

PUBLIC AWARENESS THROUGH GAME-BASED LEARNING

Project Id: 2020-054

Final Thesis Report

Dassanayake D.K.M.P.M.M

B.Sc. (Hons) Degree in Information Technology

Department of Information Technology

Sri Lanka Institute of Information Technology

Sri Lanka

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(Final Thesis documentation submitted in partial fulfilment
of the requirement for the Degree of Bachelor of Science Special (honors)
In Information Technology)

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DECLARATION

“We declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Date: 07.09.2020

[Dr. Windhya Rankothge]

Abstract

This research is to demonstrate about educate the public about four main problems facing by Sri Lanka using Game Based Learning. In this research report we are mainly focused on Health Awareness. Based on health awareness we are mainly focusing on Dengue fever. The Dengue menace is widely spread in the Island and the People are suffering a lot without a proper awareness and premeditation. Finally, we are implementing a game-based learning platform named **AwareME** to learn people about above Dengue Awareness. Beginning of this research we are gathering information from some source of public [School Children, Middle Class Families, well Educated Personalities] to identify the current knowledge of these three functions about Dengue Fever. We are using well prepared questionnaires to gather information from the public. After analyzing the gathered information from the public, we are identifying what are the abilities should improve by the public to aware of these topics of Dengue Fever with more accuracy [Ex: Thinking ability, Recalling ability]. After identify the abilities what should improve as mentioned above categories of public, we are scheduled to be finalize the most suitable game to improve the identified abilities of the people. We are using Virtual Reality techniques and 3D Modeling for improve the creativity of the game. The main goal of this Health Awareness Module is to educate public about, what are the abilities should improve by them to Prevent, Response and Recovering from Dengue Menace using Game Based Learning

Keywords: Game Based Learning, Awareness Games, Health Awareness

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The work mentioned in this document was carried out as our 4th year research project for the CDAP module. This project is the result of all the dedicated work of the group members and the encouragement, support and guidance of many others. Our team would like to express our appreciation to everyone who has supported us in fulfilling this important task.

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Contents

1 INTRODUCTION	11
1.1 Background	11
1.2 Literature survey	17
1.2.1 Common problems Faced in Existing System	17
1.3 Research Gap	19
1.3.1 Existing activities	20
1.4 Research Problem	23
1.5 Research Objectives	24
1.5.1 Main Objective	24
1.5.2 Specific objectives	25
2 METHODOLOGY	28
2.1 Flow of the Project	28
2.1.1 Requirement gathering and analysis	29
2.1.2 Design	30
2.1.3 Implementation	30
2.1.4 Testing	34
2.2 Tools and Technologies	35
2.2.1 Technologies	35
2.3 System Overview Diagram	39
2.4 Commercializing aspect	39
3 RESULTS AND DISCUSSION	41
3.1 Health Awareness – Results	41
3.2 Research Findings	42
3.3 Discussion	43

4 Summary of Students Tasks.....	44
5 CONCLUSIONS.....	45
References	47
6 Appendences	49
7 Budget and Budget Justification	51

List of Figures

Figure 1. 1 Current working status of participants.....	12
Figure 1. 2 Attending percentage to awareness sessions	13
Figure 1. 3 is it successful.....	13
Figure 1. 4 Knowledge participants	13
Figure 1. 5 Find the better games to be implemented.....	14
Figure 1. 6 Identify the abilities should improv	14
Figure 1. 7 Feedback of the participants	15
Figure 1. 8 Dengue Free child game	20
Figure 1. 9 The age of dengue game.....	21
Figure 1. 10 dengue cases report by WHO 2019	24
Figure 1. 11 Identify the most suitable game.....	26
Figure 2. 1 Methodology of Health Awareness	28
Figure 2. 2 Flow of the model.....	29
Figure 2. 3 AwareME Kiddies dengue 2D puzzle game MENU.....	31
Figure 2. 4 AwareME Kiddies dengue 2D puzzle game Level1	32
Figure 2. 5 AwareME Kiddies dengue 2D puzzle game Level2	32
Figure 2. 6 AwareME Adults dengue 3D action game Level1	33
Figure 2. 7 AwareME Adults dengue 3D action game Level2.....	34
Figure 2. 8 System overview diagram	39
Figure 2. 9 Commercial aspects	40
Figure 3. 1 Bar chart for the result finding of the 2D puzzle game	42
Figure 3. 2 Bar chart for the result finding of the 3D action game.....	42

Figure 6. 1 Public awareness platform flow chart	49
Figure 6. 2 Grant chart of the entire system.....	50

List of Tables

Table 1. 1Research Gap of existing systems.....	22
Table 3. 1 AwareME kiddies' dengue 2D action game results.....	41
Table 3. 2 AwareME adults dengue 3D action game results	41
Table 4. 1 Summary of Students Tasks.....	44
Table 7. 1 Budget and Budget Justification	51

1 INTRODUCTION

1.1 Background

We are live in a 21st Century. Here is Lord Buddha Quotes “health is the greatest gift, contentment the greatest wealth [1]. In the beginning of this Century as a developing third world country Sri Lanka facing some Health issues. According to the Health Ministry Reports Dengue Fever is the most widespread fever in Sri Lanka in past few decades. Based on Divisional Secretariat Health Departments Reports public are not much aware about this deadly menace.

Currently in Sri Lanka.2010, 2261 dengue infections and 24 deaths informed by WHO, after 10 years of time its increases to 55,894 infections and 74 confirmed deaths by the end of the 2019 October. Based on the the Epidemiology Unit Records, December to February rainy conditions expected the increasing of dengue deaths. WHO reports shows 80% of human activities responsible for increase numbers in past 10 years of time [2] Most of health awareness sessions were conducted by the divisional secretariat to inform people about this deadly menace but the minimum attractiveness and understanding of the sessions wasted their hope? Then they required a more accuracy mechanism for increase the awareness rate of public with maximum attractiveness.

When the people are unaware of what are the necessary actions should take to prevent dengue fever. How to take remedial measures when dengue gets infected. Finally, what are the actions needs to take recovering after dengue gets infected. As a solution for the above-mentioned problems we are implemented a game-based learning platform for increasing the public awareness. In this Thesis document Mainly focusing on Health Awareness based on Dengue Fever.

The public should have proper practice and should remember the steps quickly to save themselves in such a situation. Since people are busy with their own work and have less time

to engage in practical sessions. According to the Health Awareness module Research Team

conducted a questionnaire session using a google form to gather data from general public.

Fifty participants are participated to this questionnaire as a profession well educated people's

middle class peoples and School Children's.

According to the information gathered,

- i. Fifty Responses participated to the Online Survey. Different Age groups And different working status.

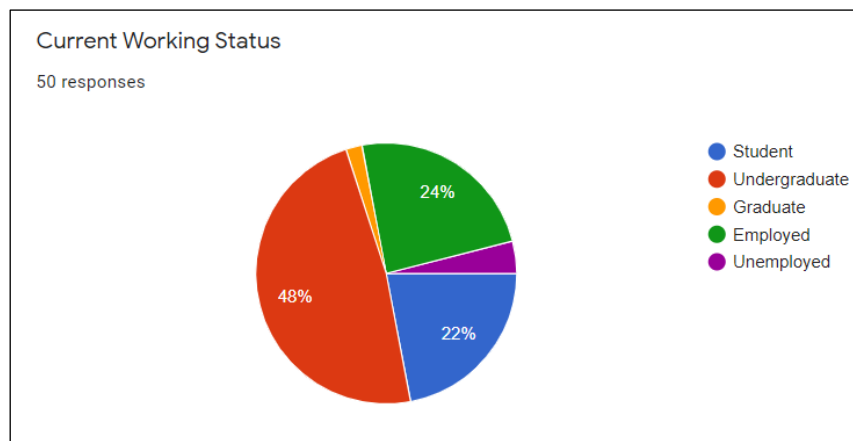


Figure 1. 1 Current working status of participants

- ii. The most common reasons for not participating in dengue awareness programs are having no free time, being uninterested and believing that this is not the case.

