KOLEJ UNIVERSITI POLY-TECH MARA

COVID-19 MOBILE GAMES

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Declaration of Originality

I hereby that work in this project is our own that have been duly acknowledge. This project is a present is presentation of our original work. Wherever contribution of others is involved, every effort is made to indicate this clearly, with due reference to literature and acknowledge of collaborative research and discussion.

Copyright Acknowledgement

Signed: Date:

Office Stamp

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Acknowledgements

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Thank you.

1.0 Introduction

1.1 Background to the Project

This project is an educational game using a mobile application platform. The purpose of creating this game is to provide one of the education methods through the game platform. Simultaneously, to spread the awareness about Covid-19. Users can use this game as one of the sources to learn about Covid-19 instead of reading from the book, news, and other sources.

This game was named as Covid the Game. This game educates about the important facts that people need to know related to Covid-19. It can help people to know about the symptoms and the vaccine. It helps educate people about the vaccine that have been introduce to the world such as Pfizer, AstraZeneca, and Sinovac.

This game is a type of medium that would benefit people to learn about Covid-19. Especially, during this pandemic people always find thing to entertain them while quarantine such as doing TikTok, play video games and others. By creating this game, people can entertain playing the game at the same time learn about Covid-19.

While developing this game, I will use the Prototype methodology because it allows flexibility and interactivity in the development process of the video game. This method is suitable because keep the ricks as low as possible, can start with the core features and allow fast change. Besides, I can get the prototype of the project quickly.

Covid-19 The Game will be developed for public user from the age of 13 and above to learn about the threat of Covid-19. Besides, the main objective is spread the awareness of Covid-19 in interactive way. During pandemic, people need to be educated with all the fact and information about the Covid-19 issues. However, people nowadays are more interested in visual information method rather than verbal information method. “The research concluded that using visuals aids as a teaching method stimulates thinking and improves learning environment” (Shabiralyani et al., 2015).

The game will start by accessing to user Google Play account. This is to make sure all the game checkpoint, high score, and achievement are saved. Then it will show the main menu of the game. After that, the game will show all the game level. Every game level will provide with all the facts and information related to Covid-19. Every level has a different storyline and scene to tell the story and information. If all the level or chapter is completed it will show the conclusion or synopsis of the game and the learning outcome that gained from the game.

1.2 Problem Statement

1.2.1 Lack of awareness

Especially during this pandemic, some of the communities are not aware about the threat of Covid-19 to humanity. Some of it does not believe about the existence of the virus. People need to be educated about these issues such as Covid symptoms, the standard operating procedure (SOP) during Movement Control Order (MCO) and others.

1.2.2 Lack of information about vaccine

There are many types of vaccine that have been introduced to the world. However, some of the information are not understandable to the society. The hesitancy of some community about taking the vaccines are linked to the lack of knowledge and awareness of Covid (Paul Cullen Health, 2021). Providing a factual information about the vaccine might help bridge the gap in knowledge.

1.2.3 The learning method is outdated

The learning method that using these days start to outdate the era of modern with technology. We need to start to find a new way to improve the learning method, so it follows the flow of the era of a student nowadays. According to Mehta (2019), studies shows that the traditional learning method is outdated because there a gap between the student and their innovation thinking. Lacking in decision making and problem-solving skills (Mehta, 2019).

1.3 Project Objectives

1.3.1 To spread awareness about Covid-19 in an interactive way

Covid-19 is an important issue during this pandemic. Government have used many methods to spread the awareness such as through news, newspaper, and others. However, these method does not interest most of the people. By creating this game, it might help to spread the awareness about Covid-19 in more interactive way. Additionally, interactive learning can sharpen critical thinking skills. People will be more entertained to play and interested learn about Covid-19. This visual learning method are easier to understand. It will be up to the next level to using educational video games as a new platform to spread the awareness about Covid-19

1.3.2 To create new platform of learning

Game can be a new platform of learning whether related to academic or skills. However, this is one of the methods that can approach the youngers nowadays. It universal where everyone knows how to use it with the advance technology that existed nowadays. That make educational games one of the new platforms to learn.

1.3.3 To provide new learning approach by using multimedia elements.

Learning can be applying for a lot of methods. Multimedia is one of the methods to improve our education. Moreover, in this modern era where everything is more related to IT and technology. Learning is not only into verbal style with consist of reading and writing. Learning can come in visual such as using video and image. Also, in aural that consist of using sound such as music. So, creating this educational game with a combination of visual and aural it will provide a new learning approach other than only reading book.

1.4 Overview of This Report

Chapter 1 Introduction

In this chapter of the report will show the first sight of the project. There will be a brief about the background of the project. Furthermore, there will be a brief about the problem statement. The problem statement will analyze why this project need to be develop. Moreover, it will come with the project objective. The project objective will explain what the project will achieve concurrent with the problem statement.

Chapter 2 Literature Review

Literature Review will be the second chapter of this report. This chapter consist of research about related topic to the project. All the topic that related to this project need to do a research and find other sources such as journal, books, web sites, articles, and others. Together with a literature review on related application. It will explain three application that have been develop related to the topics. After that, we need to do a comparison and analysis from the related application. Furthermore, proceed with a discussion. This chapter will help developer to identifies the gaps of this project and identify a new way of solutions from previous research.

Chapter 3 Methodology

Every project development will implement methodology to achieve the objective. In this chapter, what kind of methodology that will be used for this project. Every process of the methodology will be explained from the start development to the end. Excellent research on the methodology will guidance the report to good image.

Chapter 4 Requirement

After that, proceed to the next section of the report with is requirement. This section describes all the process of gathering the requirement for the project. The gathering process can be done by interview or do a survey. Furthermore, the process of requirement gathering it will consist functional and non-functional requirements. Functional requirement will identify a behavior or function of the system, describe what the system should do. However, non-functional requirement describes how the system works.

Chapter 5 Analysis

Analysis will be the fifth chapter for this report. From previous chapter that collect all the data requirement from the project client. Then, proceed to the data analysis that will show the result of the data gathering in form of chart, pie chart, bar chart and others. Every model will consist with explanation for more details of the result.

2.0 Literature Review

2.1 Introduction

In this chapter, literature review will be conducted to identify, and evaluate relevant literature that relate to the project. The term literature is referred to collection of information or research that can be get from books, journal, and academic articles. However, terms review is more to summary. Terms literature review can be defined as a summary collection of information that come from books, articles, and journal. It is important to be selective the choice of sources because to ensure you analyses are directly relevant to the research (Monash University, 2018).

In this section, developer need to search other software or system to give idea to create “Covid The Game”. Developer needs at least 3 case study as a reference. Developer can see what the advantage and disadvantages of other software or system as a guide to create the education game. The case study needs to be related to the project objective, so it helps the developer to find any flaws or improvement that can be apply in the project.

Furthermore, developer also need to make research about the element that related to the project. The context of the research can consist about the features component in the project such as APIs and others. The main topic of this project also can be the research context. For this project, it will be the topic related to educational video games and Covid-19.

2.2 Research

2.2.1 Video Games in Education

Video games are knowing as an electronic game that consist of interaction with the users and input device such as joystick, keyboard, or mouse. A videogame is a game which we play thanks to an audiovisual apparatus, and which can be based on a story (Esposito, 2005). However, education if refer to Cambridge Dictionary it defines as a process of teaching or learning, especially in a school or college, or the knowledge that you get from this and known as study methods and theories of teaching (Cambridge Dictionary, 2019).

These two definitions however create a new method of learning that known as educational games with using video games in educational module. There is definition of video game in context of education. A game is a system where players are driven to an artificial conflict, defined by rules, where the result is a quantifiable measure (Salen and Zimmerman, 2003). Using video games as one of education method can be an interactive way to approach the user such as students and other. There is some consideration between video games influence and educational objective.

An experiment from Young and Loveridge (2004) have been conducted to show the result learning mathematic concept using video games approach. About 106 participants have been involve and it shows a remarkable result. Children that use the video games to learn the mathematic concept give more improvement against those who did not use the video games and it consistent for a year. This shows educational video games give more interactive way of learning and motivation to commit in learning process.

2.2.2 Awareness of Covid-19

The world has been startled about the corona virus disease in 2019 that know as COVID-19 that emerged in Wuhan, China. Since then, World Health Organization (WHO) have declared a global pandemic because it has spread over 200 countries. Cases started to increase day by day and same goes to the number of deaths because of the Covid-19. About 2.3 million cases were recorded globally positive Covid-19 and Malaysia about 5000 cases. The Standard Operating Procedure (SOP) about Covid-19 have been introduce to the world to make sure people aware the hazardous of Covid-19.

The average knowledge score of Malaysians regarding COVID-19 was moderate at 10.5±1.4 with an overall correct rate of 80.5%. (Azlan et al., 2020). This statistic shows the high percentage people in Malaysia educate and aware about the Covid-19. However, there are people or community that have a low knowledge score of Covid-19. The research from Azlan et al. (2020) recorded that Malaysians that above the age of 50 hold the higher knowledge scores about Covid-19. This may because people that age above 50 have the higher risk toward Covid-19 viruses. So, they are more aware about these issues. Those with low monthly income scored among the lowest knowledge scores (Azlan et al., 2020). These research shows that the deficiency of income may affect the lowest knowledge score of Covid-19. This might cause limitation of access to the information and affect the awareness of the Covid-19 virus.

This also come to the other issues that related to awareness of Covid-19. From the first day the disease was detected, health authorities consistently provided all the information the world need to know about Covid-19 virus. However, fake news and disinformation have become a bizarre problem related to Covid-19 issues. The overload of information may have caused confusion and difficulty ascertaining correct information (Azlan et al., 2020).

There are several research that shows the lack of awareness about Covid-19. One of it are the study from Kristina, Annisa, and Ihsan (2020) discover that community in Indonesia was less aware about the preventive practice that need to apply during the pandemic. Previous study also reported that there was a lack of awareness of prevention of the virus among urban populations in Yogyakarta, Indonesia (Kristina, Annisa, and Ihsan, 2020).

2.2.3 Integrated Google Login

Google Application have provided with various of product such as Google email, Classroom, Drive, and Calendar. Additionally, Google also provided Application Programming Interface (API) that can be used by any developer to access any Google services. API is a software intermediary allow two applications to talk each other. (Mulesoft, 2018). The way API works are when user open or use an application on their phone, then the application connect to the Internet and send the data to the server. Next, the server retrieves the data, interprets, then performs the necessary actions and send back to your phone.

The Google Play Game Services not just provide integrated google login, but it also acquires user and engage save game data. It provides a convenient way to save all user or player progress to Google's server. The data then be retrieved from the game player play and allow player to continue from their last save point at any device.

Use Friends APIs to complement and enhance your existing in-game friends' system and other social systems your game may access. (Google Developers, 2020). It allows users to access their friend list information such as game status, add friends, and others. Additionally, user can see their friends level and what game was initiated.

2.3 Related Application

2.3.1 Mario Time's Machine

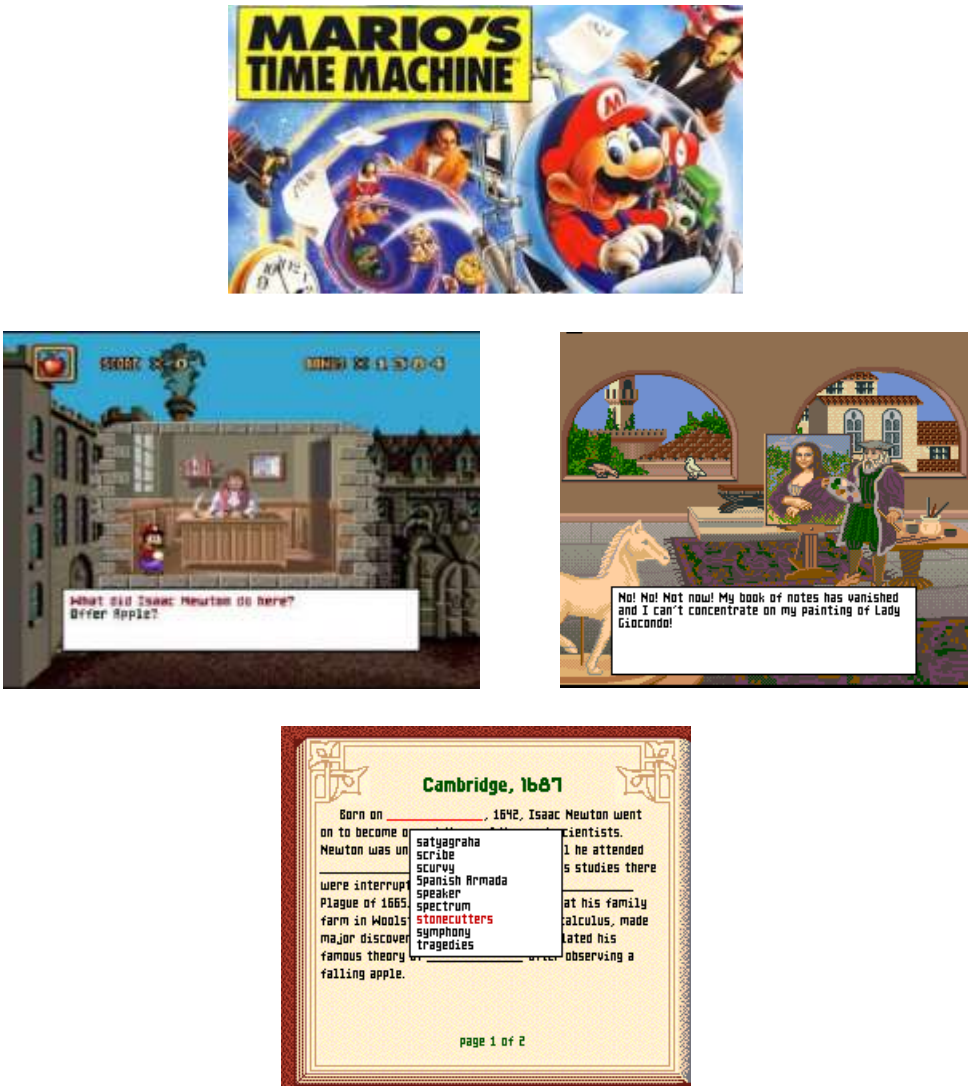


Figure 2. 1: Mario's Time Machine Gameplay

Mario's Time Machine is an education game that focuses on teaching human history. This game concept is the player Mario need to return all the history artifact in the correct year. This concept is interested because every chosen year or level have their own history and games to attract user. This will attract user more because it not pointed in one game concept only, but it exposes user with many missions and history. Besides, in every year that the player Mario at the player will required to answer some question such as fill in the blank.

2.3.2 Mega Man X: Math Tornado

Figure 2. 2: Mega Man X: Math Tornado Gameplay

Mega Man X: Math Tornado is an educational game that taught about mathematic. The game can enter player name, save high scores and a leaderboard showing the highest score from all other players. This game use robot as their enemy. The player needs to shoot the robot with a number that coinciding to the answer to the math problem question. Every question has a time limit of 60 second, so the player needs to answer the question fast and correct to proceed to next level. The player needs to collect 500 point to face the boss level and the game end after player collect 1000 point. The player can print the certificate.

2.3.3 BodyQuest

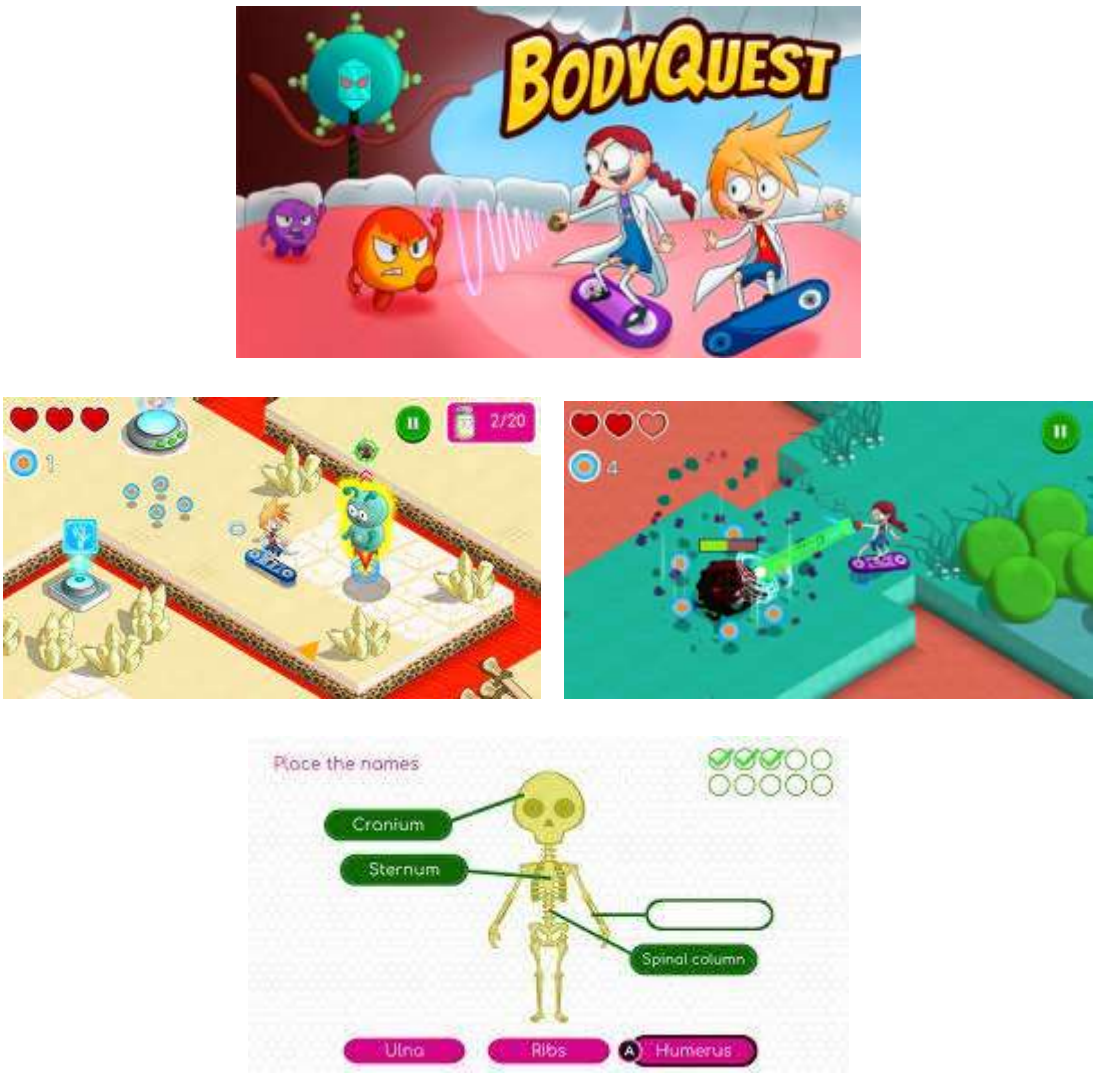


Figure 2. 3: BodyQuest Gameplay

BodyQuest an educational video games that release by Nintendo. This game is about a journey of human body from its insides. The main of the games are to surpass all the 25 levels to get the disk that unlock the nanobots. Player will need to face with the viruses, puzzle games, sticky walls, and other as the obstacles. Before the player get to play the game, their need to register. In the register it will require player to enter their ages. This is because the game provides the information or the educational content for specific range of age. This will make the player easy to understand the content and get the outcome of the game.

2.4 Comparison and Analysis

Topic	Mario's Time Machine	Mega Man X: Math Tornado	BodyQuest
Game Themes	Human History	Mathematics	Science about human body
Method of Education	Every mission consists of history and fill in the blank question.	Players need to shoot a robot with a number coinciding to the answer to the questions.	Adventure games that provide quiz for every part of the body systems.
Graphic and Animation	Graphic pixel but good animation flow frame by frame.	Medium rate in graphic and animation.	More quality graphic and animation
Game Platform	Super NES consoles	Personal Computer (PC)	Nintendo Switch
Login	No login required, just enter player name in the game.	No login required, just enter player name in the game.	Using Nintendo Account
Target User Range age	17 years old and above	9 years old and above	6 years old and above
Gameplay	Travel to the specific years and answers all the question refer to the choose history.	Mathematic question is shows and the player need to shoot all robot with number to answer questions. Every time player shoot the wrong number robot the player lost health.	Players discover human body systems. Every checkpoint provided with quiz and question that related to every section of body system. Player also need to avoid obstacles such as viruses, toxic smoke, and others.

Table 2. 1: Comparison and Analysis Table

I may compare the three prior case studies based on their game theme, method of education, graphic and animation, and game medium, as shown in Table 2.1. With these comparisons, I can examine how to evaluate their performance and create a new educational game. Furthermore, it will provide users with a new experience.

2.5 Discussion

2.5.1 Game Themes

Game themes are the main topic for every game development because it represents the identity of the games. It also a guide on how the story line of the game will follow. Besides, an excellent theme will create a good story for user to play and learn. This will generate an excitement for the user to play the game. BodyQuest is a suitable game theme for this Covid The Game.

An adventure games that will provide information about the Covid-19 and a main quest to collect all the vaccine to save the world. The adventure theme will provide excitement the user to play the game. These adventure themes are more in line with the game's basic concept. The game's core concept is that the main character fights Covid infections and is given a task to free the world from these viruses by collecting all vaccines for the people.

2.5.2 Method of Education

To create an educational game, it must have the method to educate the user while playing the games. Furthermore, from my observation the method of education that apply in Mega Man X: Math Tornado and BodyQuest are a good combination to create an interactive education game. The combination brings the new idea of how the “Covid The Game” should be. The game will have the main character that will save all the vaccine to fight the Covid. However, at the same time the main character will be provide all the information about the Covid-19 viruses. Every level will have a different story and information about the Covid viruses and vaccines.

The method of education for this project will provided will fact s and information about the Covid virus, and vaccines. There will be several chapter or level in the game. Every level will provide with the stories, facts, and information. Example draft or planning about the level of the game. Level 1 will consist with the introduction of Covid. This level will explain what Covid-19 is and will introduce the character. However, level 2, level 3, and level 4 will consist of the information about the vaccine. Every level has different vaccine such as Sinovac, AstraZeneca, and Pfizer.

2.5.3 Graphic and Animation

These features are the first key of creating a game. Graphic of the game need to decide whether to be pixel, 2-dimension, or 3-dimension. The basic graphic is pixel and 2-dimension because it easy to organize and design. However, the animation also the key to the game project. The animation will show the movement and motion of the game character, button, background, and others that related to motion. The graphic and animation choices might be combination from Mario's Time Machine and BodyQuest. A graphic pixel games with a medium rate of animation.

The graphic for this project will be pixel because it easy to design and animate. The combination from game Mario's Time Machine and BodyQuest it creates an idea to design a pixel game with a more details on the design structure. The number of pixels is important because it can show how details the design is. The character pixel size will be 32 x 32 pixel. It is the basic size and can see the details of the characters. However, for other component such as obstacles, doors and checkpoint will be design using 16 x 16 pixels size. Overall size of the map might be 128 x 128 pixels.

2.5.4 Game Platform

Every game can be played at specific game platform such as console, personal computer (PC), Nintendo Switch, PS4, Xbox and other. Nowadays, an interactive game also can be seen on mobile application games. Player Unknown Battle Ground (PUBG) also now can be play on mobile.

Covid The Game will be in Mobile Application platform. It will be an interactive educational mobile game about Covid-19. Mobile Application game are more popular these days because of accessible to access the games. User can play the game at anytime and anywhere they want. This project "Covid The Game" will be use Mobile Application as the game platform.

2.5.5 Login

These features are important because it can save all the player gameplay, achievement, and high scores. Most of game nowadays use this feature to track their players gameplays, and login rewards to make sure their user always keep track with the game. According to the Table 2.1, from all the comparison only BodyQuest have the login features rather than other two games. Others two not using login features as today features, it saves the game using the memory card and in game save. The login features for game BodyQuest are more suitable to choose as reference for Covid The Game.

The login features for this project will be Google Play login. This login features can be used for android device only. I will be using Google Play API in this project. It will provide with login features and other related features. After, user download the game and started the game, it will require user to login to Google Play account using their Google email. This login feature is user friendly and user experience because all users nowadays have Google account.

2.5.6 Age Rating

Not to forget about the user. In developing a game, developer need to know for who the game for, who is the user, and what the range age for user to play the game. Every game that existed have the age rating. Usually, it displays the age rating at the game description to show the minimum age group that suitable to play the games. My observation from table 2.1, the suitable age rating is from game Mega Man X: Math Tornado with age rating from 9 years old and above.

However, for this project the age rating will be 13 years old and above. I think it the suitable range of age especially a game about awareness of Covid-19. This game will be using a simple scientific term that student 13 years old can understand. Besides, to spread the awareness it is better to start from the age of 13 years old because at this age student start to become mature. The way of thinking also will be different from student age below 13 years old.

2.5.7 Gameplay

The video gameplay will show how the games works. This gameplay consist how the player character do, what the mission, how to solve the mission, and other aspects. From the observation, I think the combination gameplay from Mario Time's Machine and Mega Man X: Math Tornado will be the great gameplay for this Covid The Game project.

The combination creates a new gameplay idea for this project. Player can choose any chapter to play about the Covid-19, just like gameplay in Mario Time's Machine. Additionally, every chapter the player needs to shoot all the obstacles with is the Covid viruses. It same to the Mega Man X: Math Tornado gameplay where player need to shoot the robot to survive the game.

2.6 Conclusion

The literature review is crucial since the developer will need to conduct research to compare and choose the best solution for the project. Furthermore, a literature review can assist developers in determining the strengths and weaknesses of software, systems, or games. In this chapter, we can conclude that how important literature review in process of develop a project.

Overall, from the literature review I notice to create an educational game for “Covid The Game” that consist the game theme from the game “BodyQuest” an adventure games that will provide information about the Covid-19. Furthermore, the education method will be the combination from “Mega Man X: Tornado Math” and “BodyQuest” that create a new education method for this project, where the game will have the main character that will save all the vaccine to fight the Covid and provide all information about the viruses. However, the game will be in pixel graphic with a medium rate of animation. Lastly, the game will be run in Mobile Application medium.

3.0 Methodology

3.1 Introduction

A methodology is a repeatable process that includes project-specific procedures, best practices, rules, guidelines, templates, checklists, and other characteristics for creating manageable and valuable quality systems. The process can be used and utilized indefinitely. The repeatable process of performing projects the same way every time is the essential phrase here. To put it another way, a methodology is a road plan that will lead you to your destination.

However, in this project I am using Prototype methodology. Prototype methodology is defined as a Software Development model in which a prototype is built, test, and then reworked when needed until an acceptable prototype is achieved. It also creates a base to produce the final system. Every stage of the methodology will be elaborate related to the project timeline. In this chapter, I will do a justification why Prototype methodology is being choose for this project.

3.2 Prototype Model

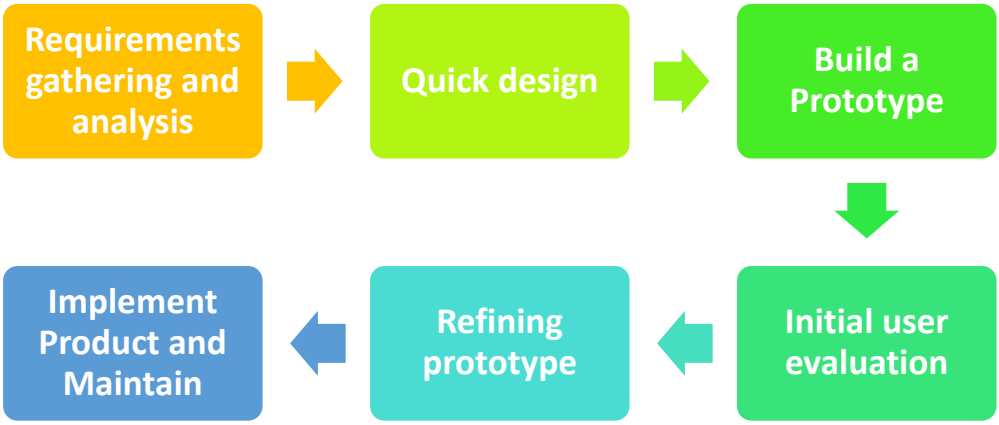


Figure 3. 1: Prototype Model

3.2.1 Requirement gathering and analysis

The first phase in prototype model will be gather all the requirement and analysis. In this phase, the requirements of the software are defined in detail. During the process, the users of the software are interviewed or create questionnaire to know what their expectation from the software.

In this phase we start give the project questionnaire to the user in the range of age 13 and above. I use Google forms to create the questionnaire, send to the user and get the result. The result from the questionnaire then will be analysis before I proceed to create a quick design of the project.

3.2.2 Quick design

The second phase is a preliminary design or a quick design. In this stage, a simple design of the system is created. However, it is not a complete design. A quick design of the game will be created to see the idea of the game. The quick design helps in developing the prototype. The quick design for this game might be start with the main menu interface, character design and movement, level map design, and including the function for every element of the game. The prototype is not fully function and design.

I will proceed to do a quick design for the character of the game. It will consist of the design and movement of the character. Furthermore, I will do a quick design for interface of the game. The main menu or front page of the game are the important because it carry the first impression of the game. Finally, to complete this quick design phase I will develop the first map of the game. This will consist of all the element of the game such as main character, the obstacle, the enemy of the game and others.

3.2.3 Build a prototype

In this phase, an actual prototype is designed based on the information gathered from a quick design. We start to continue the design to be more specific from what it should be and user expectation. In this phase, it will show detail of the game, and the game are start fully functional. The game can be play and consist of all the required information. The game also might be published to the Google Play Store for user can download the game. The prototype needs to be done before going to the next phase.

