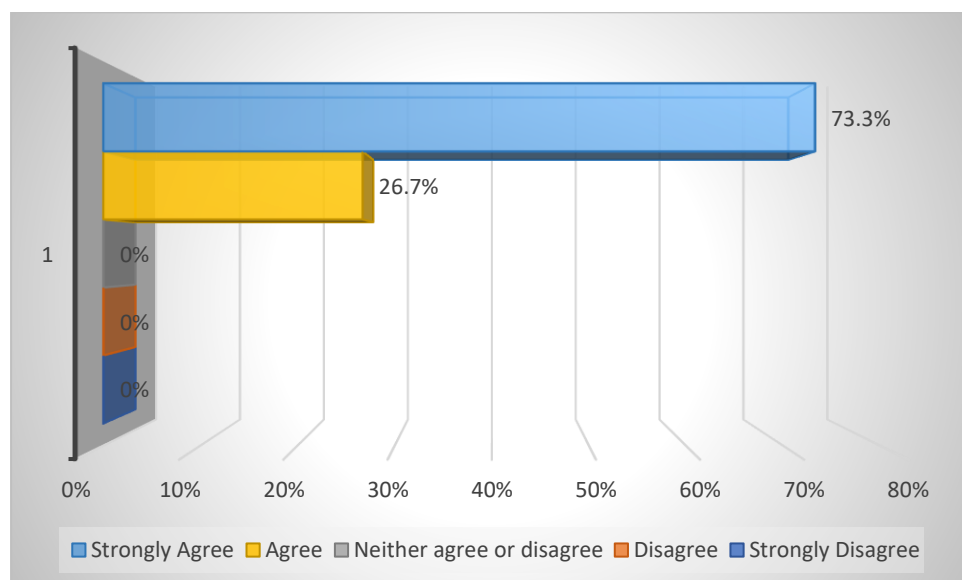


Figure 5.01 Bar Chart of SUS question 1

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1(strongly disagree) to 5(strongly agree). Majority of the respondents in this questionnaire strongly agreed that they would like to use this system frequently, account for 73.3% of the respondents. While 26.7% of the respondents agreed that they would like to use this system frequently. None of the respondents select option strongly disagree, disagree, and neither agree or disagree. The total number of respondents that strongly agreed that they would like to use this system frequently are 22 out of 30 respondents, while 8 out of 30 respondents agreed that they would like to use this system frequently.

2. I found the system unnecessarily complex.

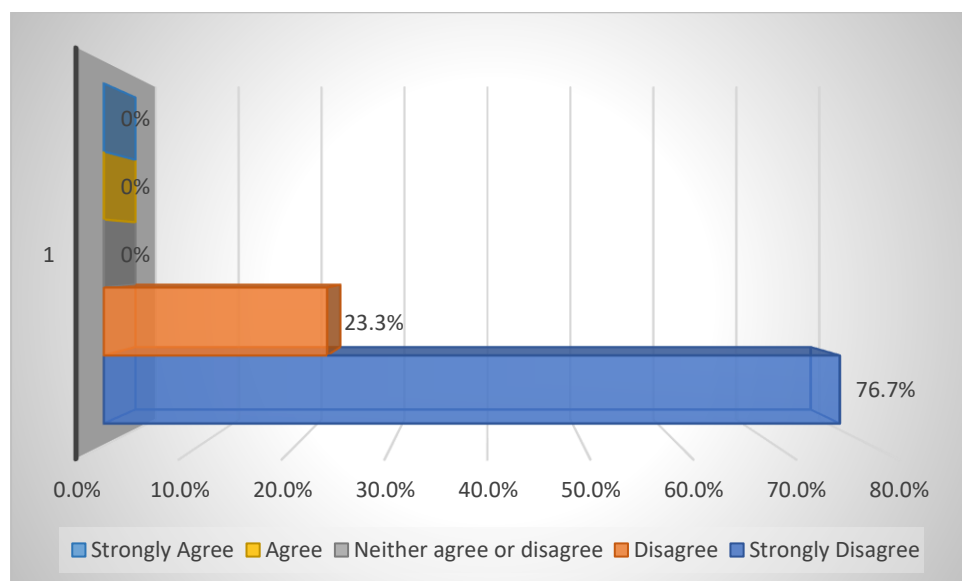


Figure 5.02 Bar Chart of SUS question 2

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly disagree) to 5 (strongly agree). Majority of the respondents in this questionnaire strongly disagreed that they found the system unnecessarily complex, account for 76.7% of the respondents. While 23.3% of the respondents disagreed that they found the system unnecessarily complex. None of the respondents select option strongly agree, agree, and neither agree or disagree. The total number of respondents that strongly disagreed that they found the system unnecessarily complex are 23 out of 30 respondents, while 7 out of 30 respondents disagreed that they found the system unnecessarily complex.

3. I thought the system was easy to use.

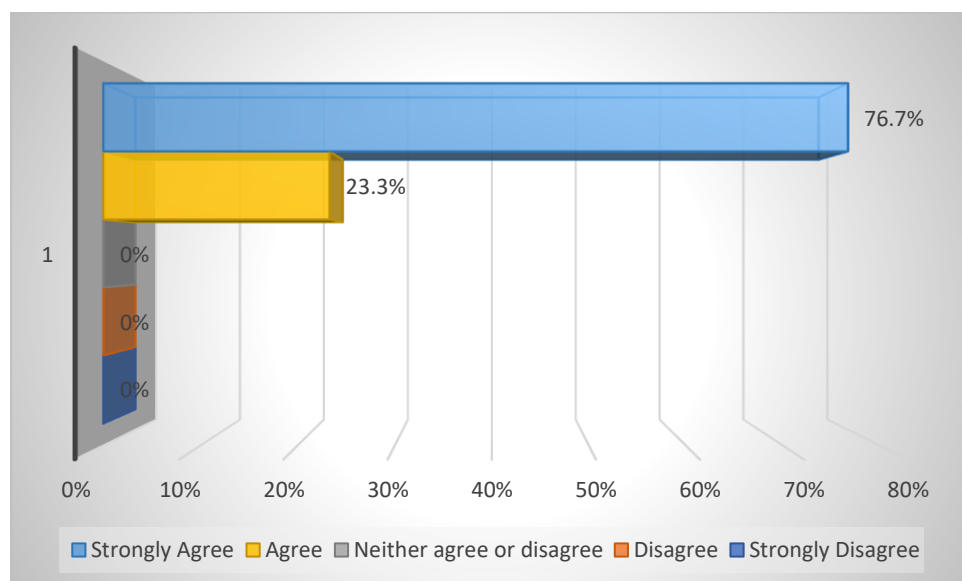


Figure 5.03 Bar Chart of SUS question 3

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly disagree) to 5 (strongly agree). Majority of the respondents in this questionnaire strongly agreed that they thought the system was easy to use, account for 76.7% of the respondents. While 23.3% of the respondents agreed that they thought the system was easy to use. None of the respondents select option strongly disagree, disagree, and neither agree or disagree. The total number of respondents that strongly agreed that they thought the system was easy to use are 23 out of 30 respondents, while 7 out of 30 respondents agreed that they thought the system was easy to use.

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

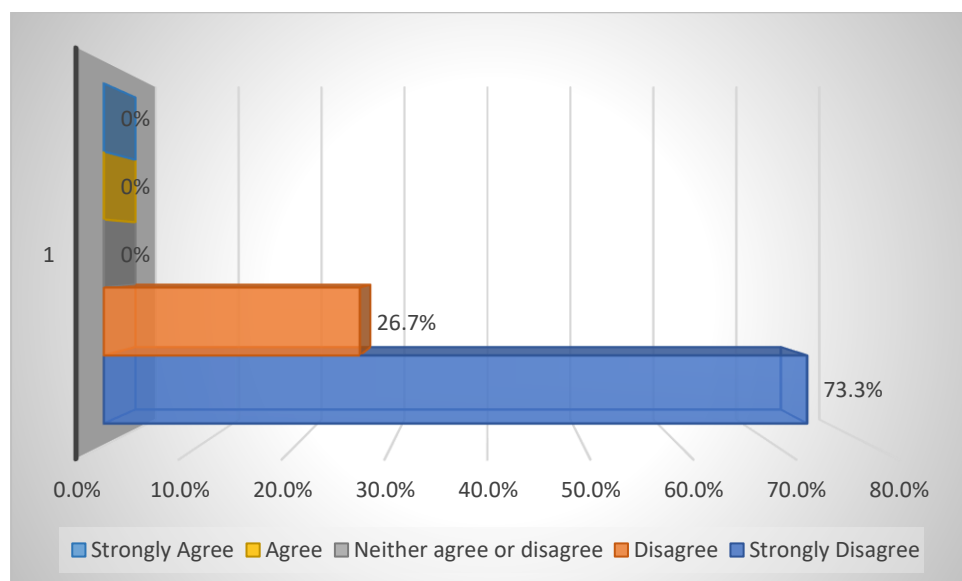


Figure 5.04 Bar Chart of SUS question 4

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly disagree) to 5 (strongly agree). Majority of the respondents in this questionnaire strongly disagreed that they think they would need the support of a technical person to be able to use this system, account for 73.3% of the respondents. While 26.7% of the respondents disagreed that they think they would need the support of a technical person to be able to use this system. None of the respondents select option strongly agree, agree, and neither agree or disagree. The total number of respondents that strongly disagreed that they think they would need the support of a technical person to be able to use this system are 22 out of 30 respondents, while 8 out of 30 respondents disagreed that they think they would need the support of a technical person to be able to use this system.

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

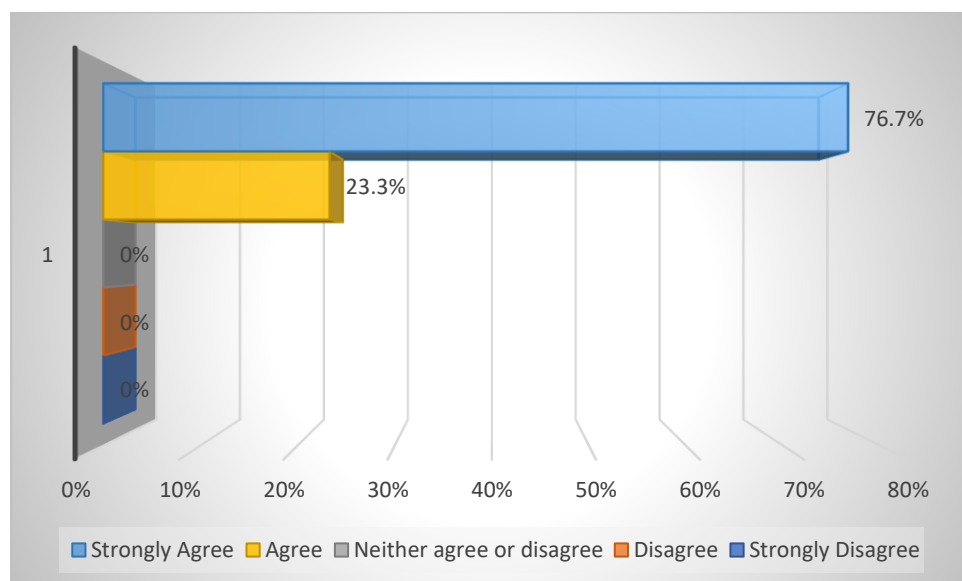


Figure 5.05 Bar Chart of SUS question 5

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly disagree) to 5 (strongly agree). Majority of the respondents in this questionnaire strongly agreed that they found the various functions in this system were well integrated, account for 76.7% of the respondents. While 23.3% of the respondents agreed that they found the various functions in this system were well integrated. None of the respondents select option strongly disagree, disagree, and neither agree or disagree. The total number of respondents that strongly agreed that they found the various functions in this system were well integrated are 23 out of 30 respondents, while 7 out of 30 respondents agreed that they found the various functions in this system were well integrated.