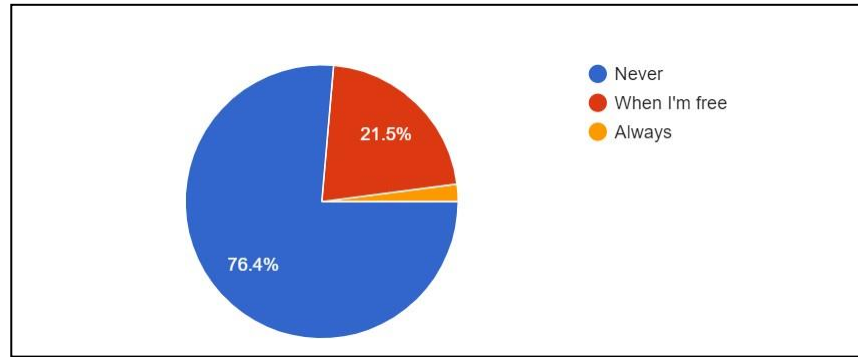


Figure 1. 2 Attending percentage to awareness sessions

- iii. Even if people participate in dengue awareness programs, less amount of them believes those programs are useful.

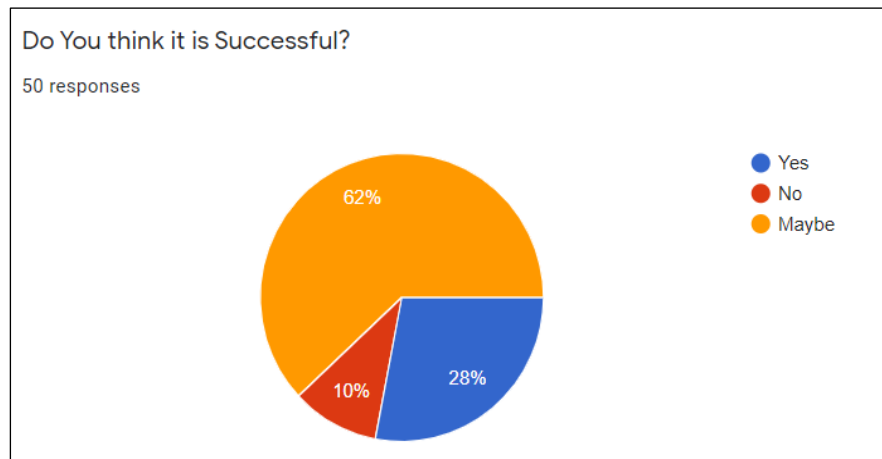


Figure 1. 3 is it successful

- iv. A small amount of people has middle and less knowledge about dengue fever

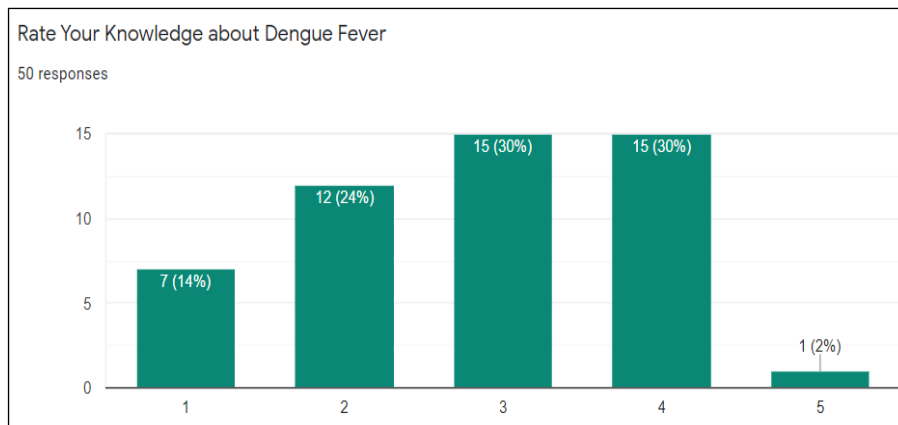


Figure 1. 4 Knowledge participants

- v. Most people prefer Puzzle games while there's a considerable amount of people interested in Action games & quizzes too.

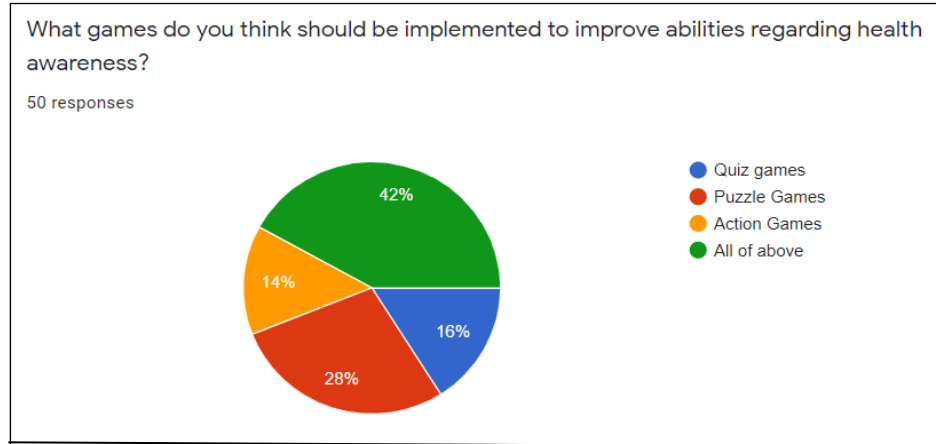


Figure 1. 5 Find the better games to be implemented

- vi. Identified abilities should improve by the public

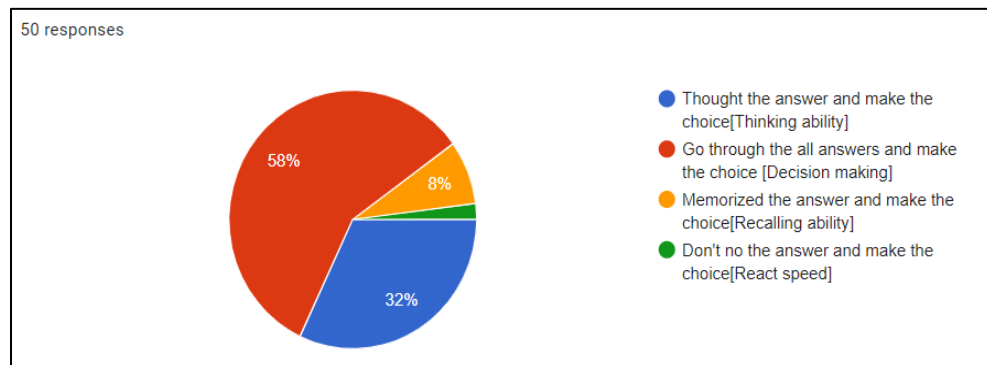


Figure 1. 6 Identify the abilities should improv

- i. Our questionnaire achieved the following ideas in addition through the Google form survey.

Reason for choosing the games to be implemented? *

Action is better than words

Add individual feedback

Reason for choosing the games to be implemented? * So we can improve the knowledge about Dengue fever and how to react.. Add individual feedback
Reason for choosing the games to be implemented? * I think all games are familiar with public and easy to learn and improve knowledge via these games Add individual feedback
Reason for choosing the games to be implemented? * I guess it's far more practical Add individual feedback
Reason for choosing the games to be implemented? * Puzzle Games are more attractive and complicated Add individual feedback

Figure 1. 7 Feedback of the participants

Mobile devices know people better in modern society, and it is very easy to create something memorable for people with the help of a mobile game as it gives them the opportunity to actively participate in the game's activities [3].