The expected result in building the prototype for this project is there will be the mobile application game with all elements that needed for the game. Prototype Covid The Game will be refer from the quick design but it will be more details. All character has movement, the ma for every chapter can be play and provide with all the information that need for this game. However, it might have some bug because it not the final result of the game.

3.2.4 Initial user evaluation

In this stage, the proposed software is presented to the client or user for an initial evaluation. Besides, from this evaluation it helps us to find out the strength and weaknesses of the working model. Comment and suggestion are collected from the user by answering the questionnaire that provide for reviewing the prototype model. The questionnaire will be sent to the user that have play the prototype of the game, and the evaluation will be made from the result.

This phase I might publish the beta of the game for user evaluation. The beta of Covid The Game will be publish in Google Play store for user to do a testing of the game. After user have finish tested the game, I might refer to the Google Play application comment section or provide a questionnaire from Google Form to know user comment and suggestion the game. Then, from the evaluation I will proceed to the next phase of the model which is refining the prototype.

3.2.5 Refining prototype

After the evaluation, If the user is dissatisfied with the present prototype, we must improve it based on the user's input and suggestions. This phase will continue until all of the user's criteria have been met. A final system is produced based on the approved final prototype once the user is pleased with the developed prototype.

The expected result will be an upgrade version from the beta version of Covid The Game. I will refer the comment from the user evaluation and do some observation. Then I will proceed refining what need to make sure the game is follow user expectation and at the same time it achieves the objective of the project.

3.2.6 Implement product and maintain

The final system is thoroughly tested and deployed to production when it is developed based on the final prototype. Routine maintenance is performed on the system to save downtime and prevent large-scale failures.

This maintaining phase, I as the developer will make sure the game will not consist if bug, user can login to their Google Play account and play the game, and the game not crash or other downside of the game.

3.3 Justification

The basic idea of prototype model is when the user does not know the exact project requirement. Therefore, the project prototype of the product is first developed, tested, and refined from the user feedback. It repeated until it achieved the final acceptance of the final product. There is reason why I use prototype model for this project. Firstly, it reduces time and costs. Strong prototyping can ensure product quality and savings for years to come (Rapids Reproductions, Inc., 2017). Using the prototype model, it helps improve the quality specification and requirement that provided to the user.

Furthermore, it improved and increased user involvement. Prototyping most importantly helps eliminate misunderstandings and miscommunications during the development process (Rapids Reproductions, Inc., 2017). Users are actively involved in the development, it enables them to see and interact with the development of the project. Moreover, user can give their immediate feedback, request project changes, and alter model specifications.

Moreover, this Prototype Model also give advantage to the developer. Quicker user feedback helps you to achieve better software development solutions, (Guru99, 2019). The prototype of the game provides with the quick feedback received from users that play the game help the developer to find better solution for every problem in the project. This is really benefits me as the developer because sometimes problem related to bugs of the game, or any downside might take time to solve it but with the quick feedback of the user I can prevent the problem in a short time.

3.4 Conclusion

Methodology is one of the key prospects in this project. In this project, I use Prototype methodology. Using the Prototype methodology, it helps developer to organize the project in the short time because it provides a quick design and prototype. This helps the developer to see the actual product that need to present to the client or user. Furthermore, I manage to see the design on how the game should be present by follow step by step phase in the Prototype methodology.

Finally, the important major reason of using Prototype methodology are we get to know the feedback from the client or user before we proceed to project to the final phase with implement the product and maintain. This helps the developer to improve the software and know the strength and weakness of the software. Besides, it helps developer fulfill client and user demand.

4.0 Requirements

4.1 Introduction

In this chapter, it is discussing on the project requirement. Before proceeding with the development of the game, it needs to list all the requirement that will be needed in the game. I will describe all the requirement that will be use in this section. Project requirements are conditions or tasks that must be completed to ensure the success or completion of the project (Raynor, 2019). The statement shows that how important requirement in project development.

This project requirement helps create a clear picture of the project that need to be done. Developing this game really need the requirement such as the hardware, software, and the game engine that will be using to run the game. At the same time, provide the questionnaire to find the user requirement. It is important because the project need to achieve the objective and follow what user need in these games. A project without user requirement will be a project without a goal.

Additionally, this chapter also elaborate the software and hardware requirement for this game development. This is one of the essential components in project development because developer will use this equipment to accomplish project objective. Hardware and software requirement will be analyze based on the games plan specification. When all the requirements follow the criteria of the project then the objective will be achieved.

4.2 Data Gathering Technique

4.2.1 Questionnaire

Data gathering typically consist of multiple of data collection technique and can be collected from various sources. Having relevant data for your project or business means that you have the knowledge to make good decisions (Esther, 2020). The data gathering help developer decide and confidence in explaining the solution. With the solid data, the probability for developer to make a mistake very low. Data gathering can be done in various type technique. However, this project will be using questionnaire method for data gathering.

Questionnaires are the series of questions that related to the project requirement. It usually designed to collect data from a group. Using questionnaire, it gives advantage in terms of cost effectiveness because it can be administered in a large number. It also a good tool in protecting the participant privacy, easy to analyze and visualize.

The questionnaire for this project will be establish using the Google Form because it cost effective and efficient. After creating the questionnaire, Google Form will generate a link for the questionnaire. Respondent can click the link and will be redirect to the survey. The survey link will be share to WhatsApp directly or in group message. The survey target user will be public in range age 13 and above. The component in the survey will consist of respondent details, video games as education platform, and spread awareness of Covid-19 using video games. Furthermore, we also provide questionnaire to collect gamers perspective about function that need in this game development.

4.3 System Requirements

4.3.1 Functional Requirements

In this section, I will elaborate the service and features that will be develop in the game. By listing all the functional requirement, developer can manage to analyze the function, feature, and service that need in developing this project. According to Dabbagh, Lee and Parizi (2015), functional requirement is the documentation of the exact function in the system such as authentication of the system.

Function	Requirements
Login	User or player can login through Google Play account using their Google email.
Control Player	User can control the game player. The player can jump, run, and shoot.
Save game	User can save the gameplay they want.
Achievement	Users may save and track their progress toward their goals. Show the player which tasks have been completed and which have not.

Table 4. 1: Functional Requirement

4.3.2 Non-Functional Requirements

4.3.2.1 Availability

This project will be a mobile application based. User can access the game if they have mobile phones and Google account. User just need to install the application and it can be access whenever they want.

4.3.2.2 Usability

In terms of usability, the game will apply the user friend and user experience aspect. User will not have difficulty to learn about how the game works. This is because the game design and gameplay are not complex to play. The game required player to survive from the Covid virus and save the vaccine. User should be able to understand the flow of the application.

4.3.2.3 Responsiveness

Mobile application should be responsive to the user or if there any interruption while using the application it be able to save and return to same state. Example while play the game, user get interrupted by a phone call. The game will be in save state and return to the same state when the application re-open.

4.3.3 Software Requirements

4.3.3.1 Unity

Figure 4. 1: Unity Logo

This game project will be develop using Unity engine. It cross-platform game engine. Unity able to develop video games for desktop platform, console, and mobile application. This software has been used on biggest games industry. Popular game such ah Angry Birds, Subnautica, Temple Run, Super Mario Run are develop using Unity engine. 3D or 2D game can be create in Unity. It provides with built in features such as physic, 3D rendering and others. In Unity, it also includes with asset store. It an essential place where developer can upload their creation such as character design, map design, tiles design and others. Other's developer can download the asset if they want to use the design. This is the reason why I choose this software to develop the game. All features that I need to develop this game Unity already provided.

4.3.3.2 Visual Studio Code

Figure 4. 2: Visual Studio Code Logo

Visual Studio Code an open-source code editor that can be run on Windows, macOS and Linux. Since Unity use C# coding language to handle code and logic. Visual Studio Code will be the suitable code editor for this project. Whole bunch of APIs that Unity provided can be run in this code editor. Unity has built in a support for opening the script in Visual Studio Code. This software will be used for this project to create code, character movement logic, map logic, apply APIs, and others.

4.3.3.3 Adobe Illustrator CC 2019

Figure 4. 3: Adobe Illustration Logo

Adobe Illustrator is a computer application creating drawings, illustrations, and artwork. It was released March 19, 1987, and continues to be updated. Furthermore, Graphic designers, web designers, visual artists, and professional illustrators utilize Adobe Illustrator to create high-quality artwork all over the world. PC Magazine named Adobe Illustrator the finest vector graphics editing application in 2018. This software will be used to design all the game character, map, tiles, character sprite and other design. The design can be import to the Unity and set as asset of the game.

4.3.4 Hardware Requirements

4.3.4.1 Laptop

Figure 4. 4: Asus VivoBook S15 Laptop

Model	Asus VivoBook S15 S531
Operating System	Windows 10 Home 64-bit
Processor	Intel® Core™ i5-10210U Processor 1.6 GHz (6M Cache, up to 4.2 GHz, 4 cores)
RAM	4GB DDR4 on board, extra 8GB DDR4
Graphic Card	NVIDIA GeForce MX250
Operating System	Windows 10 Home 64-bit

Table 4. 2: Laptop Specifications

4.3.4.2 Wacom Intuos S Tablet

Figure 4. 5: Wacom Intuos S Tablet

The Wacom Intuos S tablet will be use as a tool to design the games. Using this tablet will help the development of the game smoothly.

4.4 Conclusion

In this chapter, I have covered the data gathering and project requirements that will be need in this project. I have explained what type of data gathering technique that will be use and why I picked it. I also elaborate the key aspect the requirement in this project that cover the functional, non-functional and system requirement.

5.0 Analysis

5.1 Introduction

Data analysis will be elaborate in this chapter. Data analysis is process of cleaning, transforming, and modeling data to discover useful information for business decision-making (Johnson, 2021). In simple terms, the purpose of data analysis is to quotation the appropriate information from the data gathering and make the decision from the result.

This chapter will elaborate related to data and system modeling for this project. It implies analyzing and gathering data from user and system requirements. Furthermore, the system modeling will consist of illustration of a use case diagram and flowchart diagram. For data finding and analysis will be related about the questionnaire feedback for this project requirement. Each question will be display and elaborate in form of chart.

5.2 Use Case Diagram

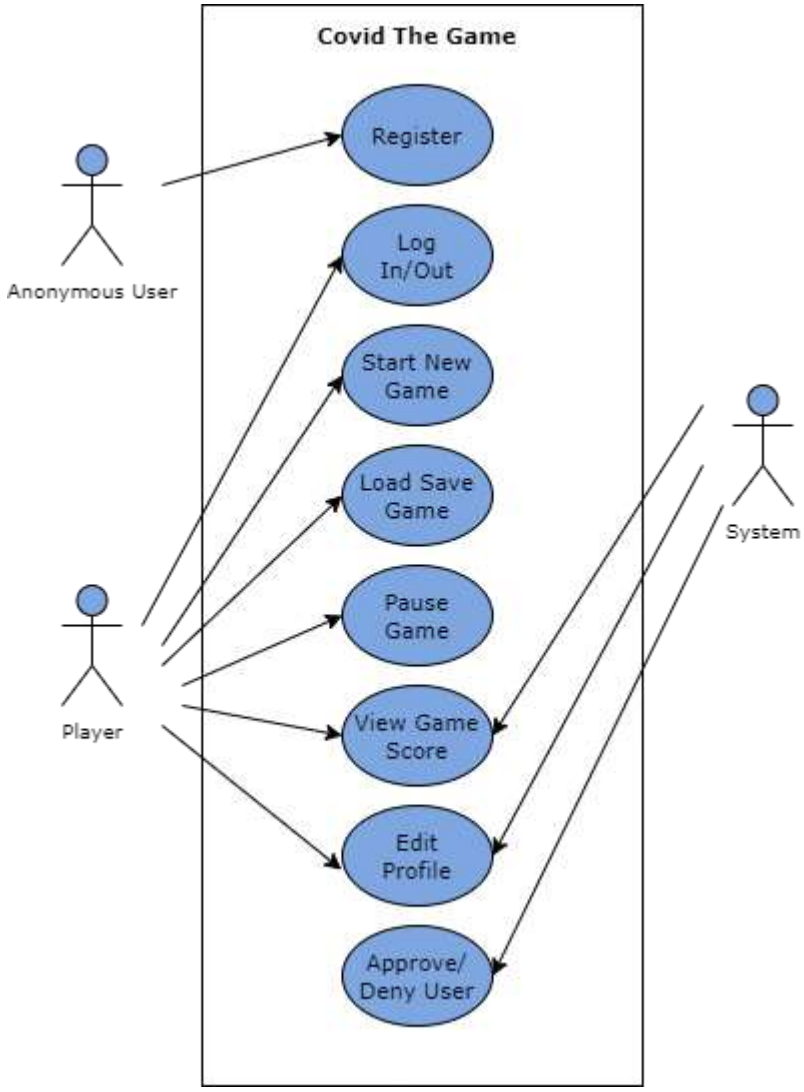


Figure 5. 1: Use Case Diagram for Covid The Game

Figure 5.1 shows the use case diagram for this project development, that is Covid The Game. In this use case there will be an actor or user that involve in this game and show how the interaction between the user and the game. Based on Figure 5.1, the actor that involve in this project are Anonymous user, Player, and the System. The System will involve Google Play Service. In Google Play Service, the developer can manage to see the all-player score and high score in the game. The system also can approve or deny any user that register in the games. This will relate to Google account. The game will require user to have Google account and it will redirect to their Google Play account. It the System check the register user are not have Google Play account it will deny the request.

Anonymous User only have features to register to the game. When user enter the game, it will require user to register to Google Play account using user Google email. The Google Play APIs then will automatically login user to the game. The registration for this game is easy because of the Google Play APIs. User just need to have Google account and it will be done with the snap of the finger.

The third actor will be the Player, which is the user that successfully have login and can access the game. As usual, player can login and logout anytime they want. When player can access the game, they can proceed to the next feature which is start the new game. When Player choose this feature the game story line will automatically start back from the beginning of the game. Furthermore, Player also can save and load the game. The save feature help Player to record their game progression. It will save through their Google Play. It can synchronize the Player game save with multiple devices. The load feature where Player can come back play from where they have saved in the game. Player also can view their game score and edit they profile through Google Play.

5.3 Flowchart Diagram

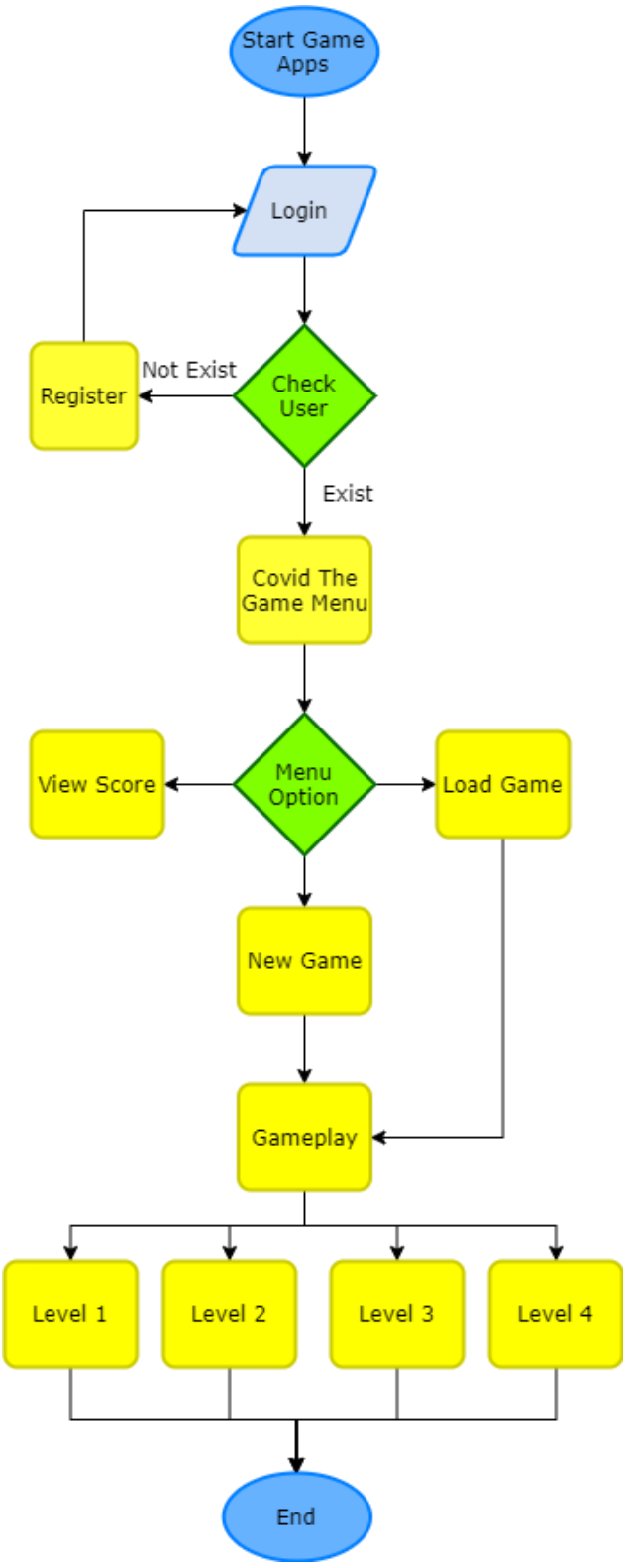


Figure 5. 2: Flowchart Diagram of Covid The Game

Figure 5.2 shows the flowchart diagram for this project. In this flowchart it will show the process that involved in the game. Based on Figure 5.2, the game will start with login input where it will redirect with Google Play account. The system will check whether the user exist or not. If user is not existed, it will require user to register and it will proceed to login. If the user exists, it proceeds to the Covid The Game Main Menu.

In Covid The Game Main Menu will have menu option, which is new game, load game, and view score. If user choose the first option which is new game, it will start the game form the beginning. It will start the gameplay of the game. User can choose which level to play. Every level has different story line and objective. After all the level is complete it will end the game. However, if user choose load game option it will load the game with the gameplay that user have save. It will bring user to the checkpoint or progression that user have save. Then user can continue the gameplay. Furthermore, if user choose the view score option. It will display the user game score. It will show the score for every level user have play.

5.4 Data Finding and Analysis

5.4.1 Question Feedback

The main motive of this questionnaire is to collect the information and requirement on the “Covid The Game” development. All the information that has been collect can be used to improve the game the will be developed. The questionnaire title is “User requirement survey for development of “Covid The Game”. In this questionnaire it consists of three sections. Section A is all about the respondent information, Section B about learning approach of Covid-19, and Section C is about educational game.

This questionnaire was open to the public and spread to user that interested about the game concept. The total respondents that have been obtain from the questionnaire is 30. It an acceptable and relevant amount of respond for this project. The data that have been collect then will be analyze and present the data in pie chart. The result of the collect data will be gathered in percentage because of the clear overall result.

5.4.1.1 Section A: Respondent Information

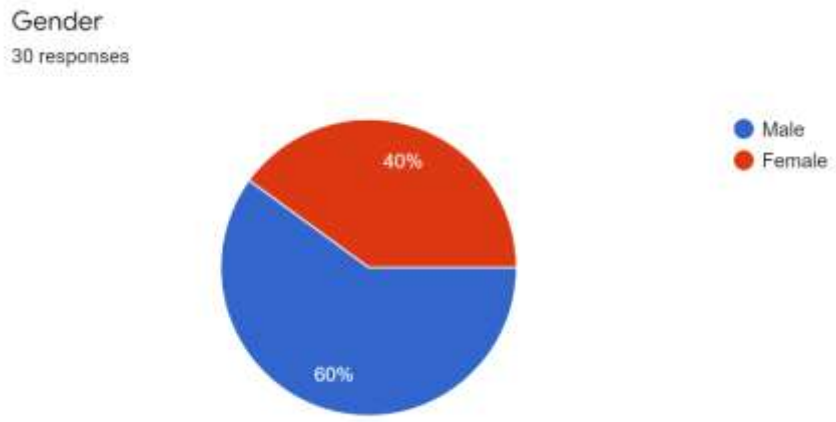


Figure 5. 3: Respondents Gender

From the Figure 5.3, shows that this questionnaire has been answered by both gender male and female. From the data collected, 60% of male have answer the questionnaire, while the rest is female which is 40% answered this questionnaire. Since both genders have answered the questionnaire, it will provide the quality result because different gender may have different perspective.

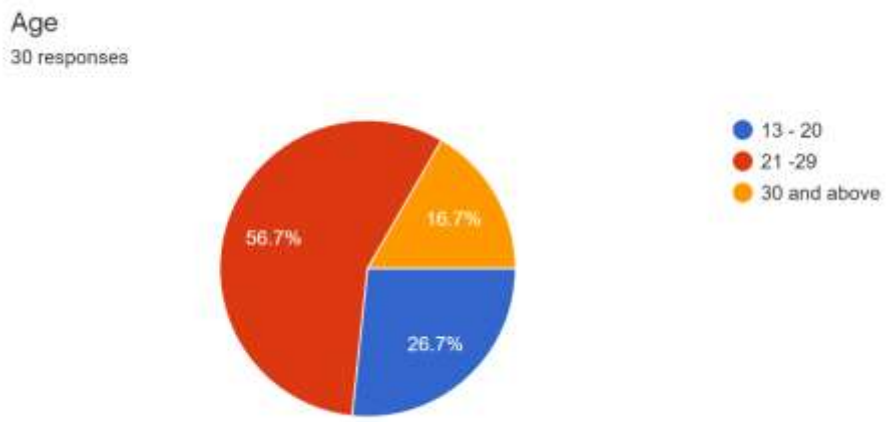


Figure 5. 4: Respondents Age

Figure 5.4 shows the age of the respondent that have answer this questionnaire. The age has been separated into three group which is aged start from 13-20, aged 21-29, and aged 30 and above. From our finding, the highest aged group that answer the questionnaire are from aged 21-29 with 56.7% or 17 respondents. The second highest are respondent from aged 13-20 with 26.7% or 8 respondents. The, aged 30 and above that have answer the questionnaire are 16.7% or 5 respondents. Since, the questionnaire have collected or answered from three different aged, it will be an ideal result because we can see which range of age that are more interested with this project.

5.4.1.2 Section B: Learning Approach of Covid-19

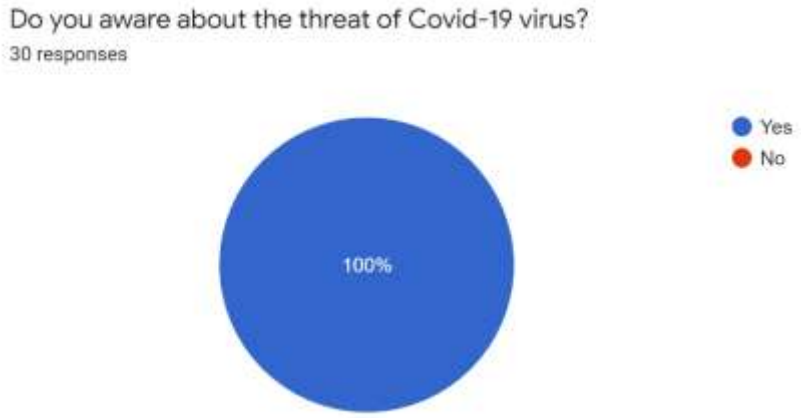


Figure 5. 5: Result of Section B Question 1

From the Figure 5.5, we ask our respondent about awareness of Covid-19 virus threat. Based on the Figure 5.5, majority of it respond yes, that they are aware about the threat of Covid-19 virus. This shows the result that people serious when come to Covid-19 virus threats.

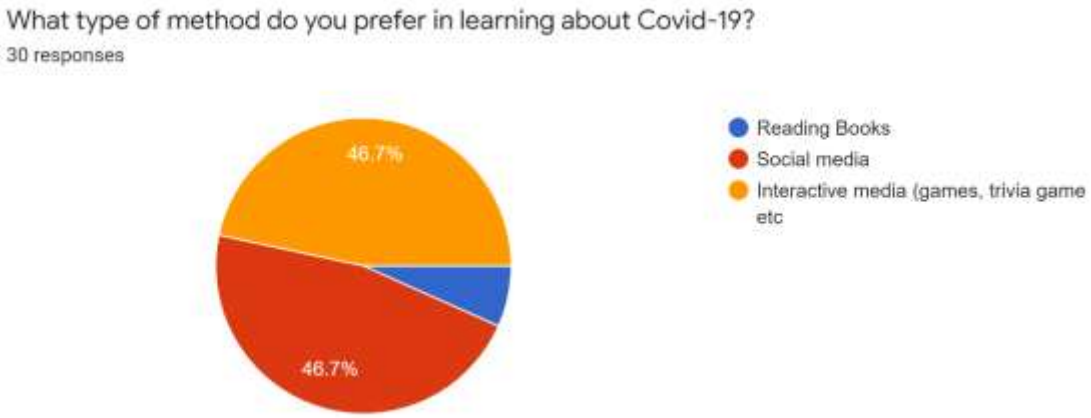


Figure 5. 6: Result of Section B Question 1

Figure 5.6 shows the result of question 2 for section B. Our finding shows that our respondents prefer learning method from social media, and interactive media. Both have the same percentage which is 46.7% or 14 respondents. However, the rest is 6.7% or 2 respondents are preferring reading books learning method. This show that people are more interested in interactive learning method because of the improvement of technology nowadays. So, reading books will be the last option of learning method.

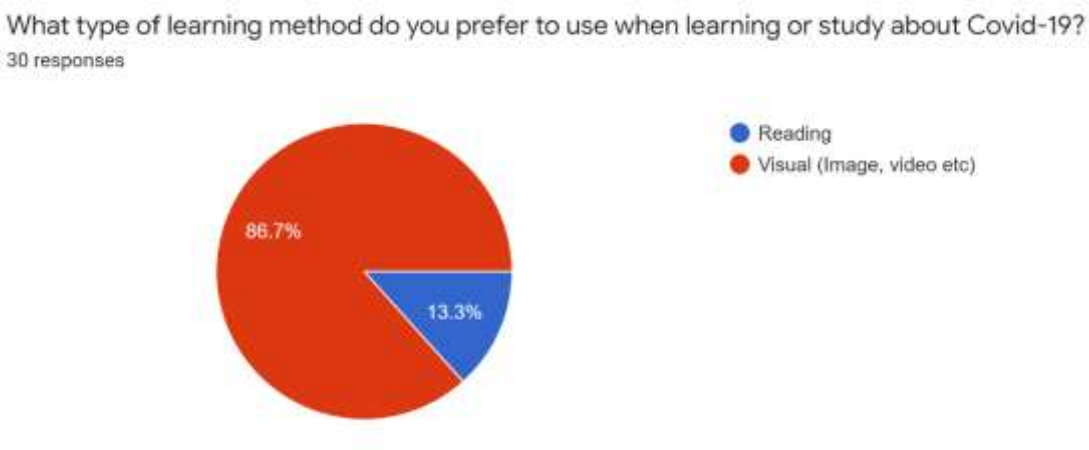


Figure 5. 7: Section B Question 3

Figure 5.7 shows the result of question 3 for section B. The outcome shows that 86.7% or 26 respondents are prefer visual learning method when come to learning or study about Covid-19. However, 13.3% or 4 respondents are prefer reading as the learning method to learn or study about Covid-19. This shows that people are more interested to visual learning method because it easy to understand, rather than reading.

5.4.1.3 Section C: Educational Game

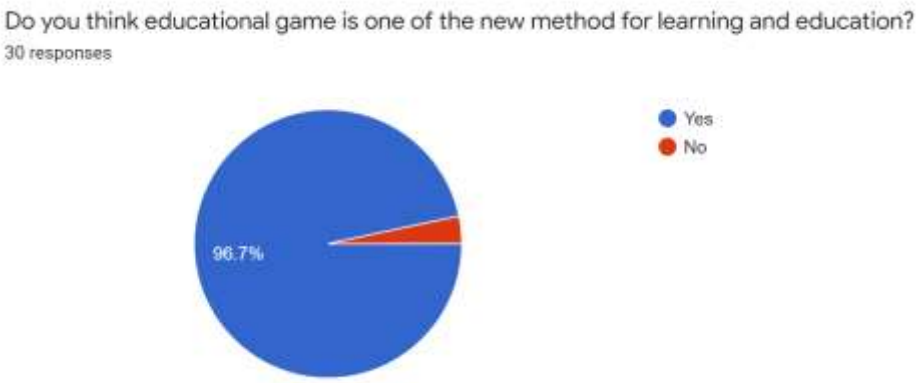


Figure 5. 8: Section C Question 1

Above figure show the result of Question 1 for section C. Majority of the respondents answered yes which is 96.7% or 29 people, when asked about educational game is one of the new methods for learning and education. The rest which is 3.3% or 1 person answer no to educational game as one of new learning method for learning and education. Our finding shows that people are interested about educational game as one of learning method. It shows that start to improve the education method follow with the technology improvement.

