Mobile Game-Based Learning Application about Semai People

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Abstract
The current platform for cultural education that teaches about indigenous people lacks a sufficient element of gamification and cultural preservation. The main objective of this research project is to develop a mobile game-based learning application of Kenali Semai through the digital platform by applying gamification elements. This mobile game-based learning application would be aimed at the public to pique their interest in learning about Semai's cultural element while playing games and the application uses the Malay language for the content. The methodology adopted is the Digital Educational Game Life Cycle (DEG) which consists of four processes; (i) game design, (ii) software design, (iii) implementation and publishing, and (iv) game-based learning and feedback. A few gamification elements were embedded, and the mobile game-based learning application was developed using Construct 2 and Android Studio and deployed using Google Play Store. As for future works, it is suggested to enhance to iOS platform so that can increase the number of users and improve the feature of the Kenali Semai mobile game-based learning application.
Keywords Mobile Game-Based Learning, Gamification, Human-Computer Interaction

Introduction
Mobile game-based learning is a new way of communicating knowledge and information to the rest of the world. Creating a mobile game-based learning environment is a technology that most people are familiar with these days. Mobile game-based learning can be used to improve the learning methodology as it transitions from a traditional to a digital platform. However, the development of a mobile game-based learning application would be related to gamification elements.

Nowadays, game-based learning is used as a technique and resource to increase learner interest, because most educationally designed games generate player enjoyment, which benefits educational objectives. Game-based learning will create a symbiotic relationship between gaming and learning elements, laying the groundwork for two critical foundations: a fun component and an educational component. As a result, learners remain competitive in

a gaming scenario while attempting to complete a set of learning activities on their own or in groups in game-based learning.

Gamification is an element that should be present in a game to keep the momentum between the mobile game-based learning application and its users going. Gamification includes many elements such as levels, scoring, rating, avatars, leaderboards, and many more (Abdul Rahman et al., 2018). Instead of having a positive impact on users, all the elements in gamification are important in raising the mood of playing the game. This mobile game-based learning with the element of gamification would be a good engagement between the mobile game-based learning application and the users since users would feel interactivity that occurs within the game.

The focus of the content of the mobile game-based learning application would be the indigenous people of the Semai ethnic. Why are we focusing on indigenous people of Semai ethnicity? It is because the Semai ethnicity has the biggest population in their subcategory of ethnicity (Hussain et al., 2017). Therefore, by using a mobile game-based learning application, it can be a great medium to deliver the knowledge about Semai ethnic of indigenous people. Preserving culture using mobile game-based learning applications can be done in many ways in terms of interactive ways of integrating the environment, knowledge, and object related to the culture of the Semai ethnic. By placing learning in its proper context and fostering a firm grasp of learning, culture plays a decisive role in people's engagement to enhance people's identity and critical thinking. Hence, the "Kenali Semai" mobile game-based learning application will act as a bridge for citizens, especially for the young generation to learn more about indigenous people. The current platform for cultural education that teaches about indigenous people lacks a sufficient element of gamification and cultural preservation. Current technology-related research on Semai People may not be sufficient to preserve the cultural heritage of Semai People (Isa et al., 2021). There is a need for more mobile learning applications that focus to preserve the cultural heritage of the Semai People.

Methods
In this project methodology, the method of Digital Education Game Life Cycle (DEG) is being adapted to develop a mobile game-based learning application. The methodology adopted and revised in the context of the research is the Digital Educational Game Life Cycle (DEG) which consists of four processes which are (i) game design, (ii) software design, (iii) implementation and publishing, and (iv) game-based learning and feedback (Aslan & Balci, 2015). A few gamification elements were embedded, and the mobile game-based learning application was developed using Construct 2 and Android Studio and deployed using Google Play Store.

