



## The 2D Educational Game Prevention of Covid-19 in Indonesia

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### ABSTRAK

Kemunculan virus corona yang disebut Covid-19, telah menimbulkan pandemi di seluruh dunia, khususnya Indonesia. Banyak orang yang belum paham tentang virus ini. Game yang dikembangkan dengan Construct 3 berbasis 2D ini diharapkan dapat menarik lebih banyak perhatian pengguna untuk mempelajari Covid-19, seperti Gejala, Riwayat, Protokol Kesehatan, dan Vaksin. Kemudian seiring dengan perkembangan teknologi yang semakin maju akan mempermudah pembelajaran dan sosialisasi yaitu dengan adanya Game Kuis ini. Penelitian ini bermaksud untuk membuat game edukasi kuis Covid-19 yang dikembangkan dengan kuis berbagai level untuk dicapai pengguna, dengan subjek penelitian masyarakat pada umumnya. Game ini menggunakan metode SDLC (System Development Life Cycle) dengan metode waterfall. Waterfall SDLC merupakan salah satu dari sekian banyak metode pengembangan sistem yang cukup populer dan sering digunakan oleh para pengembang sistem, aplikasi berbasis web, sistem informasi, namun tidak hanya itu SDLC waterfall juga dapat diterapkan di berbagai software lainnya, salah satunya di pengembangan aplikasi game khususnya game edukasi. Hasil pengujian akan menggunakan blackbox dalam game edukasi kuis, dan berjalan tanpa kesalahan atau cacat. Hasil uji validitas dan reliabilitas angket 70 orang masing-masing valid dan konsisten/reliable. Dapat disimpulkan bahwa pengembangan game ini dapat membantu mengedukasi masyarakat Indonesia tentang Covid-19.

### ABSTRACT

The emergence of a corona virus called Covid-19, has caused a pandemic throughout the world, especially Indonesia. Many people do not understand about this virus. The game, which was developed with 2D-based Construct 3, is expected to attract more users' attention to learn about Covid-19, such as Symptoms, History, Health Protocols, and Vaccines. Then, along with the development of increasingly advanced technology, it will facilitate learning and socialization, namely with this Quiz Game. This study intends to create a Covid-19 quiz educational game developed with quizzes of various levels for users to achieve, with research subjects people in general. This game uses the SDLC (System Development Life Cycle) method with the waterfall method. SDLC waterfall is one of the many system development methods that is quite popular and is often used by system developers, web-based applications, information systems, but not only that SDLC waterfall can also be applied in various other software, one of which is in the development game applications, especially educational games. The test results will use blackbox in the quiz educational game, and run without any errors or defects. The results of the validity and reliability test of the 70 people's questionnaire are respectively valid and consistent/reliable. It can be concluded that the development of this game can help to educate the Indonesian people regarding Covid-19.

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## 1. INTRODUCTION

Since January 2020, more than 2,245,872 people worldwide have infected Corona Virus Disease-19 (Covid-19) (Azhar, 2020). Due to this virus, more than 152,000 people have been confirmed dead. Covid-19 is a respiratory disease caused by a new coronavirus that was first identified in Wuhan, China, in December 2019 (Long et al., 2020). It did not take long to change the status of this virus outbreak into a global epidemic, until finally the United Nations through the WHO declared the Covid-19 outbreak a global pandemic (Churiyah & Sakdiyyah, 2020). The outbreak has spread to 210 countries and territories around the world (Deb & Nafi, 2021). At this time the world is being hit by a very worrying pandemic, namely Covid-19. Almost all countries in the world are experiencing the Covid-19 pandemic, including Indonesia (Setyawan & Lestari, 2020). Covid-19 is a new type of virus that was discovered in 2019 and has never been identified to attack humans before (Fitria & Ifdil, 2020). It causes many symptoms such as prolonged flu, fever, cough, sore throat, weakness and so on (Nishiura et al., 2020). In Indonesia, the government responded to the crisis through regulation and action (Abdullah, 2020). In just three months, from January to March 2020, as many as 15 regulations related to the Covid-19 pandemic have been issued by cross-governmental sectors (Adella Halim et al., 2020). The National Disaster Management Agency in Indonesia (BNPB) was appointed to lead the acceleration of handling Covid-19

(Abdullah, 2020). The military, police and religious organizations are involved in socialization, education and mitigation (Sultan & Rapi, 2020). This virus is contagious and it can spread to other people. The spreading can be through splashes coming out of the mouth and nose of people who are infected with this virus (Nishiura et al., 2020). It can also come from coughing or exhaling. This virus can be transmitted through splashes and inhalation of droplets from other people (Sarnoto & Hayatina, 2021). Therefore, prevention protocols are needed. For example, by maintaining a minimum distance of 1 meter from people who have been infected (Prayitno et al., 2020).