The main objective of this module is to improve the skills that the public should improve in order to prevent, respond to, and recover from the dengue threat. Improve the identified skills and implement a mobile game called "AwareME" which includes the steps to be followed at each stage of dengue

awareness so that they can be easily saved and put into action when needed.

Modern society is more passionate about mobile games than attending the practical sessions of the divisional secretariat, health organizations, and non-governmental organizations. This allows people to interact with the activities in their free time and get good practice in the steps that should be taken to save themselves from the dengue threat by playing multiple times. In addition, the games are designed separately for children and adults. Therefore, the goals of the dengue awareness programs can be more accurately achieved through the activities in mobile game.

The first module of “AwareME” platform focuses on health awareness, specifically on dengue threat. We have identified three main stages for dengue awareness: (1) awareness on preventing dengue fever, (2) awareness on responding when suffering from dengue fever and (3) awareness on speedy recovering from dengue fever [4]. We have developed a puzzle game to improve thinking ability and recalling ability and, a 3D Action game to improve the decision-making ability for above mentioned awareness stages. The puzzle game has five levels and levels are categorized into three parts as thinking, memorizing, and summarizing. As shown in Figure 3, a standard

puzzle is given to think and solve at a given time, targeting to improve the thinking ability. After the successful completion of puzzles, a tag with specific actions required for previously mentioned dengue awareness stages is shown, to read and memorize. Finally, for the summarizing, players are required to identify the correct summary, which describes the specific actions required for corresponding dengue awareness stage.

The 3D action game has three levels, it uses maze runner decision making concept. Players must take necessary decision-making actions to get out from the maze in given time and collect some required coins to complete the levels. Decisions are based on dengue prevention, response, and recovery.

1.2 Literature survey

1.2.1 Common problems Faced in Existing System

At this time public awareness is a challenge facing by the Sri Lankan Government. And also making people aware about, as a public how we should prevent from the dengue fever is another big challenge. In here briefly explain about past awareness approaches by researchers using game-based learning, dengue awareness through game-based learning, improvements of abilities using game-based learning.

Sherlock Dengue

Diego Bachinger and Marcelo da Silva Hounsell are graduate students in Santa Catarina State University, DCC – Computer Science Department, Brazil. for final year research project, they implement a game including 8 sublevels for aware people about dengue fever. in this research they focusing on traditional learning concept. Some levels of that game there using Augmented Reality Technology. And some levels they used Virtual Reality Modeling Language [VRML]. They used sherlock homes 3d model as an Actor in this game. In this research they using Sherlock Holmes investigative skills and thinking ability to increase the effectiveness and the awareness of public [5].

Debriefing Study -The Good Bye to Dengue Game

In 2005 Jeffery L Lennon and David W Coombs publish a research paper about dengue They implement an educational gaming tool called GBD for school age children. The purpose of this research was to examine the debriefing of Philippine students after playing of the health education game on dengue fever. And 4 determining the student's opinions of this game, their awareness of dengue fever and finally explore the possibilities

of this game. In this research, researchers mainly focused on data collection part. They collect data from two different school grade 5 students. And check the current awareness of students. And they encourage students to play the GBD. After finished the game play researchers manually analyze the new awareness status of the students who play the game with the students who didn't play the game [6].

Playing against Dengue-X Dengue

A Serious game called X Dengue developed by Tiago Lima and Bremono Barbadosa. They published this research paper in 2006. These two mainly used gamification techniques to stimulate the motivation of their target audience. This game-based learning platform divided their tasks into two categories called research and the development. Based on the research part their aiming and requiring the specific related knowledge about application domain [Ex: Vectors Life Cycle, dengue transmission dynamics] based on the gathered information in the development part researchers are conceiving, designing, building and evaluating the Virtual Reality Prototypes. And also, they used Augmented Reality technology for some levels of the game. In this module players are facing 3D models and 2D models along through the game play [7].

The utility of a board game for dengue hemorrhagic fever

Dengue hemorrhagic fever is the dangerous hazard that goes beyond the normal dengue fever. Researchers publish this research to educate school children about how to prevent dengue hemorrhagic fever using game-based learning concept. The purpose of this research is to test the effectiveness of an educational board game for increasing knowledge, positive attitudes and the self-efficacy for dengue prevention among the school children. Researchers have found out the lectures in the schools are no more valuable concept for educate students about these deadly menaces. Then they decided to implement

a school-based pre-test /post-test experimentally controlled game-based learning platform to aware students about this deadly hazard. They used simple game implementing technologies to develop this game. Finally, as a result the student who play the game improved their positive attitudes and self-efficiency and improve their current knowledge about dengue hemorrhagic fever than who are not play the game [8].

1.3 Research Gap

After decreasing the efficiency of awareness sessions, researchers are found out a new concept of awareing public.it is game based learning. Dengue awareness using game-based learning is a new research area that researchers are mainly focusing on past decade. These days the gaming industry is growing fast and new tools and technologies are introducing to the technological world. Then the value of the game-based learning concept is increasing in day by day. Sherlock Dengue Game is well prepared virtual reality game using 3D modeling. (1) they used Sherlock Holmes investigative and thinking abilities to implement the game. Mainly focusing on the implementation parts of the game. They encouraging only the school children to play the game. According to the good bye dengue game is a web-based application implemented using Augmented Reality Technology.in this research they mainly focusing about the data collection part. they manually getting feedbacks from the children those who play the game and who are didn't play the game to check the new awareness status. There is no much consider to the game development process. They also encouraging only the school children to play the game.

X-Dengue game is a web-based gaming platform. It's mainly using gamification techniques to implement the game. They mainly focusing on information gathering about dengue fever as research part of this research. There are not much focusing about user abilities.in the development part there using 2D models to implement the X-Dengue Game. There is no much idea about using 3D modeling. There is no use of virtual reality technologies. Dengue hemorrhagic fever Game is a simple utility board game. There is no use of virtual reality technologies and 3D modeling. They mainly focusing on to

improve positive attitudes and the self-efficiency for Dengue Prevention among the School children. Focusing only the school children. AwareME (Proposed game) is a game-based learning mobile application using virtual reality which help the users to improve their abilities to educate about how they should prevent from the dengue fever. Mainly we are considering about what are the abilities should improve by the younger generation and the elder generations. After analyzing the gathered data, we implementing most suitable games according to the mentioned generation satisfaction.

1.3.1 Existing activities

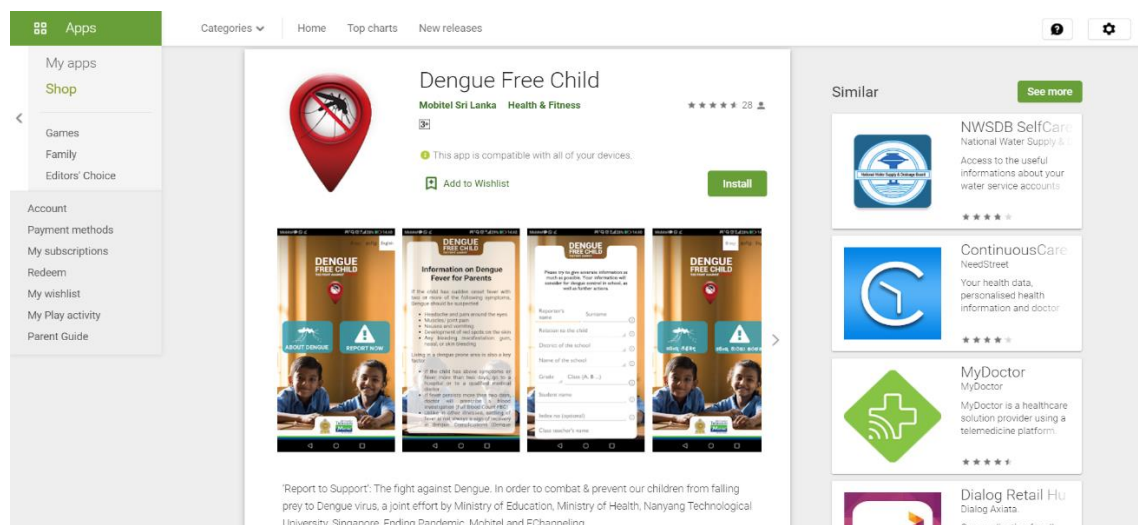


Figure 1. 8 Dengue Free child game

Dengue Free child mobile health and fitness app mainly designed for children to educate about dengue menace. it is mainly based on theoretical parts that children should know to prevent this deadly fever and reporting to the health ministry and health Organizations where the breeding places of dengue mosquitoes.