Results and Discussions
A. Game Design Using Storyboard
When developing a game with multiple phases or focusing on a specific visual presentation, a storyboard provides a better visual overview. Fig. 1 depicts the storyboard for the "Kenali Semai" mobile game-based learning application. The mobile game-based learning application is divided into three stages, starting with the most important things they must consider and progressing to the most important things they must remember. The storyboard for the public mobile game-based learning application about Semai ethnic knowledge is shown below. The

images below depict the storyboard for the "Kenali Semai" main menu, the storytelling, the trivia game, the bonus game, and points for the highest score of players.
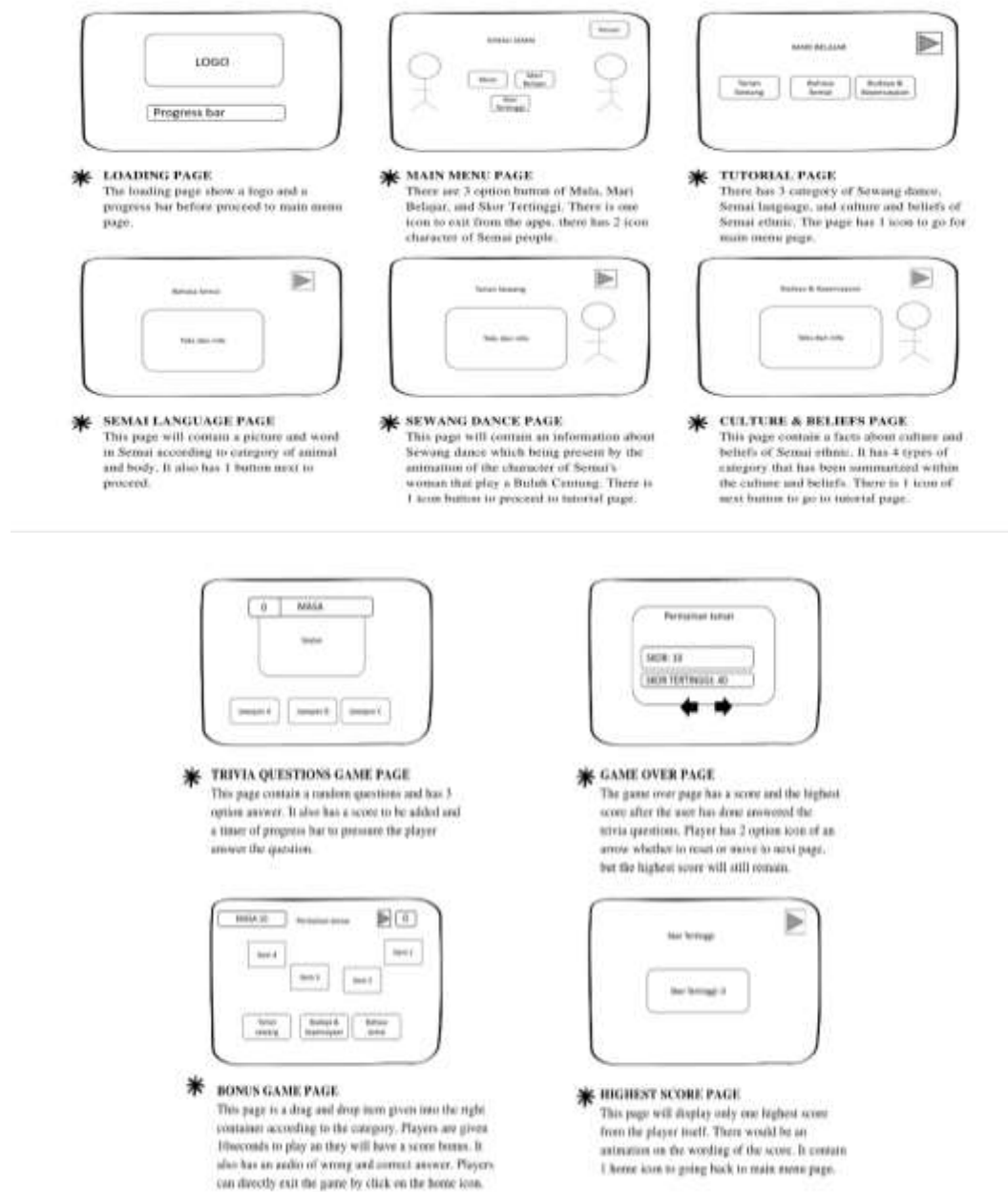