The spread and transmission of this virus is very fast and facilitates the humans on earth to be more quickly infected by the virus outbreak. This has caused the Indonesian government to overcome it by making policies to be able to close all forms of activity to avoid the corona outbreak which is increasing every day. But not everyone understands about this Covid-19 virus outbreak. This educational game is expected to be able to educate about the outbreak (de Souza Gaspar et al., 2020). Games are activities that are usually performed for fun and as a medium of learning (Arta & Putri, 2020). It is the one that is used as entertainment and filling the spare time. In addition, it can also be used as learning media called educational games (Nuqisari & Sudarmilah, 2019). And with this game, it can help the government in socializing the outbreak. The making of the Quiz Game is expected to re-ignite a sense of awareness and curiosity about the Covid-19 outbreak (Rohmah et al., 2020). This game will be equipped with various levels of training questions to test educational skills related to Covid-19. And it is equipped with material as a learning guide as well. The development of the Covid-19 educational quiz game will be made using Construct 3. With this game, users are more enthusiastic and willing to learn about Covid-19 in Indonesia. In particular, providing information and increasing citizens' understanding of the importance of agreements in preventing the spread of Covid-19 (Prayitno et al., 2020). In terms of features, this quiz game will be given multiple-choice questions to answer.

The research intends to create a Covid-19 quiz game developed with quizzes of various interesting levels for users to achieve. The quiz contains various kinds of materials such as symptoms, first treatment, history, daily protocol, etc. The questions in this quiz game will provide several answers and choose one to answer the question as in multiple choice. Animations and designs will be more attractive and interesting, especially for millennials who tend to like attractive designs (de Souza Gaspar et al., 2020). Games are structured or semi-structured activities that are usually carried out for fun and as entertainment and to fill spare time, as well as a learning medium called educational games (Nuqisari & Sudarmilah, 2019). They are the ones designed to stimulate thinking, including improving concentration and problem solving (Coovert et al., 2017). Dimensions can be interpreted as several methods of determining the position of an object based on several references (Ratulangi et al., 2018). If an object can be defined by numbers, then it is defined as a dimension (Ratulangi et al., 2018). Dimensions in the game are divided into several sections below. One-dimensional is a dimension with only one-dimensional elements represented from the x-axis (Manurung & Trisnadoli, 2021).

Two-dimensional objects are represented in a plane consisting of an x-axis and a y-axis, usually called a Cartesian plane (Manurung & Trisnadoli, 2021). The x-coordinate indicates the position on the horizontal or horizontal axis, and the y-coordinate indicates the position on the vertical or vertical axis. Three-dimensional objects are represented in a coordinate plane consisting of the x, y, and z axes (Khairani et al., 2021). In games, the third dimension is usually the x position moving left and right, the y position moving up and down, and the z position moving back and forth along the respective coordinate axes. In this case, the position coordinates can move freely in 3-dimensional space or have no dimensional boundaries. Moreover, coronaviruses have been known since the 1930s and are known to exist in animals (Hui et al., 2018). In 2002, a new type of coronavirus disease emerged, causing Severe Acute Respiratory Syndrome (SARS) (Shrestha & Shrestha, 2020). In 2012, a new coronavirus reappeared, causing Middle East Respiratory Syndrome (MERS) in the Middle East, especially in Arab countries (Nishiura et al., 2020). On February 11, 2020, WHO officially announced that the new mysterious pneumonia-causing virus was named Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2), and the disease it caused was named Coronavirus Disease 2019 (Covid-19) (Long et al., 2020).

Research on virtual reality educational games contains the introduction and prevention of the Covid-19 virus for early childhood (Arpiansah et al., 2021). The media of the game uses virtual reality which can make users relate to a real area that is imitated or really an area that only exists in imagination (Arpiansah et al., 2021). The purpose of this educational game is to teach how early childhood or the general public can understand and follow health protocols during the Covid-19 virus pandemic. Furthermore, research will be conducted on how to increase student activity during online learning through educational quiz games during the prevention of the spread of Covid-19 (Nurhayati, 2020). Educational games as learning media that are integrated with evaluation questions are expected to make learning more interesting, fun and active (Coovert et al., 2017). The application of quiz games results in students being able to study at home through electronic devices such as smartphones and laptops (S. S. Saputri & Sudarmilah, 2020). The purpose of this quiz game is to find out the increase in learning activities in online learning through the media of quiz education games (S. S. Saputri & Sudarmilah, 2020).

## 2. METHOD

In making this educational game, the method that will be used to create and design is the SDLC (System Development Life Cycle) approach with the waterfall model. The SDLC waterfall is commonly known as The Waterfall Model. This model was first introduced by Winston W. Royce (1929-1995) although it was not named as such. SDLC waterfall is one of the many system development methods that is quite popular and is often used by system developers, web-based applications, information systems, but not only that SDLC waterfall can also be applied in various other software, one of which is in the development game applications, especially educational games (Firmansyah & Jamilah, 2018). This is because the stages of the SDLC waterfall are very flexible to implement (Firmansyah & Jamilah, 2018). The following are the stages as shown in Figure 1.