Two main categories are identified in this app

1. About Dengue – information about dengue fever in worldwide
2. Report Dengue – Reporting to the authorities about dengue breeding places

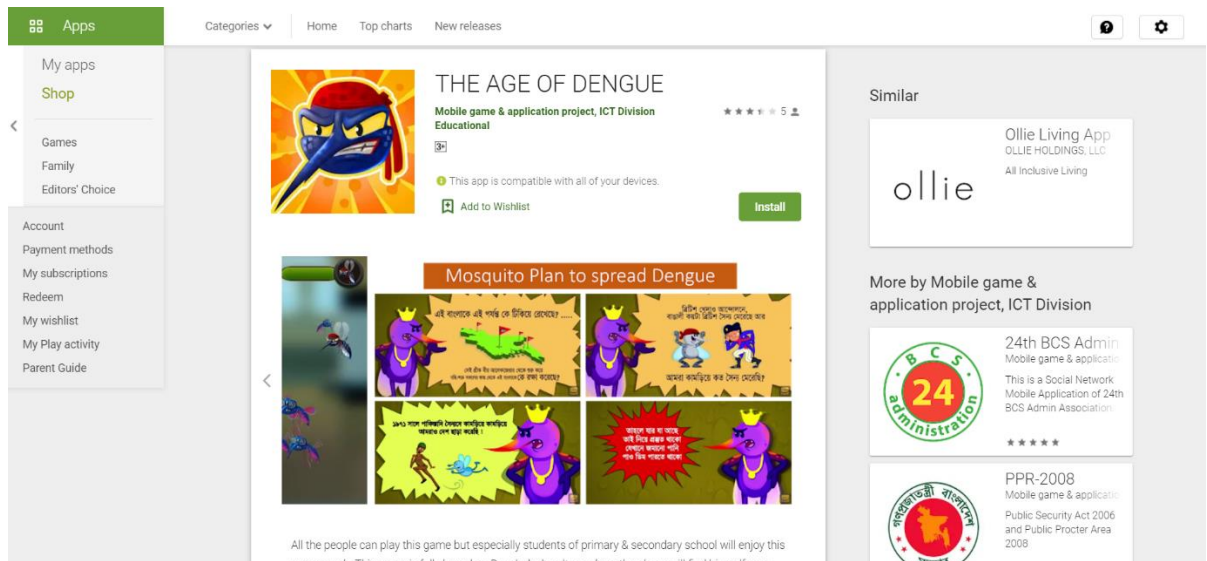


Figure 1. 9 The age of dengue game

The Age of Dengue Game App implement to the children as an educational game. Two categories are reidentified in this game.

1. Fighting with dengue mosquitoes.
2. Breeding plan of dengue mosquitoes

Table 1. Research Gap of existing systems

Features	Sherlock Dengue Game [1]	Good Bye Dengue Game [2]	Design and develop ment Serious Dengue game [3]	Dengue homeorheti c Fever Game [4]	Proposed Game [AwareME]
Identifying the abilities of the player should improve	√	X	X	X	√
Identifying the most suitable game to be implement	X	X	X	√	√
Using Virtual Reality	√	X	√	X	√
Using 3D modeling prototypes	√	X	√	X	√
No restriction for the different ages	√	√	X	X	√

1.4 Research Problem

There are many types of public awareness programs presenting in Sri Lanka to understand people how they respond and solve public problems in day to day life. In past decade's awareness programs are a bit similar, bored as well as complex, therefore the public faced difficulties in understanding how they should respond public problems living through the society. However, in the modern society in Sri Lanka game-based learning is a new and certified concept to aware people easily about the problems. In fact, public awareness through game-based learning is rather a new conception. It has not been the subject of much researches.

After analyzing the Gathered information by the divisional secretariat, we found out Dengue fever is the most dangerous hazard facing by Sri Lanka in past decades. In this proposal report we are mainly focusing on to educate public about how to prevent the dengue fever using game-based learning. we are implementing Virtual Reality games to inform public about as a citizen how we should prevent the Dengue menace.

The greatest wealth is health, currently in present days Dengue is the most widespread fever in world as well as Sri Lanka. In 2010, 2261 dengue infections and 24 deaths informed by WHO, after 10 years of time its increases to 55,894 infections and 74 confirmed deaths by the end of the 2019 October [9]. WHO reports shows 80% of human activities responsible for increase numbers in past 10 years of time. Most of health awareness sessions were conducted by the divisional secretariat to inform people? But the minimum attractiveness and understanding of the sessions wasted their hope. Mainly we are on the process to find out the answers to below mentioned question using game-based learning.

□ How do we prevent, response and recovering from dengue?

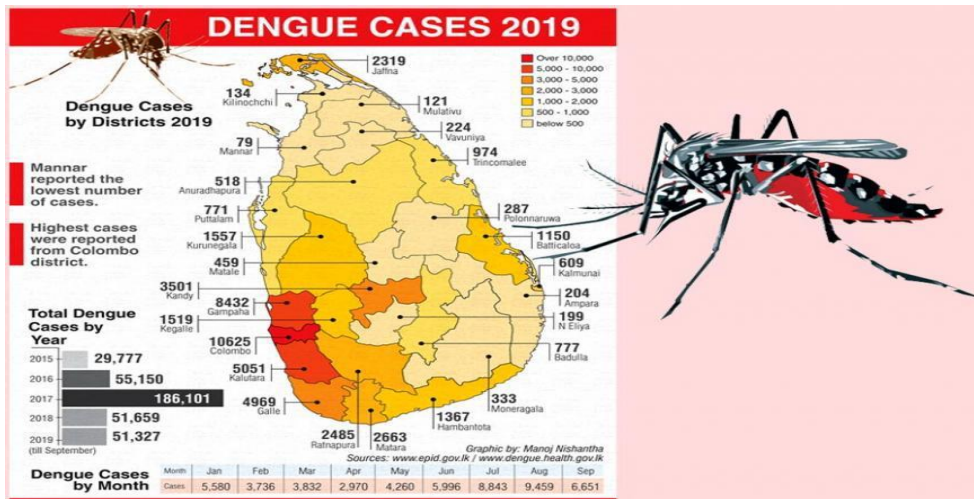


Figure 1. 10 dengue cases report by WHO 2019

This is the Sri Lankan Health Ministry Dengue Cases Chart releasing on 2019 to describe the increases and decreases of the dengue cases in all over the Sri Lanka. According to the chart the highest dengue cases [10625 Cases] reported in Colombo District. And the lowest cases reported is in Mannar District [79 Cases]. In 2015

29,777 Cases reported to the health ministry. in Last 05 Years of time highest Dengue Cases reported [186,101 Cases] in 2017.in 2019 51,327 Dengue Cases reported to Health Ministry [10]. This Increases of numbers show People are not much aware about these Deadly Menace.

