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GAME DEVELOPMENT ON AR AND AI-BASED VIRUSES FOR MICROBIOLOGY AND GENETICS COURSES

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Abstract

Since the Covid-19 pandemic, the government has implemented various policies to break the chain of the spread of Covid-19 in various sectors, including the education sector. Among them, the implementation of the lockdown policy in areas that have been included in the red zone for the spread of the Covid-19 virus and avoiding the virus by physical contact known as physical distancing and many more. The Government of the Republic of Indonesia has also established various health protocols implemented throughout Indonesia by the government with centralized guidance by the Ministry of Health of the Republic of Indonesia in 2020. This has had many impacts for Indonesia. One of the impacts on the education sector is the holding of online learning processes that are held online and in an emergency at their respective homes with the aim of reducing the level of spread of Covid-19. The learning process in schools is the best public policy tool as an effort to increase knowledge and skills. So many educational institutions in Indonesia are developing games as learning media. teaching staff need innovation in learning in this new normal period with the use of multimedia, namely the existence of Game-Based Learning. Games are media that can be used in the learning process to stimulate students in teaching and learning activities in the classroom. Educational games are games created to stimulate thinking including increasing concentration and solving problems. An effective interactive learning technique for early childhood is to use educational games, this is because most children at an early age have a high curiosity about everything in the surrounding environment. Educational games are new learning media that are believed to increase children's motivation in learning and can increase children's understanding of learning materials by using a learning media in the form of interesting games. This study aims to determine how much effective educational games are as a medium for student learning. The research method used is a game using Augmented Reality (AR) and Artificial Intelligence (AI) to beat players. Using the Agile Software Development Lifecycle (SDLC). The game is in the form of an educational game for students about viruses related to microbiology courses and the process of translation and genetic transcription related to genetics courses. This research is still completing the prototype of the learning game application and will soon be tested. We hope that students will find it easier and more interested in studying difficult subjects.

Keywords: Educational games, students, Microbiology and Genetics courses.

1 INTRODUCTION

The Covid-19 pandemic has had a major impact on all fields, including education. The world of education also feels significant in every line of learning activities. Since the Covid-19 pandemic, the government has implemented various policies to break the chain of the spread of Covid-19 in various sectors, including the education sector. Among them, the implementation of the lockdown policy in areas that have been included in the red zone for the spread of the Covid-19 virus and avoiding the virus through physical contact known as physical distancing and much more. The Government of the Republic of Indonesia has also established various health protocols implemented throughout Indonesia by the government with centralized guidance by the Ministry of Health of the Republic of Indonesia in 2020.

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This has had a lot of impact on Indonesia. One of the impacts on the world of education is the implementation of an online learning process that is carried out online and in an emergency at home with the aim of reducing the level of spread of Covid-19. The learning process in schools is the best public policy tool as an effort to increase knowledge and skills. So many educational institutions in Indonesia are developing games as learning media. teaching staff need innovation in learning in this new normal period with the use of multimedia, namely Game Based Learning.

In addition to the impact of the covid pandemic, genetics and microbiology material is material that is quite difficult to learn for students due to the lack of effective learning resources and the ability to practice the material. Supported by research by Cimer (2012) stated that genetic material is one of the five most difficult sciences in biology according to students. One of the reasons for the difficulty of students to learn it is the lack of effective learning resources and the ability to practice the material. This is caused by the lack of objects to carry out experiments, only limited to certain animals and plants. In addition, the problem lies in the time it takes to carry out the experiment which is quite long. For example, to find out the application of Mendel's law to a rabbit object, it takes a long time to wait for the object to crossbreed and give birth to offspring.

So it can be said that as a result of the limitations in carrying out these practical activities, students become less interested in studying science and do not master the material being taught. Based on these two things, we need a way that can help students master genetics and microbiology material in the era of the covid 19 pandemic and the new normal era, both theoretically and practically to improve and facilitate the learning of these materials. Learning media is a form of tool for teachers and lecturers to convey information in learning activities. Currently, there are still many schools and universities that use a learning system oriented to the media of material books and verbal delivery of material by teachers and lecturers. This problem causes a lack of understanding and lack of interest of students in understanding a material, especially in the matter of Genetics and Microbiology. The learning media provided by the teacher is still insufficient to support the achievement of maximum student and student achievement. Therefore, an interesting learning media is needed that aims to foster students' interest in learning and increase their understanding of genetics and microbiology. Alternative learning media that can be used are educational games based on Android. Educational games are games designed to stimulate and improve thinking power and concentration in solving problems. Educational games can provide knowledge for students in a unique and interesting way. Educational games are used as educational media that have a learning by doing learning pattern. According to Eun-Yong Park and Hong Yo Park (2010)

educational games can be used as a means to conduct effective learning and improve the quality of education. One of the most widely used genres of educational games is a puzzle game. Based on the opinion of Javier Melero and Davinia Hernández-Leo (2013), puzzle games train players' ability to solve problems, train logic, analyze, and hone players' memory. This shows that puzzle games are suitable to be used as media that represent practical activities that require logic and analysis in their activities. The theoretical basis used to make this game is a good game, gameplay design, in the form of a quiz to find out the shape, structure and process of the virus entering the body. In addition, it is in the form of a letter puzzle for the transcription and translation of DNA to RNA, user interface and artificial intelligence for better games, because there are instructions and time and value.