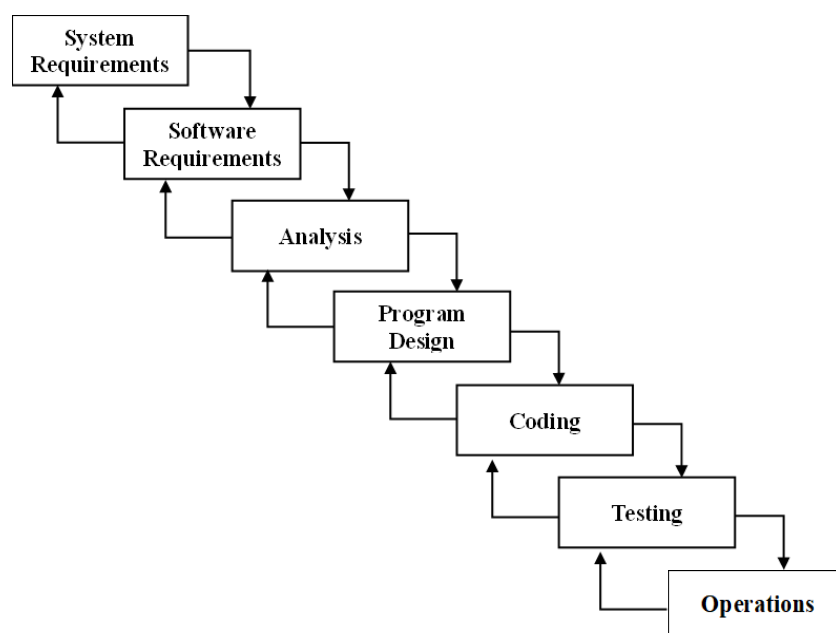


Figure 1. The SDLC Waterfall Model

The Need Analysis stage consists of System Requirements, Software Requirements, and Analysis intended to analyze the needs that will be used to create and design a Covid-19 quiz educational game. User needs are in the form of information and reviews on the game. Non-functional requirements are the tools needed and used, including software and hardware (F. H. Saputri & Ferawati, 2021). Research on virtual reality educational games contains the introduction and prevention of the Covid-19 virus for early childhood. The media of the game uses virtual reality which can make users relate to a real area that is imitate

The functional requirements are needed to support this game, namely people from various circles and ages who are the target of this game user (Adawiyah & Safrida, 2021). The material for the questions was taken from several sources from relevant government agencies such as the WHO, the Indonesian Ministry of Health, BPOM RI, and the RI Covid-19 Task Force. Users will be given 3 levels to work on the question, the consideration of separating questions from level 1 to level 3 is the level of difficulty related to understanding Covid-19. Each level consists of 10 questions, and each question uses multiple choice. If true or false, it will show the score. The non-functional requirements include the elements needed to run the knowledge quiz game and Covid-19 prevention education in Indonesia by users (F. H. Saputri & Ferawati, 2021). Requirements with specifications such as smartphones minimum using OS 7.0+ (Nougat) and available memory 8 Megabytes. If use laptop or computer, the minimum operation system is using windows 10 and available memory 408 Megabytes.

Application Design or Program Design is carried out when a needs analysis has been carried out to meet the needs in full, then the author must carry out designs including storylines, use case diagrams, activity diagrams, game storyboards, and music, assets, background in the game. Storyline is a structure of a series of events in a story that is arranged as a sequence of story parts (Fitriyani & Nita, 2021). This game is a 2D-based quiz game using Construct 3. This game aims to provide education about Covid-19 in Indonesia. In the game you have to run and complete the quiz to do. The mission in the game is that the player must complete all the quiz questions. Players are required to complete the questions correctly within the allotted time. If you answer the statement incorrectly, the blood will decrease and the points will decrease. However, if you answer the question correctly, points will be added and continue to the next question. When working on a question at 1 level, the player is given

the opportunity to answer incorrectly up to 5 times, if it has been more than 5 times then the level has failed and cannot continue because the blood has run out. This game consists of 3 levels, where at each level there are 10 questions.

Use Case Diagrams explain the functional relationships expected from the design of a system (Andrianto & Wijoyo, 2020). Use Case Diagrams have an impact on system design, it can be said that use case diagrams are the basis of system planning (Andrianto & Wijoyo, 2020). In this game, the user/actor can only do things such as playing, knowing how to play information, developer information, and exiting which will be shown in Figure 2.