Fig. 1 Storyboard for Kenali Semai

B. Software Design

The flowchart of Kenali Semai was created to act as a guideline for the flow of the mobile game-based learning application. The flowchart will give the user a better understanding and overview of the navigation of the mobile game-based learning application. The flowchart created for Kenali Semai was illustrated by using Draw.io software as can be seen in Fig. 2.
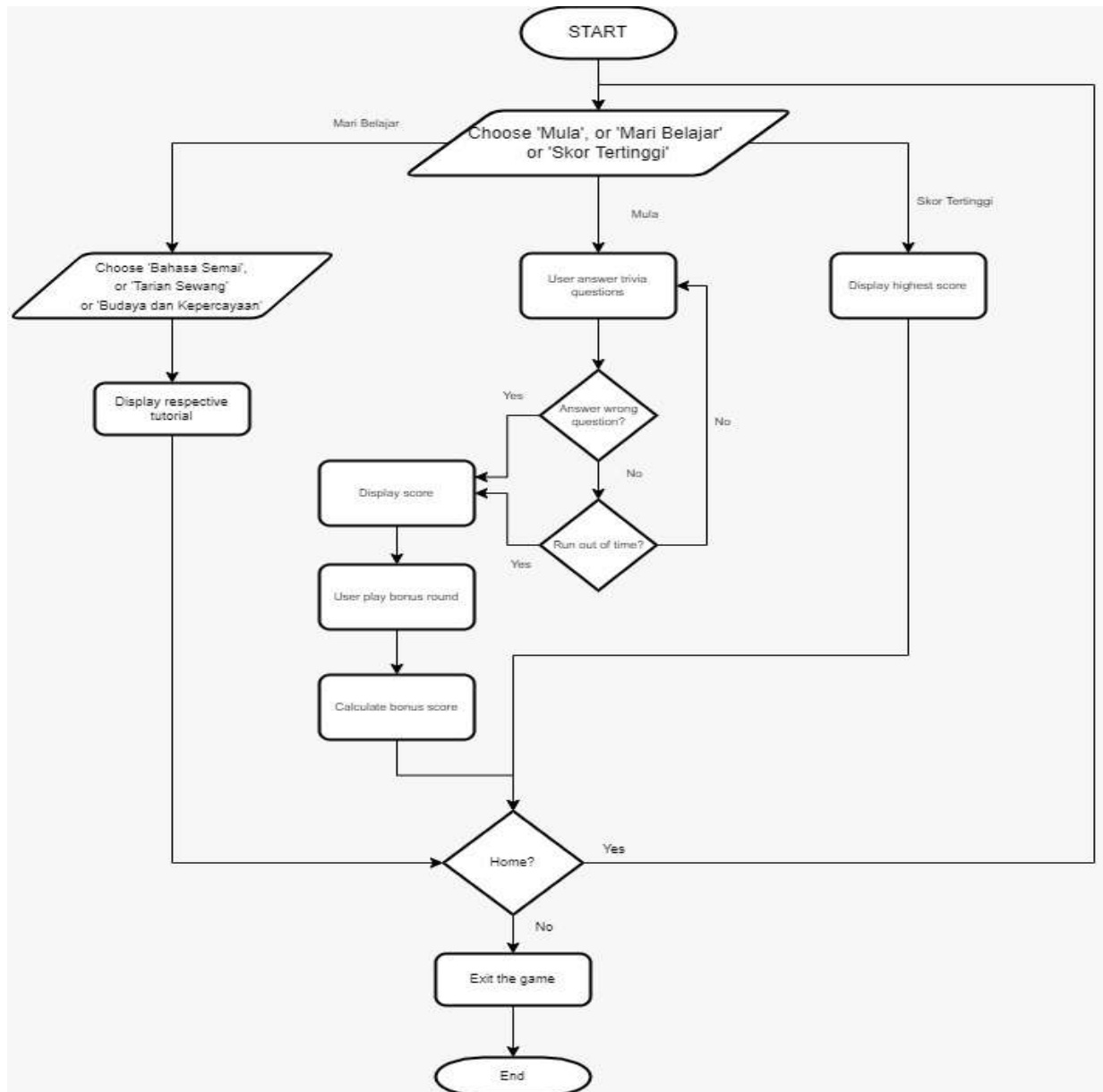
Fig. 2 Application flowchart