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

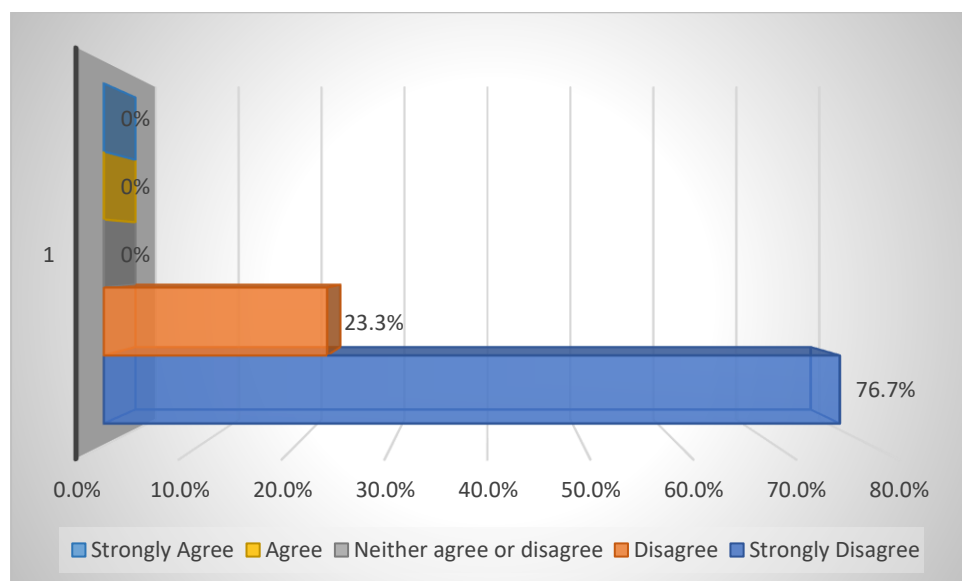


Figure 5.06 Bar Chart of SUS question 6

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly disagree) to 5 (strongly agree). Majority of the respondents in this questionnaire strongly disagreed that they thought there was too much inconsistency in this system, account for 76.7% of the respondents. While 23.3% of the respondents disagreed that they thought there was too much inconsistency in this system. None of the respondents select option strongly agree, agree, and neither agree or disagree. The total number of respondents that strongly disagreed that they thought there was too much inconsistency in this system are 23 out of 30 respondents, while 7 out of 30 respondents disagreed that they thought there was too much inconsistency in this system.

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

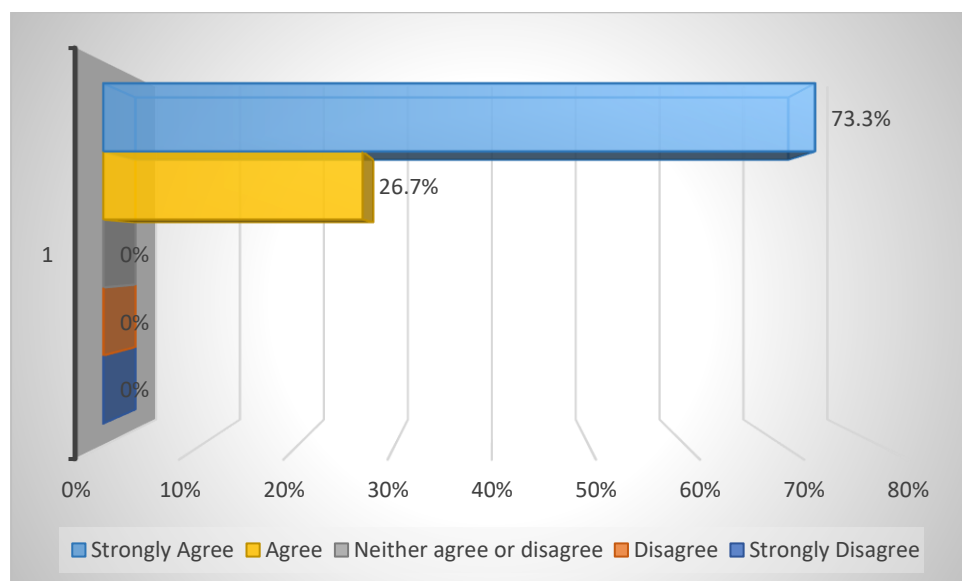


Figure 5.07 Bar Chart of SUS question 7

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly disagree) to 5 (strongly agree). Majority of the respondents in this questionnaire strongly agreed that they would imagine that most people would learn to use this system very quickly, account for 73.3% of the respondents. While 26.7% of the respondents agreed that they would imagine that most people would learn to use this system very quickly. None of the respondents select option strongly disagree, disagree, and neither agree or disagree. The total number of respondents that strongly agreed that would imagine that most people would learn to use this system very quickly are 22 out of 30 respondents, while 8 out of 30 respondents agreed that they would imagine that most people would learn to use this system very quickly.

8. I found the system very cumbersome to use.

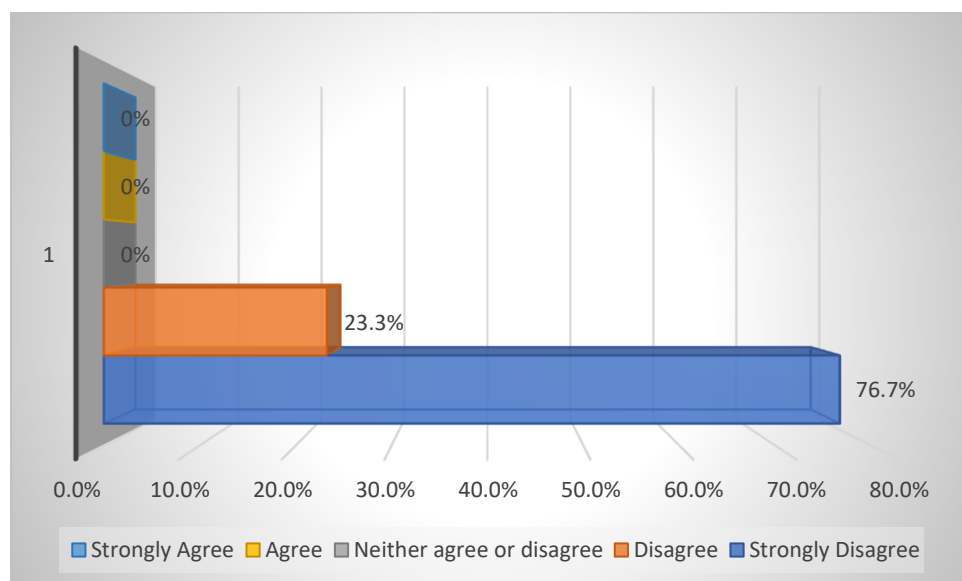


Figure 5.08 Bar Chart of SUS question 8

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly disagree) to 5 (strongly agree). Majority of the respondents in this questionnaire strongly disagreed that they found the system very cumbersome to use, account for 76.7% of the respondents. While 23.3% of the respondents disagreed that they found the system very cumbersome to use. None of the respondents select option strongly agree, agree, and neither agree or disagree. The total number of respondents that strongly disagreed that they found the system very cumbersome to use are 23 out of 30 respondents, while 7 out of 30 respondents disagreed that they found the system very cumbersome to use.

9. I felt very confident using the system.

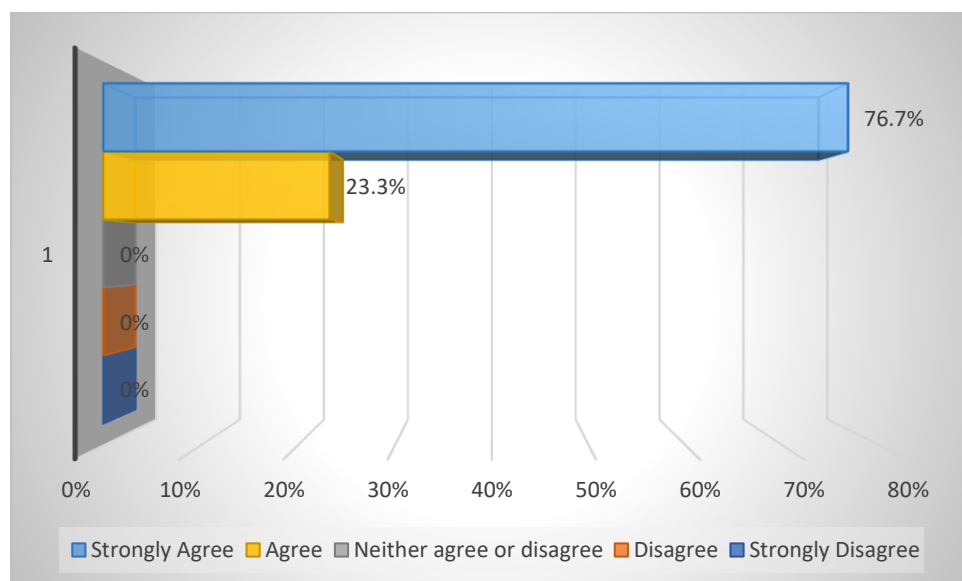


Figure 5.09 Bar Chart of SUS question 9

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly disagree) to 5 (strongly agree). Majority of the respondents in this questionnaire strongly agreed that felt very confident using the system, account for 76.7% of the respondents. While 23.3% of the respondents agreed that they felt very confident using the system. None of the respondents select option strongly disagree, disagree, and neither agree or disagree. The total number of respondents that strongly agreed that they felt very confident using the system are 23 out of 30 respondents, while 7 out of 30 respondents agreed that they felt very confident using the system.

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

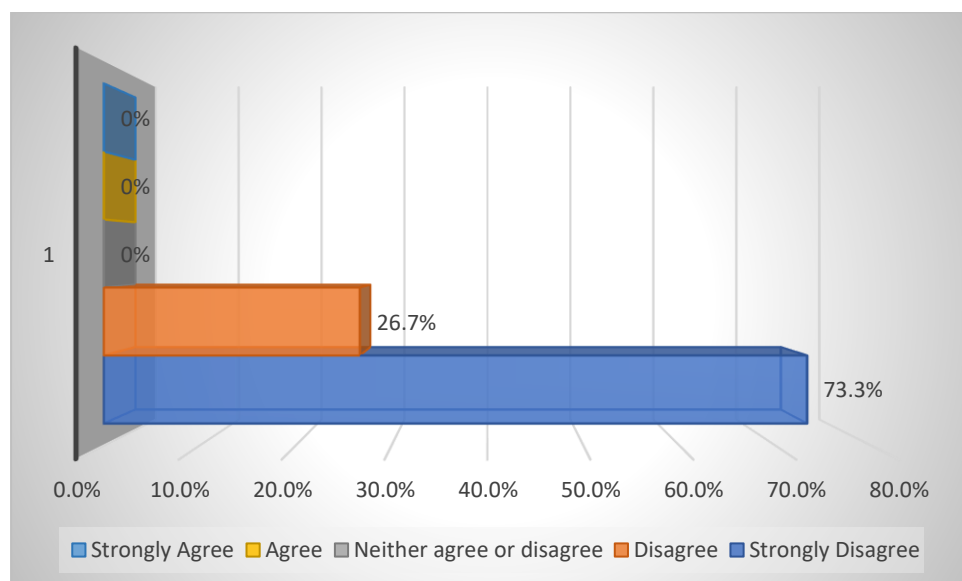


Figure 5.10 Bar Chart of SUS question 10

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly disagree) to 5 (strongly agree). Majority of the respondents in this questionnaire strongly disagreed that they think they needed to learn a lot of things before I could get going with this system, account for 73.3% of the respondents. While 26.7% of the respondents disagreed that they think they needed to learn a lot of things before I could get going with this system. None of the respondents select option strongly agree, agree, and neither agree or disagree. The total number of respondents that strongly disagreed that they think they needed to learn a lot of things before I could get going with this system are 22 out of 30 respondents, while 8 out of 30 respondents disagreed that they think they needed to learn a lot of things before I could get going with this system.