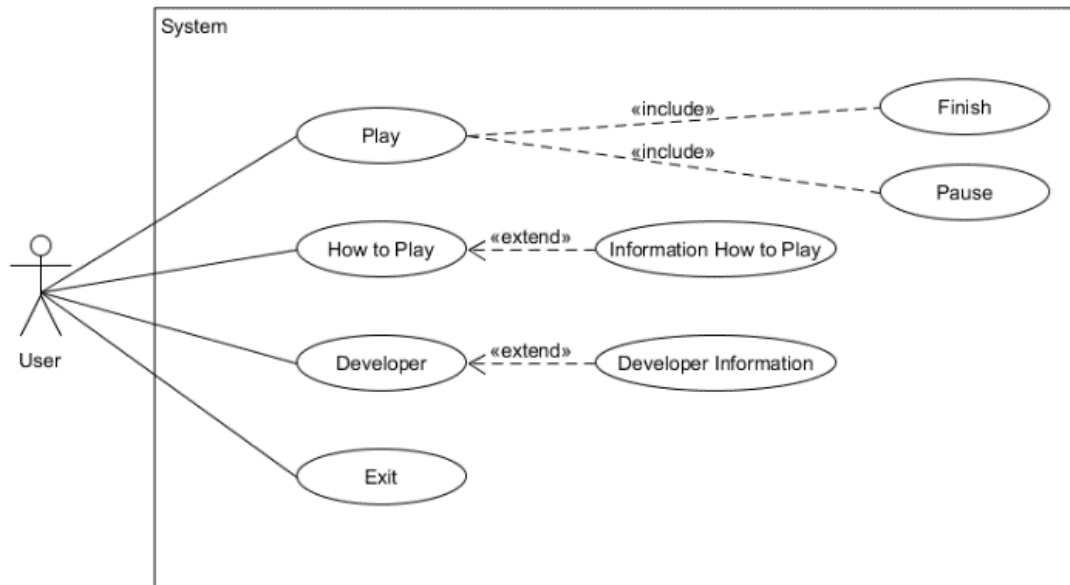


Figure 2. Use Case Diagram

Activity diagrams are system activities in the form of a series of actions, how each action starts, and decisions that may occur until the end of the action (Suendri, 2018). Users when on the first page are only given 2 choices, namely starting the game or exiting the game. So that users from various circles have no difficulty in using the game. Activity diagrams are created using the Unified Modeling Language (UML). UML is a visual language for building and modeling software systems (Muhamad et al., 2019). The following Activity Diagram is shown in Figure 3.

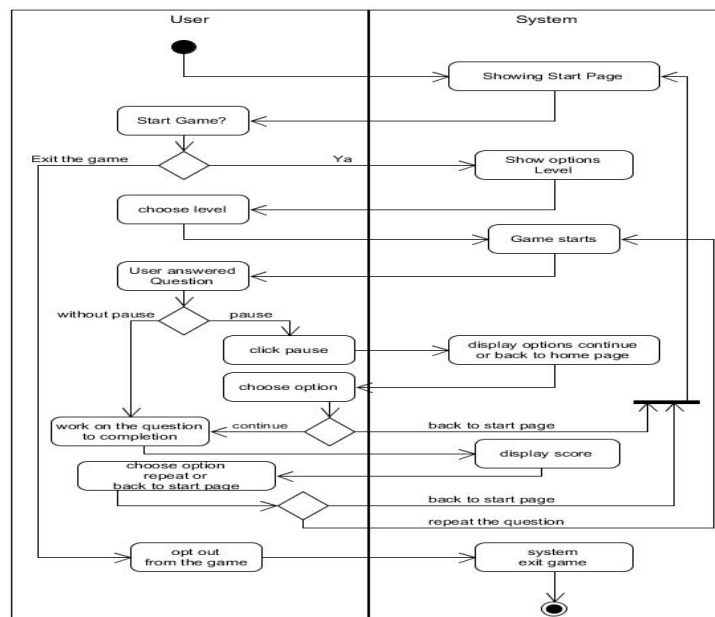


Figure 3. Activity Diagram



Storyboard is a sketch of images that are arranged sequentially according to the script (Kurniadani et al., 2018). Through storyboards we can convey the flow of the game to users more easily. Before making an educational game, it is necessary to have a picture/illustration that will explain the flow of the game from beginning to end, namely the storyboard (Ayrton, 2020). The purpose of storyboarding is to identify the needs that will be used in the game, attractive appearance, and how to develop games that are attractive and easy to play by users. This storyboard can be seen Figure 4. Figure 4 scene (a), it is the main layout as the first page of the game. There is a developer information button about this game, the stages of how to play this game. Figure 4 scene (b), it is the quiz layout of the game. Here, the game has started. There are 4 options to answer, and the running time is for one minute to be given the opportunity to answer the 10 questions. The user is also given the opportunity to answer incorrectly 5 times by showing the available blood/heart in the upper right corner to the left of the pause button. If you want to pause the game, there is also a pause button in the upper right corner.