1.5 Research Objectives

1.5.1 Main Objective

In this research part main objective is improving abilities to making people aware about dengue prevention using game-based learning. This help people to understand how to take remedial measures to prevent the dengue fever. How we should response when dengue gets infected and what are the methods should use to recover dengue fever. when it comes

to improving the abilities as an example if a man moving, see a coconut shell on the ground with full of water. He knows that it is a dengue breeding site. But in his busy situation he ignoring it. Then we can assume that his decision-making ability and thinking ability is in a low level. After analyzing the gathered information from the public, we are identifying what are the abilities in low level [Ex: Thinking ability, Recalling ability]. And improving that abilities using game-based learning. So, generate players who are aware of prevent dengue fever by improving their low-level abilities through a game-based learning platform is an effective main objective of this research.

1.5.2 Specific objectives

Gathering information to identify the current awareness level and current abilities of the people related to dengue menace.

Thinking ability improvement

According to the data analysis report research team identified children are least in thinking ability in this health awareness module on dengue prevention is improved through a puzzle game. This puzzle game mainly designed to children. Included Tasks on this puzzle game help to improve their thinking ability, and the player gets the knowledge on the methods of preventing, response and recovering from this deadly menace.

Improve effective decision making

According to the information, children and adults are the least improved in their decision-making ability. To improve decision-making skills, our research team implemented a 3D action game based on the decision-making concept of the maze walker. The player should take the necessary measures to get out of the maze in due course. The decisions are based on dengue prevention, response and recovery.

Improve the recalling ability

Children get the least improvement based on information gathered from the public. 2D Puzzle and 3D Maze Action Game recommend that both children and adults. 2D puzzle game design in three categories: thinking, memorizing, and summarizing. A summary category was added mainly to improve this recall ability. After the task is fully completed, players will need to identify the correct summary that describes the specific actions required for the appropriate dengue level of awareness.

Determination the audience of this research

basically, focusing on School Children, middle class people and educated people in the society including 50 participants participated for the online survey.

Identifying the most suitable games for improve the low-level abilities.

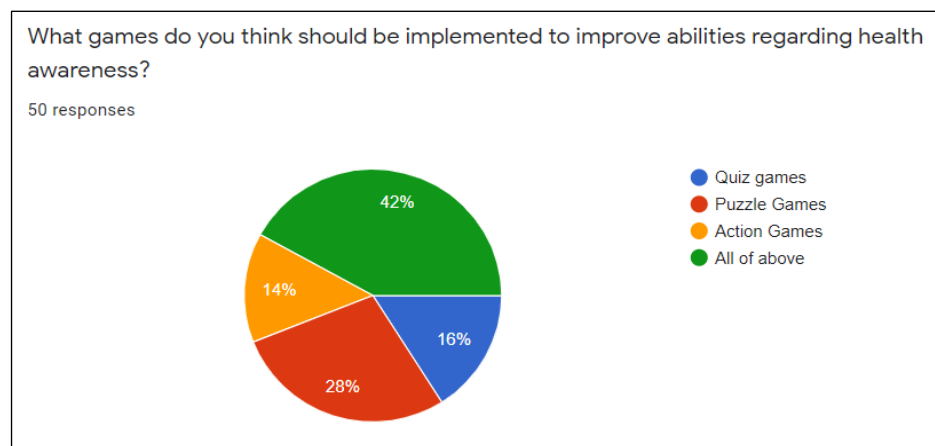


Figure 1. 11 Identify the most suitable game

- Learning about Game based learning Concepts and Virtual Reality techniques to optimize the solution of this project
- Study previous research documents based on Dengue Awareness through Game Based Learning and identifying the successes and failures in that researches.
- Identifying the improvements of the users by testing their awareness levels using score levels.

Based on AwareME 2D Dengue Awareness, the player should complete the task within a certain amount of time and collect the necessary coins to unlock the next level

Based on the AwareME 3D dengue awareness game that calculates the time the maze was vacated. And the player should have to have certain coins to complete the level

2 METHODOLOGY

2.1 Flow of the Project

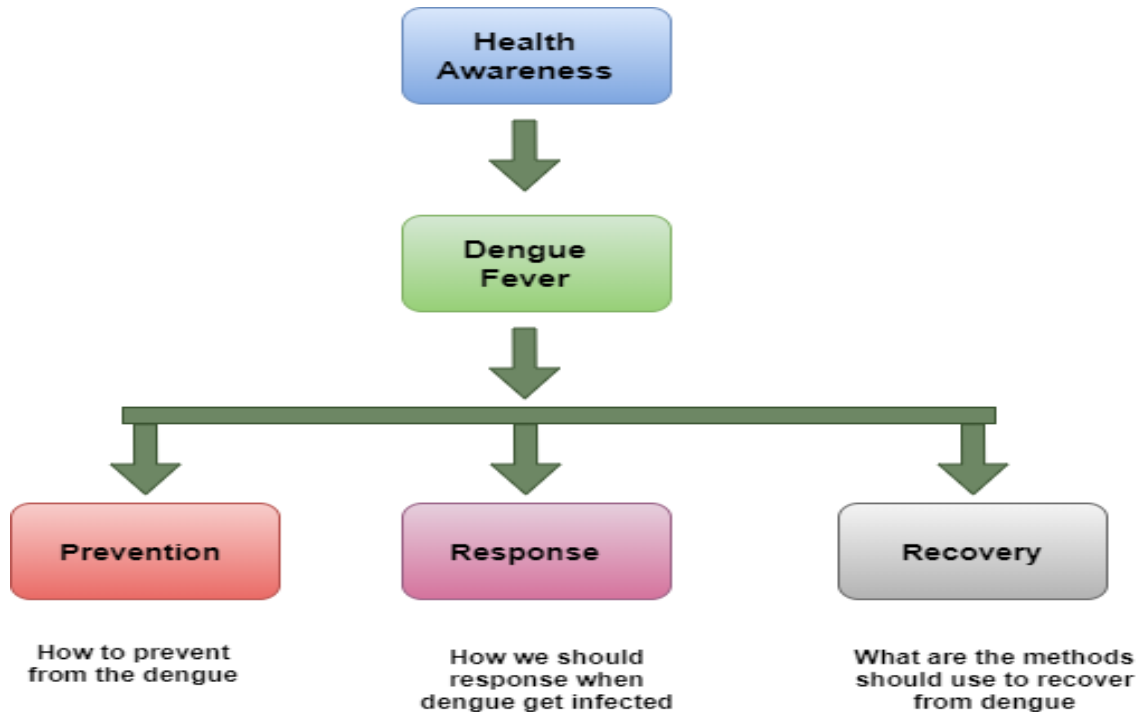


Figure 2. 1 Methodology of Health Awareness

In this project report mainly focused on health awareness based on dengue menace. The WHO have informed the Sri Lankan Health Sources that a considerable number of deaths are reported in Sri Lanka due to Dengue Fever in the past decade. The increase of these numbers of deaths are evident that public not aware about this deadly aspect. After analyzing the gathered data from the Divisional Secretary, Health Departments, we listed down the three types of functions to aware people about dengue fever, and how to take remedial measures to prevent the dengue fever. How we should response when dengue gets infected and what are the methods should use to recover dengue fever. We are using game-based learning concept to aware people about these three functions of the dengue menace.