Section B: Post-Study System Usability Questionnaire(PSSUQ)

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

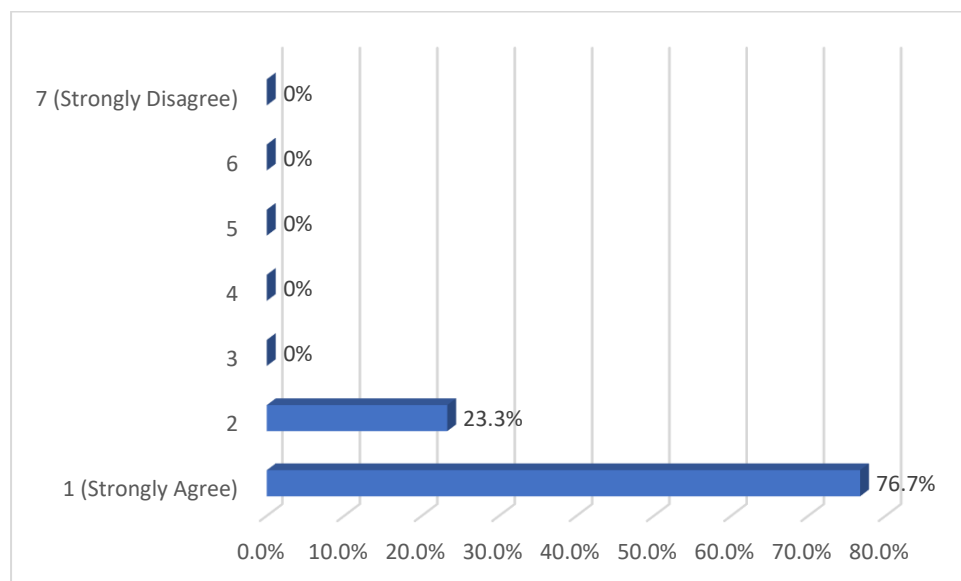


Figure 5.11 Bar Chart of PSSUQ question 1

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly agree) to 7 (strongly disagree). Majority of the respondents in this questionnaire strongly agreed that they are satisfied with how easy it is to use this system, account for 76.7% of the respondents. While 23.3% of the respondents agreed that they are satisfied with how easy it is to use this system. None of the respondents select option 3, 4, 5, 6, and 7 (strongly disagree). The total number of respondents that strongly agreed that they are satisfied with how easy it is to use this system are 23 out of 30 respondents, while 7 out of 30 respondents agreed that they are satisfied with how easy it is to use this system.

2. It was simple to use this system.

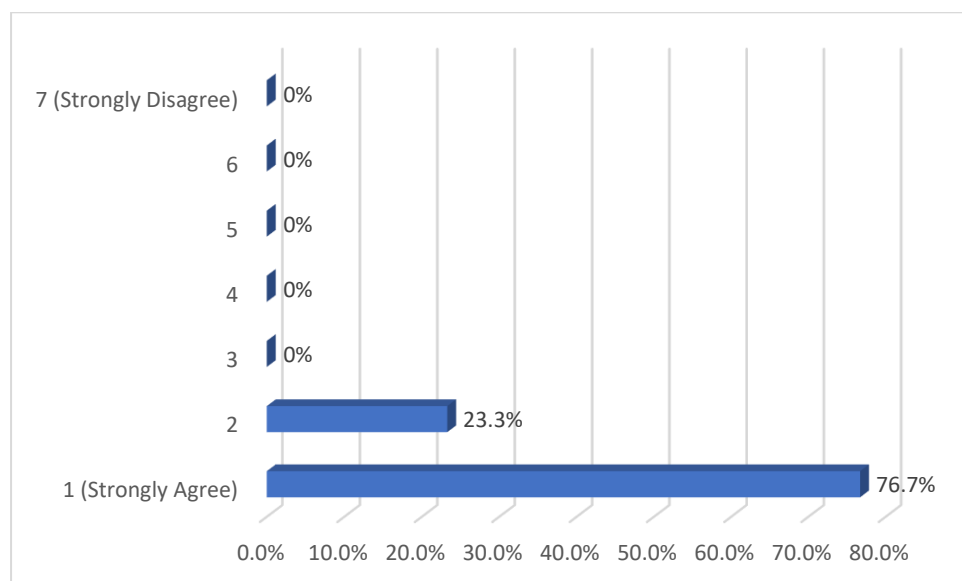


Figure 5.12 Bar Chart of PSSUQ question 2

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly agree) to 7 (strongly disagree). Majority of the respondents in this questionnaire strongly agreed that it was simple to use this system, account for 76.7% of the respondents. While 23.3% of the respondents agreed that it was simple to use this system. None of the respondents select option 3, 4, 5, 6, and 7 (strongly disagree). The total number of respondents that strongly agreed that it was simple to use this system are 23 out of 30 respondents, while 7 out of 30 respondents agreed that it was simple to use this system.

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

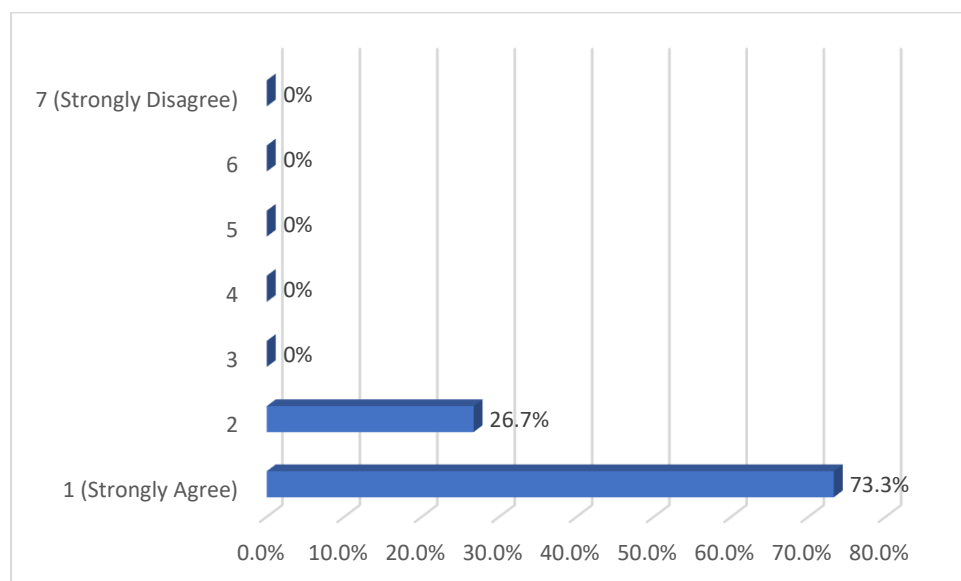


Figure 5.13 Bar Chart of PSSUQ question 3

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly agree) to 7 (strongly disagree). Majority of the respondents in this questionnaire strongly agreed that they are able to complete the tasks and scenarios quickly using this system, account for 73.3% of the respondents. While 26.7% of the respondents agreed that they are able to complete the tasks and scenarios quickly using this system. None of the respondents select option 3, 4, 5, 6, and 7 (strongly disagree). The total number of respondents that strongly agreed that they are able to complete the tasks and scenarios quickly using this system are 22 out of 30 respondents, while 8 out of 30 respondents agreed that they are able to complete the tasks and scenarios quickly using this system.

4. I felt comfortable using this system.

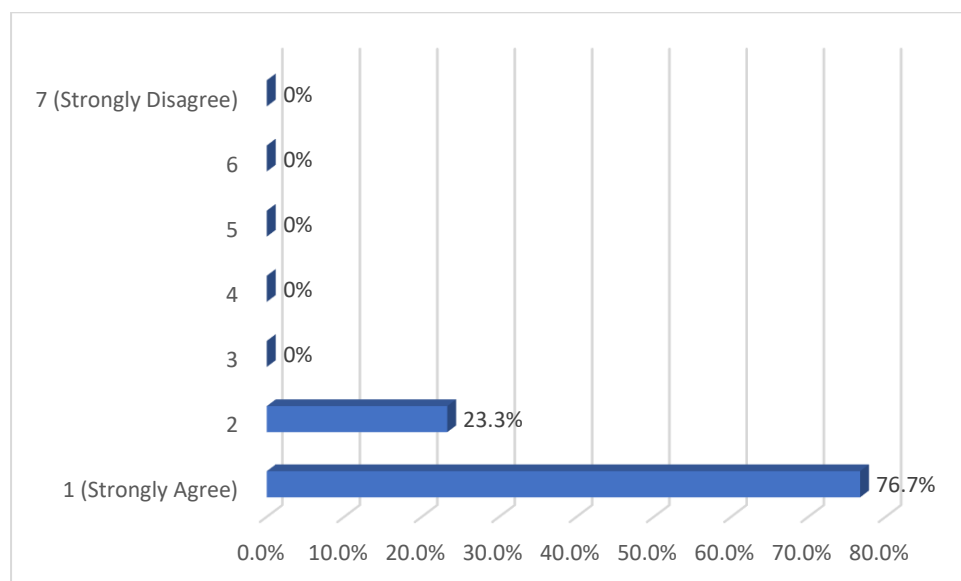


Figure 5.14 Bar Chart of PSSUQ question 4

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly agree) to 7 (strongly disagree). Majority of the respondents in this questionnaire strongly agreed that they felt comfortable using this system, account for 76.7% of the respondents. While 23.3% of the respondents agreed that they felt comfortable using this system. None of the respondents select option 3, 4, 5, 6, and 7 (strongly disagree). The total number of respondents that strongly agreed that they felt comfortable using this system are 23 out of 30 respondents, while 7 out of 30 respondents agreed that they felt comfortable using this system.

5. It was easy to learn to use this system.

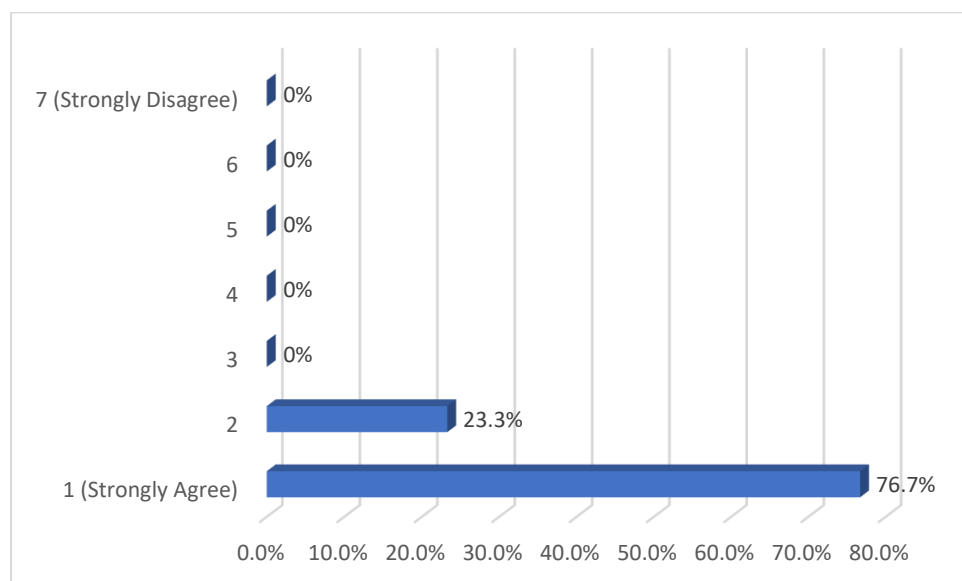


Figure 5.15 Bar Chart of PSSUQ question 5

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly agree) to 7 (strongly disagree). Majority of the respondents in this questionnaire strongly agreed that it was easy to learn to use this system, account for 76.7% of the respondents. While 23.3% of the respondents agreed that it was easy to learn to use this system. None of the respondents select option 3, 4, 5, 6, and 7 (strongly disagree). The total number of respondents that strongly agreed that it was easy to learn to use this system are 23 out of 30 respondents, while 7 out of 30 respondents agreed that it was easy to learn to use this system.