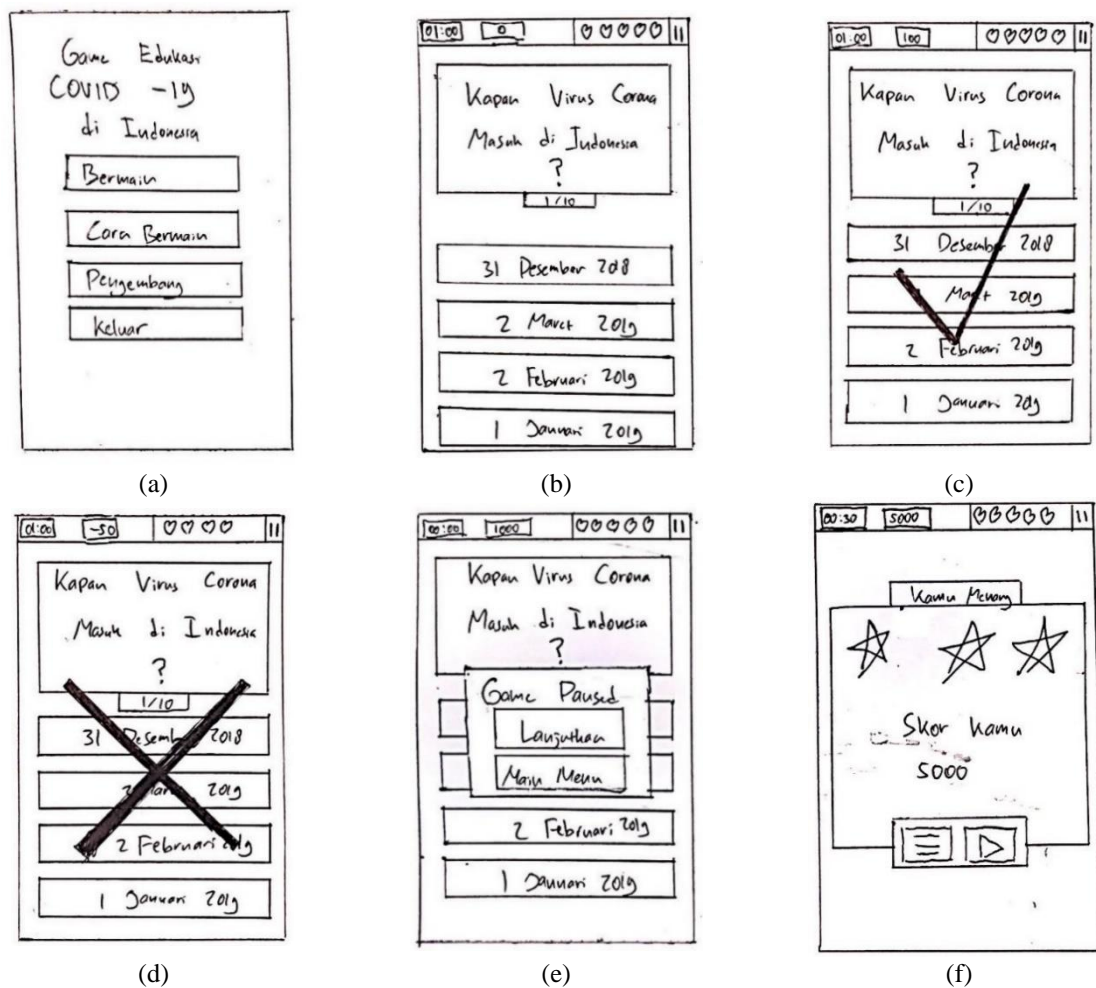


Figure 4. Storyboard

Figure 4 scene (c), it is the correct answer quiz layout. In this section, the user chooses the correct answer and displays a check mark that he answered the question correctly on that one question, and gets a score of 100 points, and the blood does not decrease. Figure 4 scene (d), it is the wrong answer quiz layout. In this section the user chooses the wrong answer and displays a cross that answers the question incorrectly on one of the questions, and the score is reduced by 50 points, and blood is reduced by one if the error is answered once. Figure 4 scene (e), it is the pause quiz layout. In this section, the user presses the pause button to pause the game. Then the user is given the choice to continue or return to the main menu/game main page. Figure 4 scene (f), it is the finish quiz layout. In this section, the user has completed the game by answering the 10 questions provided, then the game will display the finish and display the user's score. Users will be given the option to repeat the problem again, or return to the main menu/game main page. In addition to designing the storyboard, the author also prepares the music, assets and background that will be used in the game according to the theme. There is also relaxing music

to complement when doing quizzes. To complete the animation, many of the assets used are taken from the Freepik site along with the results of making/engineering in Photoshop and Paint 3D.

In the stage of making this game, it is made based on the needs and conformity with the existing design (Gunawan & Irsyadi, 2016). This game is made using Construct 3. Construct is one of the many game development tools dedicated to 2D games based on HTML 5. It makes it easy for users to create games without any programming knowledge. With Construct, you can easily design a game with just drag and drop. After making the game, the author will do the testing. Testing is conducted using the Black Box method to find out how well the game is running, as well as to find out whether there are errors or not. In a study, it is necessary to test the validity and reliability as a condition to assess the quality of research (Aribawa, 2018). In this case, the list of questions to be tested is shown in Table 1. The validity test is used to measure the validity or validity of the questionnaire. If the questions on the questionnaire are able to reveal something that will be measured by the questionnaire, then the questionnaire is said to be valid. Test reliability refers to the extent to which test measurement results remain consistent after repeated tests are performed on subjects under the same conditions. If a study provides consistent results for the same measurement, the study is considered reliable. Maintenance or operations is very necessary to keep the system adapting according to needs, so that the system can operate properly. Maintenance is also required, such as following up to date quiz questions, improving game skills, and pointing out system errors or weaknesses that were not detected during testing.

