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Mobile Learning Application for Malaysia History using Virtual Reality Approach

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Abstract: Virtual reality technology with a concept mobile learning application has great potential in education. The use of virtual technology can make student attract to learn the subject, especially History. History is one of a subject that not every student took an interest in. Therefore, *Sejarah Malaysia Aplikasi Pendidikan* has been developed by approaching it using Multimedia Mobile Content Development (MMCD). This project aims to design Malaysian History Education Apps using a Virtual Reality approach with a syllabus from Form 5 in an interactive way. This application uses First-Person Controller which is controlled from a first-person perspective and consists of modules and quiz.

Keywords: Virtual Reality, History, Mobile Learning

1.   Introduction

In this era technology, Virtual Reality (VR) is one of technology that often used on any device platform for learning methods. Virtual Reality is an advanced, human-computer interface that creates a lifelike world. The virtual world allows the participants to walk about freely. They may look at it from a variety of perspectives, reach into it, grab it, and modify it [1]. A learning application is a platform that can help students with remote learning of any kind using mobile software. A variety of people and institutions are using this education app to help them gain knowledge or learn. Therefore, virtual reality can allow the student to better understand the concepts as this technology can satisfy the student [2]. Using Virtual Reality in the subject of History, provides students with many advantages. It is believed that feelings of reality and presence from virtual reality implementations one of the factors that affect the student by increasing their interest in the subject [3]. Then, this education can make effective tools for learning and teaching for students and teachers. As we know history is the study of past events that related with a particular person or event so by created the educational application can help them to study more using their gadget. The project that want to developed is about Malaysian History which can help in many aspects.

The objectives of this developed application are to design Malaysian History Education Apps using the Virtual Reality approach. The second is to develop a Malaysian History education applications by using

Android technology. And lastly, perform functional testing and user acceptance test on the developed application to the target user which is student from form 5.

The main target user for this education application is student from 17 years old which is form 5. Its meaning, the student that study history will gain the knowledge from this apps and also can help them to do their assignment or work about history. The module consists in Malay language and also provided some quiz which is multiple choice question to make it more fun and help user to remind back about things that they have learn and read from module. The module consists about 5 modules that user can learn with the syllabus topic chapter 5 from form 5. For quiz, it has roughly 15 multiple choice question in it. At the end of the 15 question, it will provide the total score that user have obtained through the quiz answer.

Other section is organized as follows: related work that discusses literature review and existing applications. After that, the methodology used to develop the application, followed by the section that discusses the results of analysis from the user acceptance test. Finally, the last section about the work and possible future improvement on the developed application.

2. Literature Review

This section will explain about the technology approach that used in this developed application and similar application that related with project.

2.1 Virtual Reality

Virtual reality is a type of technology that allows people to interact with a virtual world created by computer software. To create a computer-generated simulation for the user, several multimedia components such as 3-dimensional (3D) visual graphics, a mix of sound, content text, and photos are merged. The input devices beyond the keyboard and mouse and include the game controllers and hand and body-tracking sensors to recognize the user action. Mobile platform also can be including as it also includes the software to interface to the devices that run applications and software tools for building it [4]. One of the applications that widely used nowadays is walk-through VR. In the walk-through VR system, a simulation character or avatar will be developed for the user to manage movement, particularly first-person movement walk-through in VR with multiple input devices. [5] User also can use their own actions which is their hand gesture system with palm normal for control steering develop. Other than, it allows users to modify moving pace based on hand gestures and the range of the user's hand, resulting in a smooth and rapid movement.

2.2 Mobile Learning Application

Mobile technology has brought to a physical classroom context along with the student behavior as they participate in learning institutions which is mobile learning [6]. Mobile learning application plays important role both for educators and students as they use this to teaching and learning. Nowadays, this features really help students also educators as it is used to communication and learning also working virtually on project or assignments. Then, mobile learning application also can be used in any devices such as mobile phone, iPad, Tab and other related devices. The learning application also can be finding at Google Play for Android and Play Store for IOS.

Students may learn at their own pace, anywhere and at any time, using this mobile learning application. The goal of this mobile learning application is to supplement current classroom and e-learning methods. It cannot replace professors and lecturers, but it may improve the quality and reach of their instruction when used in conjunction with other approaches [7].