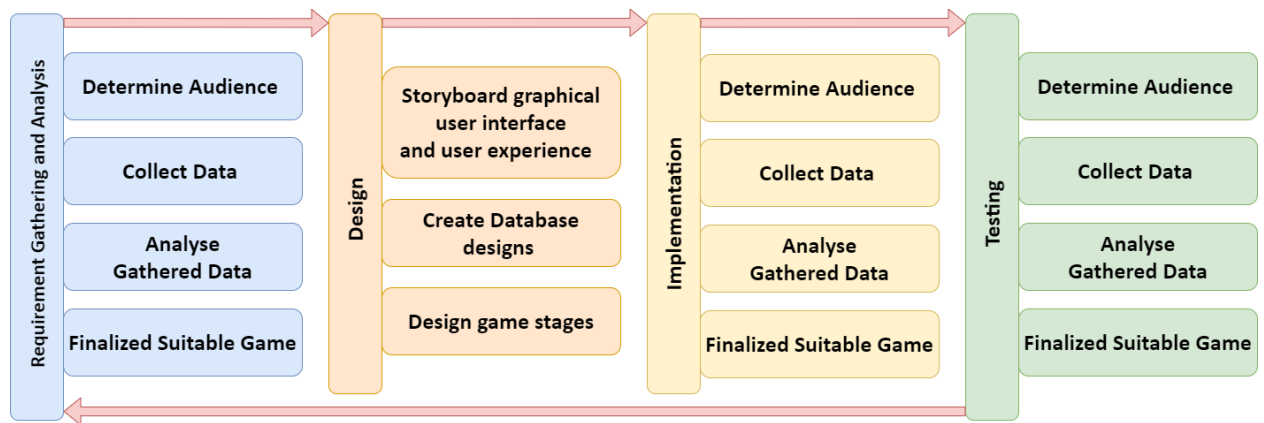


Figure 2. 2 Flow of the model

According to the above figure the process of our research is given. There are 4 flows in the process, Requirement Gathering and Analysis, Design, Implementation and the Testing. Each stage should be completed to move on to the next stage. In every stage there are sub tasks to complete. As an example, if user acceptance and the current awareness is not much in the testing part, the whole process starts again. Here the waterfall software development life cycle is used.

2.1.1 Requirement gathering and analysis

At the beginning of this research, the audience has to decide the data collection process. There are main separate games in the proposed awareness gaming platform based on Dengue Fever, Mainly this game focus on different age groups. It depends on the requirement

In this study, have to gather data to implement the most perfect game to increase people's awareness. Therefor we decide to collect data through the standard questioner. As an example, relevant questions from World Health Organization (WHO). Questionnaire should be designed as needed. The questionnaire gives to a selected group of people and marks each answer. After collecting the data, we need to analyze the data as required

Based on the information obtained, we decide what the best game is to implement for each separate game. The main target of our research is to create a perfect game to enhance people's abilities in thinking, decision making. Four weeks will be set aside for this purpose.

2.1.2 Design

In this phase of the development, the game will be designed. System design helps to gather the system requirements and come up with the overall architectural design. The overall project includes the designing of 4 games which are integrated together by the end. Each game needs a plan for the implementation. In this stage of the game, how to give scores, how the interface appears, sounds, 3d models, database and interface design are built.

2.1.3 Implementation

In the implementation phase, requirement specifications and design specifications will be implemented. The overall project will be implemented using the waterfall model. Virtual reality is the main technology used. Tools such as unity, android studio, adobe photo shop, blender, adobe illustrator and SQLite are used

The first module of “AwareME” platform focuses on health awareness, specifically on dengue threat. We have identified three main stages for dengue awareness:

- (1) awareness on preventing dengue fever,
- (2) awareness on responding when suffering from dengue fever and
- (3) awareness on speedy recovering from dengue fever .

We have developed a puzzle game to improve thinking ability and recalling ability and,

a 3D Action game to improve the decision-making ability for above mentioned awareness stages.

The puzzle game has five levels and levels are categorized into three parts as thinking, memorizing, and summarizing. As shown in Figure 3, a standard

puzzle is given to think and solve at a given time, targeting to improve the thinking ability. After the successful completion of puzzles, a tag with specific actions required for previously mentioned dengue awareness stages is shown, to read and memorize. Finally, for the summarizing, players are required to identify the correct summary, which describes the specific actions required for corresponding