2 METHODOLOGY

This game is a quiz to help students, especially students, better understand microbiological material regarding the shape, structure, and process of entering the virus into the body. As well as letter puzzle games to understand the process of transcription and translation of DNA to RNA in genetic material. This game uses Augmented Reality (AR) and Artificial Intelligence (AI) to beat players by the system. Using the Agile Software Development Lifecycle (SDLC). The design method in this study uses the Agile Software Development Life Cycle (SDLC) which is a combination of iterative and incremental process models. It focuses on process adaptability and customer satisfaction with fast delivery of working software products. The Agile SDLC breaks the product into small incremental builds. This build is provided into iterations. In the process of developing agile SDLC, the customer can see the result and understand whether he is satisfied or not. This is one of the advantages of the agile SDLC model. One drawback is that there are no defined requirements making it difficult to estimate development resources and costs.

Each iteration of the Agile SDLC consists of a cross-functional team working on different phases:

1. Collection and analysis of needs

2. Design the requirements

   In phases 1 and 2, you must define the requirements. This game is made complete with artificial intelligence, with game hints, answer hints, distractors, time and score in the game.

3. Construction/iteration and Implementation

When the team defines the requirements, the work begins. The designers and developers started working on their projects. The goal of designers and developers is to deploy the work product within the estimated time. The product will go through various stages of upgrade, thus encompassing simple and minimal functionality. In this process, plots and story boards are created. And the application of the game started from the process of making a quiz to measure the understanding of students in microbiology material, with 5 questions, such as virus forms, virus types, virus morphology, virus structure, virus transmission. If you succeed, you get a score of 100. Next, the questions are in the form of a puzzle game by arranging the letters of the DNA structure that are transcribed and translated into RNA and Interferons. If successful, the score is 300. Thus, the total score is 400. And there is time for each question and answer instructions. If the player cannot be on time, the player will be game over, in other words, the player or student does not understand the concept of microbiology and genetic material.

4. Testing and Feedback

When installed on Android, it must have a large storage capacity and permission to access the installation on Android. In the process of making this game, we invited experts to provide some input, both changes to the story board, features, and plot.

3 FINDINGS AND DISCUSSION

The designs made for this game are material design, gameplay design, user interface design, and visual design. The microbiology-based quiz game and genetic-based puzzle game for college students have the name Genvir. The game has a quiz and puzzle genre with combined gameplay, where the player chooses the correct answer for the quiz and drag and drop the name arrangement of the image part of the virus body, as well as drag and drop on a gene letter puzzle element to find the gene pair for the transcription process and translation, and the emergence of interferon.

Interface Design

a. Game Menu Interface Initial View

This is displayed when the application is open, there is about ownership of the game, the play button to start (start), then appears for game instructions, click continue to start the quiz question.

b. In-game display

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This view appears after clicking continue. In this screen, players will answer quiz questions, there are 5 quiz questions such as virus forms, virus types, virus morphology, virus structure, virus transmission. There is a picture of a lamp in the upper right corner, as a clue to the answer, every 1 question is given a duration of 2 minutes to answer and is given a value of 20 for the quiz, so a total of 5 questions is 100.

Then to the next question, there are instructions for playing with compiling a genetic letter table and matching them with their partners to continue the process of transcription and translation of genes from DNA to RNA, resulting in the emergence of interferons for immunity. Each phase is worth 100 so that if it is correct the value is 300. So if successful the student will get a value of 400. But on the contrary if it is not successful, then the game will be given a warning and there will be more viruses, so it's game over.

Seen in the following figure:

Figure 1 Appearance begin the game

Source: Primary Data, 2022

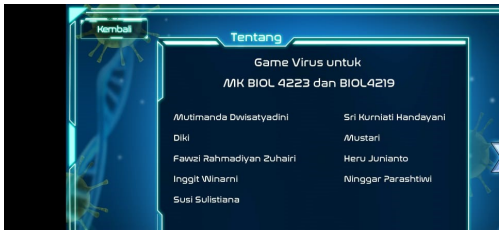

Figure 2 About the research teams

Source: Primary Data, 2022

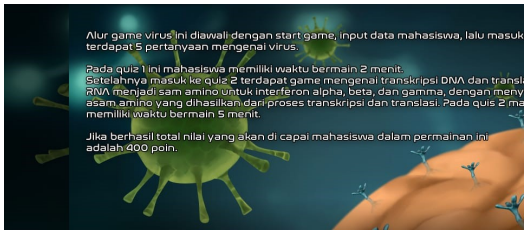

Figure 3 The Rule of The game

Source: Primary Data, 2022

Figure 4 Question 1 for the shape of the virus

Source: Primary Data, 2022

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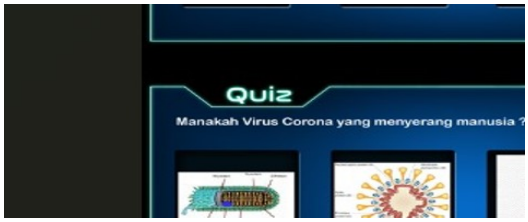