2.3 Similar Existing Application

There are 3 similar of existing application that similar with the project based on features and the platform being used. The 3 of similar application is *Sejarah Malaysia*, English Grammar Exercises,

Grammar Test and Biology eBook & Quiz as Figure 1. The similarities of these 3 existing applications is they only available for Android platform only and can be found at Google Play Store
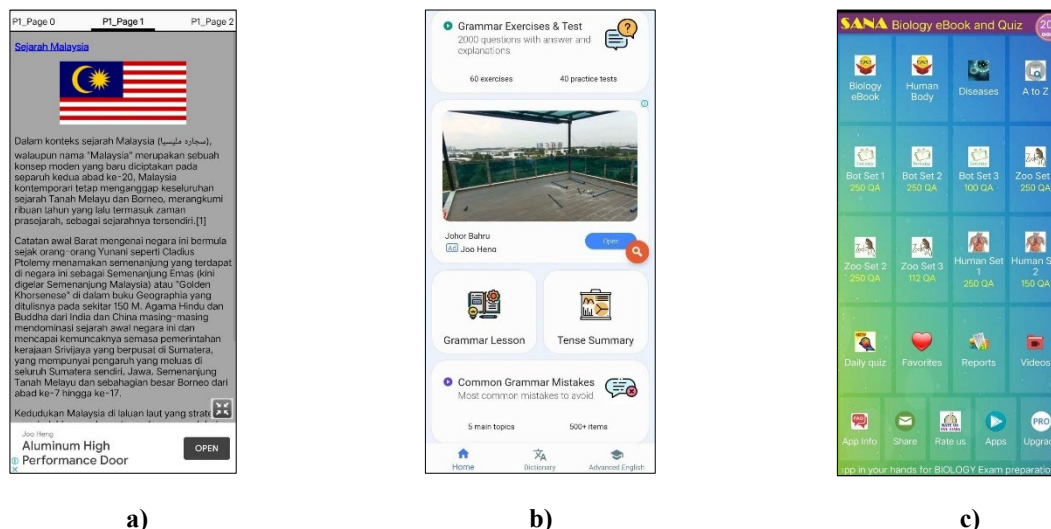

Figure 1: a) *Sejarah Malaysia*, b) English Grammar Exercises, Grammar Test, c) Biology eBook & Quiz

In addition, these 3 similar applications are learning application that have different features shown in Table 1. The develop application should identify the problems and what to improve based on the similar application.

Table 1: Comparison between similar application and developed application

Features	*Sejarah Malaysia* [8]	Exercise, Grammar Test [9]	Biology eBook & Quiz [10]	*Sejarah Malaysia: Aplikasi Pendidikan*
Virtual Reality (VR)	Not Provided	Not Provided	Not Provided	First Person Controller
Gameplay	This learning apps only provided note with various language.	Provided various note of grammar and some exercise. The audio such as the translation from word to audio also provided	Provided various note and various of quiz and video to make user more understand and can revise it whenever they want	The learning part will play as storyline by showing some animation of character with the note to avoid user feel bored when study.
Connectivity	Some note can be access offline and some note must access online	Offline for note Online for exercise	Online for both note and quiz	Offline and online for both note and quiz
Multimedia Element	Text, Graphic	Text, Graphic, Audio	Text, Graphic, Video, Audio	Text, Graphic, Animation, Audio
Language	20 language	English	English	Bahasa Malaysia

Based on review apps, Virtual Reality are not applied in this 3 review apps. therefore, in our developed application, this type of Virtual Reality will be developed in order to make it more convenience for user to use this application. The type of Virtual Reality that will be create is First-Person Controller as this type doesn't need internet when user using this application. Hence, user can directly install and access

to the learning application. After that, the connectivity for the 3 existing application does need to access in online either for module and quiz. So, in application, it can be access both for module and quiz for user can access it anywhere and anytime.