6. I believe that I could become productive quickly using this system.

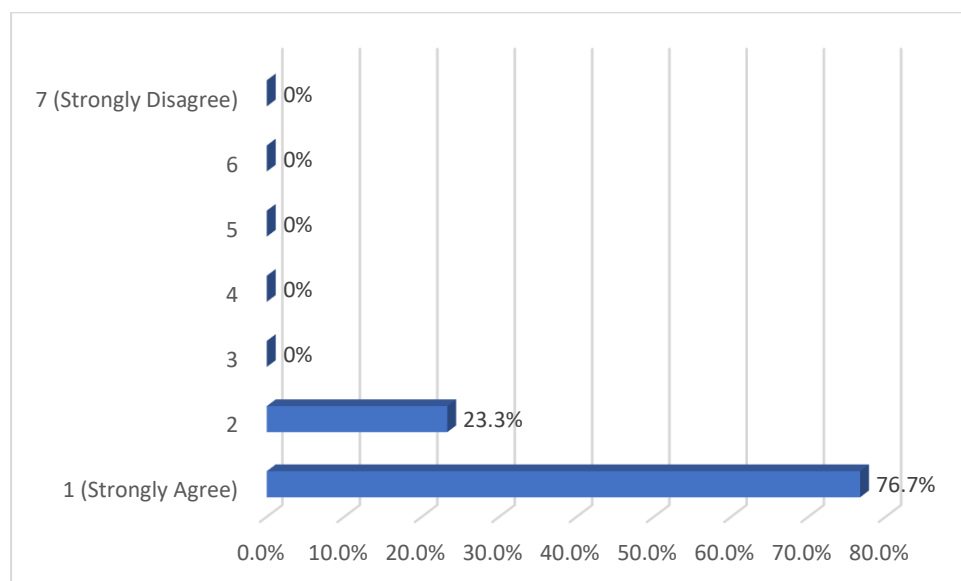


Figure 5.16 Bar Chart of PSSUQ question 6

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly agree) to 7 (strongly disagree). Majority of the respondents in this questionnaire strongly agreed that they believe that they could become productive quickly using this system, account for 76.7% of the respondents. While 23.3% of the respondents agreed that they believe that they could become productive quickly using this system. None of the respondents select option 3, 4, 5, 6, and 7 (strongly disagree). The total number of respondents that strongly agreed that they believe that they could become productive quickly using this system are 23 out of 30 respondents, while 7 out of 30 respondents agreed that they believe that they could become productive quickly using this system.

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

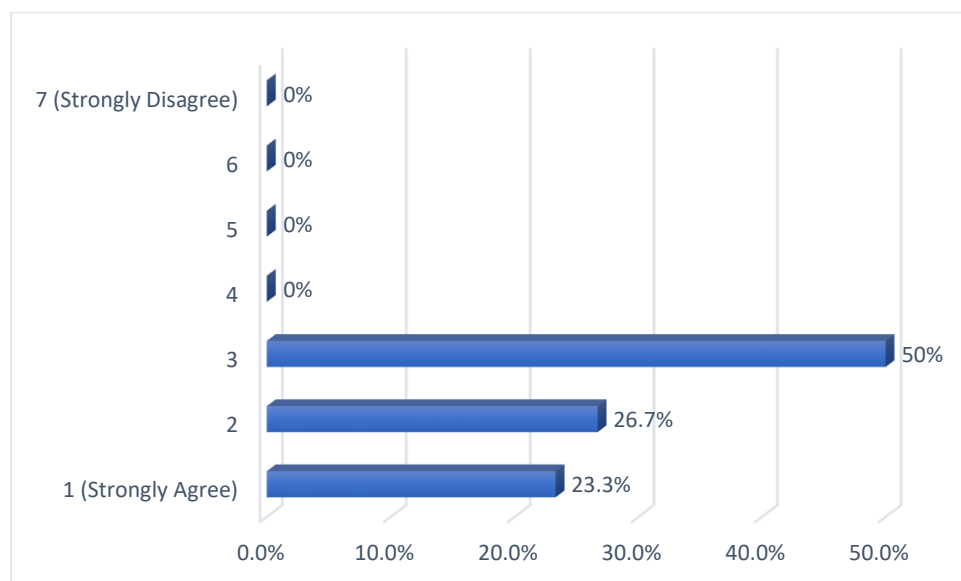


Figure 5.17 Bar Chart of PSSUQ question 7

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly agree) to 7 (strongly disagree). Majority of the respondents in this questionnaire selected option 3 that the system gave error messages that clearly told me how to fix problems, account for 50% of the respondents. While 26.7% of respondents agree that the system gave error messages that clearly told them how to fix problems, and 23.3% of respondents strongly agreed that the system gave error messages that clearly told them how to fix problems. None of the respondents select option strongly disagree and disagree. The total number of respondents that neither agree or disagree that the system gave error messages that clearly told them how to fix problems are 15 out of 30 respondents, while 8 out of 30 respondents agreed that the system gave error messages that clearly told them how to fix problems, and 7 out of 30 respondents strongly agreed that the system gave error messages that clearly told them how to fix problems.

8. Whenever I make a mistake using the system, I could recover easily and quickly.

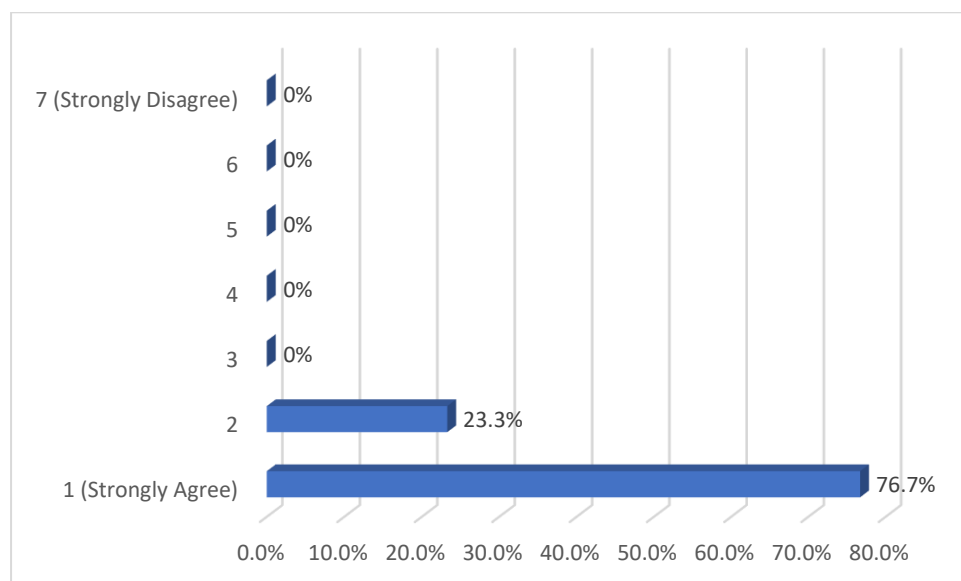


Figure 5.18 Bar Chart of PSSUQ question 8

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly agree) to 7 (strongly disagree). Majority of the respondents in this questionnaire strongly agreed that whenever they make a mistake using the system, they could recover easily and quickly, account for 76.7% of the respondents. While 23.3% of the respondents agreed that whenever they make a mistake using the system, they could recover easily and quickly. None of the respondents select option 3, 4, 5, 6, and 7 (strongly disagree). The total number of respondents that strongly agreed that it whenever they make a mistake using the system, they could recover easily and quickly are 23 out of 30 respondents, while 7 out of 30 respondents agreed that whenever they make a mistake using the system, they could recover easily and quickly.

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

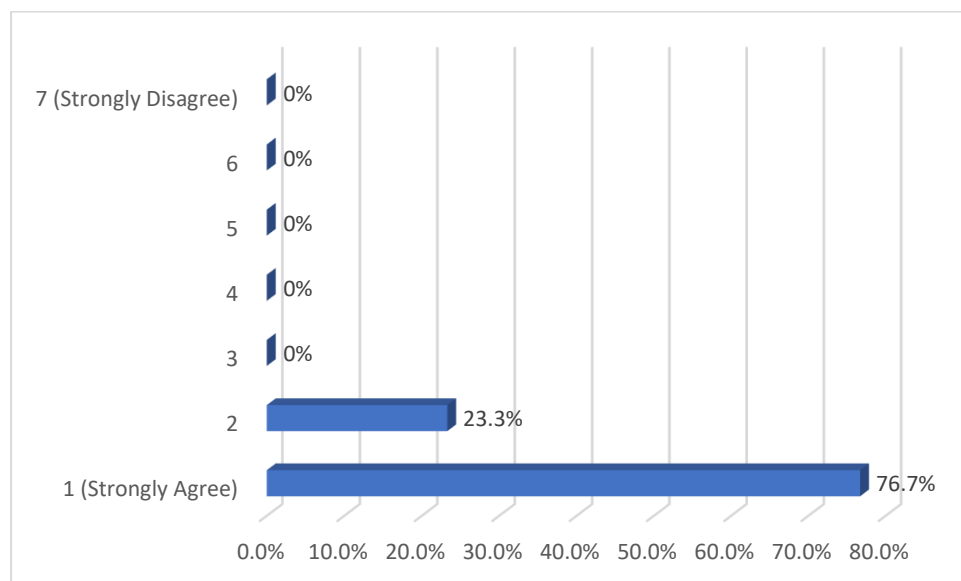


Figure 5.19 Bar Chart of PSSUQ question 9

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1(strongly agree) to 7(strongly disagree). Majority of the respondents in this questionnaire strongly agreed that the information provided with this system was clear, account for 76.7% of the respondents. While 23.3% of the respondents agreed that the information provided with this system was clear. None of the respondents select option 3, 4, 5, 6, and 7(strongly disagree). The total number of respondents that strongly agreed that the information provided with this system was clear are 23 out of 30 respondents, while 7 out of 30 respondents agreed that the information provided with this system was clear.

10. It was easy to find the information I needed.

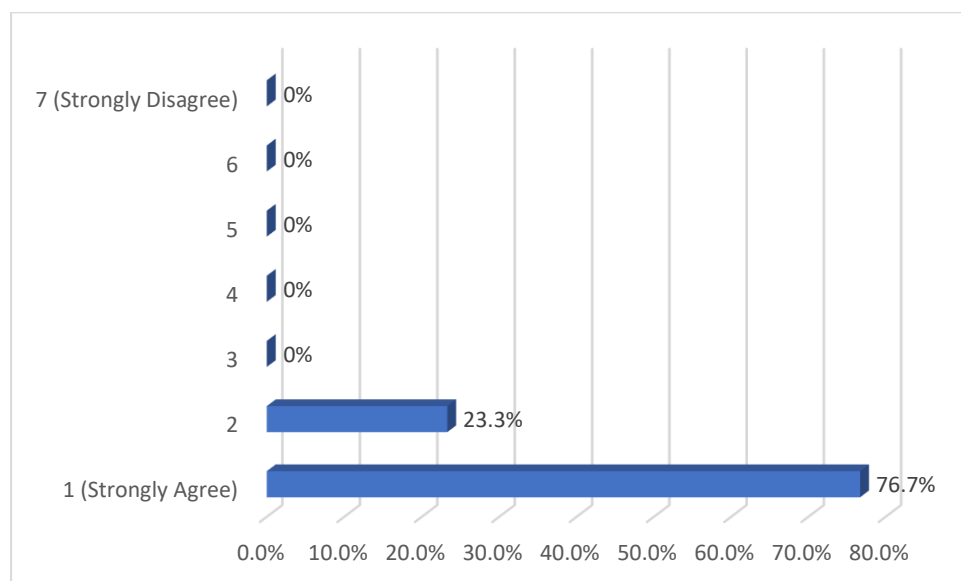


Figure 5.20 Bar Chart of PSSUQ question 10

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly agree) to 7 (strongly disagree). Majority of the respondents in this questionnaire strongly agreed that it was easy to find the information they needed, account for 76.7% of the respondents. While 23.3% of the respondents agreed that it was easy to find the information they needed. None of the respondents select option 3, 4, 5, 6, and 7 (strongly disagree). The total number of respondents that strongly agreed that it was easy to find the information they needed are 23 out of 30 respondents, while 7 out of 30 respondents agreed that it was easy to find the information they needed.