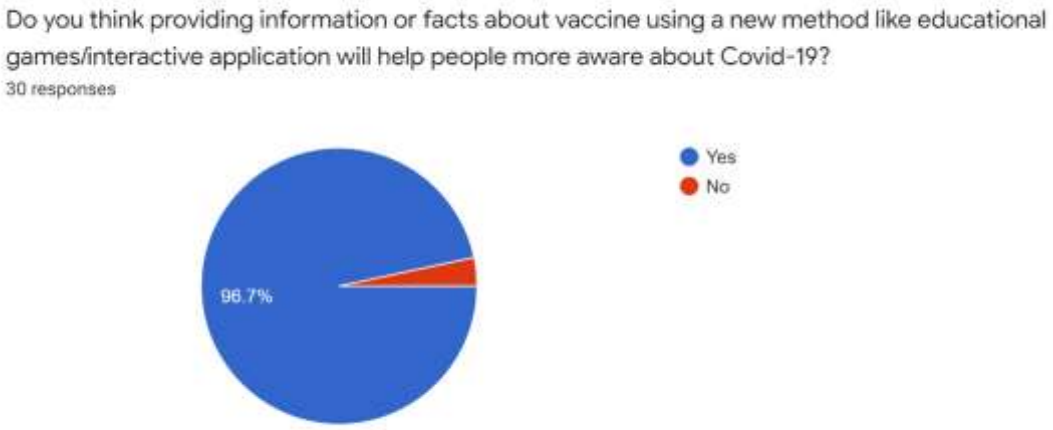


Figure 5. 9: Section C Question 2

Figure 5.9 show the result or question 2 for section C. We asked respondents that by providing information or facts about vaccine using educational game platform will help people more aware about Covid-19. Majority answer yes which 96.7% or 29 respondents and another 3.3% or 1 person answered no. From the result, come a new idea where it will be a great information that can be used for this game. Since, majority of respondent say it will be great information especially when it come to Covid-19 virus.

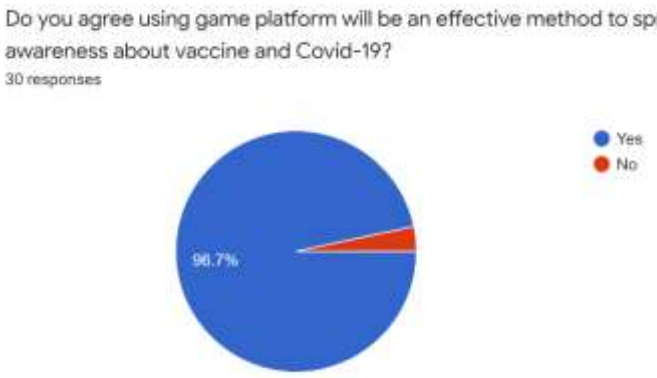


Figure 5. 10: Section C Question 3

Figure 5.9 show the result or question 3 for section C. We asked respondents opinion that will it be an effective method if we use game platform to spread knowledge and awareness about vaccine and Covid-19. The outcome shows that majority answered yes which is 96.7% or 29 persons and 3.3% or 1 person answered no. The result shows that using game platform can educate people about Covid viruses and persuade people to take the vaccines. This is because game platform has a big community from any place on earth.

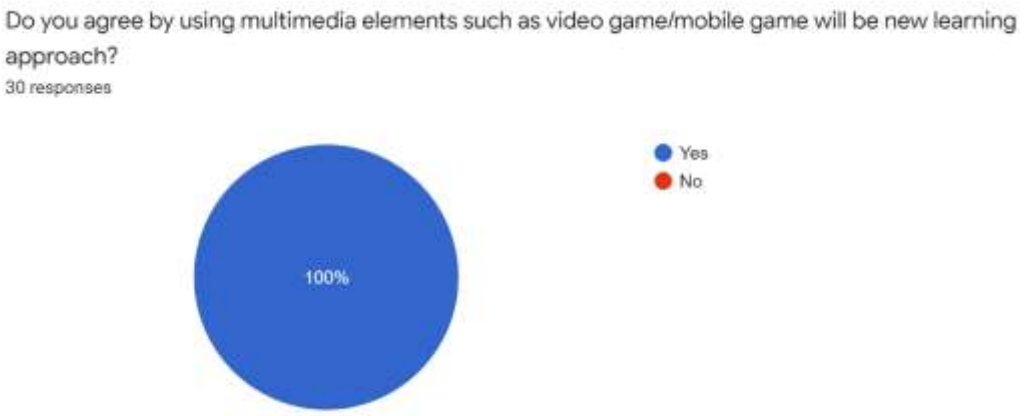


Figure 5. 11: Section C Question 4

Figure 5.9 show the result or question 3 for section C. We asked our respondents, will there any respond or outcome if using multimedia element such as mobile game as a new learning method. Majority answered yes, most of the respondents agree using multimedia element such as mobile game for new learning approach. This is because mobile application is more popular in this smart phone era. Additionally, mobile application is useable, people can easy download from any device and use anywhere anytime they want.

5.4.2 Question Feedback from Gamers Perspective

Any gamer who plays any type of game was eligible to participate in this study. The goal of this survey is to gather feedback from players on what functions should be included in the development of Covid-19 mobile games. The total number of respondents obtained from the questionnaire is 20. For this project, it is an acceptable and meaningful number of responses. After collecting the data, it will be analyzed and explained in a pie chart. Because of the evident overall outcome, the collected data will be compiled in percentages.

5.4.2.1 Section A: Gamer Perspective

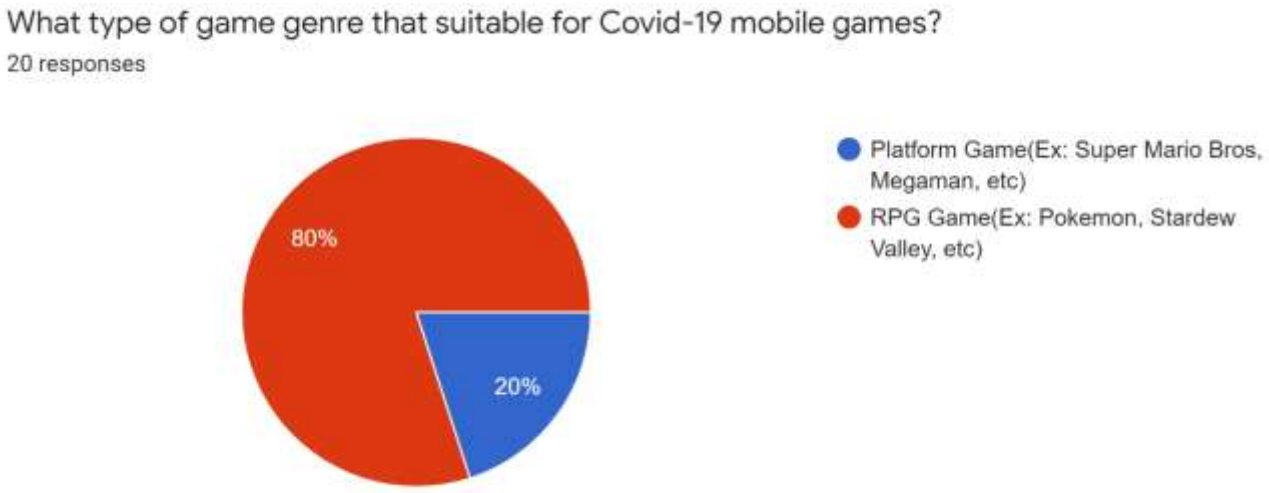


Figure 5. 12: Section A Question 1

The answer to question 1 for section A is shown in Figure 5.12. We asked our gamers what kind of game genres they thought would be appropriate for Covid-19 mobile gaming. Most respondents (80 % or 16 people) chose RPG Games as the game genre for Covid-19 mobile games. The remaining 20%, or four people, choose Platform Game. Because of the open world, most players are more interested in RPG games, according to the results. Role play is used in RPG games, with the player taking on the role of the main character.

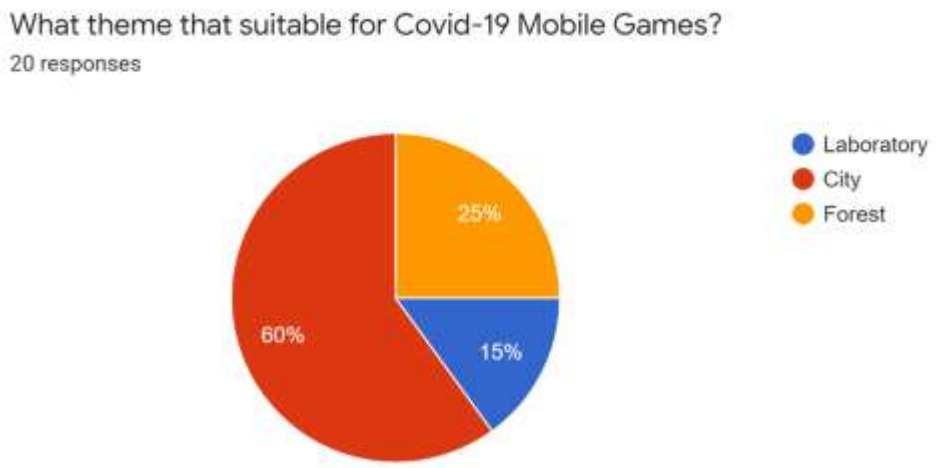


Figure 5. 13: Section A Question 2

The answer to question 2 in section A is shown in Figure 5.13. We asked our responders what they thought would be a good reference for Covid-19 Mobile Games. For Covid-19 Mobile Games, almost 60% of people, or 12 people, chose the city theme. However, 25% of respondents (or 5 people) chose the forest theme, while the remaining 15% (or 3 people) chose the laboratory theme. Because of the open environment, most of the players are interested in city themes, as evidenced by the results. With the design, it will make the game more fascinating.

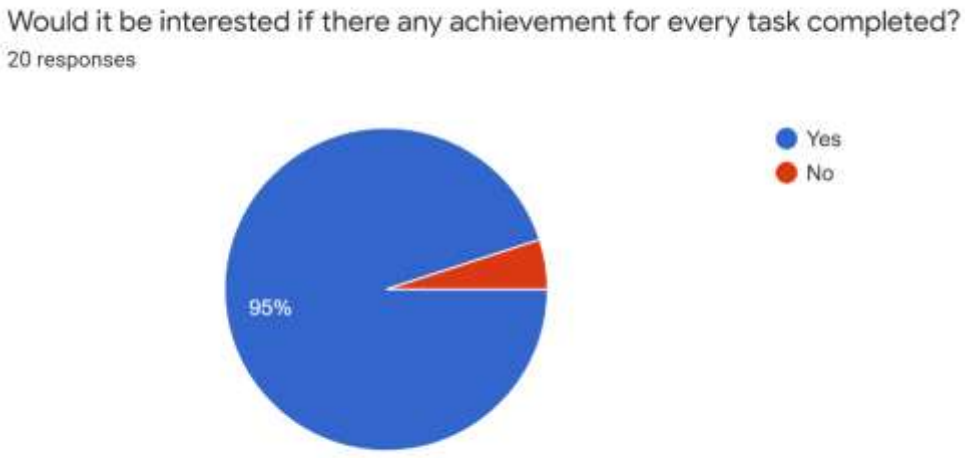


Figure 5. 14: Section A Question 3

The answer to question 3 in section A is shown in Figure 5.14. We asked our responders would it be interested if there any achievement for every task completed. Most of the responder's answers yes with 95% respondents or 19 persons. This is because achievement will motivate player in the games.

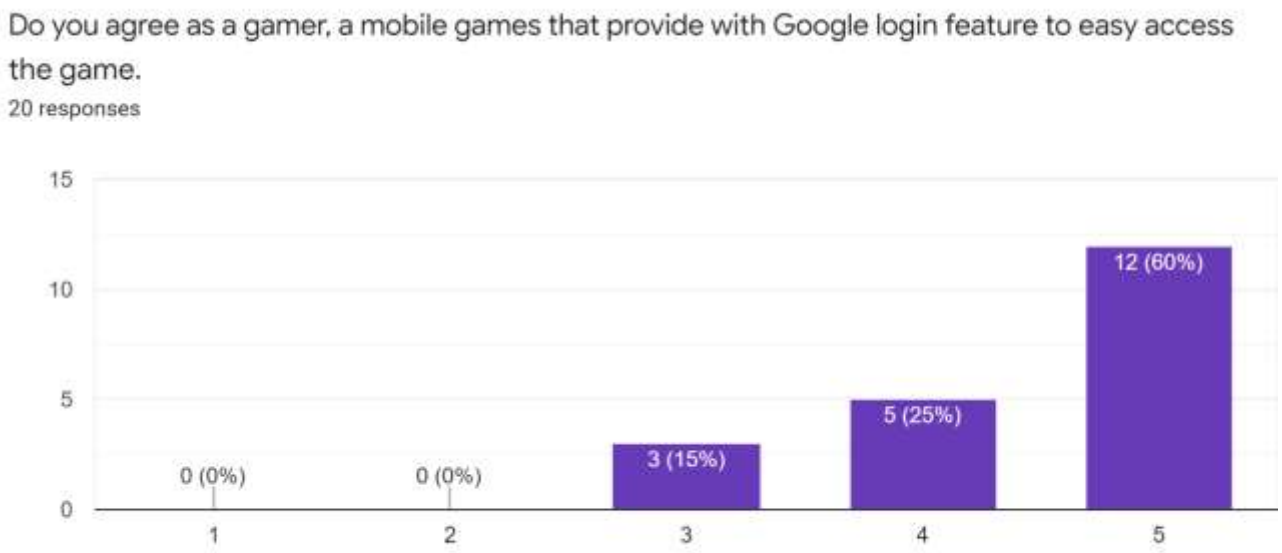


Figure 5. 15: Section A Question 4

In Figure 5.15 shows the result question 4 for Section A. We ask gamers opinion about Google login features. As a gamer do, they agree, a mobile game that provide with Google login features easy access the game. Majority of the respondent answer totally agree with the statement with 60% persons (or 12 people). However, 25% (or 5 person) answer agree and 15% (or 3 person) answer neutral. This show result that Google login feature will be the requirement for these games.

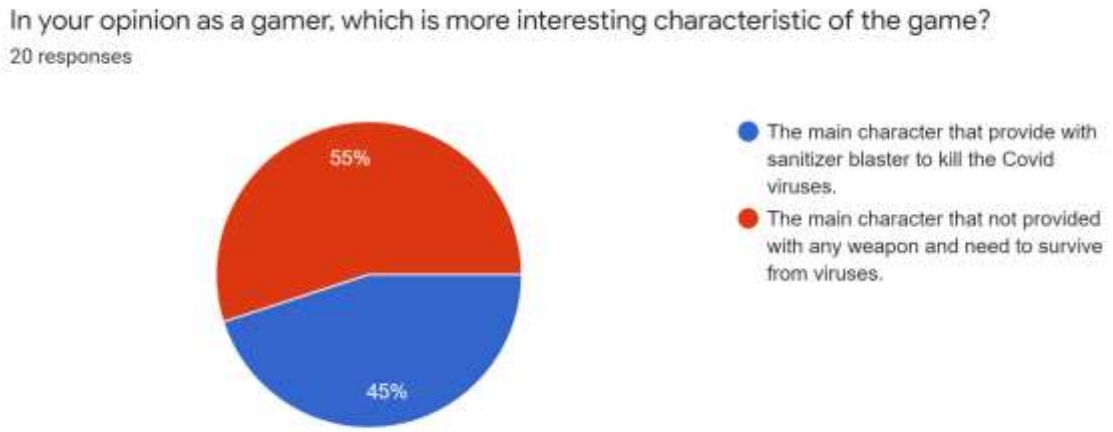


Figure 5. 16: Section A Question 5

In Figure 5.16, show the result of question 5 for section A. We ask gamers opinion, which is from the following description are more interesting character of the game. Most of the respondent choose the main character that not provided with any weapon and need to survive form the viruses with 55% of respondent (or 11 person). The reminding 46% (or 9 person) choose the main character that provide with sanitize blaster to kill the Covid viruses. This show that most of the player are more interested to survivor game.

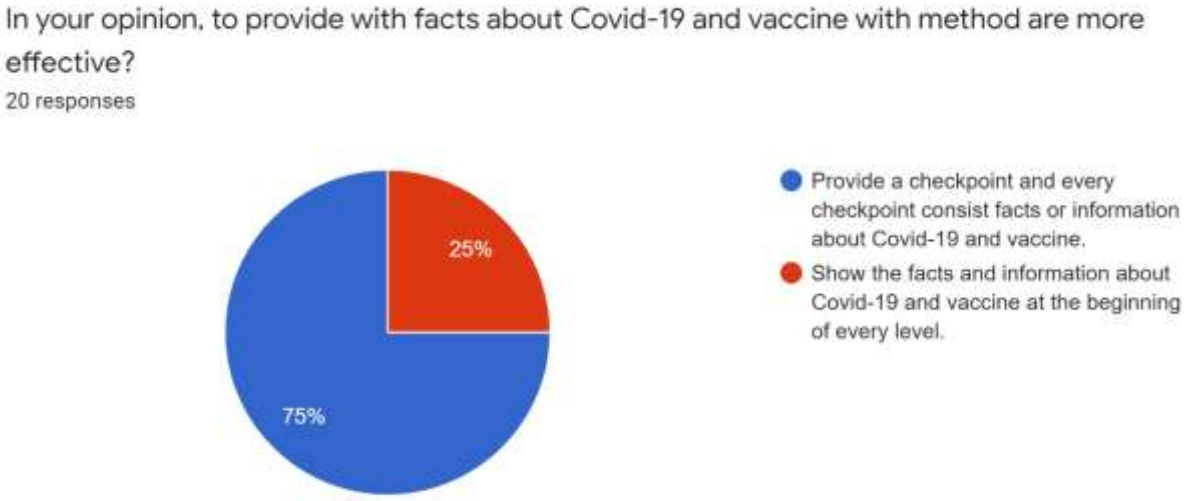


Figure 5. 17: Section A Question 6

In Figure 5.17, show the result of question 6 for section A. We ask gamers opinion on which method will be effective to provide the facts about Covid-19 and vaccine. 75% of the respondent (or 15 person) choose by provide a checkpoint and every checkpoint consist of facts or information about Covid-19 and vaccine. This will help player easy to memorise all the facts and information.

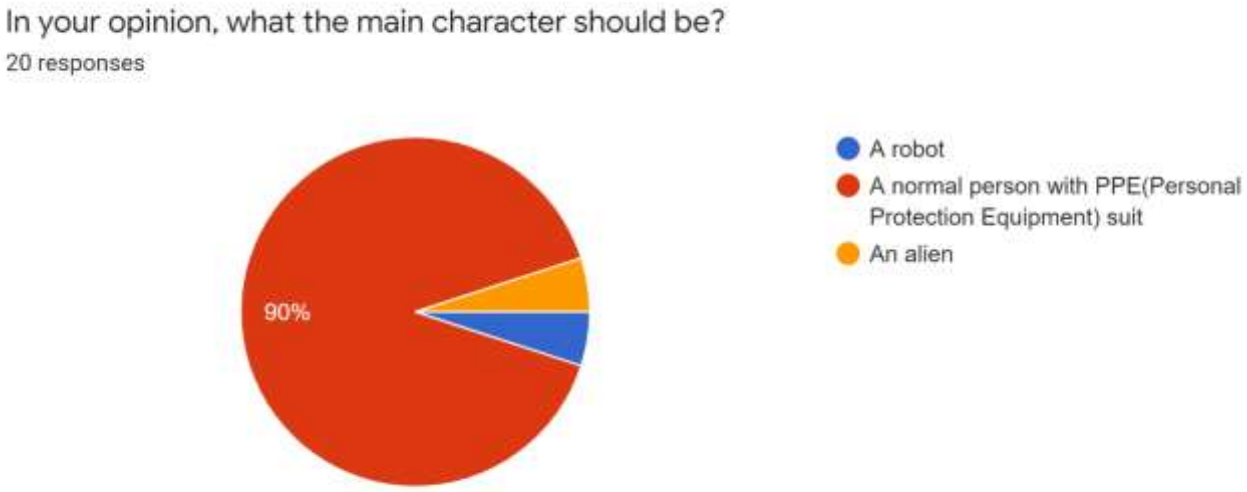


Figure 5. 18: Section A Question 7

In Figure 5.18, show the result of question 7 for section A. We ask gamers opinion, what the main character should be in the Covid-19 Mobile Game. 90% of the respondent (or 18 person) choose the main character should be a normal person with PPE (Personal Protection Equipment) suit. This is because the character is more related to the game themes.

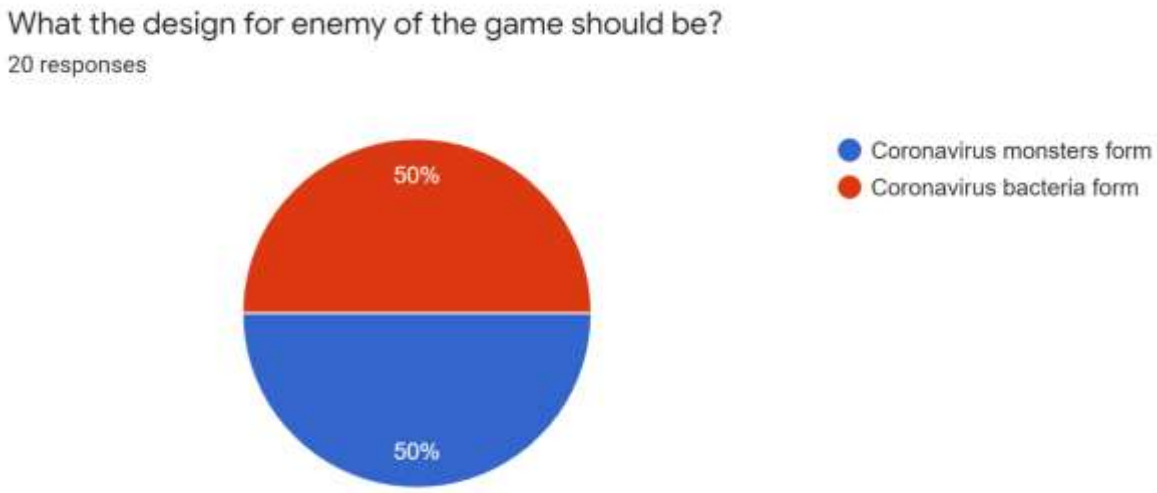


Figure 5. 19: Section A Question 8

In Figure 5.19, show the result of question 8 for section A. We ask our respondent about the design of the enemy of the game. The result shows the similar percentage. 50% respondent answer Coronavirus in monster form and another 50% answer Coronavirus in bacteria form. This show that both design interest player for this game.

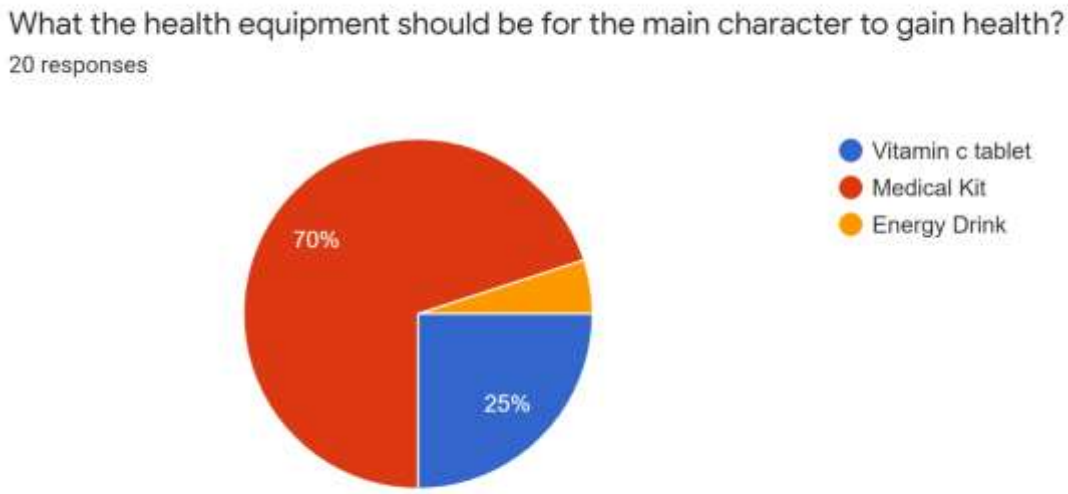


Figure 5. 20: Section A Question 9

In Figure 5.20, show the result of question 9 for section A. We ask gamers perspective about what health equipment should be for the main character to gain health. Most of the respondent choose the medical kit as the health equipment in the game with 70% respondent (or 14 person). Reminders choose vitamin c tablet with 25% (or 5 person) and another 5% or (1 person) choose energy drink. This equipment is more realistic, and player will be easy to understand. When they see the medical kit, it means heal for player.

5.5 Conclusion

In this chapter, we show the requirement that needed by the users. We also evaluate and analyze the questionnaire that have been conducted. Each of the question have been elaborate and presented in pie chart for more clear understanding. Furthermore, there also a related diagram to show the flow of the project development such as Use Case Diagram, and Flowchart Diagram. This related diagram shows the flow of the game will be and how every function in the game works.

6.0 Design

6.1 Introduction

The sketch design of the project development will be included at this phase. During the design process, the developer will elaborate on the project design that was produced. This project's design will be guided by the user requirements that have been gathered. Furthermore, before the system is produced, the design will be displayed and presented.

The design of the interface, such as the main menu interface, will be shown and described in this chapter. Then, since this is a mobile game development chapter, storyboard design is also covered. Storyboards are used to structure the storyline of the games. The Entity Relation Diagram (ERD) will be included in the storyboard section. Aside from that, the system framework is illustrated in this chapter. This will include the Application Programming Interface (API) element that will be used in the development of this game. This chapter also presents and describes the system flow so that you can understand how the project's application will work. As a result, the developer will have a better understanding of the system's architecture and requirements. As a result, they can create a system based on the design provided. This system flow may also be effective in guiding the user how to use the system.

6.2 Interface Design

6.2.1 Menu Design

Figure 6. 1: Main Menu Design

The main menu design and layout of this programme are displayed in Figure 6.1. When the player or user starts the game, they will be taken directly to this page. This main menu features a title for the game called "Covid The Game" as well as three menu options. The first choice will be the New Game menu, which will allow you to start a new game and save your progress. It will immediately immerse the gamer in the game. There is also the Load Game option, which shows the player their progress in the game and takes them straight to the latest checkpoint. The final menu is the Quit Game option. It is going to exit the game.

6.2.2 Level Design

Figure 6. 2: Level Design

The level menu design for this game is shown in Figure 6.2. This page displays the many vaccination levels available to the player or user. Each level has a unique map design and difficulty level. When the player selects a level to play, it will take them to the game map. When the player completes a level, the game will advance to the next one. Every level has its own set of achievements and objectives to meet.

6.2.3 Instructions Design

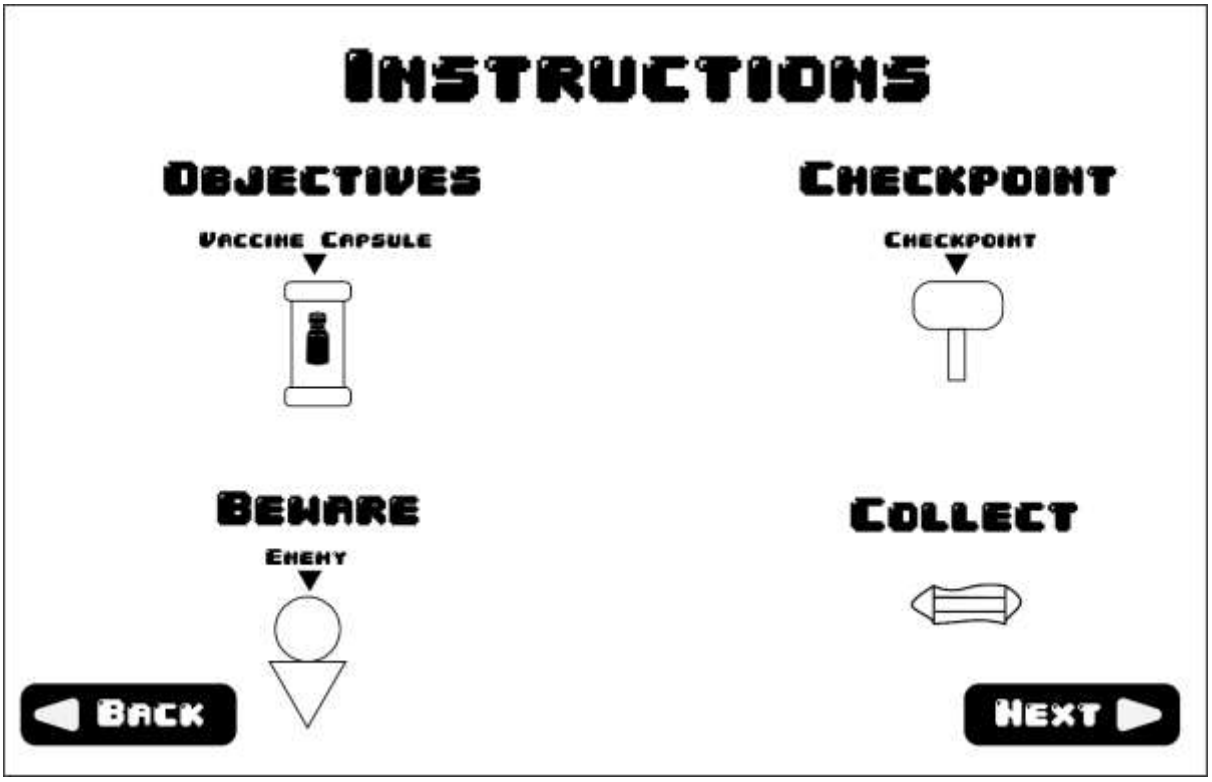


Figure 6. 3: Instruction Design

The design for the game's instruction menu is seen in Figure 6.3. It contains the player's instructions on how to play the game. The information includes the following items: Objective, Checkpoint, Enemy, and Collectable. Every level has its own set of instructions for the player to follow in order to accomplish the level.