3.   Methodology

Methodology is technique and procedures that be used to developed the project for achieve the main objectives. Multimedia Mobile Content Development (MMCD) is methodology that be used in this project. MMCD contain about 5 phases which is Application Idea Creation, Analyze the Structure, Design the Process, Development and Testing [5].
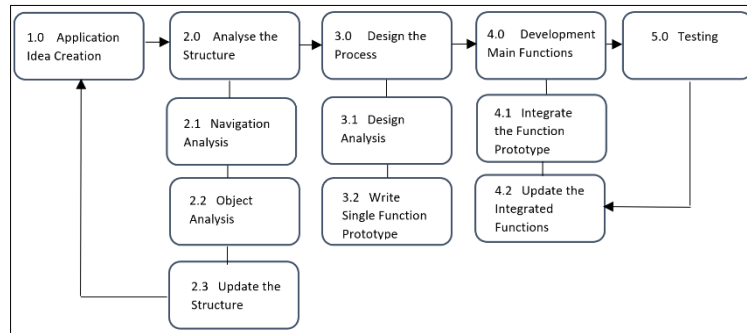
Figure 2: Multimedia Mobile Content Development (MMCD Model)

3.1   Application Idea Creation Phase

In this phase, the information and theme of developed application are being identify with the main objectives, goals and scope so that the development went well. After all the information have being identify, it will make it easier to make comparison between the existing application and the similar application. Through the compares', the application requirement will be identified and easy to determine the requirement for developed application. It is because to developer know what requirement that user want for the developed application.

Table 2: Functional Requirement

| Functional Requirement	Item	Description
Hardware	• Android Handphone	- Android 7.0 (API Level 24)
Software	• Operating System	- 1GB RAM and storage 200MB are minimum specifications that needed to user use the application

Table 3: Non-Functional Requirement

| Non-Functional Requirement	Description
Performance	• Interaction between application and user not exceed 5 seconds • The application should available every time • The application load mark should not exceed 5 seconds

Table 3: (continued)

Non-Functional Requirement	Description
Usability	• The interface of application must user friendly and allow user to easy to use
Operational	• The application operates only on Android devices • The application should compatible with any Android device. • The application can run both online and offline.

3.2   Analyze the Structure Phase

Analyze the Structure phase is phase where the two-sub component which is navigation and object will be analysis. This component is to make sure the features and component of project conducted well by doing content structure check list of the application. This phase also where the planning of project will be determining.
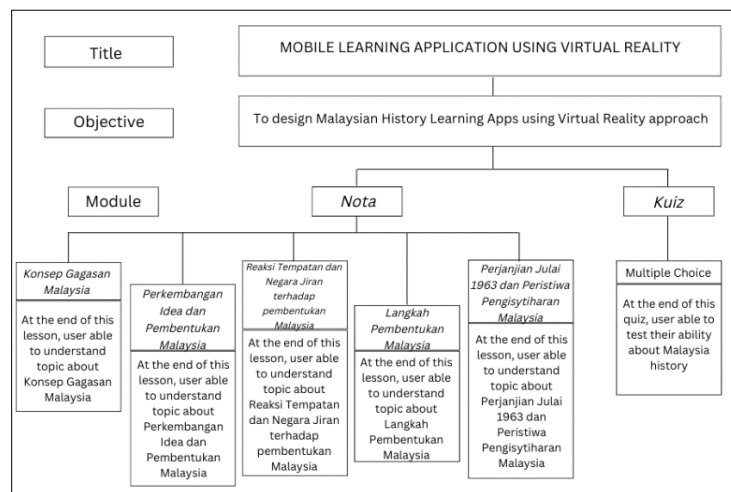
Figure 3: Content Structure Application
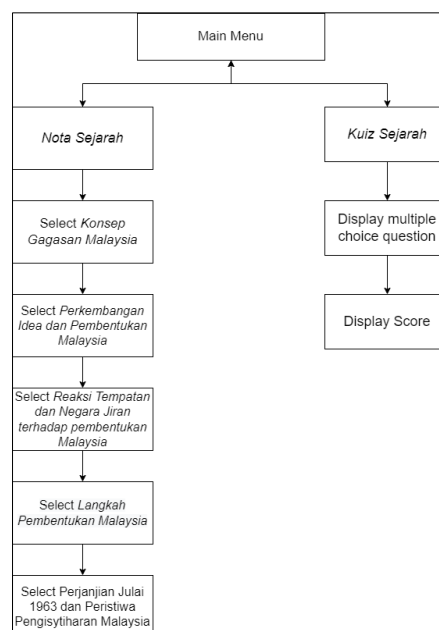
Figure 4: Navigation Structure