A use case diagram was created during the game software design phase. The purpose of the use case diagram was to show the interactions that would occur between the stakeholders and the application's system. It is to see how they will work for both parties. The Kenali Semai Use Case Diagram is depicted in Fig. 3.
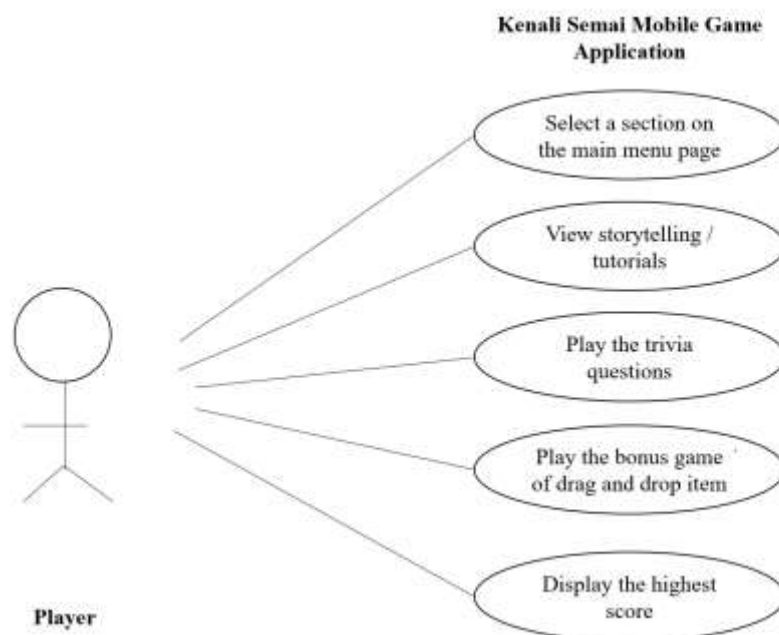
Fig. 3 Use case diagram for the application

This section addresses the third research objective by presenting the coding process to develop the Kenali Semai, the final interface of the final application user interface, and the development process for the Kenali Semai mobile game-based learning application. Furthermore, after completing the mobile game-based learning application development, it is critical to test the application to ensure that it is bug and error-free.

In general, the mobile game-based learning application was developed using Construct 2 and Android Studio. The loader page, shown in Fig. 4, is the first landing page, which serves as the application's splash screen and directs the user to the application. The logo for the Kenali Semai application will be displayed on the loading page. It is the indigenous people's representative. It will take a few seconds to load before proceeding to the main menu page. Fig. 5, on the other hand, is the home page of "Kenali Semai," which comes with the design of a living environment for the indigenous people of the Semai ethnic, with two characters inspired by one of the Semai ethnic's traditional clothes and a view of the forest with the sound of nature. These details were given to entice users to continue playing the game. The design was perfect for the project's name, "Kenali Semai," which is a mobile game-based learning application that allows people to learn more about the indigenous people of the Semai ethnic group.

Fig. 4 The loading page of "kenali semai" mobile game-based learning application

On the home page, users will have three options to choose from, the first of which allows them to select the *Mari Belajar* tutorials option to learn about the Semai ethnicity. The *Mula/Start* button, allows users to begin playing the game with a single touch. The final option is *Skor Tertinggi*/Highest Score, which allows the user to view one of the highest scores among previous players. In addition, there is one exit icon for users to use once they have completed the game.