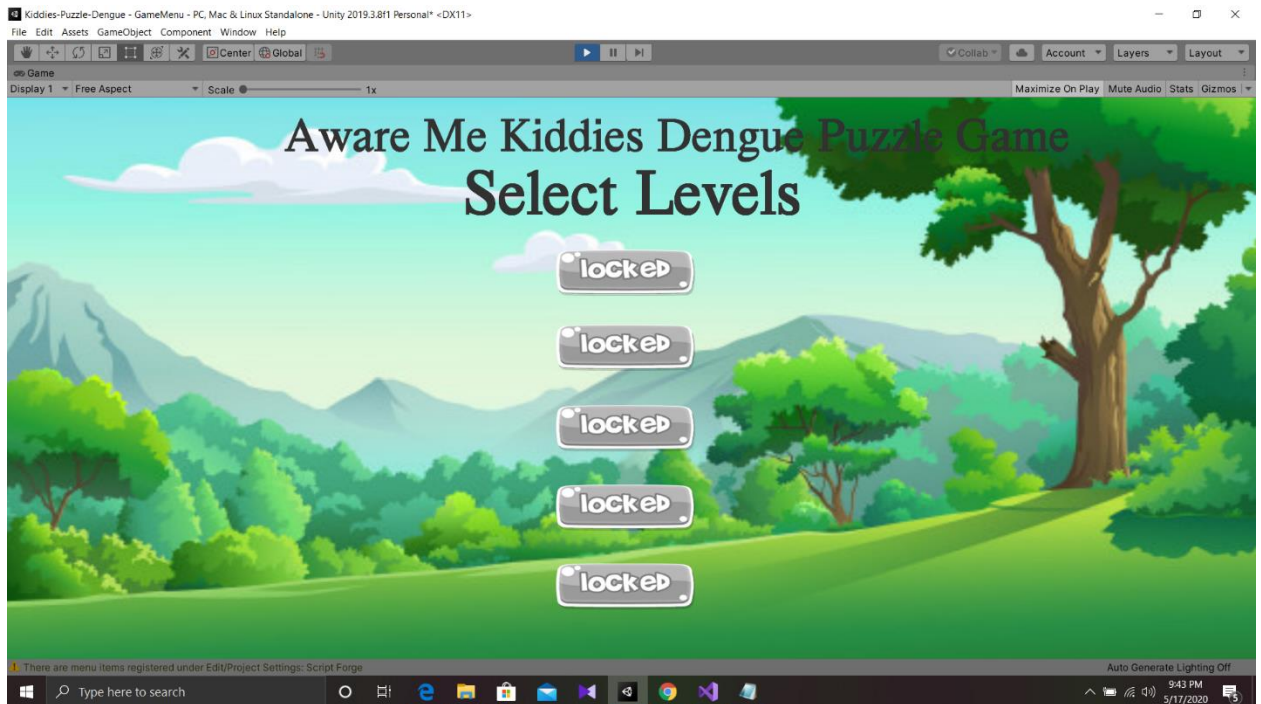


Figure 2. 3 AwareME Kiddies dengue 2D puzzle game MENU

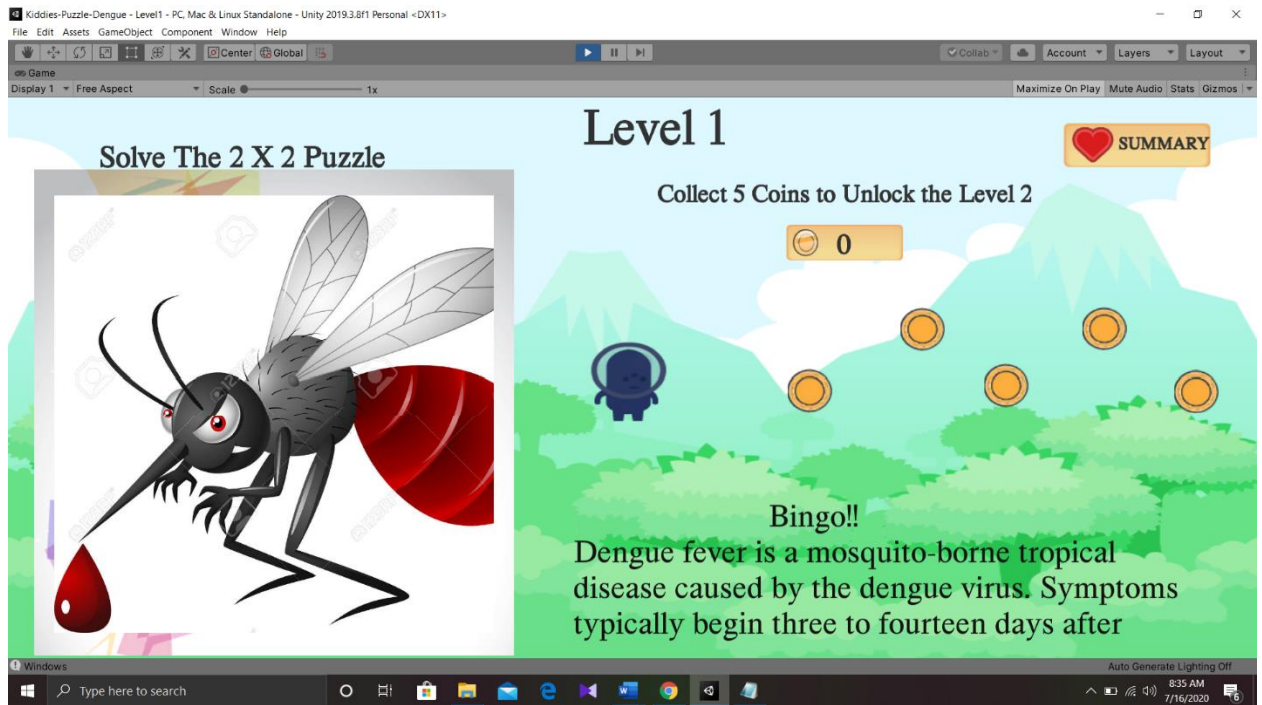


Figure 2. 4 AwareME Kiddies dengue 2D puzzle game Level1

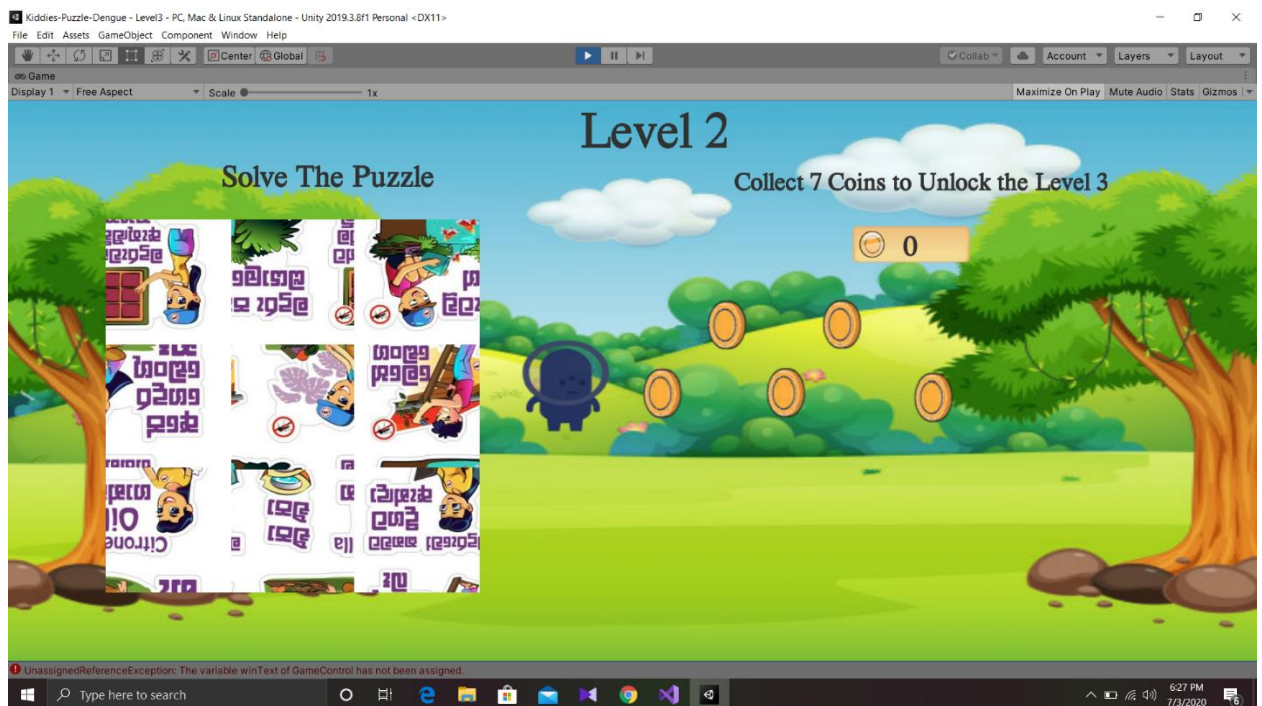


Figure 2. 5 AwareME Kiddies dengue 2D puzzle game Level2

The 3D action game has three levels and as shown in Figure 4, it uses maze runner decision making concept.

Players must take necessary decision-making actions to get out from the maze. Decisions are based on dengue prevention, response, and recovery.