3.3   Design the Process Phase

This phase is about design the developed application such as the storyboard, navigation, button, layer frame, content application and object analysis to ensure that it's easy to refer when to start build the application at the development phase. In this phase also, the flowchart, the navigation system, and the material framework are also provided to support the design process. The storyboard of developed application can be referred at Appendix A.
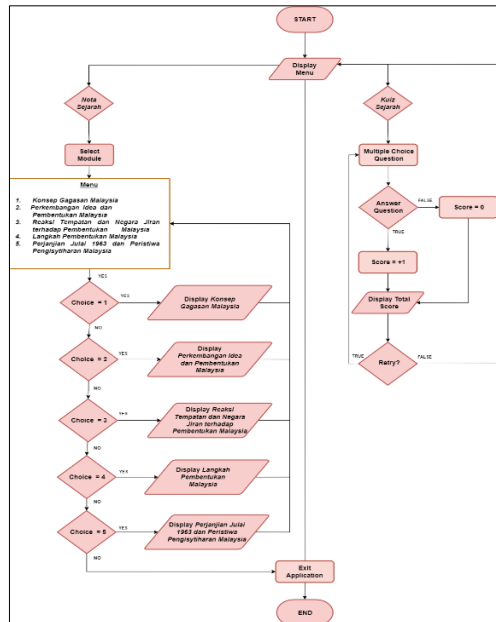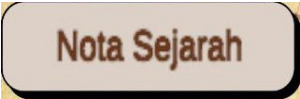

Figure 5: Flowchart

Table 4: Button Design

Button	Function Description
	Next button that navigate user to the next scene
	Home button that navigate user to go home page/main page of application
	Module 1 button to allow user open the first module of application
	Nota Sejarah button to allow user open the list of modules in the application
	Kuiz Sejarah button to allow user open the quiz scene

Table 4: (continued)

Button	Function Description
SILA CUBA LAGI	*Sila Cuba Lagi* button allow user to retry the quiz question if they want
🔊	On music button that allow user to on the music
🔊	Off music button that allow user to off the music

3.4 Development Phase

After the design the process phase which is the previous phase, the design from that phase will be started to develop in this phase. The design plan will convert into the interface based on the storyboard with the navigation and button. The platform to develop the application is by using Blender and Adobe Photoshop. The scene of application are involves in the process of designing, modelling and assign the texture that suitable based on the surrounding that want to create which is museum surrounding. All objects, button and surroundings were modelled separately and all the models with their texture are attached in Appendix C. The process of creating the surrounding for module 2 and module 4 at the Blender are shown in Figure 6(a) and (b).

a)   b)

Figure 6: (a) Module 2 in Blender, (b) Module 4 in Blender

After that, when all of the 5 scene modules surrounding finish at the blender, the scenes will be export into Unity to proceed for added the notes in the scene. Figure 7(a) and (b) shows when the scene from modules 2 and modules 4 are import in the Unity with notes provided.

a)   b)

Figure 7: (a) Module 2 in Unity, (b) Module 4 in Unity

3.5   Testing Phase

In this phase, alpha testing will be conducted by doing the functional testing that carried out by developer. It is to test the functionality of the application after the development phase. Table 3 below show the functional testing that carried out in this application. The functioning of the buttons also checked during this functional testing by the developer so that it can navigate user to the page they want. If any errors were discovered during testing, corrections on the errors were made to ensure that the specific button will functions as intended. A user acceptance test also conducted among form 5 student to measure user acceptance for the application. The .apk file was released among target users via Telegram and Google Drive together with feedback form in Google Form.

Table 5: Results of functional testing

| Element Testing	Expected Result	Actual Result
Nota Sejarah button	Navigate user to the page list of modules	Works well as expected
Kuiz Sejarah button	Navigate user to instruction page from starting quiz	Works well as expected
Home button	Navigate user to main page	Works well as expected
Arrangement quiz	The arrangement of quiz is random	Works well as expected
First Person Controller	Allow user to move and rotate the controller based on first person view	Works well as expected
Next button	Navigate user to next page	Works well as expected
Retry button	Navigate user to retry the quiz	Works well as expected
Score overview	Show user the score after the quiz	Works well as expected