Fig. 5. The home page of "kenali semai" mobile game-based application

This is the page (Fig. 6) on the category page of the tutorials page where the user can choose which category they want to learn about first. The application includes three types of categories: languages, traditional dance, and culture and beliefs. There is also a home button at the top of the page where users can return after learning the three categories of information about the Semai ethnicity.

Fig. 7 shows the page where the user will learn a few words in the Semai language according to the category provided such as animal and body part. In Fig. 8, the user would learn about the *Sewang* traditional dance which is the most famous dance among the indigenous people, while in Fig. 9, the user will learn about the culture and beliefs of the Semai ethnic which contain four categories in their beliefs.

Fig. 6. The tutorial page of "kenali semai" mobile game-based application

Fig. 7. The tutorial page of semai languages

Fig. 8. The tutorial page of the *Sewang* traditional dance

Fig. 9. The tutorial page on Semai culture and beliefs

C. Implementation and Publishing

This procedure necessitates the installation of Cordova software by the developer. The project file for the Kenali Semai mobile game-based learning application must be created to be used later in Android Studio. The integration of the Kenali Semai mobile game-based learning application project file requires the developer to integrate. This process entails running the application through the emulator and creating the APK file project for the Kenali Semai. The final step is for the developer to release the Kenali Semai mobile game-based learning application. The developer must upload the APK file to the Google Play Console to complete the task. The process must then wait for approval from the Google Play Store before being reviewed and published in a few days as shown in Fig. 10.
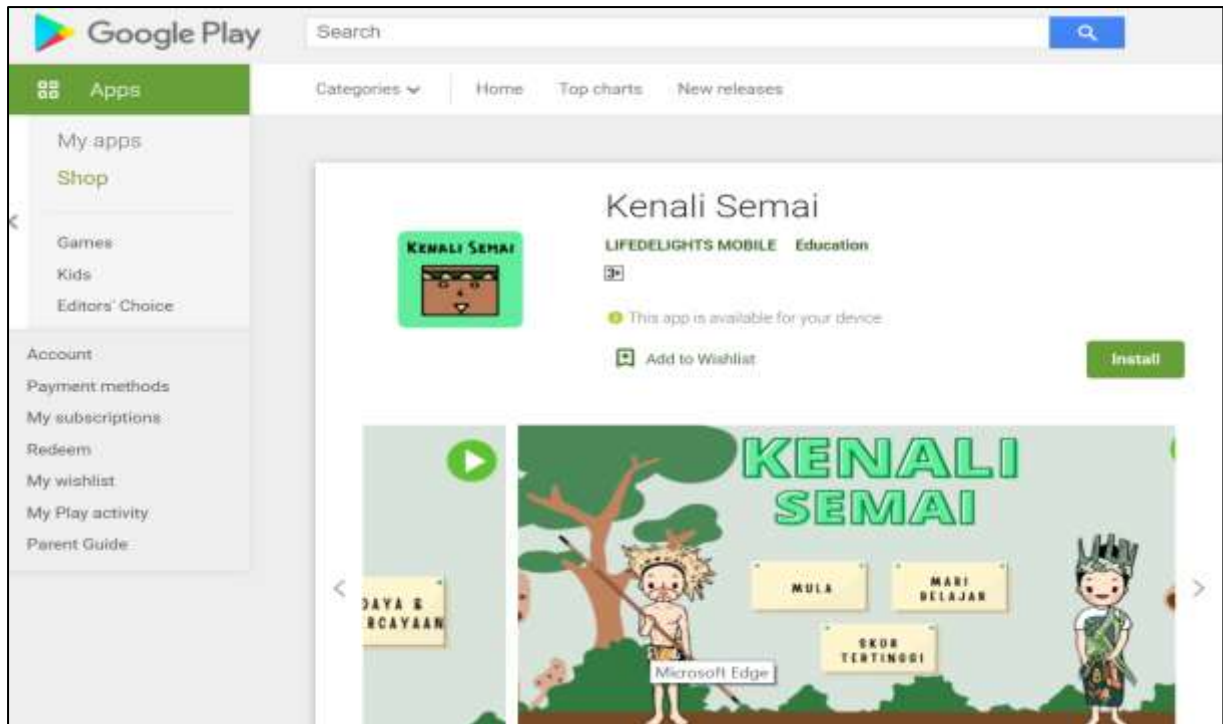
Fig. 10. Publishing into the google play store