6.2.4 Ingame Design

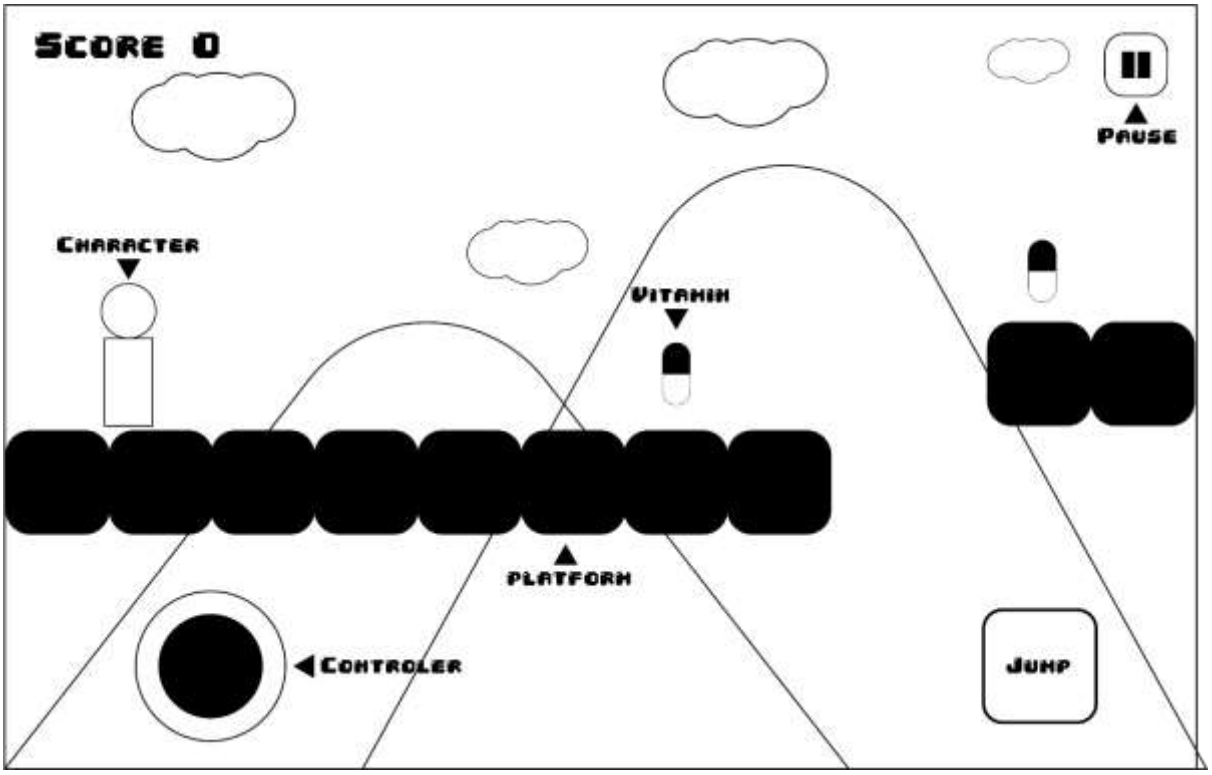


Figure 6. 4: Ingame Design

This game's in-game design and layout are seen in Figure 6.3. When a user selects the level-on-level page, this page appears. It leads the player directly to this page. The main character, background, platform, joystick, jump button, and pause button are all included in this in-game design. For this game, the main character is the character that the player will control. Using the controller, it can walk and button to jump. The platform serves as the main character's base of operations for walking and jumping; without it, the figure would fall. The game will be paused, and a menu of options will appear.

6.2.5 Pause Design

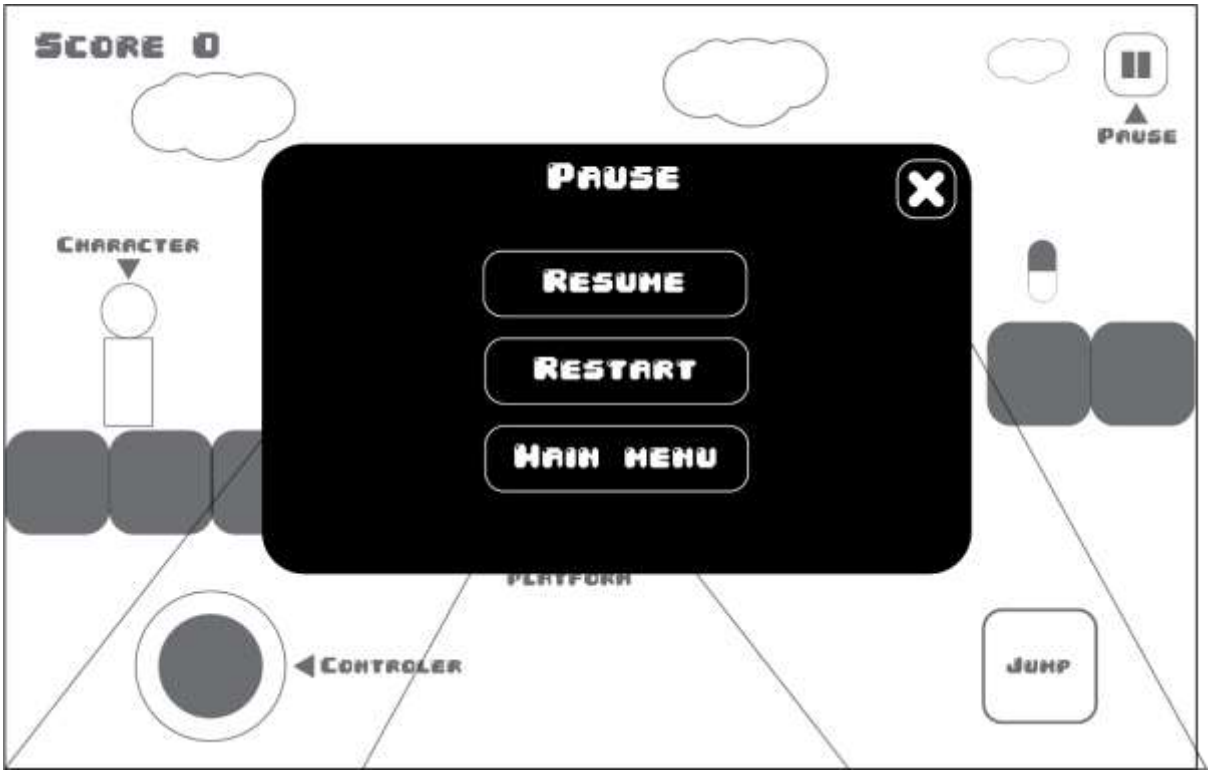


Figure 6. 5: Pause Design

The Pause menu is seen in Figure 6.5. The game will stop or idle when the pause menu is opened. There are buttons to resume, restart, and return to the main menu in the pause menu. The resume button allows you to continue playing the game. The restart button allows you to restart the game from the beginning. Finally, pressing the main menu button will take you straight to the main menu page.

6.2.6 Vaccine Information Design

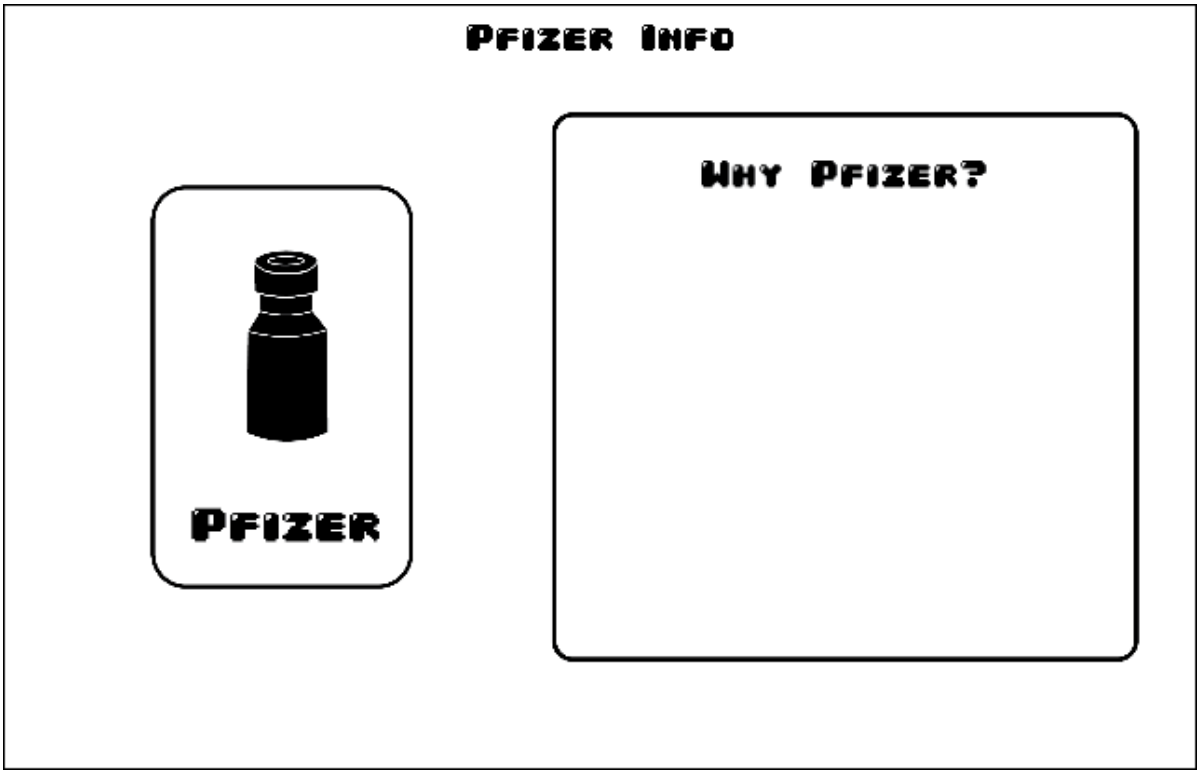
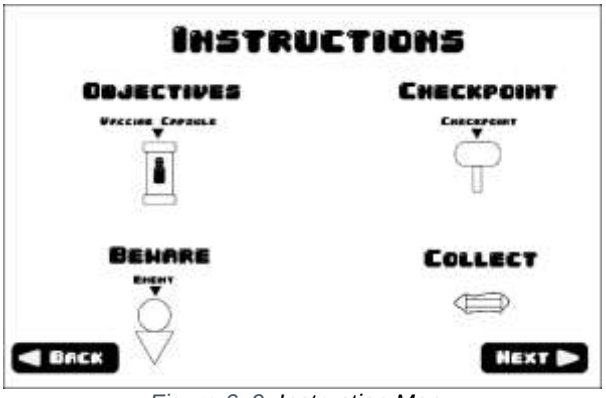


Figure 6. 6: Vaccine Information Design

Figure 6.6 depicts the vaccination information interface. This interface will be used to explain the vaccination facts that the player has obtained. This information includes the vaccination's formula, efficacy, and how the vaccine works in the human body, among other things.

6.3 Storyboard Design

Scene	
 *Figure 6. 7: Main Menu*	**Main Menu** The main menu of the game will be the first scenario in the storyboard. In this main menu, the game will begin. To begin the game, a new player will select the new game option. Players that have completed the game and saved their progress will be able to use the load option.
 *Figure 6. 8: Level Menu*	**Level Menu** The player will then be taken to the level menu. This menu will be presented to each new player or other player who has saved their progress. The player or user must first decide whatever level they want to play. Each level has its own difficulty and map layout.
 *Figure 6. 9: Instruction Menu*	**Instruction Menu** Information on how to play the game may be found in the instruction menu. The objective, enemy, checkpoint, and collecting item are all included.

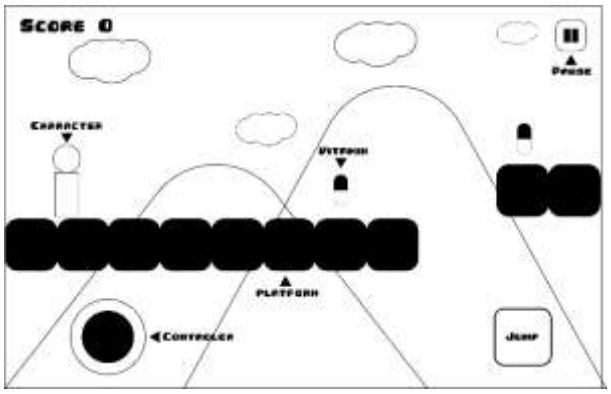


Figure 6. 10: Ingame

In game

Following that, the player will be taken to the level of choices. Every level will have a platform for the character to walk on, a mask for collectible things, a controller toggle for moving the character, and a pause button for accessing the pause menu.

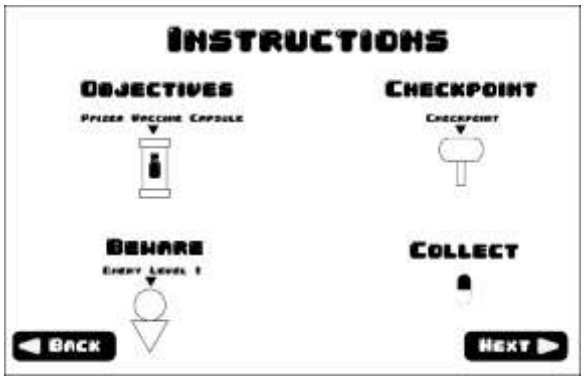


Figure 6. 11: Pfizer Instruction

Pfizer Instructions

The goal of the Pfizer instruction menu will be to obtain the Pfizer vaccination, avoid danger level 1, and gather the vitamins.

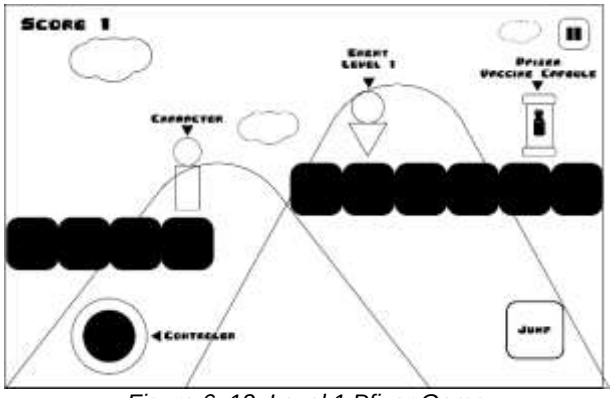


Figure 6. 12: Level 1 Pfizer Game

Level 1: Pfizer Game

For level one, player will need to survive the level and get the Pfizer vaccine at the end of the level. Player will be faced with level 1 enemy because of the Pfizer vaccine theme which is more strong vaccine than others two

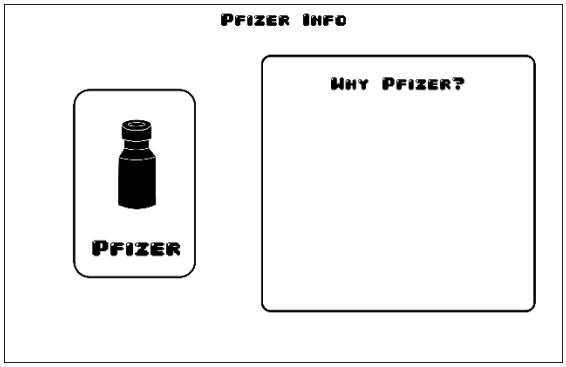


Figure 6. 13: Level 1 Pfizer Info

Level 1: Pfizer Info

The information or facts regarding this vaccine will be displayed after the level end. About why Pfizer's vaccines have a better success rate than others.

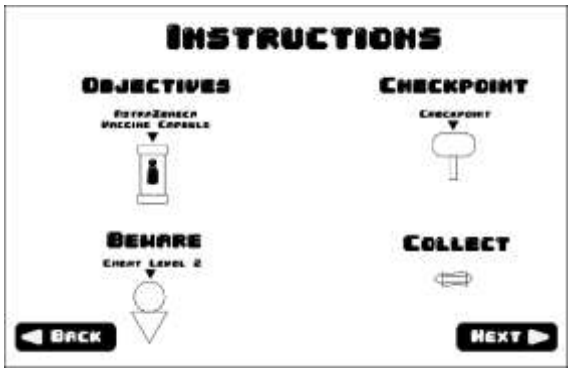


Figure 6. 14: AstarZeneca Instructions

AstraZeneca Instructions

The goal of the AstraZeneca instruction menu will be to obtain the AstraZeneca vaccination, avoid danger level 2, and gather the masks.

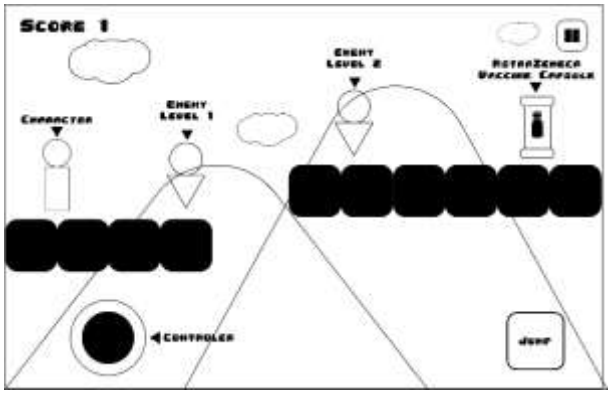


Figure 6. 15: Level 2 AstraZeneca Game

Level 2: AstraZeneca Game

Level 2 will be a bit more challenging. Player will be faced level 2 enemy and need to survive to get the AstraZeneca vaccine

Figure 6. 16: Level 2 AstraZeneca Info

Level 2: AstraZeneca Info

The game will display the information about what formula that be use in this AstraZeneca vaccine.

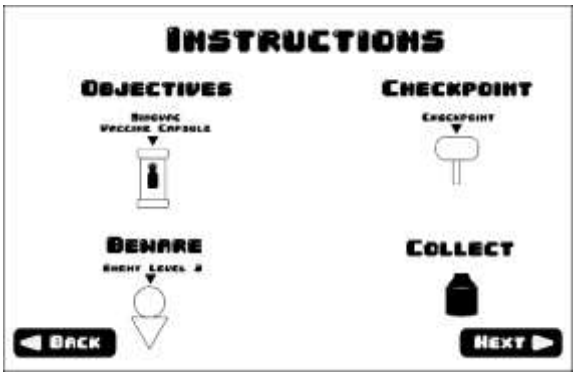


Figure 6. 17: Sinovac Instructions

Sinovac Instructions

The goal of the Sinovac instruction menu will be to obtain the Sinovac vaccination, avoid danger level 3, and gather the sanitizers.

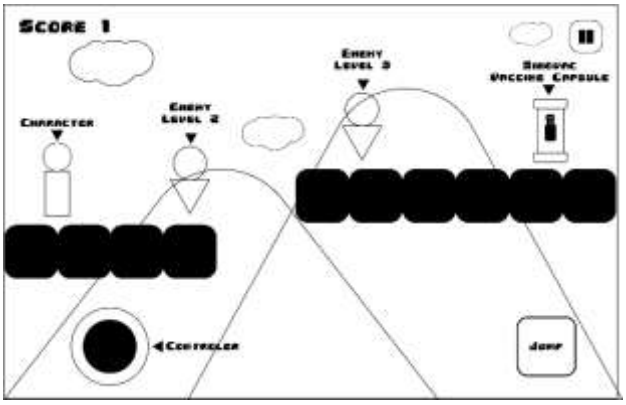


Figure 6. 18: Level 3 Sinovac Game

Level 3: Sinovac Game

This level will be hard. It follows the theme which is Sinovac is the low rates vaccine from others two.

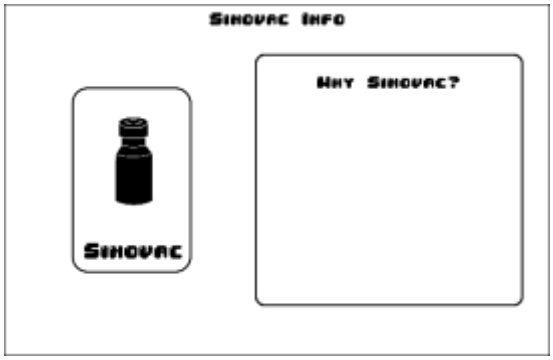


Figure 6. 19: Level 3 Sinovac Info

Level 3: Sinovac Info

Same method as others. Display the information and facts about Sinovac. Include with the formula that being used to create this vaccine.

6.4 System Framework

A framework might be for a collection of functions inside a system and how they interact, the layers of an operating system, the layers of an application subsystem, how communication at some level of a network should be standardized, and so on. A framework is more prescriptive than a structure and more extensive than a procedure (Lutkevich, 2020).

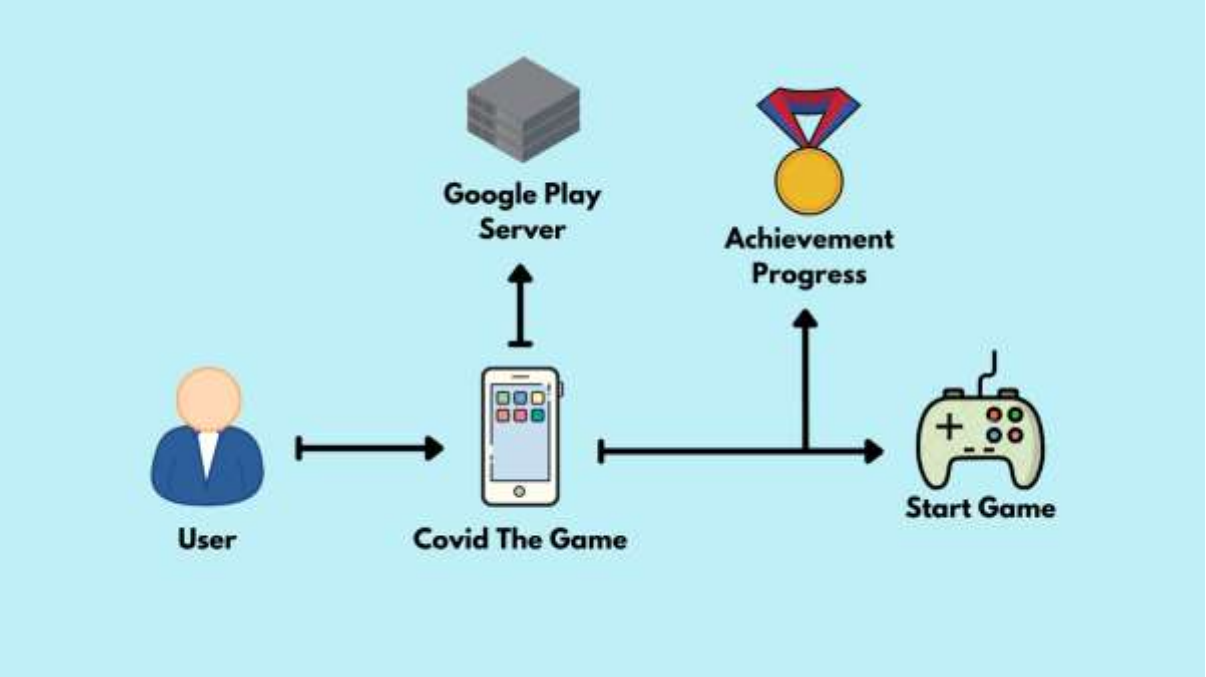


Figure 6. 20: Framework of Covid The Game

The system framework used in the game is visualized in Fig 6.20. The user will first open the "Covid The Game" game application before connecting to the Google Play Server. The Google Play configuration will be available to the application. A user's Google Play account can be used to login. After that, the user may check their game achievement saving progress. The progress of this accomplishment is being tracked or saved in Google Play Server. The accomplishment will be updated from the Google Play Server on a regular basis. The user may then begin playing the game. The game may be played on any Android device, and the game's achievements can be loaded. To load their progress, users must first check in to their Google Play account.

6.5 Process Diagram

Since it is more straightforward, the game's flow is straightforward to comprehend. This chapter will go over each step of the flow. The game's flow is determined by the user's needs and the results of the analysis. The game's flow and the features that the game must deliver should be understood and known by the developer. As a result, the application flowchart is shown first to make it easier for the developer to create this Covid-19 platform game.

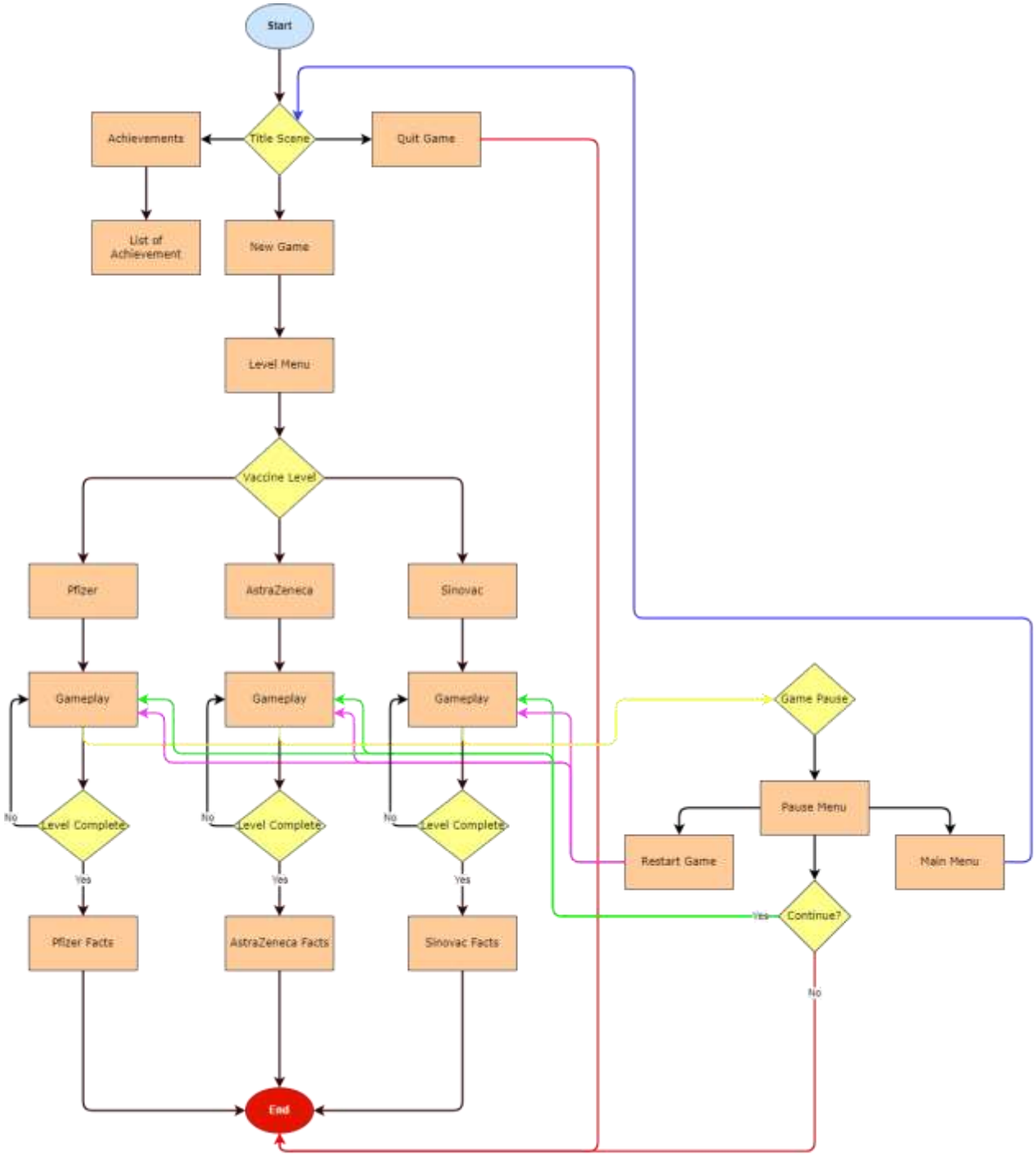


Figure 6. 21: Progress Diagram

The flow of the game for this project is depicted in the diagram above. According to the diagram, the game of Covid -19 begins when the user launches the application. When the app is launched, it will take the user to their Google Play Account. The main menu, which is the title scene, will show up after that. In the title scene, there are three choices accessible: New Game, Achievements, and Quit Game. The new game takes the player to the start of the game. The game beginnings the activity all along. The achievements menu will then display the game's user accomplishment progress. It will display the user which tasks have been accomplished and which tasks still need to be finished. Next, quit game. this will exit and closed the application.

The name of the vaccination is also shown in the Level Menu such as Pfizer, AstraZeneca, and Sinovac. Every level has a different challenge and goal. Each level must be finished by collecting all the vaccination capsules. Once the player has completed the level and obtained the vaccination capsule, the game is over. It will display vaccine-related information. This information includes the vaccine's formula, the firm that created it, and the reasons why it is fully safe.

The player can pause the game at any time throughout the game. The pause menu has two options: restart and main menu. The Restart option will take you back to the beginning of the game. When a player wants to return to the beginning of the game, they can use the restart feature. Aside from that, the player will be sent to the title scene if they select the main menu option. After that, the player can choose to continue the game or quit it from the pause menu. If this continues, the player will return to their game. However, if this is not the case, the player may leave the game.

6.6 Conclusion

Finally, we can see from this chapter that the design phase is an important factor in project development. This chapter showed how a developer sketches and illustrates project design elements such as the game interface, a narrative board to describe the game's storyline, and the system's flow. The system design is developed based on the user's requirements and the results of the study. To enable the developer in comprehending the system flow design, a guide on how the gaming system works is required. Furthermore, this designing process can assist users in understanding the system's flow and meeting the system's needs.

7.0 Implementation

7.1 Introduction

Following the completion of the built design phase, every project goes through the implementation phase. The developer will begin developing the code to construct the game during this implementation phase. The design that was previously developed will be turned into source code. The phase of project implementation is when visions and plans become a reality (Dillon, 2020).