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

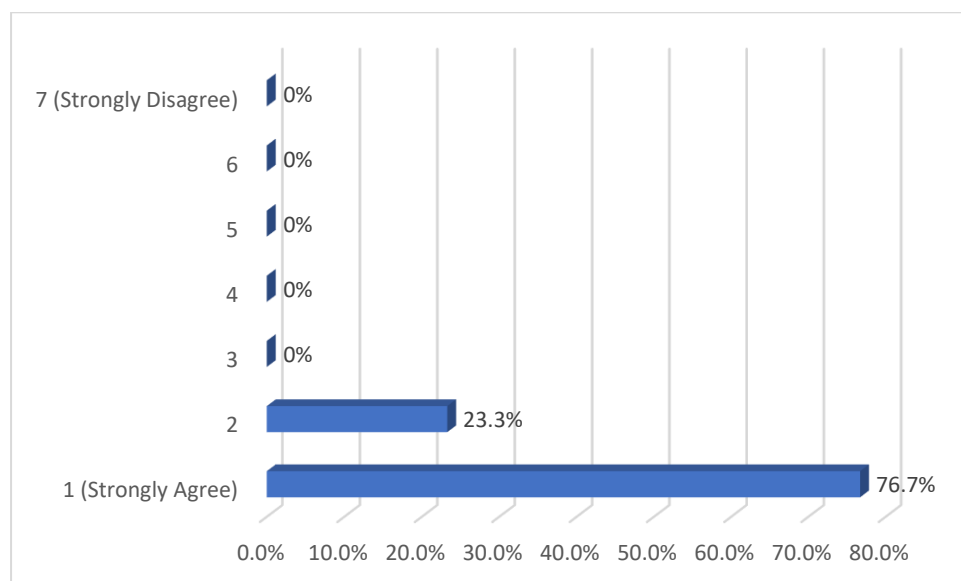


Figure 5.21 Bar Chart of PSSUQ question 11

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly agree) to 7 (strongly disagree). Majority of the respondents in this questionnaire strongly agreed that the information was effective in helping them complete the tasks and scenarios, account for 76.7% of the respondents. While 23.3% of the respondents agreed that the information was effective in helping them complete the tasks and scenarios. None of the respondents select option 3, 4, 5, 6, and 7 (strongly disagree). The total number of respondents that strongly agreed that the information was effective in helping them complete the tasks and scenarios are 23 out of 30 respondents, while 7 out of 30 respondents agreed that the information was effective in helping them complete the tasks and scenarios.

12. The organization of information on the system screens was clear.

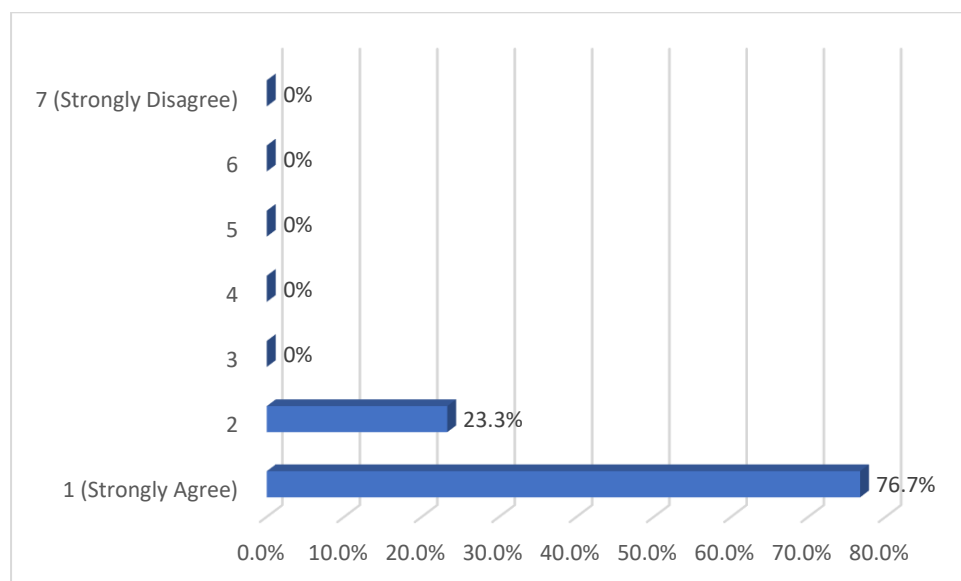


Figure 5.22 Bar Chart of PSSUQ question 12

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly agree) to 7 (strongly disagree). Majority of the respondents in this questionnaire strongly agreed that the organization of information on the system screens was clear, account for 76.7% of the respondents. While 23.3% of the respondents agreed that the organization of information on the system screens was clear. None of the respondents select option 3, 4, 5, 6, and 7 (strongly disagree). The total number of respondents that strongly agreed that the organization of information on the system screens was clear are 23 out of 30 respondents, while 7 out of 30 respondents agreed that the organization of information on the system screens was clear.

13. The interface of this system was pleasant.

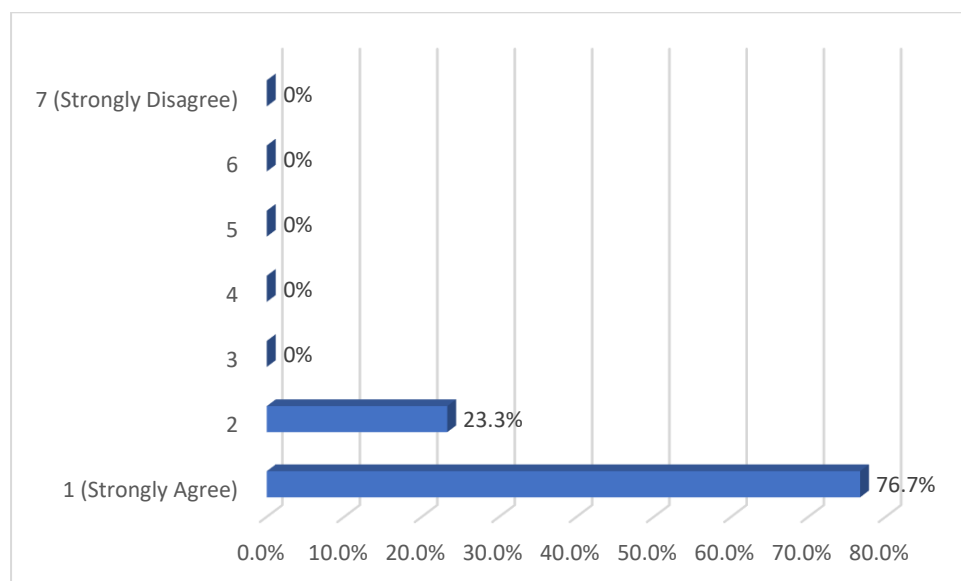


Figure 5.23 Bar Chart of PSSUQ question 13

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly agree) to 7 (strongly disagree). Majority of the respondents in this questionnaire strongly agreed that the interface of this system was pleasant, account for 76.7% of the respondents. While 23.3% of the respondents agreed that the interface of this system was pleasant. None of the respondents select option 3, 4, 5, 6, and 7 (strongly disagree). The total number of respondents that strongly agreed that the interface of this system was pleasant are 23 out of 30 respondents, while 7 out of 30 respondents agreed that the interface of this system was pleasant.

14. I liked using interface of this system.

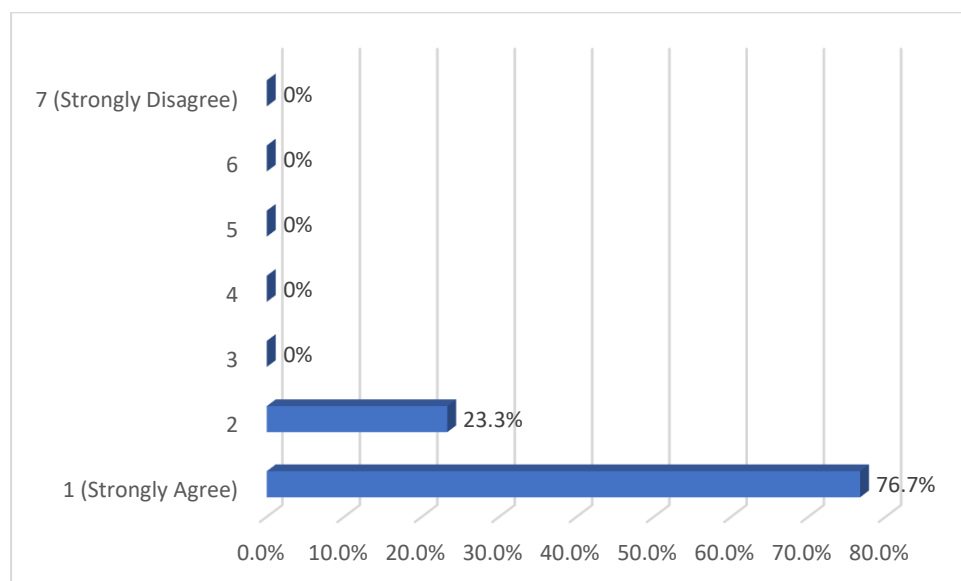


Figure 5.24 Bar Chart of PSSUQ question 14

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly agree) to 7 (strongly disagree). Majority of the respondents in this questionnaire strongly agreed that they liked using interface of this system, account for 76.7% of the respondents. While 23.3% of the respondents agreed that they liked using interface of this system. None of the respondents select option 3, 4, 5, 6, and 7 (strongly disagree). The total number of respondents that strongly agreed that they liked using interface of this system are 23 out of 30 respondents, while 7 out of 30 respondents agreed that they liked using interface of this system.