4.   Result and Discussion

Mobile Learning Application for Malaysia History using Virtual Reality approach has been successfully developed with the function button that successfully work. In beta testing, about 16 users give feedback regarding the learning application. There is about 16 respondent that give feedback for developed application which is from age under 16 years old, 16 years old, 17 years old, 18 and above. Figure 8 show the user analysis for age respondent that shows 50% from respondent from Form 5 which is pass for the target user, 12.5% from age 16 years old and others 12.5%.
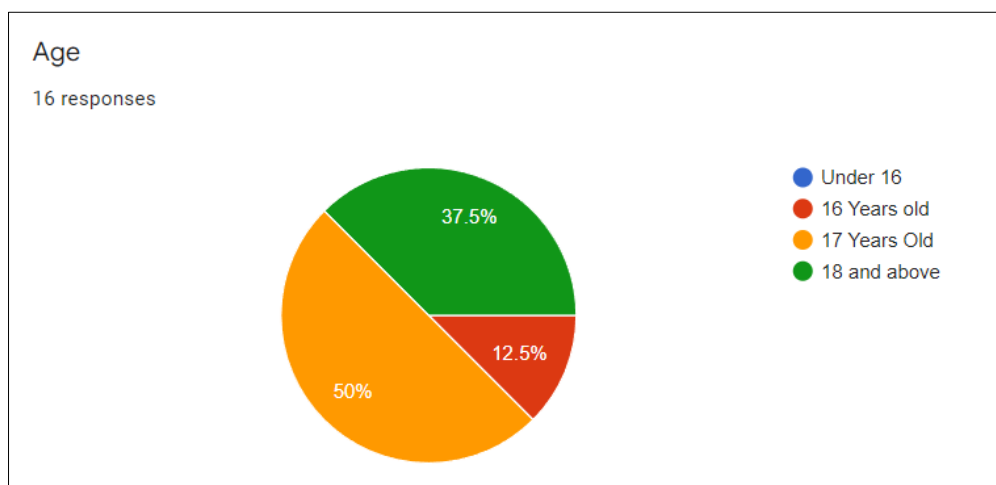
Figure 8: Age of Respondent
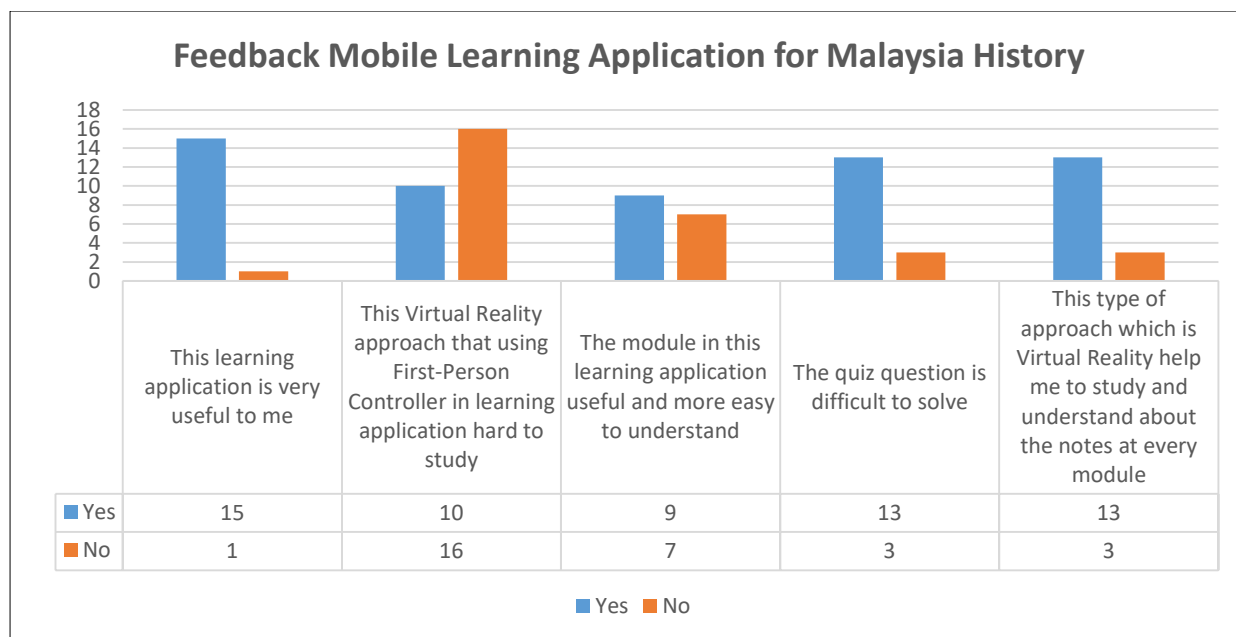
Figure 8: Feedback Respondent