**Table 1.** List of Questionnaire Questions

No	List of Questions
1	In my opinion, I like this game application so much that I will play it many times.
2	I think this game is not complicated to play.
3	I think this game is easy to play.
4	I do not need the help of others to play this game (can play alone without assistance).
5	I consider these parts of the game are playable well.
6	I think how to play this game is not confusing.
7	I think other people will learn to play this game very quickly (easy).
8	I find this game practical (not difficult) to play.
9	I feel like I can play this game.
10	I don't need to learn much to be able to play this game.

### 3. RESULT AND DISCUSSION

#### Result

##### Game Implementation Display

The implementation of the game follows the storyboard concept and it has the user interface of the story during the journey as shown in Figure 5. It is also equipped with motion animations of the buttons and characters to make it more interesting. Figure 5 (a), Main menu. The first button from the top is the button to start playing the game. This button will direct to select the level before the start of the game. The second button is to display the Page on How to Play Page. The third button is the button to display the Developer Page. The fourth button is the button to display the Exit Confirmation Page. Figure 5 scene (b), Level Selection. It displays the available levels in the game, then after selecting a level, it will display the Prologue Page. In addition, there is also a button to return to the Main Menu. Figure 5 scene (c), Prologue. This page shows the background of the story before the game starts, and the contents of the background of each level. There is also an audio prologue to make it more interesting. Then if you press the play button you will go to the Map Page.

Figure 5(d), Map Page. This page shows the basic steps for each question. So if you do every question correctly, you will move and move forward, then return to the Game Page. Then at the beginning of the question after the Prologue Page also displays to this page. Figure 5(e), Game Page. This Game page displays the questions that must be solved. If you answer correctly, you will add 100 points. If you answer incorrectly, the points will decrease by 50 and your blood will decrease by 1. There is also a pause button to pause the game. Figure 5 (f), Game Pause page. This page is for stopping the game. There is a continue button to continue the game, and a main menu button if you want to return to the Main Menu. Figure 5 (g), Game Page Answer Correct. Displays if you answer the question correctly. Then return to the Game Page. Figure 5 (h), Game Pages Answer Wrong. It displays if you answer the question incorrectly. Then return to the Game Page.

Figure 5 (i), Win Game Page. Displaying stars and scores when you win if you answer the question to completion as shown in this scene. There is a play button if you want to repeat the game at the same level, then it will return to the Game Page. There is also a main menu button if you want to return to the main menu. Figure 5 (j), Game Lost Page. Displays the score when the answer is wrong if you answer the question and running out of

time or blood has run out. There is a play button if you want to repeat the game at the same level, then it will return to the Game Page. There is also a main menu button if you want to return to the main menu. Figure 5 (k), Exit Confirmation Page. Displays the Exit Confirmation Page if the user wants to exit the game. There is a cross button if you want to return to the Main Menu. There is also a check button if you want to continue exiting the game.