The goal of this chapter is to demonstrate the creation and execution of the Covid – 19 games. This covers the platform on which the game will be played. In this chapter, the implementation tools, which comprise software and hardware such as programming languages and device specifications, will be discussed. Then, in this chapter, the actual system interface that was built based on the design plan will be displayed.

7.2 Execution Platform

The execution platform is a piece of software or a platform that will be used to develop, test, and run the game system code. The execution platform is crucial since it is utilized to show the produced game. The game's concept and functionality could not be implemented without the execution platform. As a result, the execution platform for this project is listed below. During the development process, I use Windows and Android as our primary platforms. Throughout the development process, I used Windows 11 and Android 11 because this operating system typically supports all types of source code applications accessible presently, I chose Windows 11 as our primary platform. Furthermore, this is Microsoft's most recent product, and Android is the operating system.

Figure 7. 1: Windows 11

Microsoft Windows 11 is a computer operating system created by Microsoft. This programme allows developers to finish the development process, interface design, implementation, and testing phases with ease.

Figure 7. 2: Android 11

The previous version of Google's smartphone operating system was Android 11. It's the Android update for 2020, and it's ready for a range of phones to download. I chose Android 11 since it is compatible with any device and allows my game project to function. Developers may use this operating system to do testing and run the game application.

7.3 Implementation Tools

7.3.1 Software

7.3.1.1 Unity

Figure 7. 3: Unity

Unity is a comprehensive cross-platform IDE and 3D/2D game engine for developers (Sinicki, 2020). Unity can provide many of the most crucial built-in elements that make a game operate as a game engine. Physics, 3D rendering, and collision detection are all examples of this. This implies that there is no need to reinvent the wheel from the developer's standpoint. Rather than starting a new project by designing a new physics engine from the ground up, which would include calculating every movement of each material or the way light should bounce off different surfaces, you could reuse an existing one. This software has advantages in terms of mobile games. This is where Unity's strength as a programming tool really shines. While the software was once known as "Unity 3D," it has evolved into a 2D creation tool as well. Not only that, but the way visuals are handled makes porting experiences to lower-end hardware a breeze.

The game engine for Covid The Game will be Unity. This game engine will be used to execute the game. This game engine will also execute C# code, which will be applied to the game object in the software. The developer will also do the animation of the characters, obstacles, enemies, and other items in this software. In this Unity, the developer will also include a collision function, in which the player will die if the character collides with an opponent or barriers. The character's death animation will thereafter be shown. Because Unity offers the box collider 2D, this method must be developed using Unity. The box collider 2D is a Unity function that detects any collision between two objects. This feature makes it easier for the developer to work on the project.

7.3.1.2 Visual Studio 2019

Figure 7. 4: Visual Studio 2019

Visual Studio Code is a software application that allows developers to write, test, and run code. This is a Microsoft-created open-source editor for Windows, Linux, and macOS. This editor will be used by the developer to write all the code. It is not a language-specific IDE because it can be used to develop code in C#, C++, VB (Visual Basic), Python, JavaScript, and a variety of other languages. It is compatible with 36 different programming languages. Visual Studio 2019 will be linked with Unity to ensure that all functions are operational. Unity will just give the game object, which will then be used to implement all the game's functions using Visual Studio.

7.3.1.3 C# Programming Language

Figure 7. 5: C# Programming Language

C# (C-sharp) is a general-purpose programming language designed to interact with Microsoft's.NET framework. C# enables developers to create a wide range of safe and robust .NET applications (Wagner, 2021). Developers frequently use it to create Windows desktop programmers, online apps, and games. C#, on the other hand, is problem-oriented, which implies that its code is easy to read and comprehend, even for beginners. The greatest tools for novices are the C# and Unity game engines. Unity is a genuine game engine that allows you to create interactive content scripts for games.

7.3.1.4 Aseprite

Figure 7. 6: Aseprite

Aseprite is a tool that lets game developers and animators make sprites and other pixel graphics for their projects. It has a graphic design interface for pixel art creation with multiple brushes, a configurable colour palette, and blend modes. It also has a timeline, keyframe labelling, and an onion peel mode, as well as a set of common animation tools. This programme will be used to create a game design. Because the game's concept is pixel-based, they are the best tools for designing the character, tiles map, and other components. This software may also help developers in the creation of animation sprite sheets for characters. After that, you may import the sprite sheet into Unity and use it in the game.

7.3.2 Hardware

To construct and build a system, you will need hardware. This project would not be able to fulfil its goal without the hardware. As a result, the developer utilizes a personal workstation, which is a laptop, to execute this project. This laptop will be used by the developer to do all project duties, including designing, and implementing the system.

7.3.2.1 Asus Vivobook S15 S531

Figure 7. 7: Asus Vivobook S15 S531

Model	Asus VivoBook S15 S531
Operating System	Windows 10 Home 64-bit
Processor	Intel® Core™ i5-10210U Processor 1.6 GHz (6M Cache, up to 4.2 GHz, 4 cores)
RAM	4GB DDR4 on board, extra 8GB DDR4
Storage	512GB SSD with 32GB Intel® Optane™ Memory
Graphic Card	NVIDIA GeForce MX250
Display	15.6-inch, FHD (1920 x 1080)
Operating System	Windows 11 Home 64-bit

Table 7. 1: Asus Vivobook Specification

The developer utilizes an Asus Vivo Book S15 S531 laptop, according to the table above. The processor utilized is an Intel® CoreTM i5-10210U Processor 1.6 GHz, with microprocessor speeds up to 4.2 GHz. The laptop's Random-Access Memory (RAM) is 4GB DDR4 with an optional 8GB DDR4 expansion. The 12GB Random-Access Memory (RAM) is sufficient for smoothly building a game. The storage capacity is 512GB SSD, which is sufficient for the game's system file. The laptop's graphic card is an NVIDIA GeForce MX250, and the screen resolution is 1920 x 1080 pixels. As a result, the laptop should be easy to operate. Windows 11 is the operating system that has been installed.

7.4 Game Interface

7.4.1 Start Page

Figure 7. 8: Start Page

Figure 7. 9: Setting

Figure 7. 10: Achievements

The "Covid The Game" start page interface is seen in Figure 7.8. The user can adjust the music volume through the settings interface on the start page, as illustrated in Figure 7.9. Furthermore, the achievement button allows the user or player to monitor their progress toward their goals. The achievement interface, shown in Figure 7.10, will provide a list of achievements that need to be accomplished as well as achievements that have already been completed.

7.4.2 Level Page

Figure 7. 11: Level Page

Show the level page interface in figure 7.11. There are three buttons on the level page interface that will redirect you to the game. Every level has a different difficulty level, ranging from easy to hard. Pfizer represents the easy level of difficulty, AstraZeneca the medium level of difficulty, and Sinovac the hard level of difficulty in the diagram above. The user or player has the option of selecting the level they wish to play.

7.4.3 Instruction Page

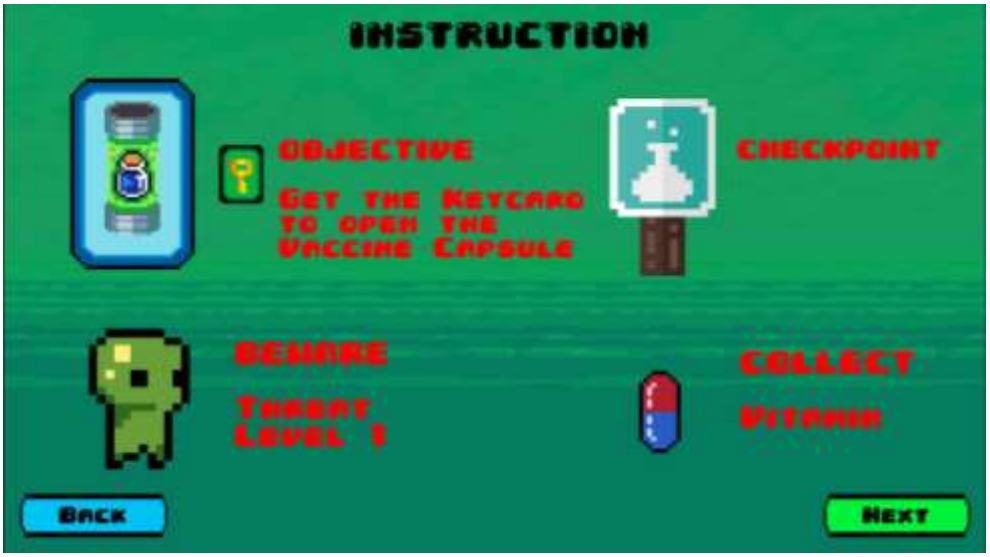


Figure 7. 12: Pfizer Instruction Page

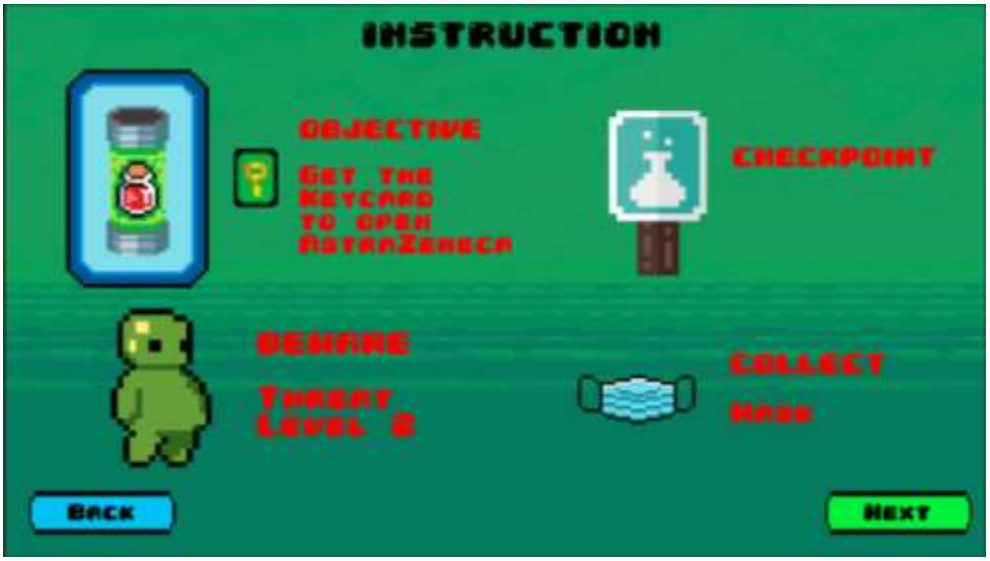


Figure 7. 13: AstraZeneca Instruction Page

Figure 7. 14: Sinovac Instruction Page

The interface for the instruction page is seen in the figure above. This page provides the player with the necessary information before they begin playing the game. Each level has its own goal, obstacles, checkpoints, and collectibles. The Pfizer instructions reveal that the goal is to discover the key card to open the Pfizer vaccination capsule, avoid the threat level 1, and collect the vitamins (see Figure 7.12). Figure 7.13 AstraZeneca instructions, on the other hand, illustrate the goal of finding the AstraZeneca vaccination capsule, avoiding threat level 2, and collecting the masks. The goal of Figure 7.14 Sinovac instruction is to locate the Sinovac vaccination capsule, avoid threat level 3, and collect the sanitizers.

7.4.4 Pfizer Gameplay Page

Figure 7. 15: Pfizer Gameplay

Figure 7. 16: Pfizer Tiles Map

Figure 7.15 depicts the Pfizer level's gameplay interface. The joystick will be used to move the character, while the jump button will be used to jump the character. It also features score text to keep track of the collectible items that the user has collected. The health bar reflects the character's health, if the health bar reaches zero, the player dies, and the game must be restarted. The pause button allows you to temporarily pause the game. If the pause menu is closed, the player can resume the game. Every level will have a joystick, jump button, health bar, score text, and pause button. The Pfizer tiles map is shown in Figure 7.16. Each level has a unique tile map design.

7.4.5 AstraZeneca Gameplay Page

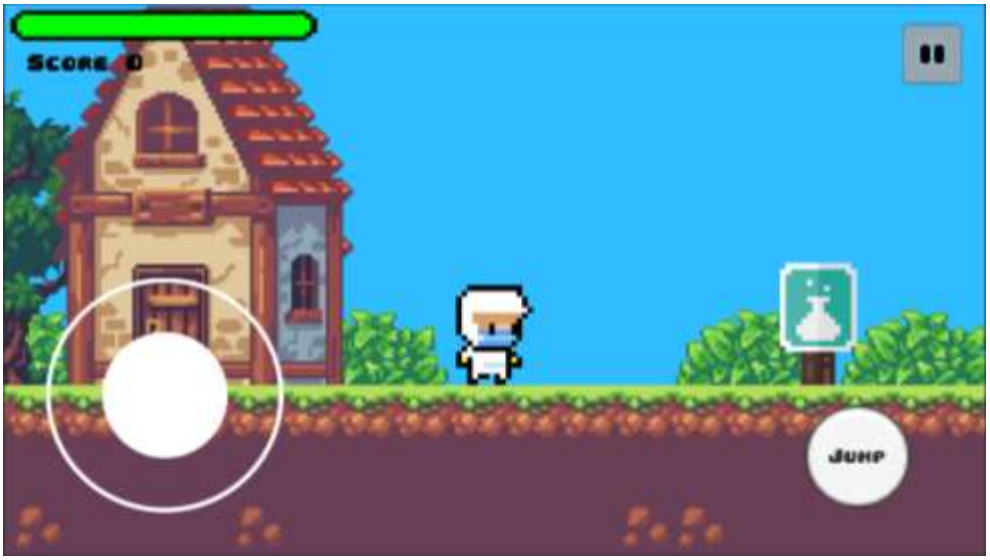


Figure 7. 17: AstraZeneca Gameplay

Figure 7. 18: AstraZeneca Tiles Map

The tiles map for AstraZeneca is shown in Figure 7.18. These tiles maps are more complex to make than the Pfizer tiles map. The player must discover where the card key is hidden, and the design is not as simple as the Pfizer tiles map.

7.4.6 Sinovac Gameplay Page

Figure 7. 19: Sinovac Gameplay

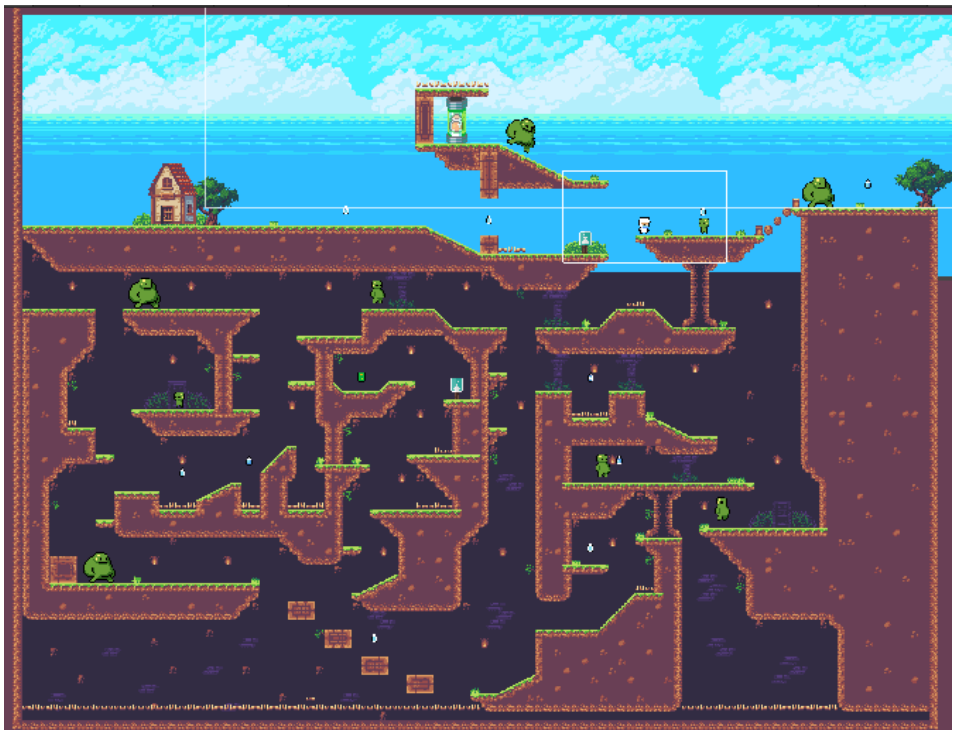


Figure 7. 20: Sinovac Tiles Map

The Sinovac tiles map is shown in Figure 7.20. Because to the route design, the Sinovac tiles map is more difficult. The map design in this level is more complicated since there are more paths or directions that might lead to the objective. The player or user must navigate their way to the goal. There are more obstacles and threats at this level, as well as a more complex map.

7.4.7 Pause Menu

Figure 7. 21: Pause Menu

The pause menu interface for Covid The Game is shown in Figure 7.21. There are three buttons on the pause menu, which is resume, restart, and main menu. The resume button will allow the user to continue playing. The restart button returns the player to the level's beginning location. The user will be sent to the level page through the main menu button. If the user clicks the pause button on the top right, a pause menu will appear.

7.4.8 Vaccine Information Page

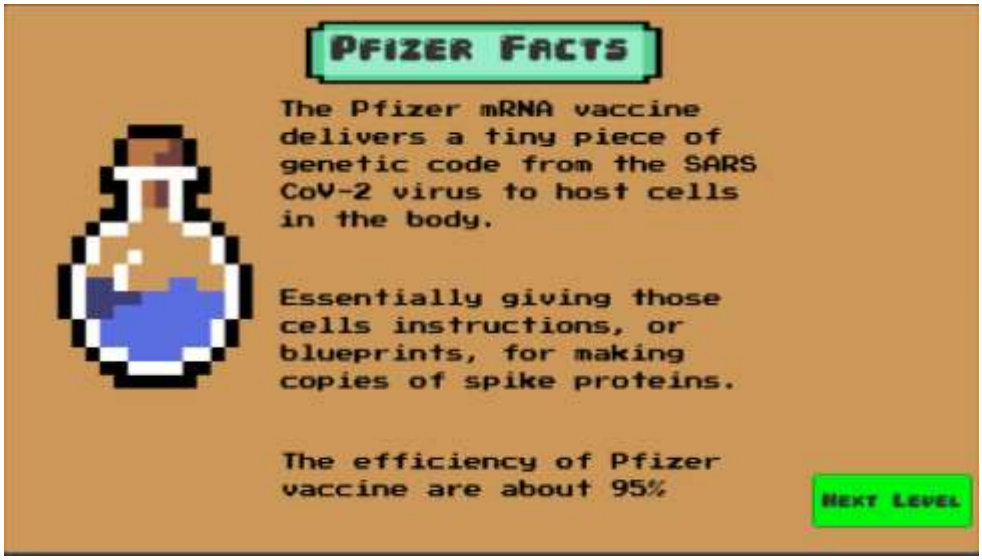


Figure 7. 22: Pfizer Facts Page

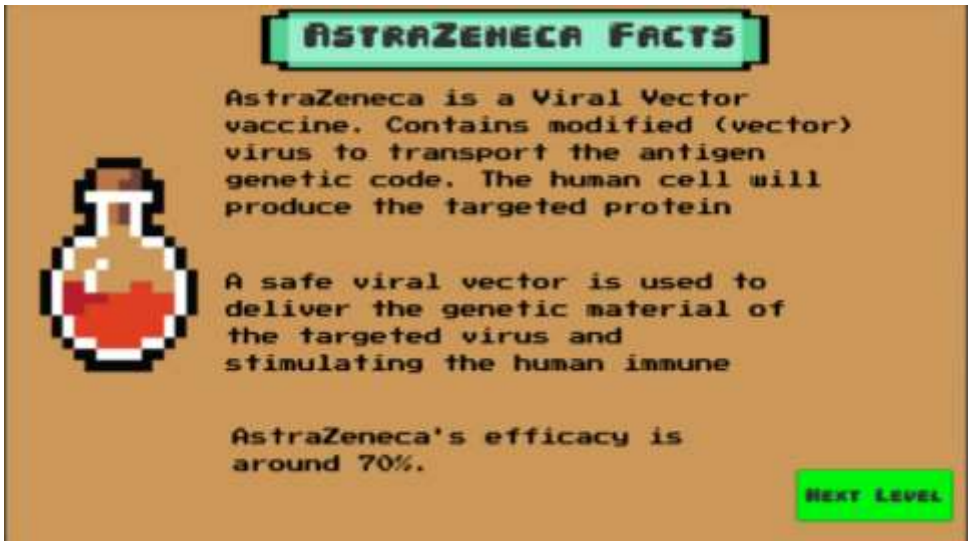


Figure 7. 23: AstraZeneca Facts Page

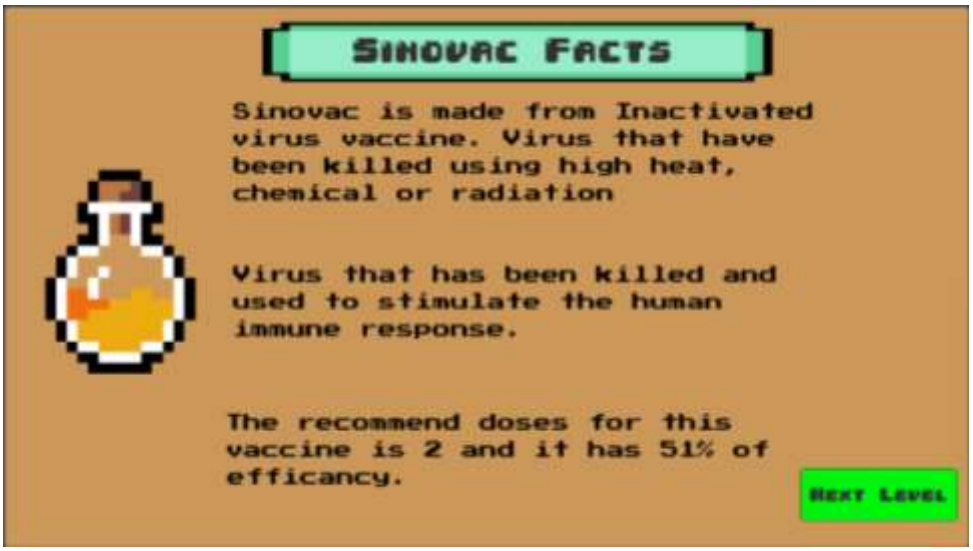


Figure 7. 24: Sinovac Facts Page

After the player completes the level, the page design for the vaccine information is shown in the figure above. As shown on the design above, there is a title for the vaccine as well as information regarding the vaccine. The facts include the vaccine's formula, how it works, and how effective it is. The next level button may be found in the bottom right corner. The player will be sent to the level page. After completing a level, the player can go on to the next one. All three vaccines facts have the same interface design.

7.5 Significant Function

The important function will show the elements of the application that are relevant to technology or the Application Programming Interface (API) (API). The Google Play Authentication, as well as the Google Play Achievement list. This is the most crucial aspect of the application in terms of making it interactive for the user. In addition, there are additional features such as character movement and controller.

7.5.1 Google Play Authentication

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using UnityEngine.UI;
using GooglePlayGames;
using GooglePlayGames.BasicApi;
using UnityEngine.SocialPlatforms;

public class GPGSAuthentication : MonoBehaviour
{
    private PlayGamesClientConfiguration clientConfiguration;
    public static PlayGamesPlatform platform;


    // Start is called before the first frame update
    void Start()
    {

        if (platform == null)
        {
            //Connect to the configuration on Google Play Service
            PlayGamesClientConfiguration config = new PlayGamesClientConfiguration.Builder().Build();
            PlayGamesPlatform.InitializeInstance(config);
            PlayGamesPlatform.DebugLogEnabled = true;

            platform = PlayGamesPlatform.Activate();
        }

        Social.Active.localUser.Authenticate(success =>
        {
            if (success) //if sucess login
            {
                Debug.Log("Logged in successfully");

                //the achievement for sucess login
                Social.ReportProgress(GPGSIds.achievement_google_signin, 100f, null);
            }
            else
            {
                Debug.Log("FAILED TO LOGIN");
            }
        });

    public void SignOutBtn()
    {
        //sign out the google play account
        PlayGamesPlatform.Instance.SignOut();
    }
```

Figure 7. 25: Google Play Authentication

Show the code for the Google Play login service authentication in Figure 7.25. There will be a condition to verify the user's authentication. This Google Play API determines whether the user has a Google Play account. It will connect immediately if the user has an account.

7.5.2 Google Play Achievements

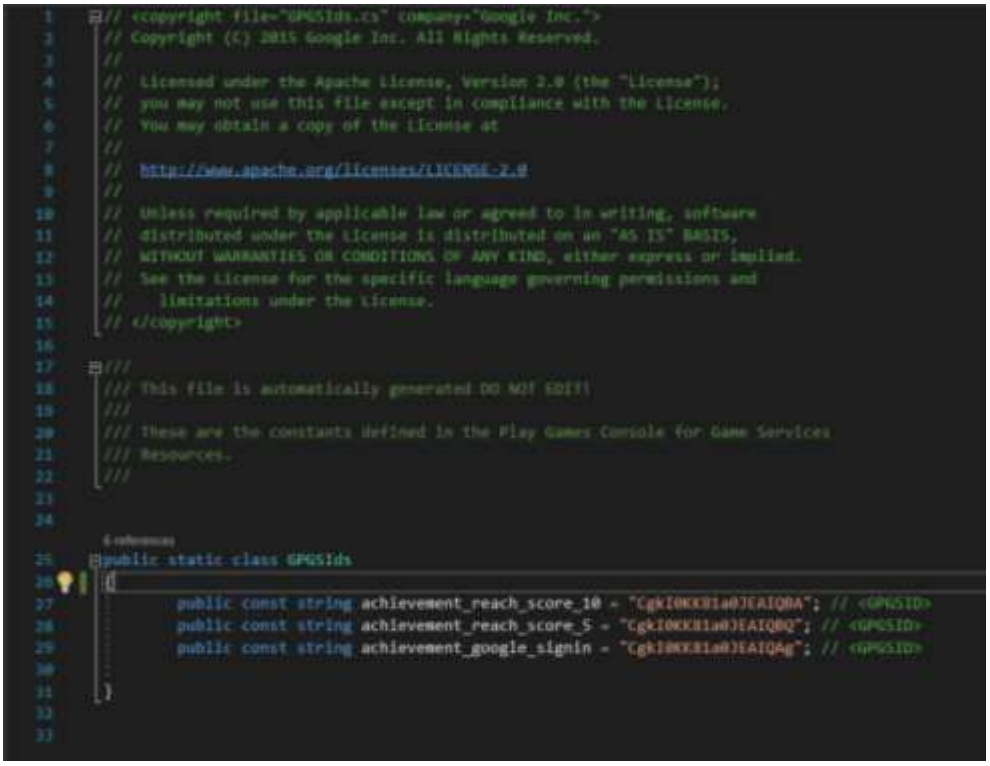


Figure 7. 26: Google Play IDs

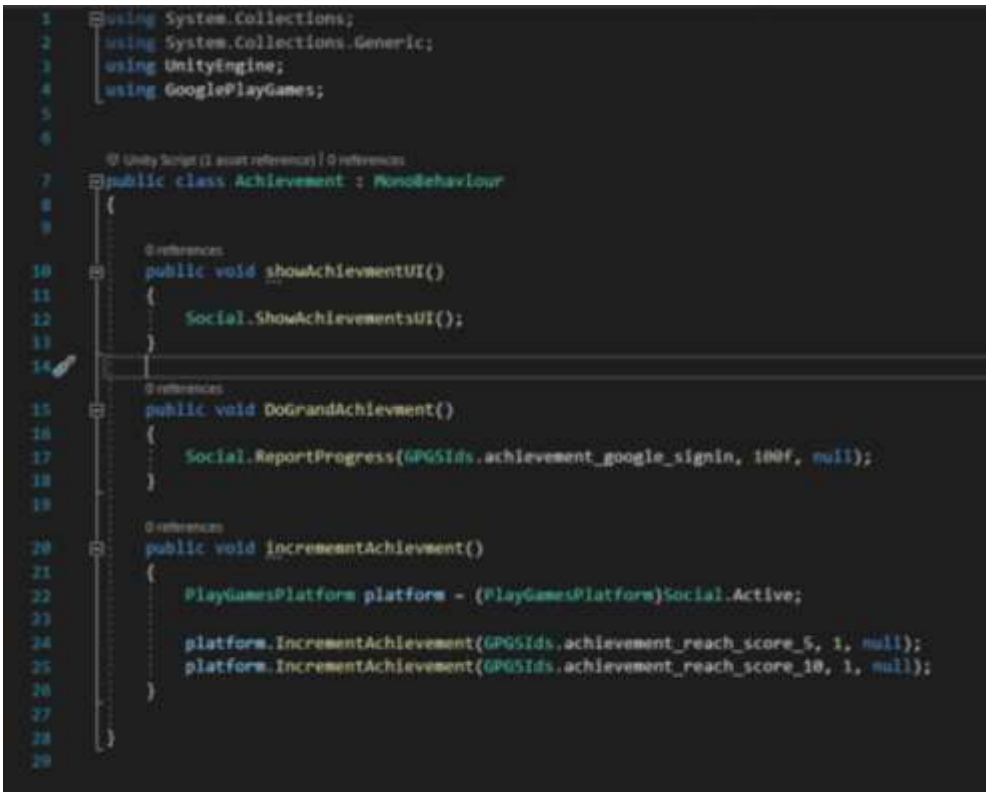


Figure 7. 27: Google Play Achievements

The Google Play IDs and Google Play Achievements are shown in the diagram above. When a developer creates an achievement and assigns it to a code, the Google Play IDs are automatically produced from the Google Play Service console. The IDs are called back in the Google Play Achievements code to refer to the Google Play Servers. As shown in Figure 7.26, there are two types of achievement: increment and non-increment. The increment is a type of achievement that is linked to a certain number of points that the developer has assigned to it. The non-increment, on the other hand, is unrelated to any quantity of value or point. For instance, success in logging in, entering a name, and other non-values related achievements. When any achievements are completed, a pop-up will appear to tell the user of the task's completion.

7.5.3 Character Controller 2D

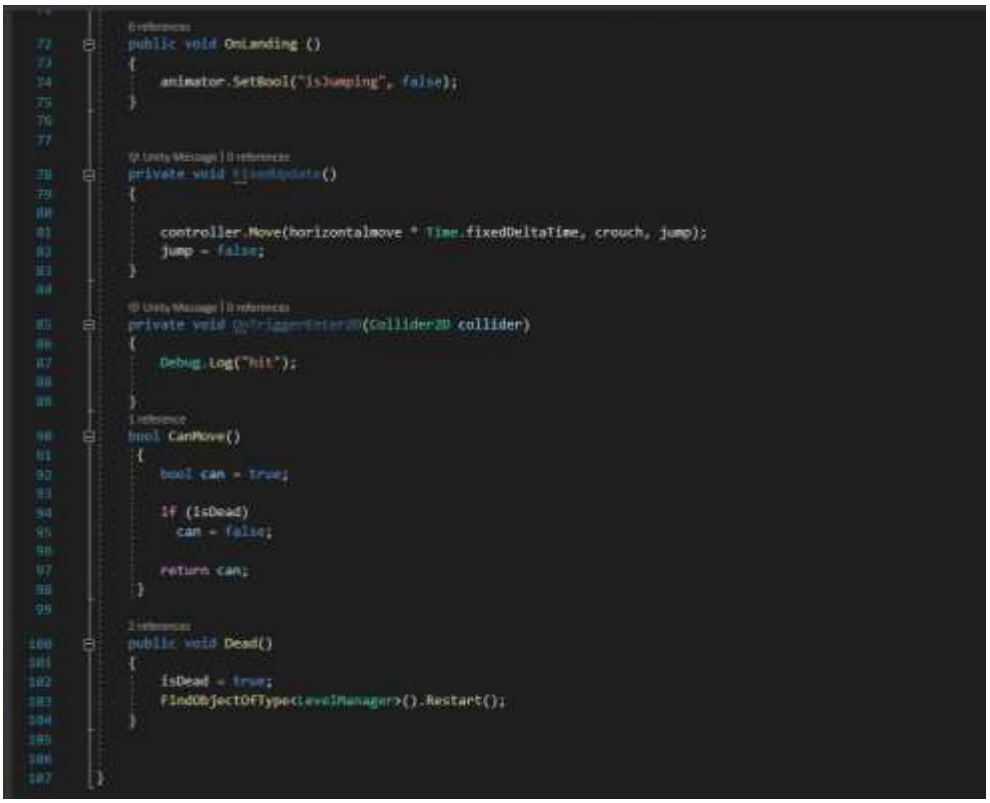
Figure 7. 28: Character Controller 2D

Show the code for the 2D character controller in Figure 7.28. This code will have the function jump force, which will allow the player to control the character's jump while moving. Also included in this code is a ground check method. The purpose of this ground check function is to ensure that the character does not fall off the ground object. The system will identify the item that has been designated as the ground, and the player can move the character on the ground tiles using the ground check method. Finally, the flip function adds this code to the mix. The flip function is used to control the direction in which the character moves. The character must flip to the positive x axis if the player travels to the right. The character must flip to the negative x axis if the player travels to the left.

7.5.4 Player Movement

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class PlayerMovement : MonoBehaviour
{
    Rigidbody2D rb;
    public float runSpeed = 40f;
    public Joystick mj;
    public float jumpspeed;
    public CharacterController2D controller;
    public Animator animator;

    bool jump = false;
    float horizontalmove;
    float x;
    bool crouch = false;

    [Range(1, 10)]
    public float jumpvelocity;

    public Transform keyFollowPoint;

    public Key followingKey;

    bool isDead = false;
    bool can = false;

    [SerializeField] private AudioSource jumpSoundEffect;
```

```
    // Start is called before the first frame update
    private void Start()
    {
        rb = GetComponent<Rigidbody2D>();

    }

    // Update is called once per frame
    private void Update()
    {
        if (CanMove() == false)
            return;

        if (mj.Horizontal >= .2f)
        {
            horizontalmove = runSpeed;
        } else if (mj.Horizontal <= -.2f)
        {
            horizontalmove = -runSpeed;
        } else
        {
            horizontalmove = 0f;
        }
        float verticalmove = mj.Vertical;

        animator.SetFloat("speed", Mathf.Abs(horizontalmove));

        rb.velocity = new Vector2(x * runSpeed, rb.velocity.y);

    }

    public void jumpButton()
    {
        //jump = true;
        jumpSoundEffect.Play();
        rb.velocity = Vector2.up * jumpspeed;
        animator.SetBool("isJumping", true);

    }
```



```
0 references
public void OnLanding ()
{
    animator.SetBool("isJumping", false);
}


Unity Message | 0 references
private void FixedUpdate()
{

    controller.Move(horizontalMove * Time.fixedDeltaTime, crouch, jump);
    jump = false;
}

Unity Message | 0 references
private void OnTriggerEnter2D(Collider2D collider)
{
    Debug.Log("hit");

}
1 reference
bool CanMove()
 {
    bool can = true;

    if (isDead)
      can = false;

    return can;
 }

2 references
public void Dead()
{
    isDead = true;
    FindObjectOfType<LevelManager>().Restart();
}


}
```