15. This system has all the functions and capabilities that I expect it to have.

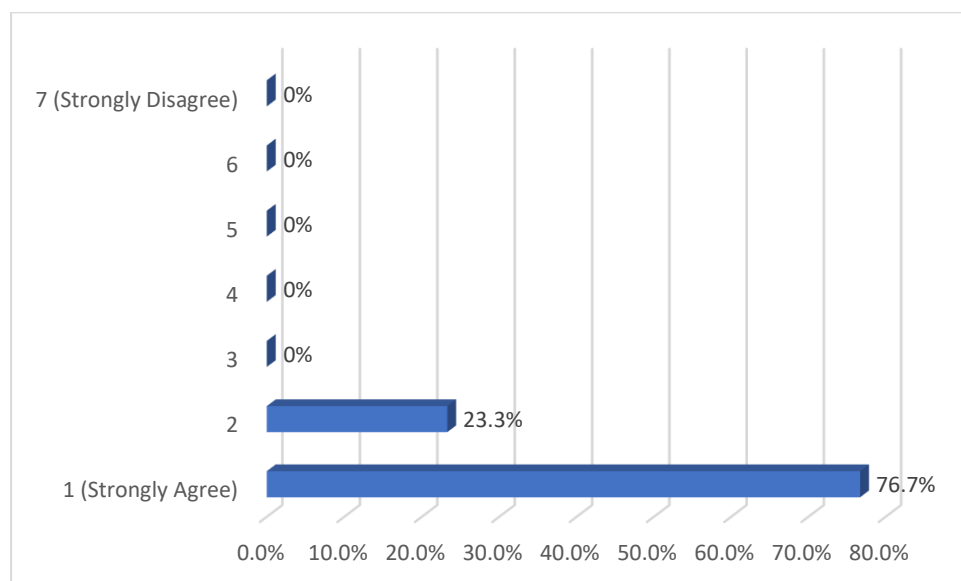


Figure 5.25 Bar Chart of PSSUQ question 15

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly agree) to 7 (strongly disagree). Majority of the respondents in this questionnaire strongly agreed that this system has all the functions and capabilities that they expect it to have, account for 76.7% of the respondents. While 23.3% of the respondents agreed that this system has all the functions and capabilities that they expect it to have. None of the respondents select option 3, 4, 5, 6, and 7 (strongly disagree). The total number of respondents that strongly agreed that this system has all the functions and capabilities that they expect it to have are 23 out of 30 respondents, while 7 out of 30 respondents agreed that this system has all the functions and capabilities that they expect it to have.

16. Overall, I am satisfied with this system.

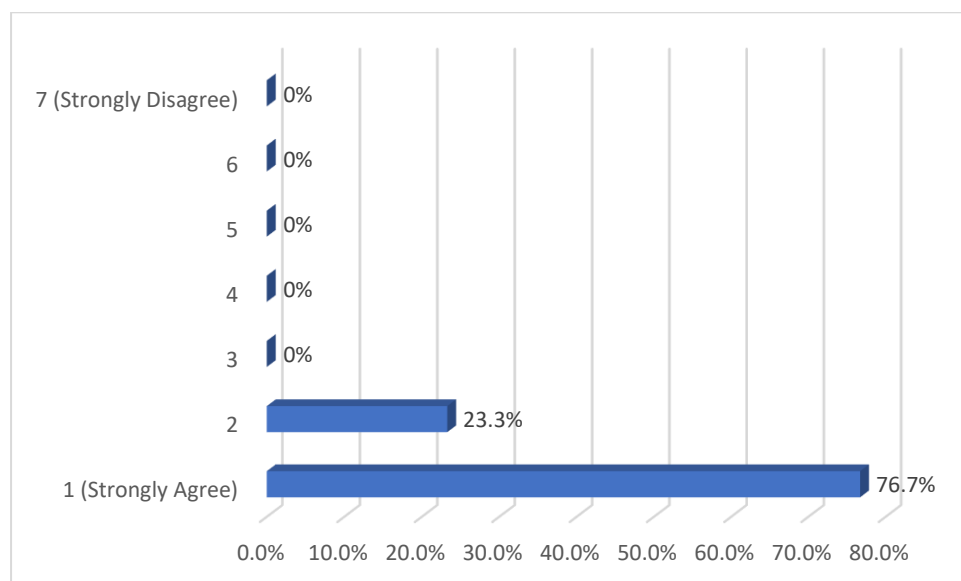


Figure 5.26 Bar Chart of PSSUQ question 16

The bar chart shows the answers of 30 respondents to the online questionnaire questions. On a scale of 1 (strongly agree) to 7 (strongly disagree). Majority of the respondents in this questionnaire strongly agreed that overall, they are satisfied with this system, account for 76.7% of the respondents. While 23.3% of the respondents agreed that overall, they are satisfied with this system. None of the respondents select option 3, 4, 5, 6, and 7 (strongly disagree). The total number of respondents that strongly agreed that overall, they are satisfied with this system are 23 out of 30 respondents, while 7 out of 30 respondents agreed that overall, they are satisfied with this system.

5.4 Results and Discussions

From the 30 responses of the 10 SUS questions, a trend could be noticed in which for every odd number questions, more than 70+% of respondents selected the option strongly agree and the remaining 20+% of respondents selected the option agree. Whereas for every even number questions, more than 70+% of respondents selected the option strongly disagree and the remaining 20+% of respondents selected the option disagree. Due to the nature of SUS questions in which odd number questions are something positive about the system and even number questions are something negative about the system, we can conclude that overall 70+% of users are very satisfied with this system and 20+% of users are satisfied with this system. None of the 30 respondents are not satisfied or very unsatisfied with the system. Therefore, this creative edutainment software is considered to be good overall from the feedback from the respondents. To go in deeper, the SUS score will be calculated with the method of minus 5 from the total score of all odd number questions, minus from 25 the sum of total score of all even number questions, and lastly multiply the sum of the two values with 2.5. By doing so, a SUS score ranging between 1 to 100 will be obtained and the higher the value is the better the overall usability of the system [41]. The average SUS score of 30 respondents for this survey is 93.83%. This indicates that vast majority of the 30 respondents thinks that the overall usability of this creative edutainment software is very good, which is a good sign towards the system. The image below is the SUS score standard and the red line indicates the SUS score of this system which is 93.83.

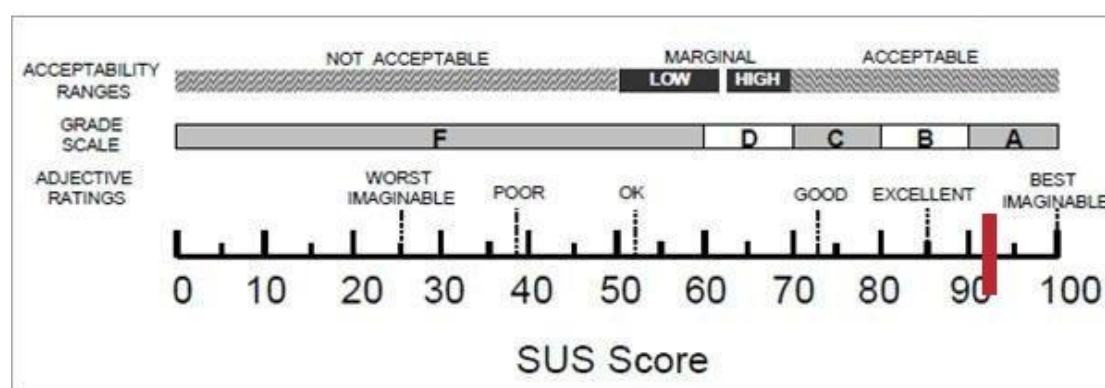


Figure 5.21 SUS score standard

Next, for 30 responses of the 16 PSSUQ questions, the same trend of more than 70+% of respondents selected the option strongly agree and the remaining 20+% of respondents selected the option agree can be noticed in this section. PSSUQ questions are more straight forward since there are no odd even number question hidden rule like SUS questions. All of the questions are the same in which the lower the score from the scale of 1-7, the better and since that for majority of the questions, 1 and 2 being the only option selected by respondents whereas 3, 4, 5, 6 and 7 are not selected at all, we can safely conclude that vast majority of the respondents are very satisfied with this creative edutainment software. However, there are one outlier of question 7 which is “the system gave error messages that clearly told me how to fix problems”. The responses of this questions are 15 of the respondents selected 3, 8 of them selected 2 which indicates agree, and only 7 of them selected 1 which indicates strongly agree. From this feedback, it indicates that the error messages that acts as guidance for users when they face errors might be insufficient or not good enough hence this causes users to be a bit skeptical when it comes to giving this question 1 or 2 marks so 3 becomes the majority option that is being selected. So, this part of the system will need some improvements in order to achieve low marks like other questions of PSSUQ. Hence, the lower the marks combined the more satisfied users are towards the system, then it can be further broken down into several sections in which for question 1-16, it is for the overall score of the system, for question 1-6, it is for the system usefulness(SYSUSE) score of the system, for question 7-12, it is for the information quality(INFOQUAL) score of the system, and lastly, for question 13-15, it is for the interface quality(INTERQUAL) score of the system [42]. The bar chart below shows the PSSUQ score for all four aspects mentioned for this system. For the average system usefulness(SYSUSE) score of the system, it is 1.24. For the average quality(INFOQUAL) score of the system, it is 1.41. For the interface quality(INTERQUAL) score of the system, it is 1.23. Lastly, for the overall PSSUQ score of the system, it is 1.29. This indicates that vast majority of the 30 respondents thinks that the overall usability of this creative edutainment software is very good, which is a good sign towards the system.

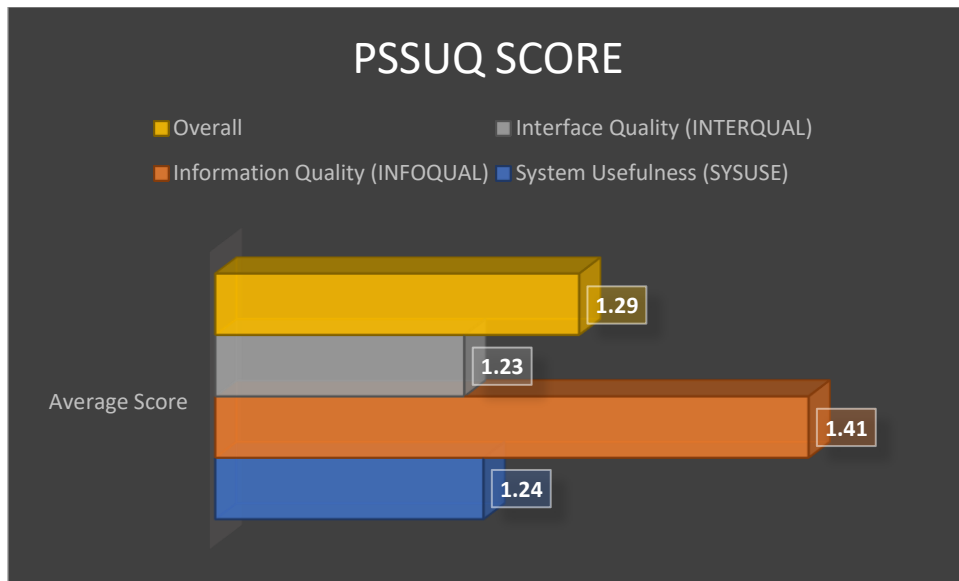


Figure 5.22 Bar Chart of PSSUQ Score

Chapter 6 Conclusion

6.1 Overview

The overview of chapter 6 which will be the last chapter of this report will be the research findings after completing this whole prototype and other report related works to find out that whether this creative edutainment software managed to solve the three problem statements of lack of multimedia elements such as graphics, audio, and animation for the information related to Lenggong Valley, lack of interactive multimedia applications in geography and history learning such as heritage site learning application, and lastly lack of 3D and Augmented Reality (AR) technology for Lenggong Valley learning software. As well as whether this creative edutainment software managed to achieve the three target objectives of to study the usage of multimedia technology in supporting Lenggong Valley learning application, to develop an interactive creative edutainment software using constructivism approach for Lenggong Valley, and lastly to evaluate the effectiveness of creative edutainment software in helping the user during the learning process and enhancing their understanding. Next, to list out and elaborate the technical issues that is being faced throughout the whole ADDIE process of Analysis, Design, Development, Implementation, and Evaluation of this prototype. Then, list out and elaborate the knowledge gained from developing this prototype and doing the report related stuff. Lastly, list out and elaborate the limitations of this creative edutainment software as well as the future enhancements that can be done towards the prototype during the future.