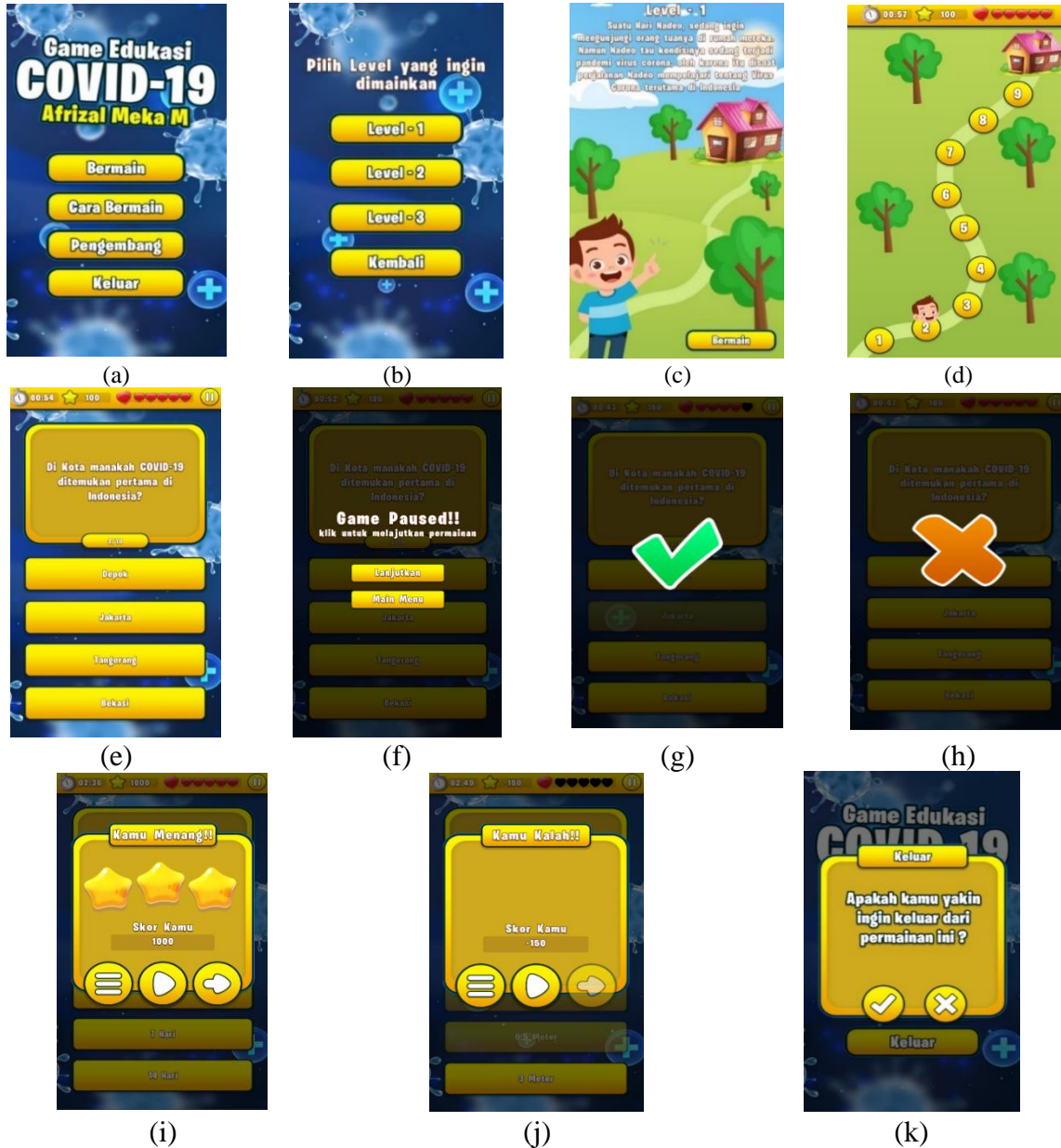


Figure 5. The User Interface

**Black Box Test**

Black Box aims to test an application that discusses the outside of a software application, from appearance to input (Hidayat & Muttaqin, 2018). The results of the black box testing of the Covid-19 quiz education game are as shown in Table 2.

Table 2. Black Box Test

Test Layout	Test Scenario	Output	Result
Main Menu Page	Play button	Go to Page Select Level	Valid
	How to play button	Go to How to Play Page	Valid
	Developer button	Go to Developer Page	Valid

Test Layout	Test Scenario	Output	Result
How to Play Page	Exit button	Go to Exit Confirmation Page	Valid
	Slide left and right button	Shifting information how to play	Valid
Developer Page	Cross button	Back to Main Menu Page	Valid
	Cross button	Back to Main Menu Page	Valid
Exit Confirmation Page	Check Button	To exit the game	Valid
	Cross button	Back to Main Menu Page	Valid
Level Select Page	Level 1 button	Go to the Prologue Page, by displaying the level 1 prologue description	Valid
	Level 2 button	Go to the Prologue Page, by displaying the level 2 prologue description	Valid
	Level 3 button	Go to the Prologue Page, by displaying the level 3 prologue description	Valid
Prologue Page	Back button	Back to Main Menu Page	Valid
	Play button	Continuing to the Map Page, after showing the motion animation directly to the Game Page	Valid
Game Page		If the answer is wrong, there will be an incorrect animation and the points are reduced by 50 blood decreases 1. And if the blood runs out it will display the Game Lost Page by displaying the score.	
	Answer Keys A, B, C, D	If true, the points increase by 100 and for questions 1-9 after answering correctly, they will go to the Map Page to display a moving animation, the closer to 10 the closer to the building. However, if it is the 10th question and answered correctly, it will immediately display the Win Game Page by displaying the score	Valid
Game Pause Page	Time has run out	Directly to Game Lost Page	Valid
	Continue button	Return to Game Page to continue the game	Valid
	Menu play button	Back to Main Menu Page	Valid
Win Game Page	Main menu icon button	Back to Main Menu Page	Valid
	Repeat icon button	Back to Replay the game by returning to the Intro Page	Valid
Game Lost Page	Next level icon button	Continue to the next level by going to the Intro Page. If it is the maximum level then the function does not work and the icon becomes transparent.	Valid
	Main Menu icon button	Back to Main Menu Page	Valid
	Repeat icon button	Back to Replay the game by returning to the Intro Page	Valid
	Next level icon button	If the game loses, then the function does not work and the icon becomes transparent.	Valid