Figure 7. 29: Player Movement

In Figure 7.29 show the code for player movement. In this code it provides with function player movement left to right with the character run speed and include with the character run animation. Next, the jumpButton() function that will manage the character to jump when the button is pressed. At the same time, the jump animation will be play when the character jump. The OnLanding() function is to manage when the jump animation need to stop. The CanMove() boolean function is to determine player movement when the character is death. Finally, there is dead function that will play the character death animation.

7.6 Conclusion

Finally, the implementation phase gives a detailed description of Covid The Game's development and implementation. This stage explains how the system will be developed. To execute the application that must be constructed, they include the usage of hardware and software such as application tools and programming languages. This phase also includes a full breakdown of the project's interface design, functionality, and technology. As a result, the implementation phase is one of the most significant stages since it specifies all the resources, equipment, design, and tools. As a result, because all the requirements have been stated in detail, this phase may make it easier for the developer to construct the system. As a result, the developer could realize the project's goal by referring to all of the necessary requirements.

8.0 Testing

8.1 Introduction

The practice of reviewing and validating that a software product or application accomplishes what it is designed to do is known as software testing. Preventing bugs, reducing development costs, and boosting performance are all advantages of testing. Late deliveries or software flaws can harm a company's reputation, resulting in dissatisfied and lost consumers. A bug or fault can impair interconnected systems or create significant problems in extreme situations (IBM, 2019). A well-tested software product provides dependability, security, and excellent performance, which saves time, money, and improves customer satisfaction (Hamilton, 2022).

This chapter will go over the testing phase that was carried out for this Covid The Game mobile game application. Before all the phases of this project are completed, this is the second-to-last step. Software testing is a technique for assessing the functionality of a software application to establish whether the created software meets the specified standards and to identify issues to offer a high-quality output. In addition, the user is asked to provide feedback or comments about the system at this phase. This section includes both alpha and beta tests.

8.2 User Acceptance Testing

User Acceptance Testing (UAT) is a sort of testing in which the end user or customer verifies and accepts the software system before it is moved to the production environment. Actual users evaluate the programmed in real-world scenarios to see if it achieves what it was supposed to do, verifying updates, and determining conformance to their application project needs (Elazar, 2018). The primary goal of UAT is to assess the end-to-end system flow. As a result, the developer will undertake alpha and beta acceptance testing for this project.

8.2.1 Alpha Testing

Alpha testing is a sort of software testing that is used to find issues before releasing a product to real consumers or the public. It falls under the category of acceptability testing. The primary goal of alpha testing is to improve the software product by identifying and addressing defects that were missed during prior tests (Hamilton, 2019).

The developer conducted alpha testing early in the creation of this application. A large number of prototypes were created to be evaluated during the alpha testing. During the development of this project, around six prototypes were created. The character movement in the first prototype is unstable. The character begins to move in an undirected manner. The enemy in the second prototype has issues. The enemy does not attack the player, and no action is taken when they clash with them. The tiles map for levels Pfizer, AstraZeneca, and Sinovac is the subject of the third, fourth, and fifth prototypes. The level map's architecture and design are lacking. Finally, the sixth prototype has issues with the display size of the screen. The game's screen size has issues in it. It does not work on any device of any size. The game begins to zoom in based on the size of the phone screen. The disadvantage is that the user is unable to see some buttons and hence cannot play the game.

8.2.2 Beta Testing

Beta testing is a sort of user acceptability testing in which a product team distributes a nearly finished product to a set of target users to assess its performance in the real world (Babich, 2019). The Beta Test gives a comprehensive summary of the real-world experience that end users have when using the product.

The beta testing for this application was sent to a restricted number of users aged 13 and above by the developer. The developer creates a feedback survey for the user to fill out to provide feedback on the application. The creator also includes a video of the game's gameplay as well as a link to download the game's Android Package File (APK) in the survey. If the user wants to participate in the game. The feedback survey is made up of 15 questions divided into four categories. The user's demographic will be the first section. The game's graphic design will be discussed in the second section. The information in the game will be the subject of the third section. The fourth section is about the game's gameplay. Because the developer need feedback from both gamers and non-gamers, the survey was produced using Google Form and delivered over Whatsapp and Discord. There are more than 44 participants in this survey.

8.2.3 Result outcome of Beta Testing

8.2.3.1 Section A: Demographic

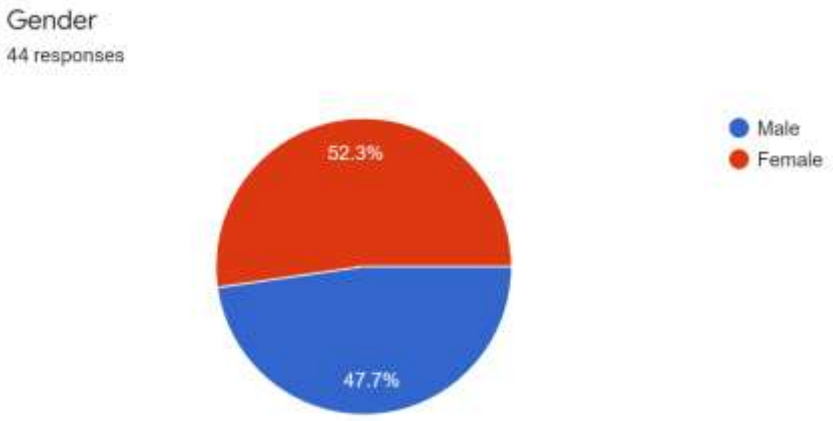


Figure 8. 1: Gender

Figure 8.1 depicts the gender of the respondents. As can be observed, the overall proportion of respondents of male gender is 47.7%, while the remaining respondents of female gender are 52.3 %. The majority of responders are female, according to this study findings.

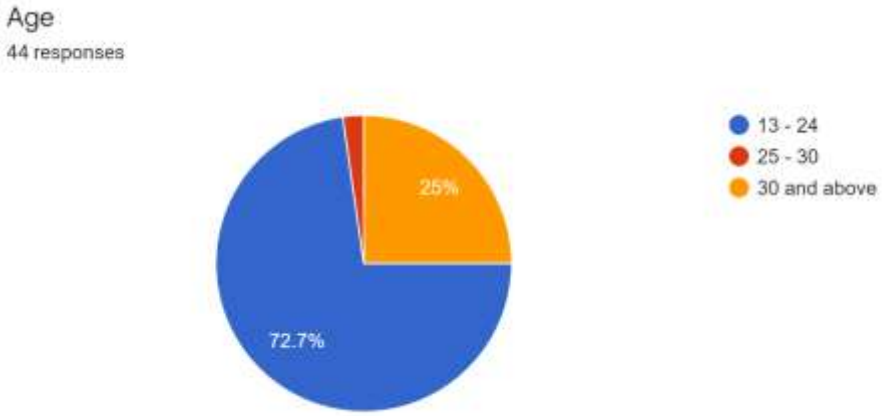


Figure 8. 2: Age

The age of the responder is depicted in Figure 8.2. As can be observed, respondents aged 13 to 24 years old compensate 72.7 %, those aged 25 to 30 years old compensate 2.3%, and those aged 30 years and above compensate 25% of the total. According to the findings of this survey, the majority of those that play this game are between the ages of 13 and 24.

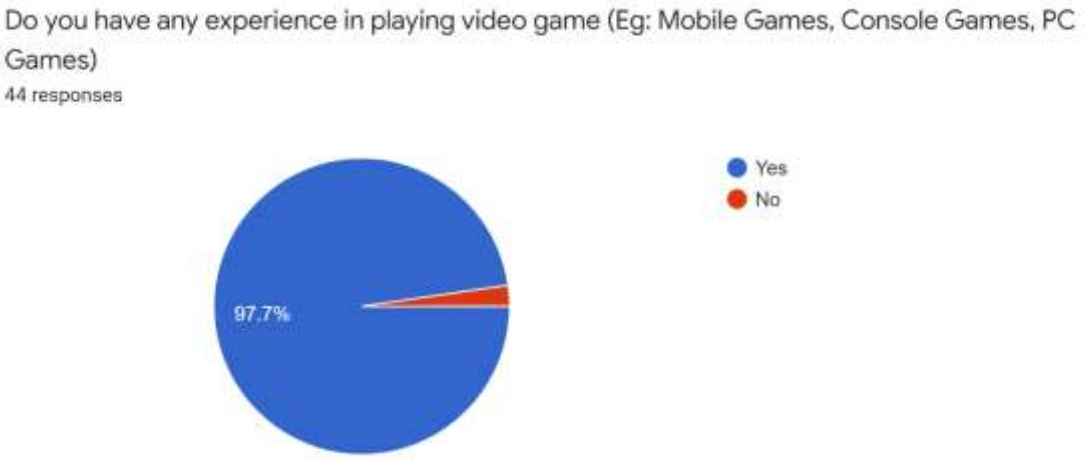


Figure 8. 3: Experience in playing video game

Figure 8.3 shows that 97.7% of the respondents have played video games before. The remaining 2.3 %, on the other hand, have never played a video game. This demonstrates that the bulk of the game testers have prior gaming expertise. Developers may obtain precise results from gamers.

8.2.3.2 Section B: Rating Graphics Design in Game

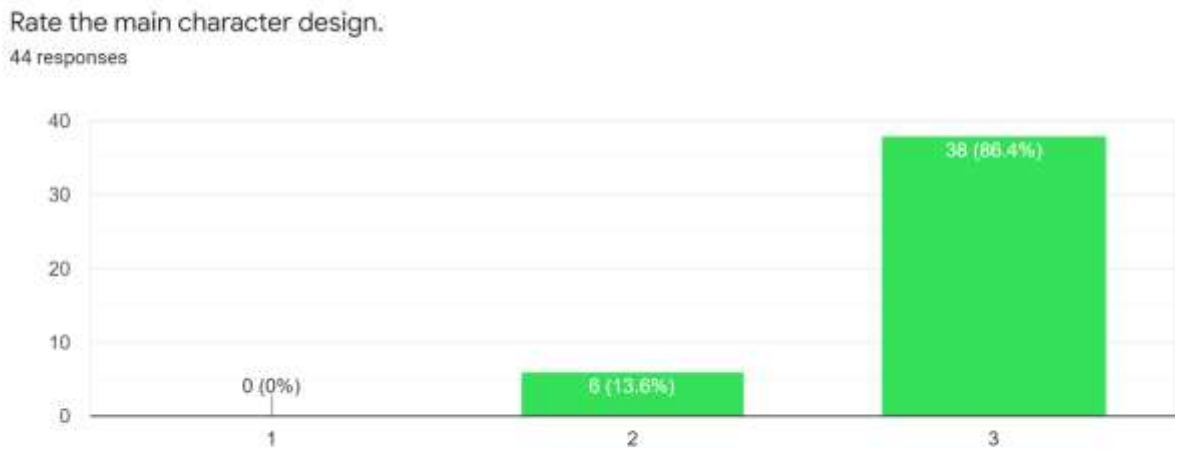


Figure 8. 4: Main Character Design Rate

According to Figure 8.4, 86.4 % think the main character's design is excellent. The remaining 13.6 % is considered neutral. The majority of respondents praised the game's main character design. Obtain user interest.

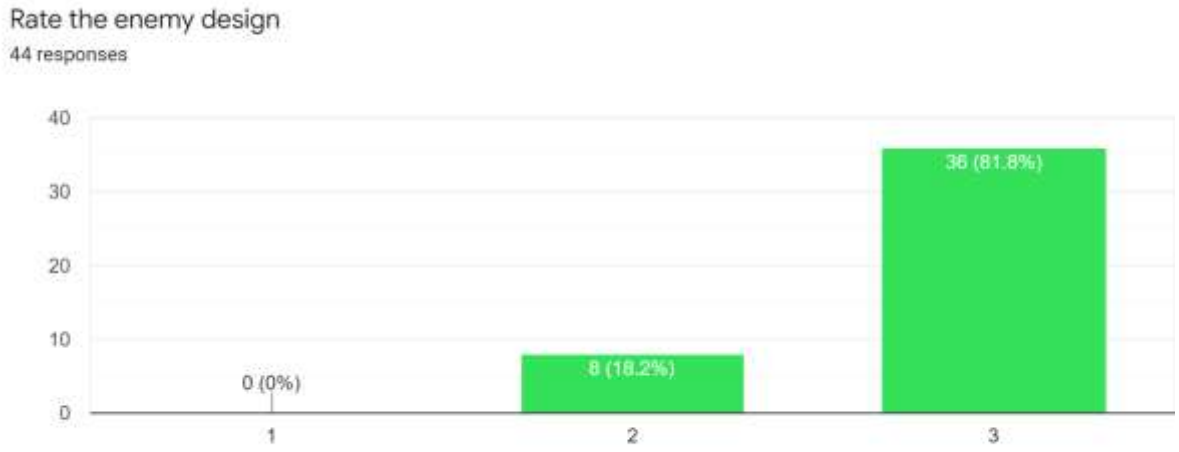


Figure 8. 5: Enemy design rate

The rating for enemy design is shown in Figure 8.5. The results suggest that 81.8 % admired the enemy design, while 18.2 % were undecided. The majority of players enjoy the game's enemy character design. Obtain user interest.

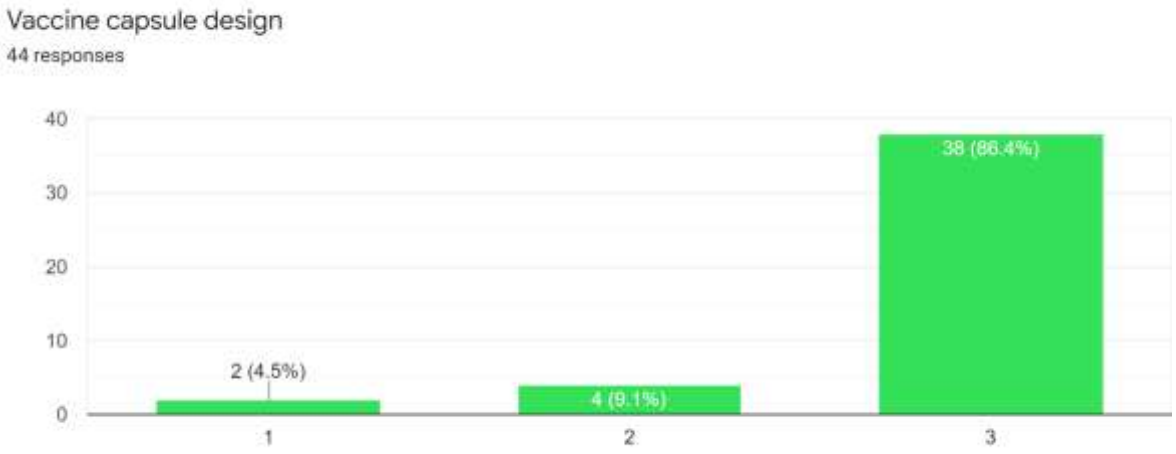


Figure 8. 6: Vaccine Capsule Design

The rating for vaccine capsule design is shown in Figure 8.6. Approximately 86.4 percent of respondents appreciated the vaccination capsule design, 9.1 % were neutral, and 4.5 percent did not admire the vaccine capsule design. The vaccination capsule design was praised by the majority. However, some participants are dissatisfied with the design. It might be due of the colour scheme or the capsule design.

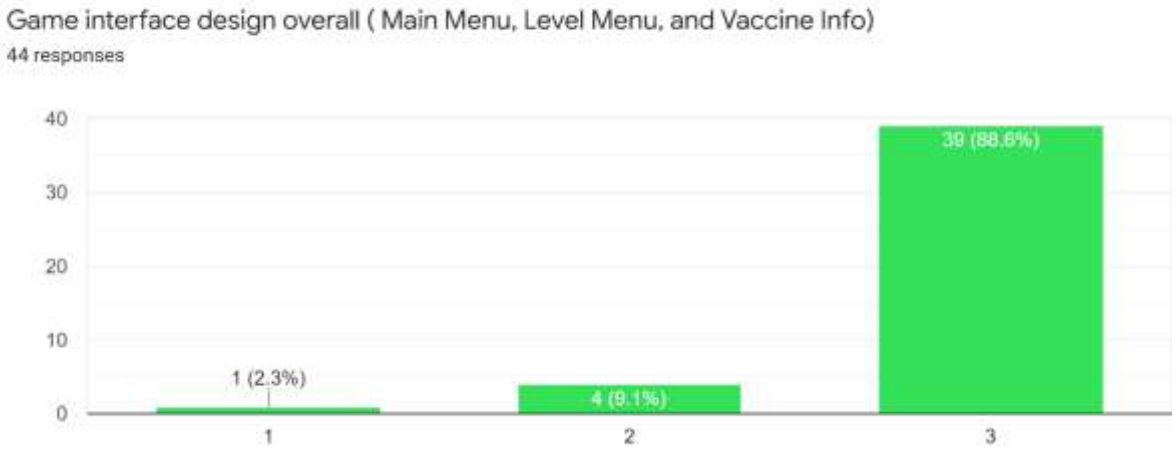


Figure 8. 7: Game Interface Design

The result of the game interface design is shown in Figure 8.7. Most respondents admired the game interface design, as shown in this graph. However, 9.1% of respondents are neutral, and 2.3 percent find the gaming interface design poor.

8.2.3.3 Section C: Information in Game

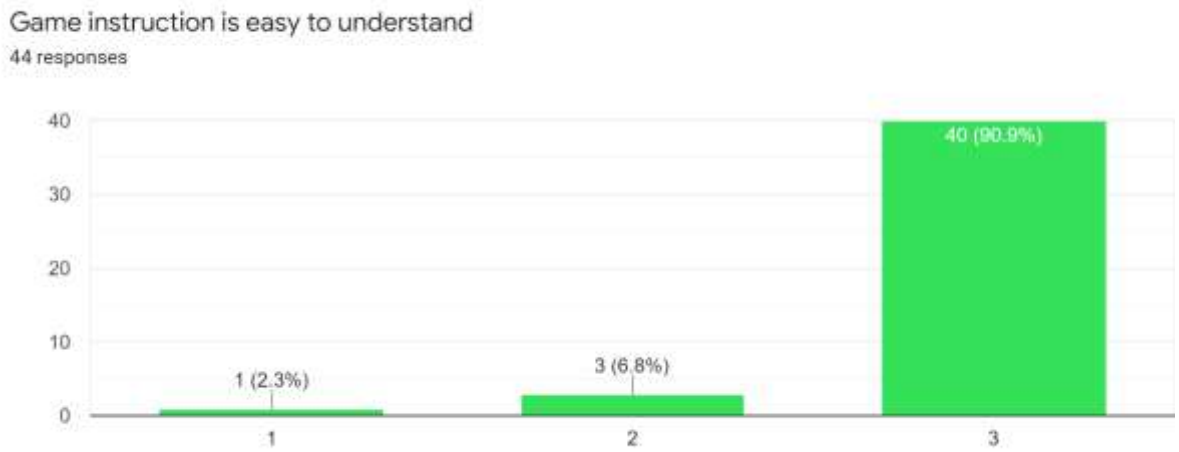


Figure 8. 8: Game Instruction Understandable

Figure 8.8 shows that 90.9 percent of respondents considered the game instructions simple to comprehend. However, 6.8% of respondents are indifferent, and the remaining 2.3 percent have difficulty understanding the instructions. The results demonstrate that because the game instruction includes a multimedia component, it makes it easier for the user to comprehend the materials.

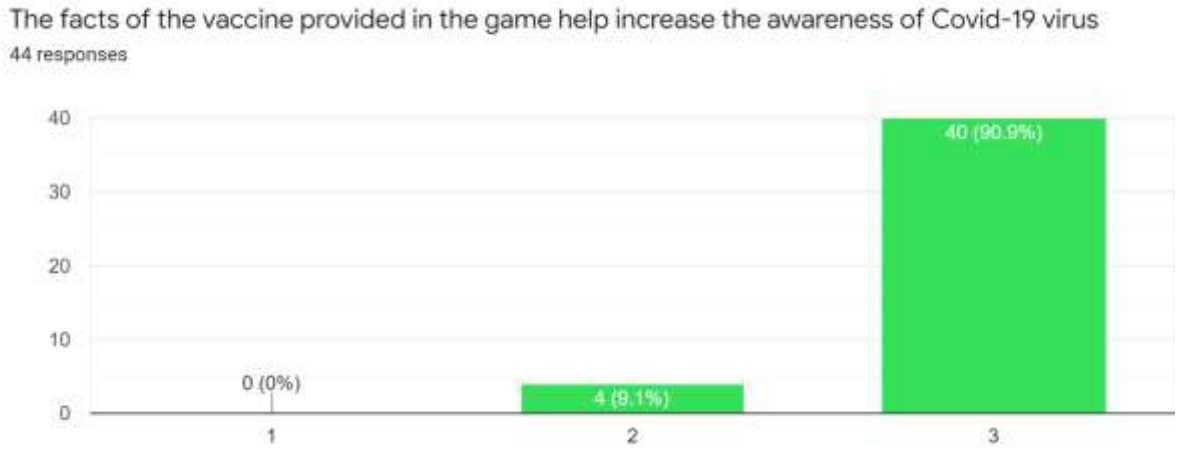


Figure 8. 9: Increase Awareness

According to Figure 8.9, 90.9 percent of respondents believe that the vaccination facts offered in the game assist raise knowledge about the Covid-19 virus, whereas 9.1 percent are unconcerned with the vaccine information provided in the game. As a consequence of the findings, the game appears to have the potential to improve user knowledge and awareness.

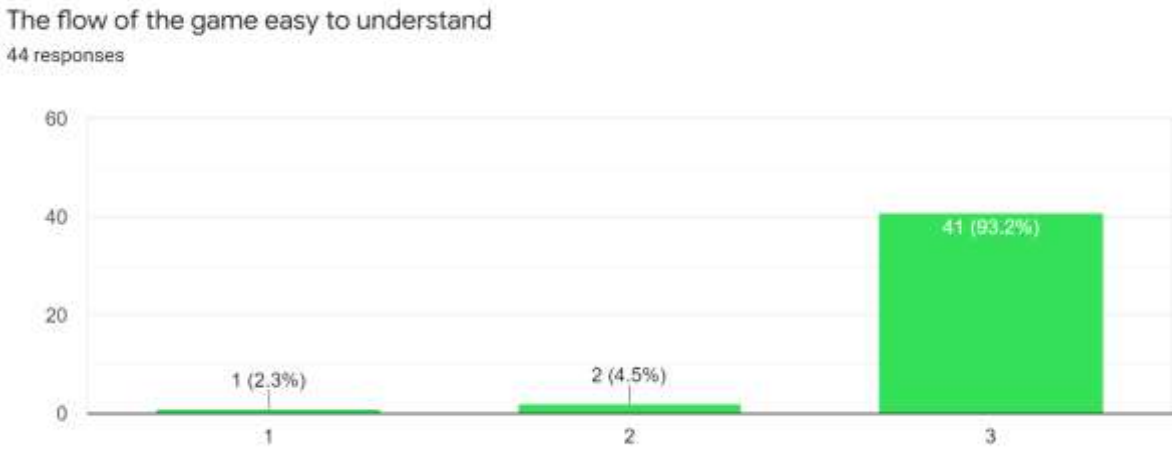


Figure 8. 10: Flow of the game

Figure 8.10 shows that 93.2 percent of respondents find it simple to comprehend the game flow, 4.5 percent find it neutral, and 2.3 percent find it difficult to understand the game flow. This indicates that the developer created a video game that is both user-friendly and meets user expectations.