6.2 Research Findings

The proposed project is a creative edutainment software for Lenggong Valley using constructivism approach. The purpose of this proposed project is to address three problem statements which are lack of multimedia elements such as graphics, audio, and animation for the information related to Lenggong Valley, lack of interactive multimedia applications in geography and history learning such as heritage site learning application, and lastly lack of 3D and Augmented Reality (AR) technology for Lenggong Valley learning software. A literature review is being conducted in order to review similar systems and the majority of them have the same weakness

CHAPTER 6 CONCLUSION

which are lack of Augmented Reality and 3D that is being implemented into the existing historical/geographical systems. Hence, this matches with the third problem statement of lack of 3D and AR. Moreover, there are no existing software at all currently at available in order for users to learn more about Lenggong Valley information and history. The only thing available are websites such as Wikipedia or news websites in which the only thing that those provides are text and couple of images which have zero interaction with users when users are trying to learn more about Lenggong Valley not to mention that the process of trying to study Lenggong Valley through those websites are very boring and will often gatekeep a lot of people that are interested about Lenggong Valley but after they searched Lenggong Valley on Google Search and found out that the only thing available are those websites with bunch of texts and some images, a lot of them will rather spent time on doing other stuff instead of reading through the “essays” without any single interaction throughout the process. This matches with the first and second problem statement of lack of multimedia elements such as graphics, audio, and animation for the information related to Lenggong Valley, and lack of interactive multimedia applications in geography and history learning such as heritage site learning application.

Next, the first survey questionnaire will be conducted in order to collect user feedback about their opinion and requirements towards the system such as what do they want in the software, which option do they prefer more to be implemented into the software, and so on. The survey consists of 30 responses which is a sufficient sample size, and their answers will be recorded and analyzed further. This will help in achieving the first objective of to study the usage of multimedia technology in supporting Lenggong Valley learning application by determining that is multimedia technology suitable in supporting Lenggong valley learning application based on user’s feedback and opinion for the first survey. Then, the creative edutainment software will be developed with multimedia elements such as images, text, audio, graphics, and animation such as AR and 3D. The software will also be designed in a way such that it is applying constructivism approach concepts when users are trying to use it. After this is finished, the second objective of to develop an interactive creative edutainment software using constructivism approach for Lenggong Valley will be achieved. Lastly,

CHAPTER 6 CONCLUSION

the second survey will be conducted after users watched the complete demo of the prototype and provide feedback and opinion regarding the software whether that they are satisfied with it or not, is the system effective at doing its job of helping in learning and so on. Since that majority of the 30 respondent feedbacks are good, hence it is concluded that the third objective of to evaluate the effectiveness of creative edutainment software in helping the user during the learning process and enhancing their understanding is also achieved.

In conclusion, all three problem statement of lack of multimedia elements such as graphics, audio, and animation for the information related to Lenggong Valley, lack of interactive multimedia applications in geography and history learning such as heritage site learning application, and lastly lack of 3D and Augmented Reality (AR) technology for Lenggong Valley learning software are able to be solved during this project. For the three objectives of to study the usage of multimedia technology in supporting Lenggong Valley learning application, to develop an interactive creative edutainment software using constructivism approach for Lenggong Valley, and lastly to evaluate the effectiveness of creative edutainment software in helping the user during the learning process and enhancing their understanding are all able to be fully achieved during this project.

6.3 Problems Faced

There are couple of technical problems that arise throughout the development process. First, the import export process. For the map navigation module, 3D map location is needed, however Macromedia Director MX 2004 are unable to create such thing, hence Blender is used in order to create the 3D map location. After finishing the first 3D model, it has to be imported to Unity in order to build and run at desktop as an .exe file. The import export process during this is where the issue comes in. Some of the materials and textures that are being used in Blender in order to create the 3D model are not supported in Unity. Hence, the part needs to be redone with different materials and textures.

Next, the device not supported issue. For the AR module, it is done by using Unity. However due to the nature of Augmented Reality in Unity not allowing users to build

CHAPTER 6 CONCLUSION

and run as .exe file on desktop, an Android/IOS phone is needed in order to plug in USB and build it as an APK file. Unfortunately, the only two options available are Huawei Mate 10 Pro and iPhone 13. For the Huawei Mate 10 Pro, it is completely unsupported for ARCore which is compulsory to be supported in order to be able to run the AR APK. Hence, the APK shows black screen forever after being forcefully built onto this phone. The alternative option of iPhone 13 is also not available since in order to build an APK on iPhone, XCode is needed which only available to run on macOS and the only operating system available is Windows. Even using a virtual machine to fake a macOS and downloading XCode did not work since the Unity cannot detect XCode located inside the virtual machine. Out of desperate, every friend or schoolmates are being consulted in order to borrow a supported Android machine to build the APK onto it. Luckily, one of them has an Android phone that supports ARCore hence able to build the APK on the phone and run it.

6.4 Knowledge gained

The knowledge gained throughout this project is that multimedia is very useful when it comes to improving the learning process and enhancing understanding when being applied to educational software or something similar. Besides, multimedia concepts such as three color principle, user interface consistency, how to use sounds to indicate button hovered/clicked by mouse, rollover cursor change on buttons in order for users to know that this is a clickable button, how to design storyboards, and so on. The concept of constructivism approach learning is also the knowledge gained during this project. Other than that, how to use Blender to create 3D models and then render it by applying textures and materials is also being learned during the development process. Next, how to link Macromedia Director MX 2004 .exe files to external Unity .exe files are also being learned. Moreover, the importance of survey gathering and feedback analysis are also the knowledge gained since the usage of survey questionnaires are one of the core aspects not only for the development and also for the report in terms of analysis.

6.5 Limitations

The limitations of this creative edutainment software for Lenggong Valley are first, for the quiz module, there are no current score being displayed in order for users to track their progress. Some of the users might feel confused about their current progress hence this is the limitation for the quiz module. For the simulation module, some of the animations are in the form of GIF file, hence the whitespace behind the object cannot be removed like normal image files such as png and jpeg, this might affect user experience. Next, for the Map Navigation Module, some users might think that the interactivity inside the Unity .exe file is not enough since they can only rotate and zoom in the 3D map location without being able to carry out other actions such as click it and it will show object name and so on. Next, for the AR module, since it cannot be supported on desktop platform, hence it forces users to have a mobile phone to build the APK to it before being able to access this module. Lastly, for the timeline module, some users might think that it is lengthy on the text part but in fact the information available on online sources are way lengthier and way overloaded compared to these at the timeline module.

6.6 Future Enhancements

For future enhancements regarding this creative edutainment software for Lenggong Valley, the score display function can be added to the first module which is the quiz module, a hint function can also be added to the quiz module for users that really cannot solve the quiz questions correctly. For the second module which is the simulation module, animations can be created to replace GIF files so that no white space will exist on the screen. It also provides more interactivity since the animation can be enhanced while GIF cannot. For the third module which is the map navigation module, more interaction such as when user click, text information will show and so on. For the fourth module which is the AR module, can try to find other development software that are available on desktop platform instead of Unity so that will not force users to build the APK on their mobile device before being able to access the module. For the last module which is the timeline module, try to find something such as animations to replace the text information.

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Appendix

User Expectation and Requirement Survey Form

Creative Edutainment Software for Lenggong Valley using Constructivism Approach

Dear Participants,

I am the undergraduate final year student of BACHELOR OF INFORMATION SYSTEMS (HONOURS) BUSINESS INFORMATION SYSTEMS in Universiti Tunku Abdul Rahman (UTAR). I am currently doing a survey for fyp1 related to the subject mentioned above. Your response is very important in helping to determine what are the user expectations and requirements towards the application development.

It would be really appreciated if you could spend few minutes of your valuable time to answer the following questions. Your response definitely will provide a deeper insight and better understanding towards the application development. Kindly be informed that your data and information will be kept private and confidential. Your voluntary participation and contributions in this survey is greatly appreciated.

Thank you.

Yours Sincerely,

Brian Chong Zhao Zun

[Sign in to Google](#) to save your progress. [Learn more](#)

[Next](#) [Clear form](#)

Creative Edutainment Software for Lenggong Valley using Constructivism Approach

[Sign in to Google](#) to save your progress. [Learn more](#)

*Required

Section A: Demographic Profile

Age *

18-25

26-35

36-45

46-60

Gender *

Male

Female

[Back](#) [Next](#) [Clear form](#)

Creative Edutainment Software for Lenggong Valley using Constructivism Approach

[Sign in to Google](#) to save your progress. [Learn more](#)

*Required

Section B:User background

What is Edutainment?

Educational entertainment or edutainment meaning refers to the media designed to educate through entertainment. Edutainment includes online games, TV shows, or other materials that intend to be both educational and enjoyable. Through the growing adoption of digital mediums in our daily lives, they are even more essential for children to spend their leisure time via fun yet educational content.

Do you ever heard of Lenggong Valley before? *

- Yes
- No

Do you have further intention of knowing more about Lenggong Valley? *

- Yes
- No

If Yes, what kind of method do you prefer the most to know more about Lenggong Valley? (skip if No for last question)

- Books
- Websites
- Edutainment softwares

Do you use computer software to learn about history/geography? *

- Yes
- No

What kind of edutainment you have experienced before? *

- Online games
- Movies/TV shows
- Education games

How often do you use them? *

- Almost everyday
- Couple times a week
- Couple times a month
- Rarely

APPENDIX

Do you enjoy using them? *

1 2 3 4 5

Very dissatisfied Very satisfied

Do you prefer traditional way of education or education through edutainment? *

Traditional education

Education through edutainment (Constructivism Approach)

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Creative Edutainment Software for Lenggong Valley using Constructivism Approach

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*Required

Section C:User Requirements

There are four modules for this edutainment software which includes Map Navigation module, Quiz module, Simulation module, and Mini Games module. The responses for this section will be used as a guideline for the development of this software.

When navigating around a map, which style do you prefer more? *

- Description focused style where detailed descriptions available for each area of the map during navigation
- Picture focused style where more photos/pictures related to the area are available with short descriptions

What type of quiz do you prefer more? *

- True False Questions
- Multiple Choice Questions
- Fill in the blanks
- Matching

APPENDIX

Which one do you prefer for quiz questions? *

- Pictures + Question
- Video + Question
- Finding answers from paragraphs

What type of mini games do you prefer more? *

- Free play games
- Structured games

What kind of style do you like more for mini games? *

- New stage available only after clearing the stage before
- All stages are unlocked at the start for users to choose freely

Which mini game do you like the most? *

- Hide and seek
- Shooting games
- Whack a mole

APPENDIX

Which style of simulation do you prefer more? *

Guided simulation where there will be a narrator to guide you during the simulation

Free style simulation where users will have full control on what action they want to carry out

What function do you want on a simulation module? *

Hint function

Skip function

Both

Which one do you prefer more for simulation module? *

2D style

3D style

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**System Usability Scale(SUS) & Post-Study System Usability
Questionnaire(PSSUQ) Survey Form**

Creative Edutainment Software for Lenggong Valley using Constructivism Approach Testing Feedback

Dear Participants,

I am the undergraduate final year student of BACHELOR OF INFORMATION SYSTEMS (HONOURS) BUSINESS INFORMATION SYSTEMS in Universiti Tunku Abdul Rahman (UTAR). I am currently doing a survey for fyp2 related to the subject mentioned above. Your response is very important in helping to determine what are your opinion towards the application.

It would be really appreciated if you could spend few minutes of your valuable time to answer the following questions. Your response definitely will provide a deeper insight and better understanding towards the application. Kindly be informed that your data and information will be kept private and confidential. Your voluntary participation and contributions in this survey is greatly appreciated.

Thank you.

Yours Sincerely,

Brian Chong Zhao Zun

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[Clear form](#)

Creative Edutainment Software for Lenggong Valley using Constructivism Approach Testing Feedback

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*Required

Section A: System Usability Scale(SUS)

The System Usability Scale (SUS) provides a reliable tool for measuring the usability. It consists of a 10 item questionnaire with five response options for respondents; from Strongly agree to Strongly disagree.