D. Game-based Learning and Feedback

To evaluate the product, user testing was performed, and a few individuals participated to complete a test and provide feedback on the product as shown in Table 1. User testing aims to identify areas of uncertainty as well as opportunities to improve the overall user experience. Participants must first install the Kenali Semai mobile game-based learning app on their Android phones before beginning usability testing. The instructions for installing the Kenali Semai are as follows:

- Download the APK file into your folder and transfer it to the Android storage.
- Install the .apk file.
- The mobile game-based learning application is ready to play.

Table 1 User Testing form

Activity Name	Question	Function (Yes (Y) / No (N))							
		User 1	User 2	User 3	User 4	User 5	User 6	User 7	User 8
View and Learn Tutorial	Are you able to complete this task successfully?	Y	Y	Y	Y	Y	Y	Y	Y
	Are you able to hear any sounds and view the animation for each category?	Y	Y	Y	Y	Y	Y	Y	Y
Play the trivia questions game	Are you able to complete this task successfully?	Y	Y	Y	Y	Y	Y	Y	Y
	Are you able to hear getting the right or wrong answer?	Y	Y	Y	Y	Y	Y	Y	Y
	Are you able to watch your current score and your highest score?	Y	Y	Y	Y	Y	Y	Y	Y
	Are you able to watch the timer move when answering the trivia questions?	Y	Y	Y	Y	Y	Y	Y	Y
Play the bonus game	Are you able to complete this task successfully?	Y	Y	Y	Y	Y	Y	Y	Y
	Are you able to hear the sound effect?	Y	Y	Y	Y	Y	Y	Y	Y
	Are you able to view the animation of the pop-out score?	Y	Y	Y	Y	Y	Y	Y	Y
View the highest score	Are you able to complete this task successfully?	Y	Y	Y	Y	Y	Y	Y	Y
	Are you able to see the animation on the highest score wording?	Y	Y	Y	Y	Y	Y	Y	Y

The user testing was carried out to identify the errors that users encountered while exploring the mobile game-based learning application. It also assists the developer in obtaining user feedback on the mobile game-based learning application. According to the comments of the participants on the application, the majority of the users said that the design of the Kenali Semai mobile game-based learning application is very well designed with the color and character that has been used within the game. On the other hand, the application's function appears to be working very well, as the application's flow allows the user to know what they

are doing on the mobile game-based learning application. This indicates that the participants appear to understand the application's purpose. The application's purpose appears to be understood by the participants. The strength of this application is that it will provide the user with a better understanding of the Semai ethnic fact by using wise words and well describing the situation to the user during the play session. Furthermore, the button included in the game allows the user to interact with the application. All of the gamification elements that have been developed within the game are also working properly, which makes the user more interested in continuing to play the game. However, there are limitations to mobile game-based learning applications because every application must constantly improve for future use.

Conclusion

The creation and execution of the Kenali Semai mobile game-based learning application have a significant impact on users. The use of this application allows users to learn more about indigenous peoples, particularly the Semai ethnic group, by teaching them about the Semai language, the Sewang dance, and Semai culture and beliefs. On the game application, the game assists the user in having a visualization of the Semai ethnicity, which gives the user a better understanding through the gamification elements that have been implemented such as storytelling, trivia questions, drag, and drop the game, animation, character, scoring, and timer that relate to indigenous people of the Semai ethnic, which will benefit the user in the future.

Acknowledgment

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