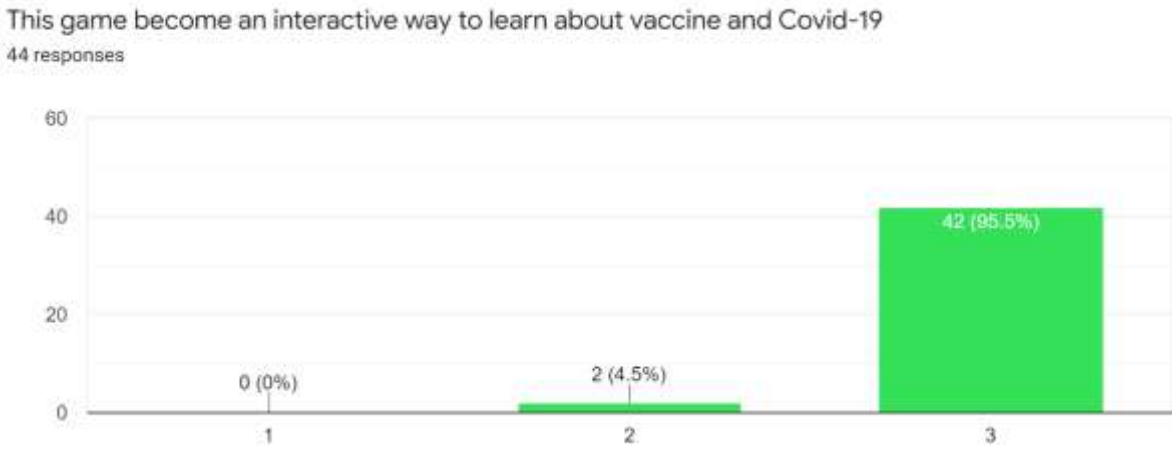


Figure 8. 11: Interactive way of learning

According to Figure 8.11, 95.5 percent of respondents think this game may be a delightful method to learn about vaccines and Covid-19, while the remaining 4.5 percent are unsure. This demonstrates that the developers met the project's goal of creating an interactive learning environment.

8.2.3.4 Section D: Gameplay

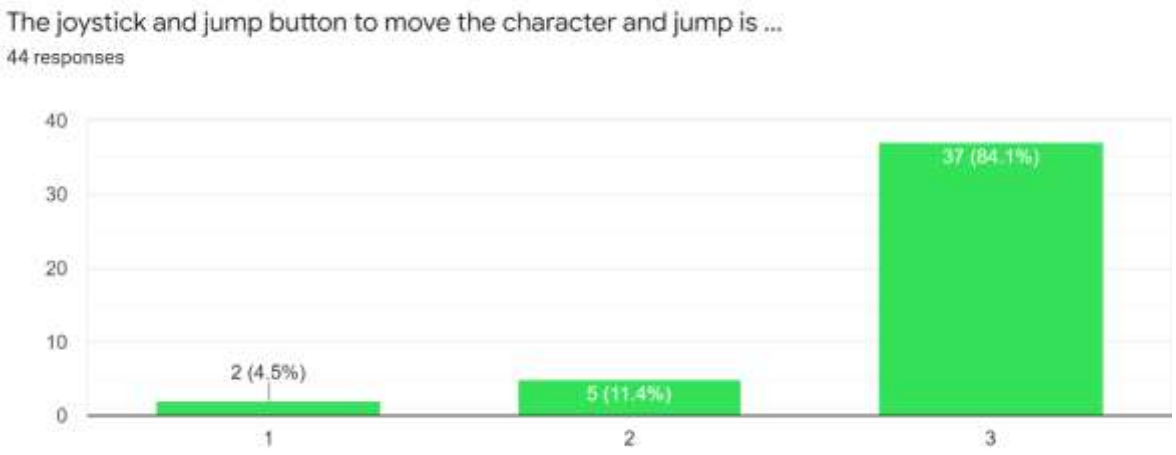


Figure 8. 12: Joystick and Jump button

Figure 8.12 shows that 84.1 percent of respondents believe the joystick and jump button to move the character work flawlessly, while 11.4 percent are indifferent, and 4.5 percent believe it does not. This might be due to various issues in the game.

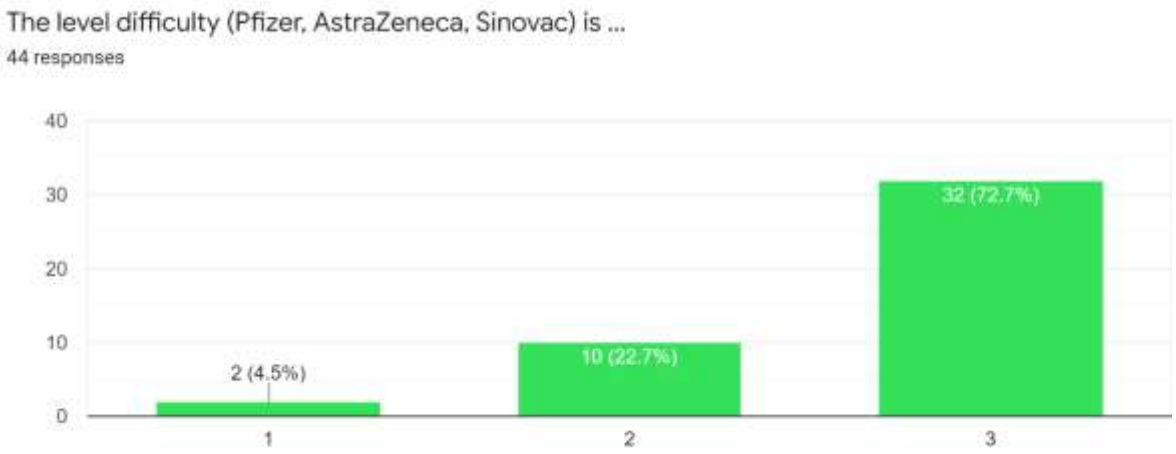


Figure 8. 13: Level difficulty

Figure 8.13 shows that 72.7 percent of respondents think the game's level of difficulty is outstanding, 22.7 percent think it's neutral, and 4.5 percent think it was too difficult. As a consequence, the developer was able to create a flawless level design.

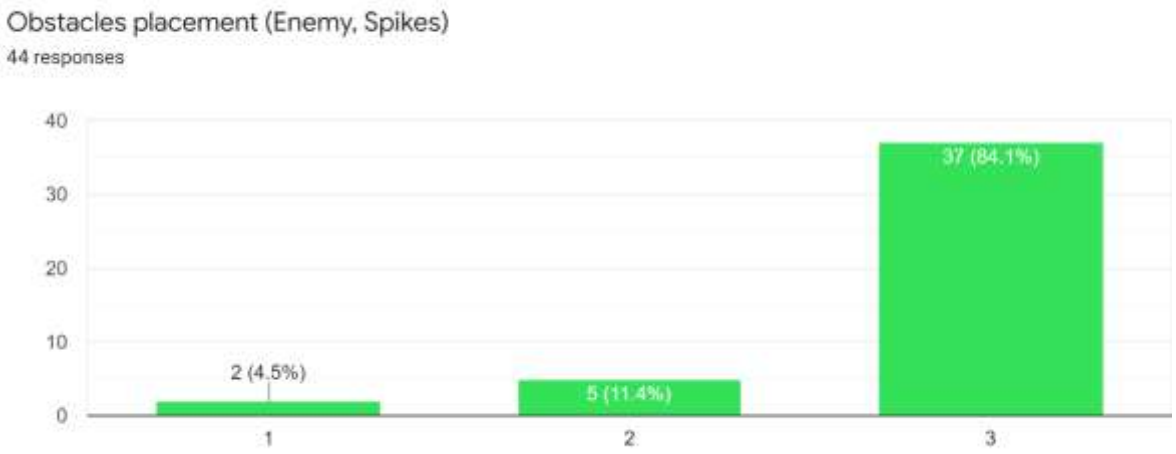


Figure 8. 14: Obstacle's placement

Figure 8.14 shows that 84.1 percent of respondents think the obstacle placement is outstanding, 11.4 percent think it's neutral, and 4.5 percent think it's poor. The majority of the participants agree that the obstacle location is ideal.

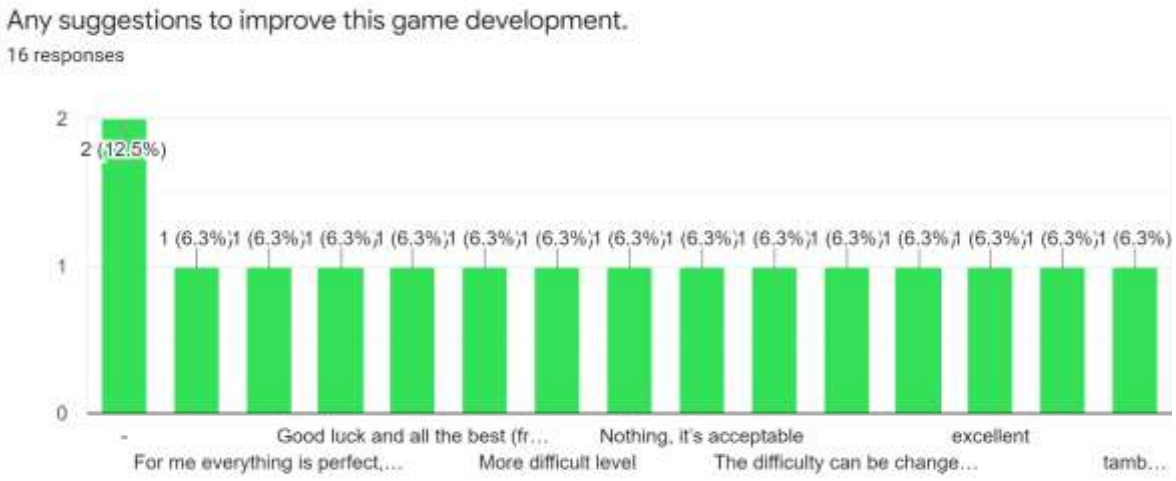


Figure 8. 15: Suggestions

According to Figure 8.15, the developer has included a suggestion section for users or respondents to provide any ideas for future game improvements. This can assist in the developer's comprehension of the user.

8.3 Conclusion

Finally, this chapter is essential in the development of this application. Covid The Game might create a better outcome after developing this mobile game application by doing user acceptability testing, which includes alpha and beta testing. This testing helps the developer to identify the system's weaknesses, which they may then fix and improve. According to the survey's findings, this system satisfies its requirements and is suitable for deployment to potential users. As a result, testing is important, and with testing, the developer may improve the system to achieve user pleasure and relevance in the market.

9.0 Project Management

9.1 Introduction

Project management is the use of procedures, techniques, skills, knowledge, and experience to meet project objectives within contribute to successful while following to project acceptance criteria. Final outputs are bound by a certain timeframe and budget in project management (Association for Project Management, 2017). Simply put, project management is the act of leading an individual to complete specific objectives or deliverables within a specified timeline. Project management involves project documentation, planning, tracking, and communication, all with the purpose of successfully completing work within time, scope, and budget restrictions.

The management of this project will be covered in this chapter using the planned strategy. From the beginning to the end, this project management will serve as a guide for the development of Covid The Game Mobile Game Applications. As a result, the project schedule and risk management will be structured in this chapter to ensure that the project meets its objectives. The project schedule will instruct a developer on how to perform each work during the development process, and it must be completed by the deadline. If any threats arise during the project life cycle, risk management will guarantee that the project accomplishes its goal and follows the plan. As a result, the project management will arrange the developer to execute the project as planned.

9.2 Project Scheduling

A project schedule is a timeline that outlines the start and finish dates of all project activities, how they connect to one another, and who is accountable for delivery (typically team members or other resources) (Australian Institute of Project Management, 2021). The timetable, resources required, and actuality of project delivery are all determined by project scheduling, which is equally as crucial as cost planning. Experienced project managers are better able to specify the tasks, effort, and budget needed to execute a project (Scott, 2020).

A work breakdown structure is frequently used in conjunction with a project timetable (WBS). To acquire a better knowledge of the project's status, the project schedule should be updated on a frequent basis. The Gantt Chart will also be built so that developers can see how long the project operations will take. As an outcome, both models make it easier for developers to keep track of their work as the system evolves.

9.2.1 Work Breakdown Structure (WBS)

A work breakdown structure (WBS) is a deconstruction of a project that is visible, hierarchical, and focused on deliverables. It's a useful diagram for project managers since it helps developers to break down the scope of their projects and visualize all the activities needed to finish them.

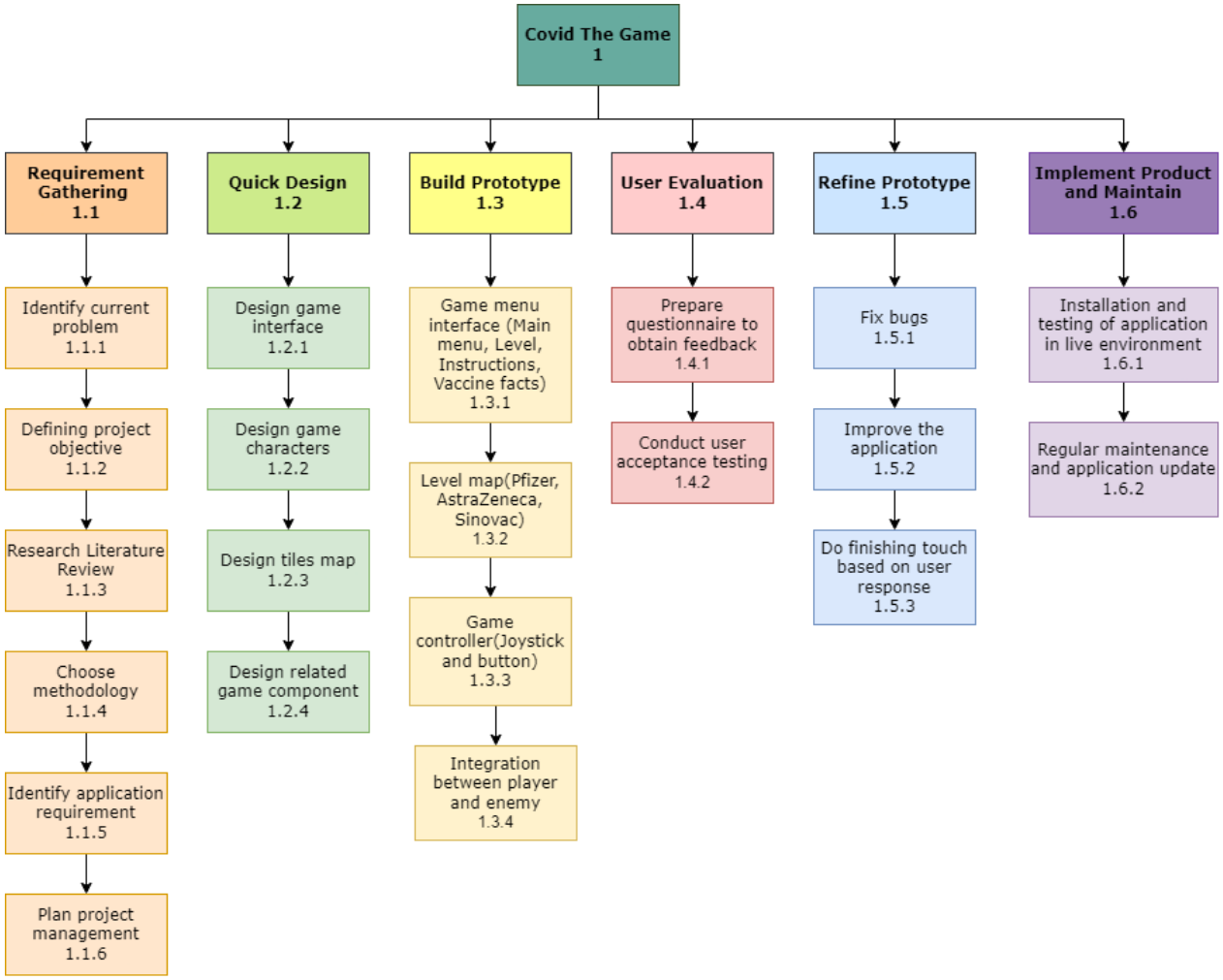


Figure 9. 1: Work Breakdown Structure (WBS)

The Work Breakdown Structure (WBS) for Covid The Game Mobile Game Application is shown in Figure 9.1. According to this diagram, the developer must complete six primary tasks or phases. The tasks include requirement gathering, quick design, prototype build, user evaluation, prototype refinement, and product implementation and maintenance. Each of these phases has a distinct duty that must be accomplished. Figure 9.1 depicts the specific task for each step. By adopting this framework, the developer will be able to see what activities need to be completed and will be able to complete the project deliverables in a more orderly manner.

9.2.2 Gantt Chart

A Gantt chart is a graphical representation of a project schedule that is widely utilized. It's a form of bar chart that displays the start and end dates of project aspects including resources, planning, and dependencies. The most frequent method for tracking project timelines is to utilize Gantt charts. Additional information about the various tasks or phases of the project, such as how the tasks relate to one another, how far each task has progressed, what resources are being used for each task, and so on, is useful for this (Gantt, 2019). The developer may use this Gantt Chart to break down the project into smaller tasks, keep organized, and visualize the relationships across projects. The Gantt Chart for Covid The Game is presented below.

Activities		Weeks	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Month	Aug 2021					Sept 2021			Oct 2021					Nov 2021
1.	Project Planning															
2.	Project Briefing															
3.	Literature Review															
4.	Project Methodology															
5.	Project Management Planning															
6.	Application Requirement Planning															
7.	Application Analysis and Data Gathering															
8.	Presentation the project for Chapter 1 - 5															

Table 9. 1: Gantt Chart Week 1 -14

The Gant Chart for this project from week one to week fourteen is shown in Table 9.1. Project planning, project brief, literature review, project methodology, project management planning, application requirement planning, application analysis and data gathering, and project presentation for chapters 1 through 5 are among the tasks involved during these 14 weeks. The table above shows the estimated time and progress on the project over the next 14 weeks.

Activities		Weeks	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Month	Dec 2021					Jan 2022			Feb 2022					Mar 2022
9.	Quick Design															
10.	Build Prototype															
11.	User Evaluation															
12.	Refine Prototype															
13.	Implement Product and Maintain															
14.	Final Report Writing															
15.	Final Presentation															
16.	Submitting full project report															

Table 9. 2: Gantt Chart Week 15 – 28

The Gant Chart for this project from week 15 to week 28 is shown in Table 9.2. Quick design, build prototype, user evaluation, refine prototype, implement product and maintain, final report writing, final presentation, and submitting a full project report are the actions involved within these 15 to 28 weeks, according to this table. The table above shows the estimated duration and progress on the project for 15 to 28 weeks.

9.3 Risk Management

Project risk management is the process of recognizing, assessing, and responding to any risk that develops throughout the course of a project's life cycle to keep the project on track and accomplish its objectives. Risk management is the practice of reducing any potential issues that might cause a project's schedule to slip (Wrike, 2019). Any unexpected incident that might have an impact on the people, procedures, technology, or resources engaged in a project is referred to as "risk." Risks are events that may or may not occur, and the developer may or may not be capable of predicting when they will occur, unlike 'problems,' which are unavoidable. Project risk, because of this unpredictability, demands preparation to be properly controlled.

As a result, this project will identify the risk that may arise throughout the system's development. For each identified risk, the developer offers a solution. With this risk management in place, the developer may quickly deal with the problem by taking action to resolve it. As a result, below is the risk management structure for this project.

Risk Identification	Analysis Risk	Mitigation Plan
Lack of understanding on how to use the game engine.	The developer lacks the skills required to work with the Unity game engine. The developer has only recently found this software. Many aspects of the software are difficult for developers to comprehend. These concerns may have an impact on the project's objective.	The developer must perform initial research on the project's knowledge and resources. They should also seek guidance and support from their lecturers, colleagues, and anybody else who is knowledgeable about the system requirements.
Lack of animation expertise.	The developer has no prior experience or knowledge in the field of animation. The importance of animation in the development of this video game cannot be overstated. This will be a challenging task for the developer.	To familiarize developer with animation, the developer will take any online course, watch YouTube videos, and do further study.

Storyboard	The developer has no experience producing a game's storyboard or plot. In order to produce this video game, the developer must understand how to design the plot for Covid The Game. A weak plot might harm the project's goal of creating an interactive education platform.	Developers could look at how other well-known video games create their story boards or plots. The game's plot may need some creativity on the part of the developer.
Google Play Service	For this project, the developer will need to use the Google Play Service Application Interface (API). This API will be used to login and achieve goals for users. However, to access this API, developers must pay the Developer Fees.	Developers may save money in order to pay the Google Play Service developer fees.

Table 9. 3: Risk Management

Table 9.3 depicts the risk management for this project. According to the table, risk management is made up of three parts: risk identification, risk analysis, and risk mitigation plan. The risk identification section included all of the possible risks that may arise throughout the project's development. The risk analysis describes the risk that the developer will encounter, as well as the risk mitigation plan that will be used to reduce or eliminate the risk.

There are four risks linked with this project, as shown in the table above. Risks include a lack of understanding of how to utilise the game engine, as well as animation expertise, a storyboard, and Google Play Service. The analysis risk and mitigation strategy are mentioned in the table above. Consequently, the developer may be able to limit the risk if it emerges throughout the project's development by referring to this risk management. This risk management will guarantee that the developer completes the safeguard development and achieves the developer's objectives.

9.4 Conclusion

Finally, project management is necessary since it will lead the developer from the start to the finish of the project. Project management may assist structure the project's development since it comprises a project schedule and risk management. Consequently, the developer may make an educated choice and stay on track throughout the development of the project. This project management will also guarantee that the project's workflow is smooth and that its requirements are satisfied.

10.0 Conclusion

10.1 Introduction

This Covid The Game was created to provide a new learning platform via the use of video game interpretation. This Covid The Game is necessary for users to understand Covid-19 and vaccines. This educational game also encourages users in spreading Covid-19 awareness. It contains all of the relevant information on the vaccine, including Pfizer, AstraZeneca, and Sinovac. This information may assist users in comprehending why this vaccination is required to fight the Covid-19 virus, how it works, and other pertinent information. Combining Covid-19 education with a mobile game allows more users to be educated and raise awareness.

The last part of this project will offer an overview of the Covid The Game development process. The developer will give an outline of the scenarios that occurred during the development of the mobile game application. This chapter will also go through all the project's goals, as well as the project's outcomes, suggestions, scope, and future research. Consequently, the successes of the project, future work, and project evaluation will be discussed in this chapter.

10.2 Achievement

Throughout the course of this project, we have been able to accomplish a significant number of goals. One of the most significant accomplishments is that we were able to meet the project goal and complete the project on time during the initial phase. Aside from that, we were able to develop the application according to our user's requirements, as well as provide complicated functionality and usability. We have developed an interesting and user-friendly mobile game application that would improve our users' overall user experience.

In addition, by learning a new programming language and framework, the developer increases development skills. This project taught the developer a variety of skills, including coding, designing interfaces, and establishing resources. Developers also picked up new skills including animation, storyboarding, and plotting. In addition, the developer improves and develops problem-solving skills. Among the skills are the ability to correct an error and cope with a risk that emerged throughout the project's development. This project was completed within the deadline and schedule that had been specified, thanks to the developer's capabilities. As a consequence, this Covid The Game was produced effectively in line with the needs of the users.

10.3 Future Work and Recommendation

The developer intends to keep updating the application in the future in order to maintain and improve it. This might include introducing new features, implementing new technologies, and improving the usability of existing platforms. This enhancement is important because it will meet the demands of the users and improve the interaction and experience between them and the application. Some of the recommendations and features that will be implemented to improve the application are listed below.

10.3.1 Upgrade the game graphic into 3D

Covid The Game currently has a 2D pixelated graphic. This suggestion, which involves converting the graphics to three dimensions, may encourage users to play the game. The use of three-dimensional graphics will provide additional details to the character design, map design, and other aspects of the project. In the gaming industry, graphics play a significant role. Gamers nowadays are very interested in the game's graphics. It might be one of the reasons why so many gamers want to play this game. With today's technology, converting this two-dimensional game into a three-dimensional game is a requirement.

10.3.2 Provide with more categories of vaccine

Pfizer, AstraZeneca, and Sinovac are the vaccine categories that have already been included in the game. Other vaccines, such as Johnson & Johnson's, Moderna's, and others, have been introduced to the world. This can assist users in becoming more knowledgeable about the vaccination and its effectiveness. At the same time, the game's developer can add new levels. For each vaccination that is introduced into the game, a variety of map designs will be created. Because of the diversity of levels featured in the game, the player or user will not become bored while playing it.

10.3.3 Able to publish in Google Play Store and Apps Store

Able to publish to the Google Play Store and Apps Store will be a big improvement. More users can download and play the game from around the world. Any kind device can play this game and earn knowledge while play the game.

10.4 Project Evaluation

Throughout the course of this project, developer ran several prototypes and tests to ensure that all the system's functions are compatible with the criteria and will meet the goals set out in the previous development phase. Each prototype has been thoroughly tested and refined. During the construction of this project, the developer encountered several mistakes and bugs. I repeat this test until the application is free of bugs and everything runs properly.

For this project to be finished, it must overcome several obstacles. The developer's lack of understanding on how to use the game engine is one of the constraints. Because of developer lack of experience, the developer must conduct research into the challenges to comprehend how the product should function. In addition, to satisfy the user, the developer performs a survey of actual users, which helps to the project's development. Finally, in order to ensure that Covid The Game is ready for release, it has been tested on real users. Before releasing the application, the developer takes the valuable feedback to make it better and meet the requirements of the customers. As a result, Covid The Game is well prepared to be completely exploited by users in order to assist them in learning about Covid-19.

10.5 Conclusion

Finally, the development of Covid The Game fulfills the requirement for reaching the objectives. As a student working on this mobile gaming application, it is not easy to complete the project. To understand what should be offered for the application, several research and practice are necessary. If the developers are unable to handle and make an educated choice on a constraint that develops during the project's development phase, the project may fall short of its objectives. As a result, the supervisor's, friends', and social community's help is extremely valuable in achieving the project's goals.

Furthermore, application features will be improved and updated in order to make Covid The Game more engaging and instructive. This mobile gaming application was created with the intention of assisting any user in learning about Covid-19 and vaccinations in the future. Finally, I'd want to express my gratitude to the faculty and supervisors who worked diligently to see that this project was finished, especially my supervisor, Madam Wan Nor Asnida Binti Wan Jusoh, and the Final Year Project (FYP) Coordinator, Miss Shuhadah binti Othman. This project will be unable to meet its objectives without their support, direction, and recommendations, and it may fail.

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Appendix A – Questionnaire

Data Gathering Questionnaire

User requirement survey for the development of "Covid The Game"

This is questionnaire to find user requirement for my Final Year Project Game with is Covid The Game with is an educational game about Covid-19.