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

1 2 3 4 5

Strongly Disagree Strongly Agree

I found the system unnecessarily complex. *

1 2 3 4 5

Strongly Disagree Strongly Agree

APPENDIX

I thought the system was easy to use. *						
	1	2	3	4	5	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

I think that I would need the support of a technical person to be able to use this system. *						
	1	2	3	4	5	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

I found the various functions in this system were well integrated. *						
	1	2	3	4	5	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

I thought there was too much inconsistency in this system. *						
	1	2	3	4	5	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

APPENDIX

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

1 2 3 4 5

Strongly Disagree Strongly Agree

I found the system very cumbersome to use. *

1 2 3 4 5

Strongly Disagree Strongly Agree

I felt very confident using the system. *

1 2 3 4 5

Strongly Disagree Strongly Agree

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

1 2 3 4 5

Strongly Disagree Strongly Agree

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Creative Edutainment Software for Lenggong Valley using Constructivism Approach Testing Feedback

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*Required

Section B: Post-Study System Usability Questionnaire(PSSUQ)

The PSSUQ (Post-Study System Usability Questionnaire) is a 16-item standardized questionnaire. It is widely used to measure users' perceived satisfaction of a website, software, system or product at the end of a study.

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

	1	2	3	4	5	6	7	
Strongly Agree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Disagree

It was simple to use this system. *

	1	2	3	4	5	6	7	
Strongly Agree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Disagree

APPENDIX

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

1 2 3 4 5 6 7

Strongly Agree Strongly Disagree

I felt comfortable using this system. *

1 2 3 4 5 6 7

Strongly Agree Strongly Disagree

It was easy to learn to use this system. *

1 2 3 4 5 6 7

Strongly Agree Strongly Disagree

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

1 2 3 4 5 6 7

Strongly Agree Strongly Disagree

APPENDIX

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

1 2 3 4 5 6 7

Strongly Agree Strongly Disagree

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

1 2 3 4 5 6 7

Strongly Agree Strongly Disagree

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

1 2 3 4 5 6 7

Strongly Agree Strongly Disagree

It was easy to find the information I needed. *

1 2 3 4 5 6 7

Strongly Agree Strongly Disagree

APPENDIX

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

1 2 3 4 5 6 7

Strongly Agree Strongly Disagree

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

1 2 3 4 5 6 7

Strongly Agree Strongly Disagree

The interface of this system was pleasant. *

1 2 3 4 5 6 7

Strongly Agree Strongly Disagree

I liked using the interface of this system. *

1 2 3 4 5 6 7

Strongly Agree Strongly Disagree

APPENDIX

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

1 2 3 4 5 6 7

Strongly Agree Strongly Disagree

Overall, I am satisfied with this system. *

1 2 3 4 5 6 7

Strongly Agree Strongly Disagree

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Poster

Universiti Tunku Abdul Rahman

Creative Edutainment Software for Lenggong Valley (Constructivism Approach)

Brian Chong Zhao Zun

Introduction

Lenggong Valley is a location at Perak that was declared as one of the World Heritage Sites by UNESCO. However, there are no multimedia software that allows learners to utilize it and learn more about knowledge related to Lenggong Valley. Hence, an edutainment software is designed in order for users to learn more about Lenggong Valley in an interactive and user-centered way.

Problem Statement

- i) Lack of multimedia elements such as graphics, audio, and animation for information related to Lenggong Valley.
- ii) Lack of interactive multimedia applications in geography and history learning such as heritage site learning application
- iii) Lack of 3D and Augmented Reality (AR) technology for Lenggong Valley learning software.

Objectives

- i) To study the usage of multimedia technology in supporting Lenggong Valley learning application.
- ii) To develop an interactive creative edutainment software using constructivism approach for Lenggong Valley.
- iii) To evaluate the effectiveness of creative edutainment software in helping the user during the learning process and enhancing their understanding

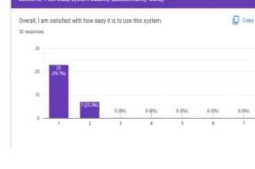
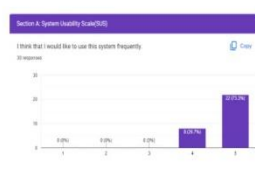
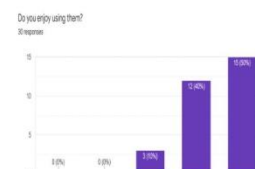
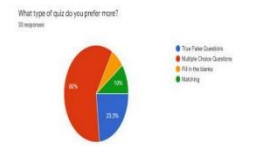
Project Scope



Literature Review

System/Application	Strengths	Weaknesses
CYARK [12]	Implements multimedia elements such as text, graphics, video, and animation. Contains guided tour and 3D explorer for users to explore geographical sites such as heritage sites and popular tourist spots. Has a timeline for for users to dig up and display locations based on the year such as BCE, and CE. Games related to monumental sites available for users to interact with.	Only available as website instead of applications or software hence forcing users to browse it through browsers. The game model of this website is very lag. No user interface, no background music available.
World Heritage App [23]	Implements multimedia elements such as text, graphics, and animation. 3D Map navigation available for users to search for world heritage map.	Lack of augmented reality. No background music available. No detailed text information related to the locations available.
Kujawa World Heritage [24]	Implements multimedia elements such as text, graphics, and animation. Information such as historical, cultural, scientific information of the locations are available.	Lack of 3D and augmented reality. No background music.
Historic Scotland Visitor App [25]	Implements multimedia elements such as text, graphics, and animation. Interactive map view with filter available.	Lack of augmented reality. No background music available. No detailed text information related to the locations available.
Planet Geo [26]	Implements multimedia elements such as text, graphics, and animation. Consists of interactive games and quizzes that allows users that test their knowledge about UNESCO's World Heritage Sites. Has video that explain details related to locations.	Lack of 3D and augmented reality. No background music.

User Testing



ADDIE Model



System Display



WEEKLY LOG

Weekly log

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	Study week no.: 5
Student Name & ID: Brian Chong Zhao Zun 18ACB04730	
Supervisor: Dr. Lee Chen Kang	
Project Title: Creative Edutainment Software for Lenggong Valley using Constructivism Approach	

1. WORK DONE

- i. First meeting carried out

2. WORK TO BE DONE

- i. Finish module 2 Simulation Module

3. PROBLEMS ENCOUNTERED

- i. No problems encountered so far

4. SELF EVALUATION OF THE PROGRESS

- i. First meeting hence no progress yet

Lee Chen Kang

Supervisor's signature

Brian

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	Study week no.: 6
Student Name & ID: Brian Chong Zhao Zun 18ACB04730	
Supervisor: Dr. Lee Chen Kang	
Project Title: Creative Edutainment Software for Lenggong Valley using Constructivism Approach	

1. WORK DONE

i. Module 2 Simulation Module

2. WORK TO BE DONE

i. Module 3 Map Navigation Module

3. PROBLEMS ENCOUNTERED

i. No problems encountered so far

4. SELF EVALUATION OF THE PROGRESS

i. Assigned tasks are completed within expected timeframe

Lee Chen Kang

Supervisor's signature

Brian

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	Study week no.: 7
Student Name & ID: Brian Chong Zhao Zun 18ACB04730	
Supervisor: Dr. Lee Chen Kang	
Project Title: Creative Edutainment Software for Lenggong Valley using Constructivism Approach	

1. WORK DONE

- i. Module 3 Map Navigation Module first submodule 3D location

2. WORK TO BE DONE

- i. Module 3 Map Navigation Module second submodule 3D location
- ii. Module 3 Map Navigation Module third submodule 3D location
- iii. Module 3 Map Navigation Module user interface

3. PROBLEMS ENCOUNTERED

- i. No 3D data from Google Map hence need to build from scratch

4. SELF EVALUATION OF THE PROGRESS

- i. Assigned tasks are completed within expected timeframe

Lee Chen Kang

Supervisor's signature

Brian

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	Study week no.: 8
Student Name & ID: Brian Chong Zhao Zun 18ACB04730	
Supervisor: Dr. Lee Chen Kang	
Project Title: Creative Edutainment Software for Lenggong Valley using Constructivism Approach	

1. WORK DONE

- i. Module 3 Map Navigation Module second submodule 3D location
- ii. Module 3 Map Navigation Module third submodule 3D location
- iii. Module 3 Map Navigation Module user interface

2. WORK TO BE DONE

- i. Module 4 AR Module

3. PROBLEMS ENCOUNTERED

- i. Materials and textures error when trying to export from Blender to Unity

4. SELF EVALUATION OF THE PROGRESS

- i. Assigned tasks are completed within expected timeframe

Lee Chen Kang

Supervisor's signature

Brian

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	Study week no.: 9
Student Name & ID: Brian Chong Zhao Zun 18ACB04730	
Supervisor: Dr. Lee Chen Kang	
Project Title: Creative Edutainment Software for Lenggong Valley using Constructivism Approach	

1. WORK DONE

- i. Module 4 AR Module first submodule AR Foundation

2. WORK TO BE DONE

- i. Module 4 AR Module second submodule Vuforia

3. PROBLEMS ENCOUNTERED

- i. Unable to build and run at phone cause phone model too old and not supported

4. SELF EVALUATION OF THE PROGRESS

- i. Assigned tasks are completed within expected timeframe

Lee Chen Kang

Supervisor's signature

Brian

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	Study week no.: 10
Student Name & ID: Brian Chong Zhao Zun 18ACB04730	
Supervisor: Dr. Lee Chen Kang	
Project Title: Creative Edutainment Software for Lenggong Valley using Constructivism Approach	

1. WORK DONE

- i. Module 4 AR Module second submodule Vuforia

2. WORK TO BE DONE

- i. Module 5 Timeline Module

3. PROBLEMS ENCOUNTERED

- i. Unable to build and run at phone cause phone model too old and not supported

4. SELF EVALUATION OF THE PROGRESS

- i. Assigned tasks are completed within expected timeframe

Lee Chen Kang

Supervisor's signature

Brian

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	Study week no.: 11
Student Name & ID: Brian Chong Zhao Zun 18ACB04730	
Supervisor: Dr. Lee Chen Kang	
Project Title: Creative Edutainment Software for Lenggong Valley using Constructivism Approach	

1. WORK DONE

i. Module 5 Timeline Module

2. WORK TO BE DONE

i. FYP2 report

3. PROBLEMS ENCOUNTERED

i. No problems encountered so far

4. SELF EVALUATION OF THE PROGRESS

i. Assigned tasks are completed within expected timeframe

Lee Chen Kang

Supervisor's signature

Brian

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	Study week no.: 12
Student Name & ID: Brian Chong Zhao Zun 18ACB04730	
Supervisor: Dr. Lee Chen Kang	
Project Title: Creative Edutainment Software for Lenggong Valley using Constructivism Approach	

1. WORK DONE

- i. FYP2 report survey questionnaire
- ii. Response Gathering
- iii. Data analysis

2. WORK TO BE DONE

- i. FYP2 report

3. PROBLEMS ENCOUNTERED

- i. No problems encountered so far

4. SELF EVALUATION OF THE PROGRESS

- i. Assigned tasks are completed within expected timeframe

Lee Chen Kang

Supervisor's signature

Brian

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	Study week no.: 13
Student Name & ID: Brian Chong Zhao Zun 18ACB04730	
Supervisor: Dr. Lee Chen Kang	
Project Title: Creative Edutainment Software for Lenggong Valley using Constructivism Approach	

1. WORK DONE

i. FYP2 report

2. WORK TO BE DONE

3. PROBLEMS ENCOUNTERED

i. No problems encountered so far

4. SELF EVALUATION OF THE PROGRESS

i. Assigned tasks are completed within expected timeframe

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Brian Chong | FYP2

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Creative Edutainment Software for Lenggong Valley using Constructivism Approach

BY

BRIAN CHONG ZHAO ZUN

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Lee Chen Kang

Signature of Supervisor

Name: Ts Dr Lee Chen Kang

Date: 7/9/2022

Signature of Co-Supervisor

Name:

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