Figure 5 Question 2 for the shape of the corona virus

Source: Primary Data, 2022

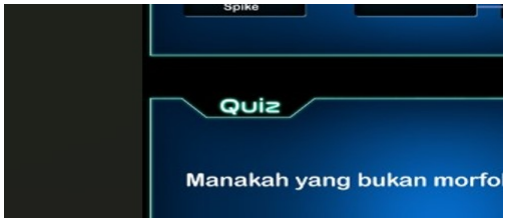

Figure 6 Question 3 for the morfology of the virus

Source: Primary Data, 2022

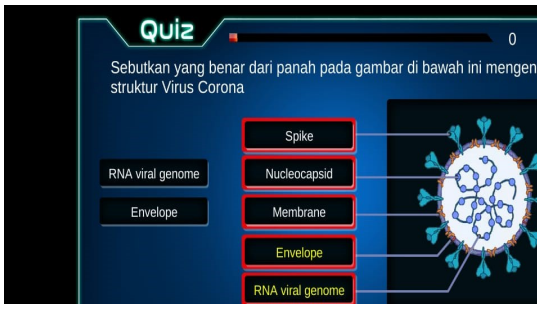

Figure 7 Question 4 for the stucture of the virus, with the instruction of true answer. Because the lamp in top of the right is yellow. But if the player isnt correct answer the line is red.

Source: Primary Data, 2022

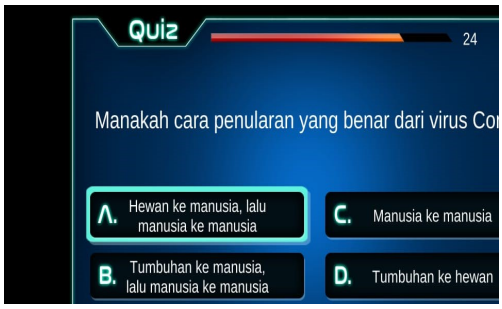

Figure 8 Question 5 for the transmission of the virus, with the true answer, because the line was green.

Source: Primary Data, 2022

Figure 9 The Rule of the game

Source: Primary Data, 2022

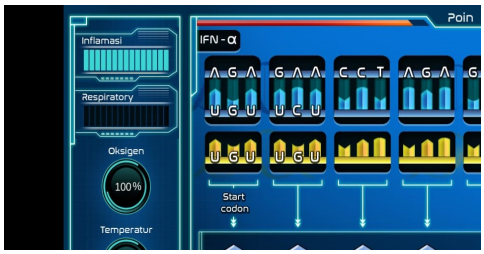

Figure 10 Question 6 for the puzzle game Transcription and Translation of DNA or RNA Interferons to amino acids

Source: Primary Data, 2022

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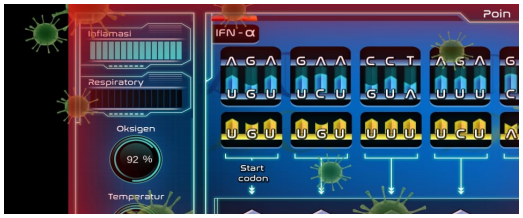

Figure 11 If the time was end virus come more to warning and the line was red.

Source: Primary Data, 2022

Figure 12 The end of this Game we can see Score.

Source: Primary Data, 2022

c. Final result display This display shows the final result after answering all the questions in the game. This display also shows the number of scores obtained and a menu to repeat, if the score is not sufficient.

4 CONCLUSION

Learning media varies along with technological developments. The use of games as learning media is expected not to be boring, thereby increasing student learning outcomes. Game Genvir is a learning game about viruses and their genetics. In this game includes 2 courses namely Microbiology and Genetics. As for the learning outcomes, students are expected to be able to understand modules 4 and 6 in microbiology courses regarding viruses, and microbial genetics. And students can understand module 5 in the genetics course on gene expression.

The flow of this virus game begins with starting the game, then entering quiz 1 there are 5 questions about the virus. In Quis 1, students have 2 minutes to play. After entering quiz 2 there is a game about DNA transcription and RNA translation into amino acids for alpha, beta, and gamma interferons, by arranging amino acids resulting from transcription and translation processes. In quiz 2 students have 5 minutes to play. If successful, the total score that will be achieved by students in this game is 400 points. This educational game for microbiology and genetics courses can be used by students to increase their knowledge. It's just that it is very limited in the use of storage capacity space on student androids because of the large enough memory storage capacity of 58 MB.

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