The objective of this project:-
i- To spread awareness about Covid-19 in an interactive way.
ii- To create new platform of learning
iii- To provide new learning approach by using multimedia elements.

ikmalsnazmi@gmail.com Switch account

* Required

Email *

Your email

Section A : Respondent Information

Description (optional)

Gender *

Male

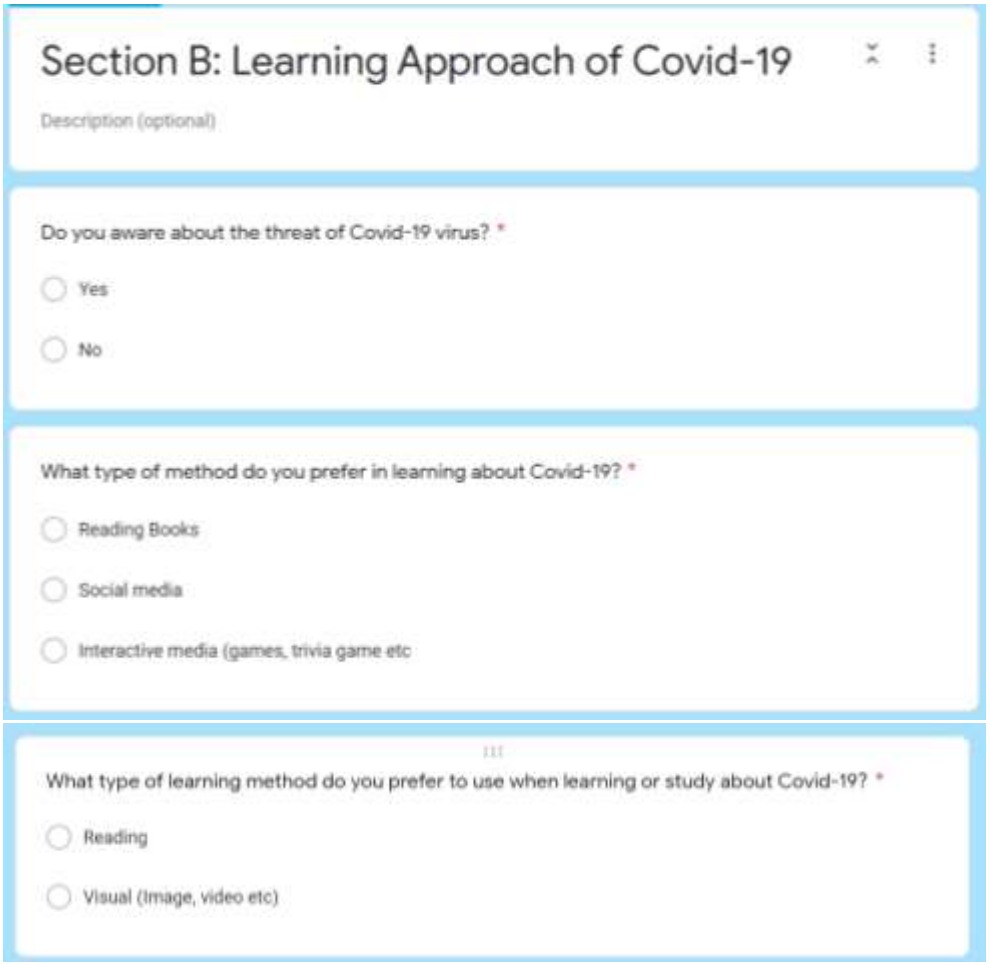
Female

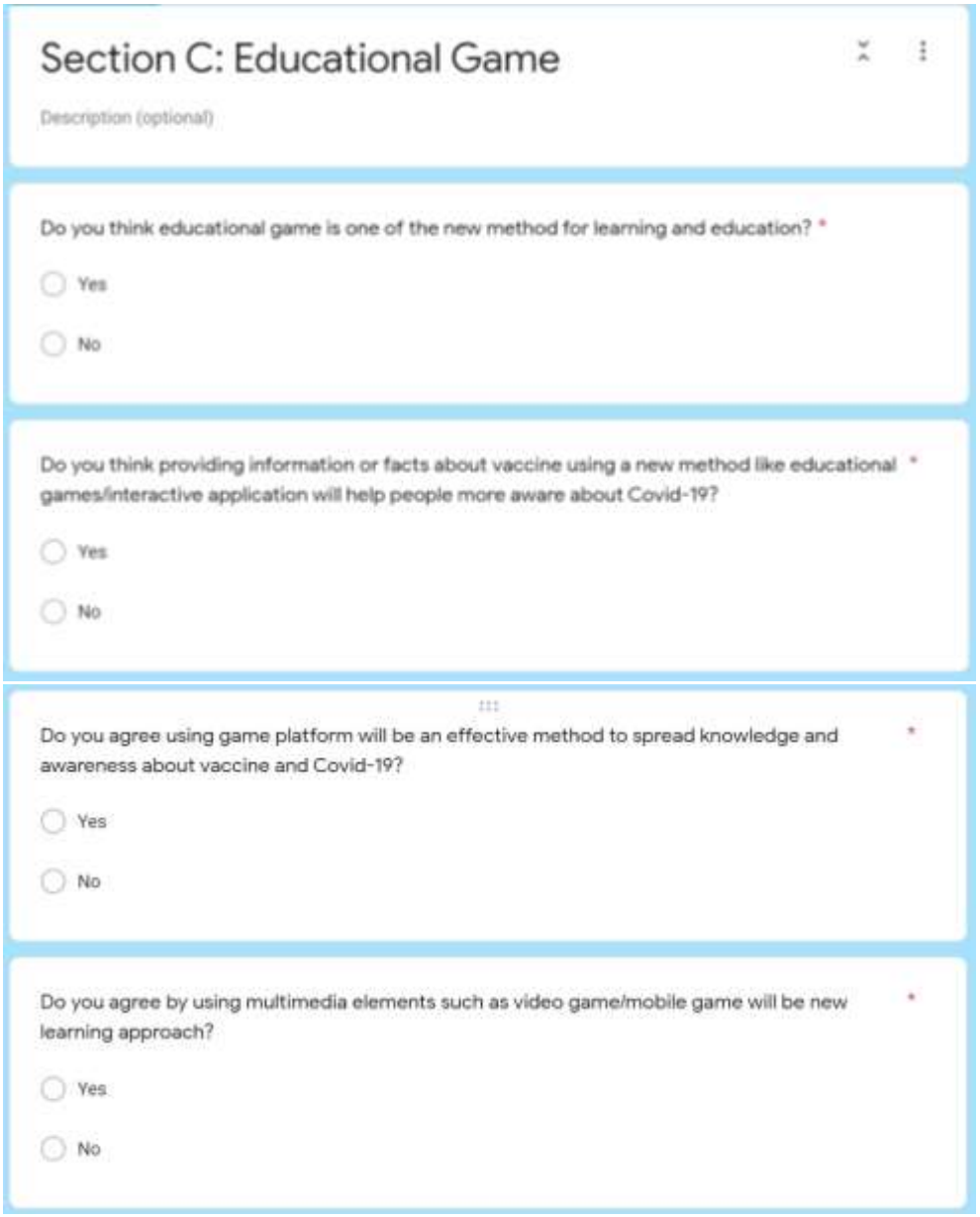
Age *

13 - 20

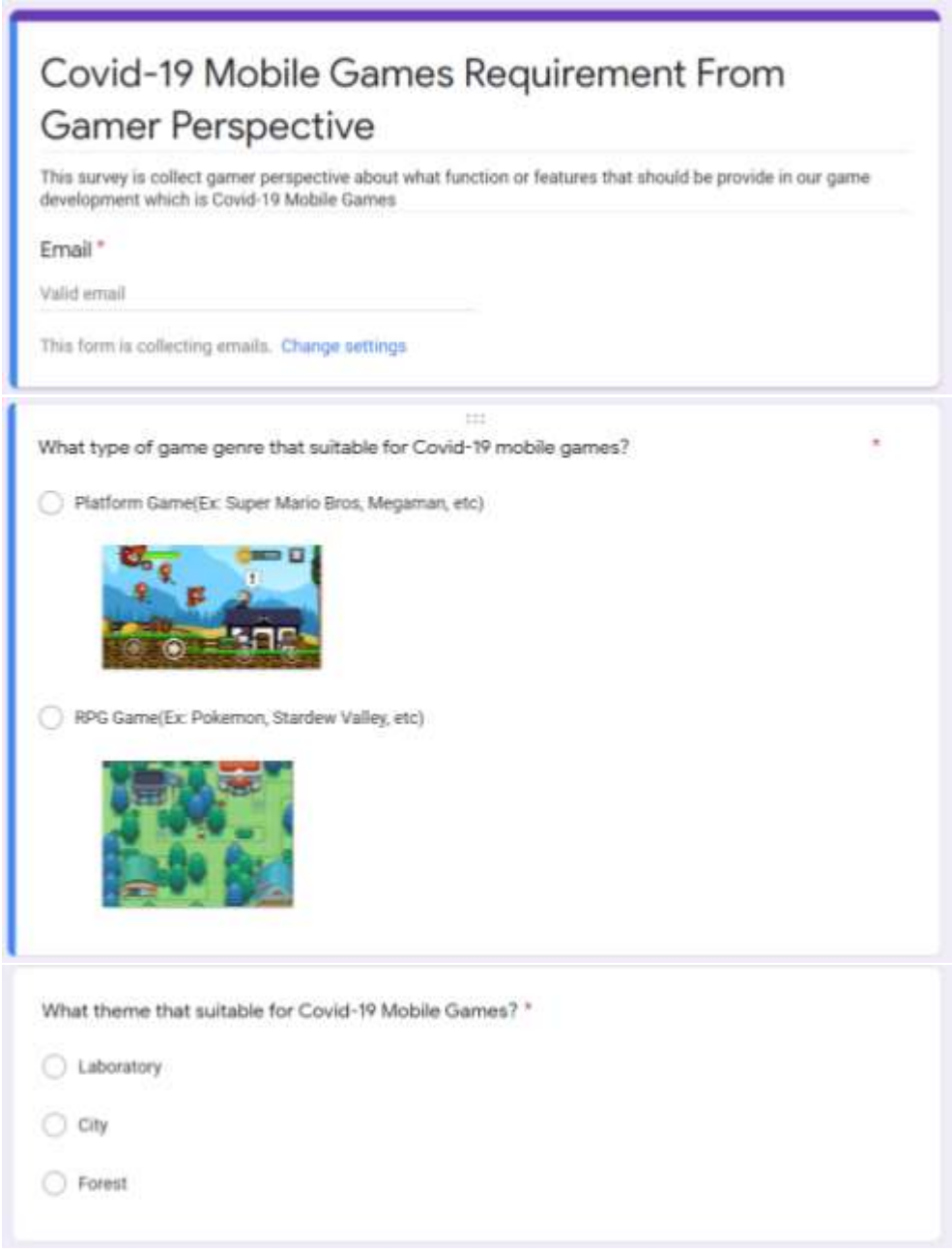
21 -29

30 and above


Section B: Learning Approach of Covid-19
Description (optional)
Do you aware about the threat of Covid-19 virus? *
Yes
No
What type of method do you prefer in learning about Covid-19? *
Reading Books
Social media
Interactive media (games, trivia game etc
What type of learning method do you prefer to use when learning or study about Covid-19? *
Reading
Visual (Image, video etc)


Section C: Educational Game
Description (optional)
Do you think educational game is one of the new method for learning and education? *
Yes
No
Do you think providing information or facts about vaccine using a new method like educational games/interactive application will help people more aware about Covid-19? *
Yes
No
Do you agree using game platform will be an effective method to spread knowledge and awareness about vaccine and Covid-19? *
Yes
No
Do you agree by using multimedia elements such as video game/mobile game will be new learning approach? *
Yes
No

Gamer Perspective Questionnaire



Would it be interested if there any achievement for every task completed? *

- Yes
- No

Do you agree as a gamer, a mobile games that provide with Google login feature to easy access the game. *

	1	2	3	4	5	
Total Disagree	○	○	○	○	○	Total Agree

In your opinion as a gamer, which is more interesting characteristic of the game? *

- The main character that provide with sanitizer blaster to kill the Covid viruses.
- The main character that not provided with any weapon and need to survive from viruses.

In your opinion, to provide with facts about Covid-19 and vaccine with method are more effective? *

- Provide a checkpoint and every checkpoint consist facts or information about Covid-19 and vaccine.
- Show the facts and information about Covid-19 and vaccine at the beginning of every level.

In your opinion, what the main character should be? *

- A robot
- A normal person with PPE(Personal Protection Equipment) suit
- An alien

What the design for enemy of the game should be? *

- Coronavirus monsters form
- Coronavirus bacteria form

What the health equipment should be for the main character to gain health? *

- Vitamin c tablet
- Medical Kit
- Energy Drink

Users Feedback

Covid The Game Feedback

Assalammualikum, and Hello!

This survey is to get user respondent on our game "Covid The Game". This survey provide with Gameplay Video of the game. The link of the game in APK also have been provided for user to download. If user want to give a try and experience the gameplay.

NOTES: Download at your own risk.

Objective of this system:-
1. To spread awareness about Covid-19 in an interactive way
2. To create new platform of learning
3. To provide new learning approach by using multimedia elements

Email *

Valid email

This form is collecting emails. Change settings

Covid The Game Gameplay

Link Download the Covid Game APK

https://drive.google.com/file/d/15KqAkPSkbf8MLOTHXA3jmmdMne9bd1HO/view?usp=sharing


Gender *
Male
Female
Age *
13 - 24
25 - 30
30 and above
Do you have any experience in playing video game (Eg: Mobile Games, Console Games, PC Games) *
Yes
No

Rating Graphics Design in Game

Consist the graphic design of the game such as characters, items and etc.

Rate the main character design. *

	1	2	3	
Unacceptable	○	○	○	Excellent

Rate the enemy design *

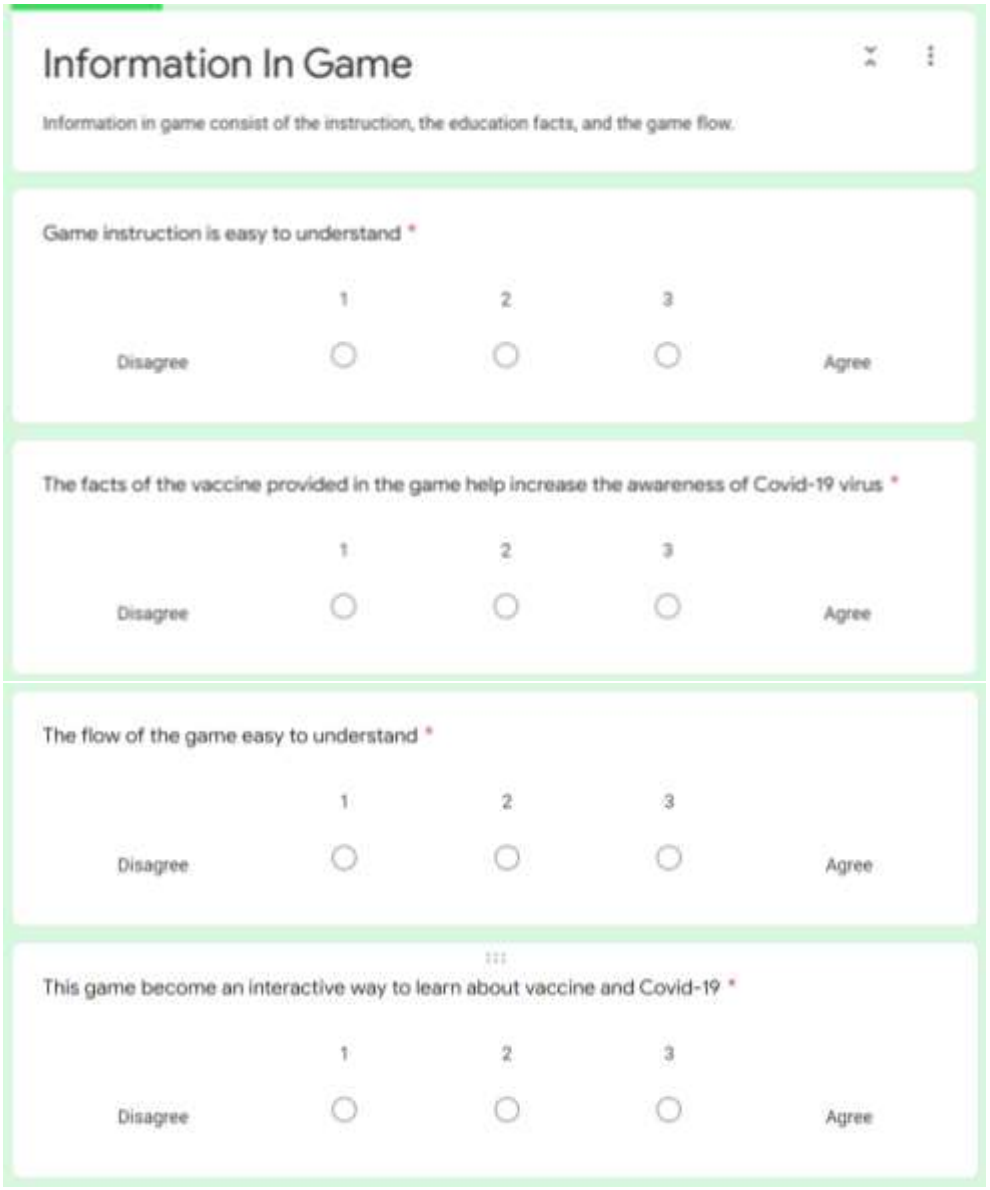
	1	2	3	
Unacceptable	○	○	○	Excellent

Vaccine capsule design *

	1	2	3	
Unacceptable	○	○	○	Excellent

Game interface design overall (Main Menu, Level Menu, and Vaccine Info) *

	1	2	3	
Unacceptable	○	○	○	Excellent

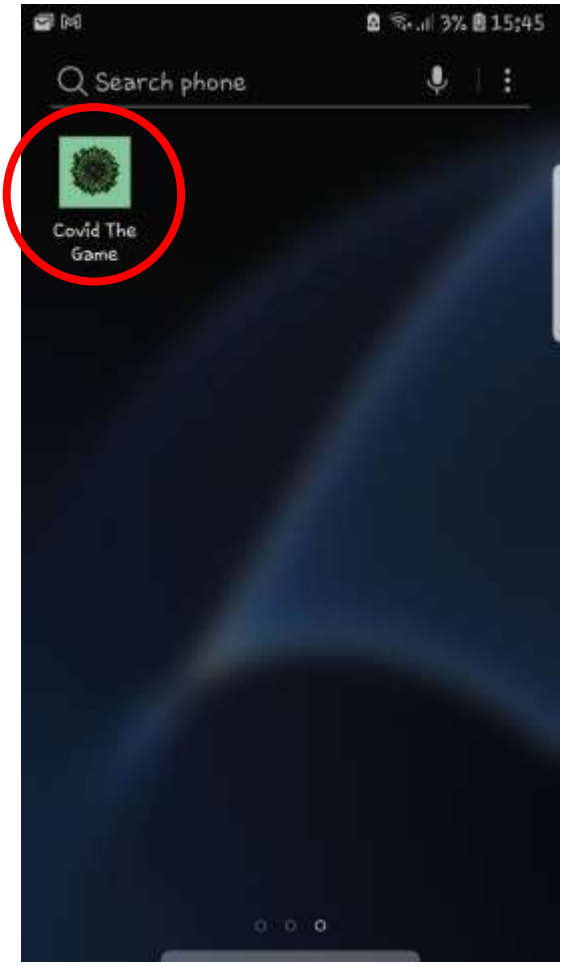

Information In Game
Information in game consist of the instruction, the education facts, and the game flow.
Game instruction is easy to understand *
1
2
3
Disagree
Agree
The facts of the vaccine provided in the game help increase the awareness of Covid-19 virus *
1
2
3
Disagree
Agree
The flow of the game easy to understand *
1
2
3
Disagree
Agree
This game become an interactive way to learn about vaccine and Covid-19 *
1
2
3
Disagree
Agree


Gameplay
Consist of component of the game during the gameplay.
The joystick and jump button to move the character and jump is ... *
1
2
3
Unacceptable
Excellent
The level difficulty (Pfizer, AstraZeneca, Sinovac) is ... *
1
2
3
Unacceptable
Excellent
Obstacles placement (Enemy, Spikes) *
1
2
3
Unacceptable
Excellent
Any suggestions to improve this game development.
Short answer text

Appendix B – User Manual

- **Open the game**

Step 1: First, the user must download the app to their phone.



Step 2: Launch the game. The user will be sent to the main menu of the game.

- **Setting**

Step 1: The user may check the game's sound volume by pressing the setting button.

- **Achievements**

Step 1: Users may check their achievement progress by clicking the achievement button. In the game, show the task.

- **Quit Game**

Step 1: The user can exit the game by clicking the quit game button.

- **New Game**

Step 1: To begin the game, the user must click the new game button. The user will be sent to the level menu.

Step 2: Show the level menu to the user, which includes Pfizer, AstraZeneca, and Sinovac. The level is divided into groups based on the vaccinations chosen.

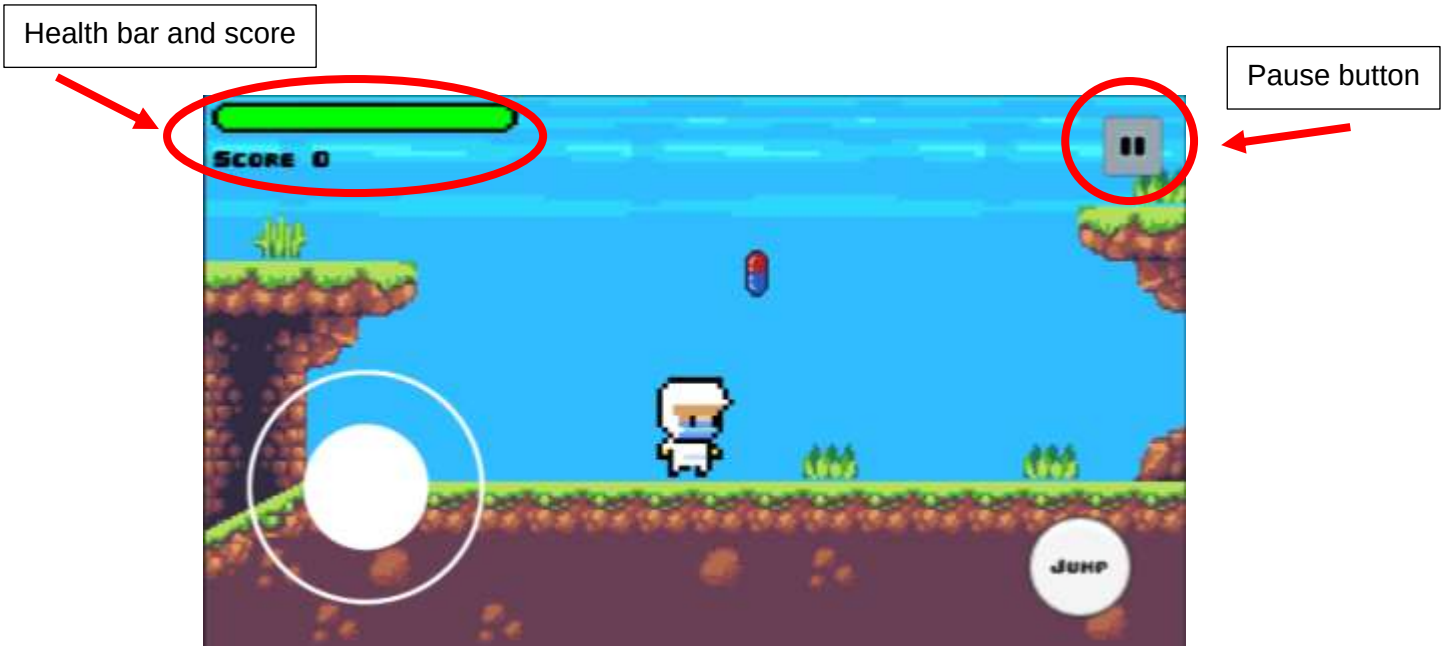
- **Choose Level**

Step 1: The user may select the level they wish to play on. To access the Pfizer level, click the Pfizer button.

Step 2: The user will be sent to the instructions page. It displays the information that the user will need to complete the game's objectives. The user must obtain the vaccIne capsule at the same time dodge the threat. The score for the player or user will be the collectible object. To begin the game, click the next button.

- **Gameplay**

Step 1: The game may now be played by the user. The gameplay interface will be displayed to the user. The bottom portion of the gaming interface contains a joystick and a jump button that may be used to control the character. However, the user healt bar, score, and pause buttons are located at the top.

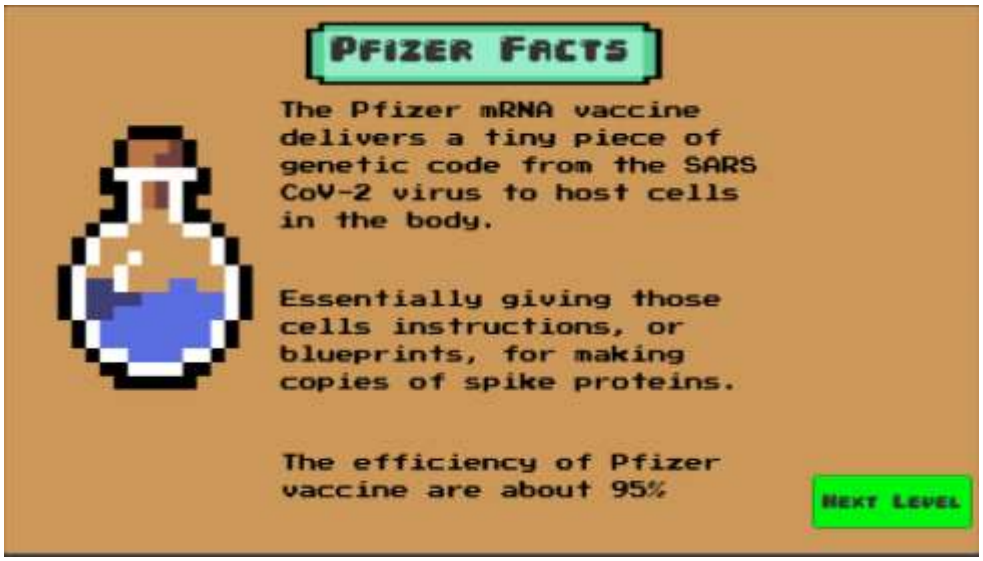


- **Pause**

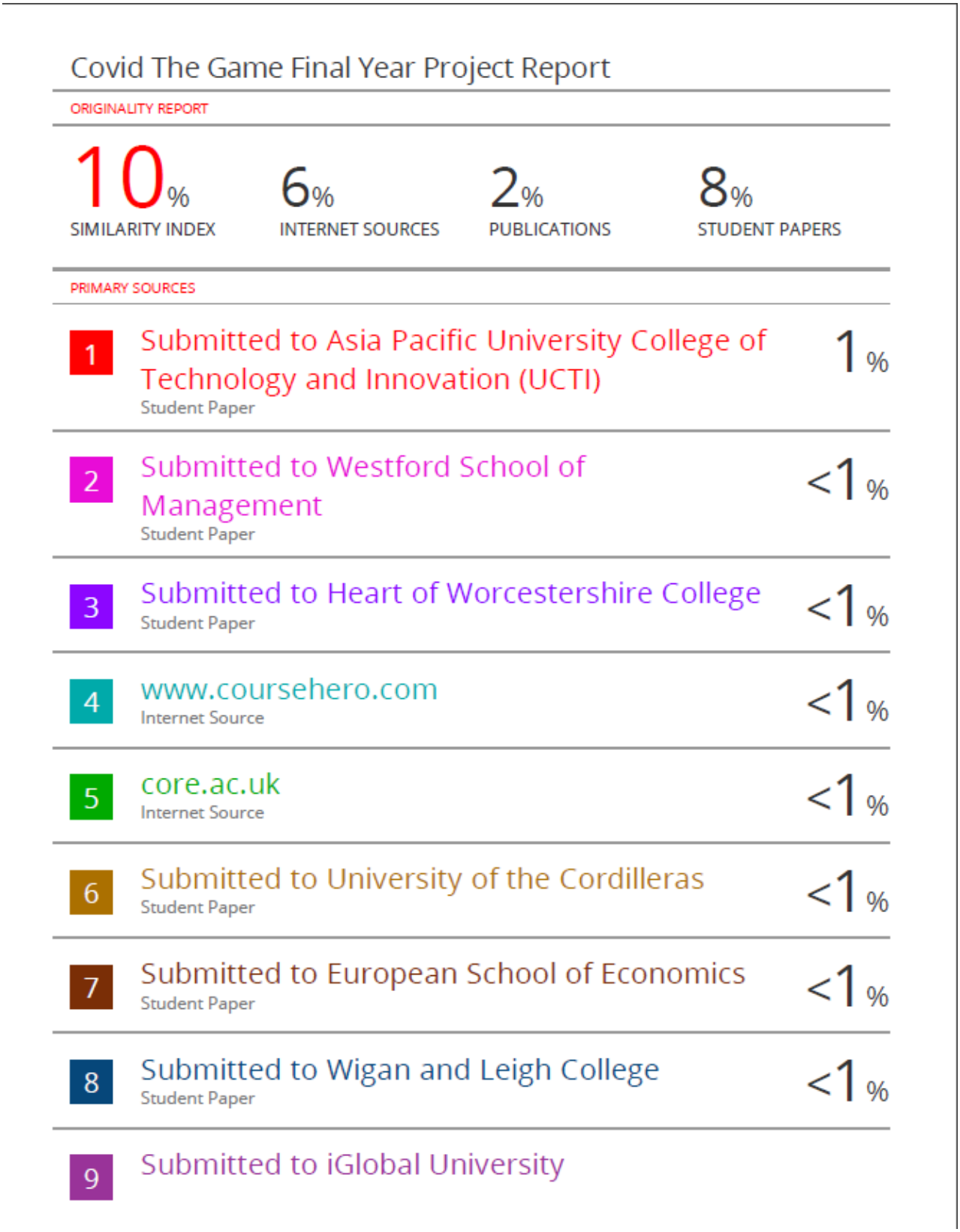
Step 1: The pause menu appears when the user clicks the pause button. The resume, restart, and main menu buttons are all found on the pause menu. To continue the game, click resume, to reset the game, click restart, and to get to the level page, click the main menu button.

- **Vaccines Facts**

  Step 1: When a level is completed, the player is taken to the vaccination information page. Facts regarding the vaccines that the player has obtained will be delivered to the player. To proceed to the next level, click the next button. Every process, from selecting a level to playing the game and pausing it, is identical.



Appendix C – Turnitin Result



Covid The Game Final Year Project Report

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Appendix D – Logbook

FACULTY OF COMPUTING & MULTIMEDIA (FCOM)

COMPUTING PROJECT 2

FYP4025/IMF403

LOG BOOK

STUDENT'S NAME	: MUHAMMAD IKMAL SHAH NOOR AZMI
ID NO.	: AM2001006685
SUPERVISOR	: MADAM WAN NOR ASNIDA BINTI WAN JUSOH
PROJECT TITLE	: COVID-19 MOBILE GAMES

Week		Agenda	Next Agenda	Signature (Supervisor / Coordinator)
1/12/2021 – 7/12/2021	1	• Briefing Final Year Project 2 Planning and time management	• Class 1: Guideline of writing chapter 6, 7, 8	
8/12/2021 – 14/12/2021	2	• Class 1: Guideline of writing chapter 6, 7, 8	• Class 2: Guideline of writing chapter 9 and 10	
15/12/2021 – 21/12/2021	3	• Class 2: Guideline of writing chapter 9 and 10	• Class 3: Ethical Report Writing	
22/12/2021 – 28/12/2021	4	• Class 3: Ethical Report Writing	• Preparing Final Report and Project Development	
29/12/2021 – 4/1/2022	5	• Preparing Final Report and Project Development	• Preparing Final Report and Project Development	
5/1/2022 – 11/1/2022	6	• Preparing Final Report and Project Development	• Preparing Final Report and Project Development	
12/1/2022 – 18/1/2022	7	• Preparing Final Report and Project Development	• Preparing Final Report and Project Development	
19/1/2022 – 25/1/2022	8	• Preparing Final Report and Project Development	• Preparing Final Report and Project Development	
26/1/2022 – 2/2/2022	**MID TERM BREAK**			
3/2/2022 – 9/2/2022	9	• Preparing Final Report and Project Development	• Preparing Final Report and Project Development	

10/2/2022 – 16/2/2022	10	• Preparing Final Report and Project Development	• Carry out alpha testing in collaboration with the supervisor	
17/2/2022 – 23/2/2022	11	• Carry out alpha testing in collaboration with the supervisor	• Carry out beta testing in collaboration with public user • Refine prototype	
24/2/2022 – 2/3/2022	12	• Carry out beta testing in collaboration with public user • Refine prototype	• Presentation briefing • Prepared slides presentation	
3/3/2022 – 9/3/2022	13	• Presentation briefing • Prepared slides presentation	• Preparing to do final presentation	
10/3/2022 – 16/3/2022	14	• Final presenting of the Covid The Game	• Submit final reports and slide presentation	
STUDY WEEK				