Figure 8 shows the respondent about feedback developed application. There is about 93.8% that agree this developed application is very useful. Next, there is about 62.5% that agree this Virtual Reality approach that using First-Person Controller is not hard to study. Other than that, this application also easy to understand as there is about 87.5% that agree with this. The quiz question is easy to solve as there is about 56.3% that answer no. Then, there is 81.3% agree that this type of approach can help them to study and understand about the notes at every module

Lastly, there is some improvement that need to be done so that the application can attract many more user to use. The improvement is putting features access for the developer to change the quiz question so that the question always different every month. This can help the student more familiar with the question in the chapter that have study. However, there has been certain weakness that cannot be to overcome which is the at the modules part, the button home often missing from the screen so the user must keep rotating the screen until the home button pop up at the left side.

5.   Conclusion

In conclusion, Mobile Learning Application for Malaysia History using Virtual Reality has been developed successfully and has a chance to make it more interesting among the student from form 5. Some future improvements can be implemented in this mobile learning application such as include animation and other things to make it easier and fun. Besides, the interaction between the system and user also can improve in future.

Acknowledgment

APPENDIX A (storyboard)

Figure 8: Main Page Interface

Table 3: Description of Main Page Interface

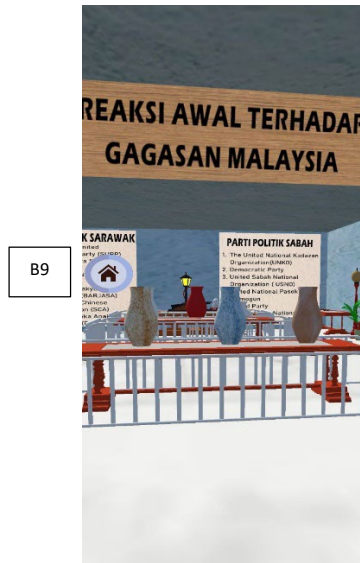| Element	Description
B1	Button setting to set the music background
B2	'Nota Sejarah' button for open modules
B3	'Kuiz Sejarah' button for quiz question

Figure 9: List Modules Interface

Table 4: Description List Modules Interface

Element	Description
B4	Home button to main page interface
B5	Module 1 button to module 1 interface
B6	Module 2 button to module 2 interface

Table 4: (continued)

Element	Description
B7	Module 3 button to module 3 interface
B8	Module 4 button to module 4 interface
B9	Module 5 button to module 51 interface

Figure 10: Modules Interface

Table 5: Description Modules Interface

Element	Description
B9	Home button to main page interface

Figure 11: Instruction Quiz Interface

Table 6: Description Instruction Quiz Interface

Element	Description
B10	Next button to next page
T1	Instruction of multiple-choice quiz
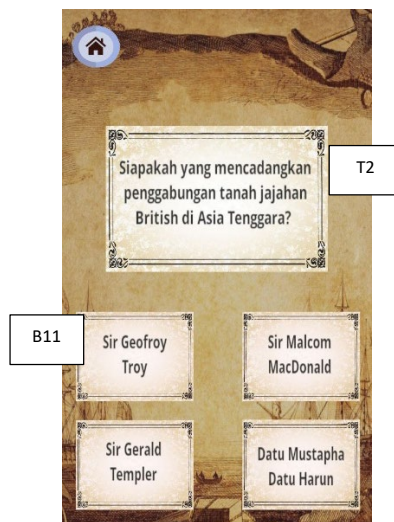
Figure 12: Quiz Interface

Table 7: Description Quiz Interface

Element	Description
T2	Question of quiz
B11	Answer button for multiple choice question
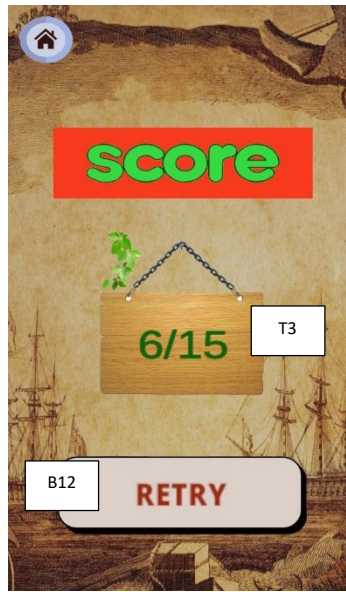
Figure 13: Score Interface

Table 8: Description Score Interface

Element	Description
T3	Display score of quiz
B12	Retry button

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