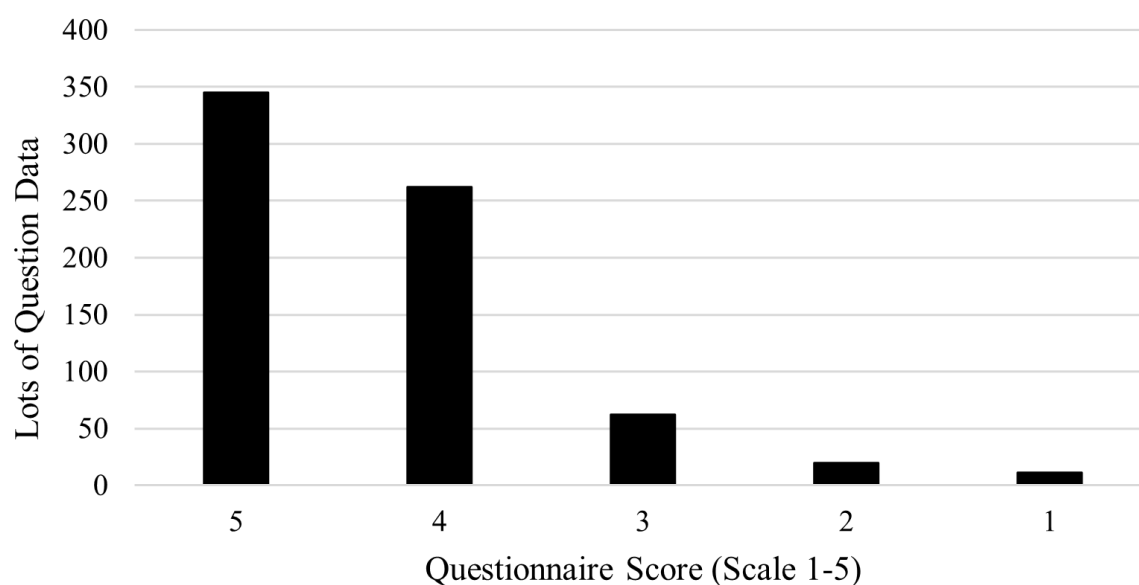
### Testing The Validity and Reliability of the Questionnaire by using SPSS

This test was carried out by 70 people from various elements of society. Then the Table R Value for 70 is 0.235 and the Validity Test is declared valid if the R Value Count is higher than the Table R Value as shown in the results of the validity test in Table 3. All questions are declared valid, since the R Value of Calculation is more than the R Value of Table. Then the reliability test is carried out. It aims to determine the consistency of the questionnaire. If it is considered reliable or consistent, then the alpha value > R table. Based on the results of the reliability test with Cronbach's Alpha of 90.0% above, the questionnaire is considered reliable because the Cronbach's Alpha value is above the value of R table which is only 23.5%.



**Table 3.** Validity Test Result

Variable	The value of R calculation	The value of R table	Significant Value	Validity
Question 1	0.821	0.235	0.000	Valid
Question 2	0.804	0.235	0.000	Valid
Question 3	0.777	0.235	0.000	Valid
Question 4	0.733	0.235	0.000	Valid
Question 5	0.772	0.235	0.000	Valid
Question 6	0.617	0.235	0.000	Valid
Question 7	0.798	0.235	0.000	Valid
Question 8	0.628	0.235	0.000	Valid
Question 9	0.605	0.235	0.000	Valid
Question 10	0.792	0.235	0.000	Valid

**Figure 6.** Community Survei Graphic Diagram

In [Figure 6](#), it is a graph diagram of a community survey given to the community and it consists of 10 questions having the answers on a scale of 1 to 5. It can be concluded that the highest score is on a scale of 5, which means that the community strongly agrees with the development of the knowledge quiz game and Covid-19 prevention education in Indonesia.

### Discussion

This research produces an educational quiz game about Covid-19 that can help to socialize and understand the Covid-19 virus in Indonesia from various circles. The creation of this game is by using Construct 3 and can be run on several platforms such as windows and android. The Covid-19 Quiz Educational Game in Indonesia was created to make it easier for the Indonesian people to understand education about Covid-19, especially in Indonesia in order to increase awareness of how dangerous this pandemic. It is threatening our lives and those we love. Based on the results of the Black box test, all features run well and the results of the validity and reliability tests are valid and consistent. Then it can be stated that this game is very feasible to help many people in Indonesia. Research on virtual reality educational games contains the introduction and prevention of the Covid-19 virus for early childhood ([Arpiansah et al., 2021](#)). The media of the game uses virtual reality which can make users relate to a real area that is imitated or really an area that only exists in imagination ([Arpiansah et al., 2021](#)). The purpose of this educational game is to teach how early childhood or the general public can understand and follow health protocols during the Covid-19 virus pandemic. Educational games as learning media that are integrated with evaluation questions are make learning more interesting, fun and active ([Coovert et al., 2017](#)). The application of quiz games results in students being able to study at home through electronic devices such as smartphones and laptops ([S. S. Saputri & Sudarmilah, 2020](#)).

## 4. CONCLUSION

The Covid-19 Quiz Educational Game in Indonesia was created to make it easier for the Indonesian people to understand education about Covid-19, especially in Indonesia in order to increase awareness of how dangerous this pandemic. It is threatening our lives and those we love. Based on the results of the Black box test, all features run well and the results of the validity and reliability tests are valid and consistent. Then it can be stated that this game is very feasible to help many people in Indonesia.

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