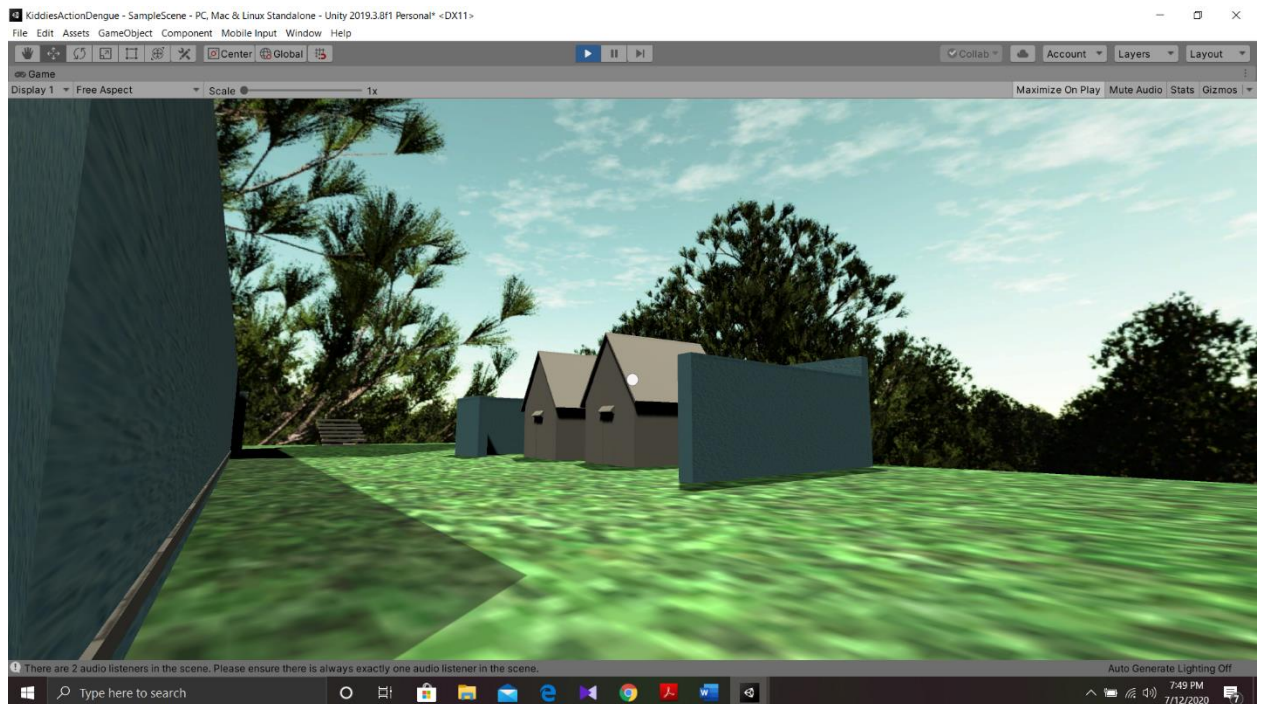


Figure 2. 6 AwareME Adults dengue 3D action game Level1

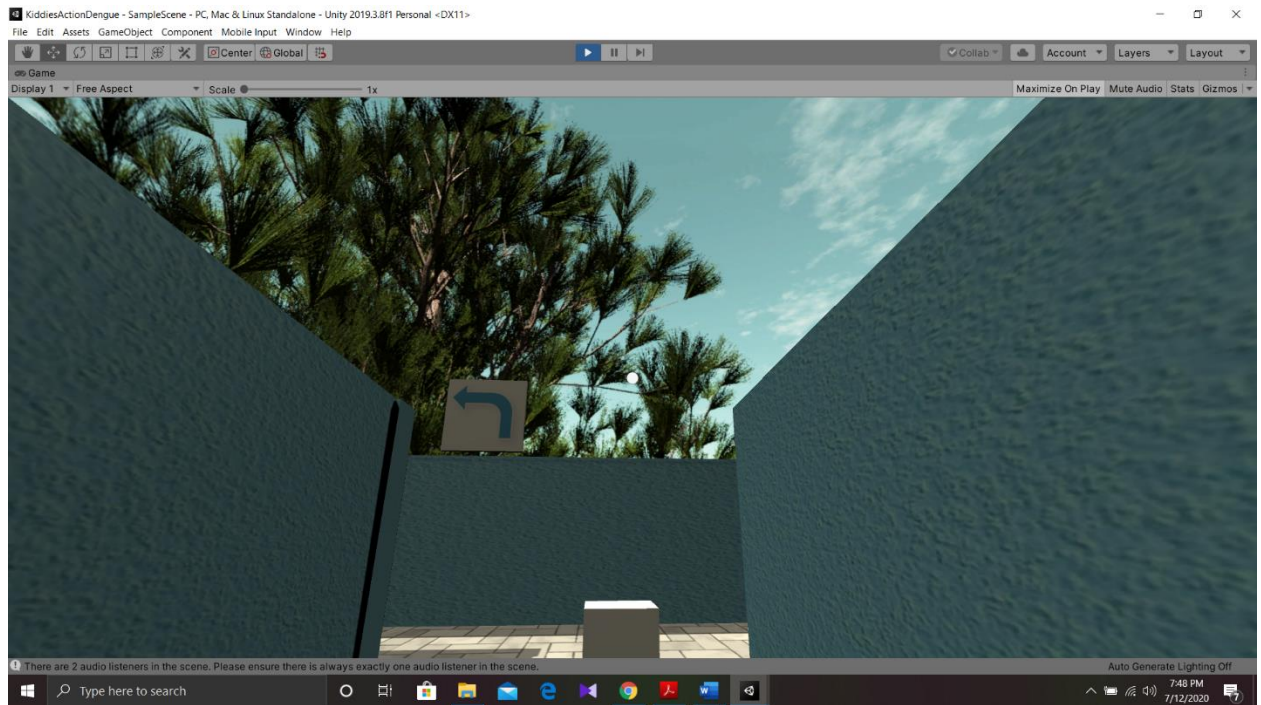


Figure 2. 7 AwareME Adults dengue 3D action game Level2

2.1.4 Testing

Testing stage is the most important to our research. In this stage testing is done to see how the users have improved their awareness level after the usage of the game. For this in the initial stage a standard question set is given where the score will be stored which the users can't access and, in the end, the same questions will be given to test whether the users have been properly improved their knowledge related to social media awareness.

User Acceptance Testing

After creating the game, users must be able to play the game. Three opportunities are given to each player. Players are the same group who participated in the information gathering stage. The data collected at requirements gathering stage will be compared with the scores obtained after playing the game

After analyzing every user's data get an idea about how far this game helps to aware people about social media and how far the users have developed the abilities through the game. If good results cannot be achieved from the game, the stages of the model should be

repeated with appropriate modifications again and again until the expected results are obtained.

All the tasks should be tested and check whether they run without any bugs. The main project consists of four components where awareness is risen in four different areas.

Unit Testing – Each team member will have to do unit testing for each of the parts they are implementing.

Component Testing - By combining several Units, component testing will be done.

Integration Testing – To test whether the communication between each component is working together, Integration Testing will be done.

System Testing – After the components are finished integration is done and the whole system will be tested to test if the complete system is working perfectly.

2.2 Tools and Technologies

2.2.1 Technologies

□ **Virtual reality**

The main technology that implements our game is virtual reality. Virtual reality technology is a three-dimensional (3-D) artificial environment that is applied to computer games. Virtual reality experiences are developed with VR software and presented to the user in such a way as to simulate the real-world environment, create illusion suspension and help the user experience the VR environment as real.

3D Modeling

3D modeling is the process of creating, using specific software, a mathematical representation of any surface of an object in three dimensions. The 3D modeling process creates a digital object which can be fully animated, making it an important technique for an animation of characters and special effects.

Mobile Gaming

The gaming experience has been taken out of the arcade and living room with the introduction of smartphones and placed into the palm of your hands. Mobile technology has made digital gaming spread beyond hardcore console consumers and online games as evidenced by countless people on your morning train commute huddled over games on their devices

Full Motion video

Full Motion Video (FMV) games are video games that rely on pre-recorded TV or film quality recordings and animations instead of characters, vectors or 3D models to represent game action

Game audio

We can make, hear and tweak sound effects and behaviors while playing the game. It features an audio authoring tool, and a cross-platform sound engine that allows audio on the fly

Unity

Unity is the best platform for developing game play. We can use Unity to create and deploy high-quality 3D and 2D games across smartphone, VR / AR, console. It is an engine of the cross-platform game. This is mainly used to create video games and simulations for computers, consoles and mobile devices.

Android studio

Android Studio is Android's official IDE. It offers Android developers personalized applications including tools for rich code editing, debugging, reviewing, and profiling

Adobe Photoshop

Adobe Photoshop is a critical tool for designers, graphic artists, and creative professionals. It is widely used for image editing, retouching, creating image compositions, and adding affects. Digital or scanned images can be edited.

SQLite

SQLite is an open-source relational database i.e. used to perform database operations on android devices such as storing, manipulating or retrieving persistent data from the database

Adobe illustrates

Adobe Illustrator is used to create a variety of digital and printed images, including cartoons, charts, diagrams, graphs, logos, and illustrations. Illustrator allows a user to import a photograph and use it as a guide to trace an object in the photograph.

Blender

Blender is a program used for 3D modeling, animation and rendering. Using Blender, you can create a 3d model from scratch, sculpt, rig, texture, animate and render it to still or movie formats. Blender also features its own game engine, and can be extended to support third party render engines

Wwise

Wwise is Autokinesis's software for interactive media and video games, available for free to non-commercial users and under license for commercial video game developers. It features an audio authoring tool and a cross-platform sound engine.

2.3 System Overview Diagram

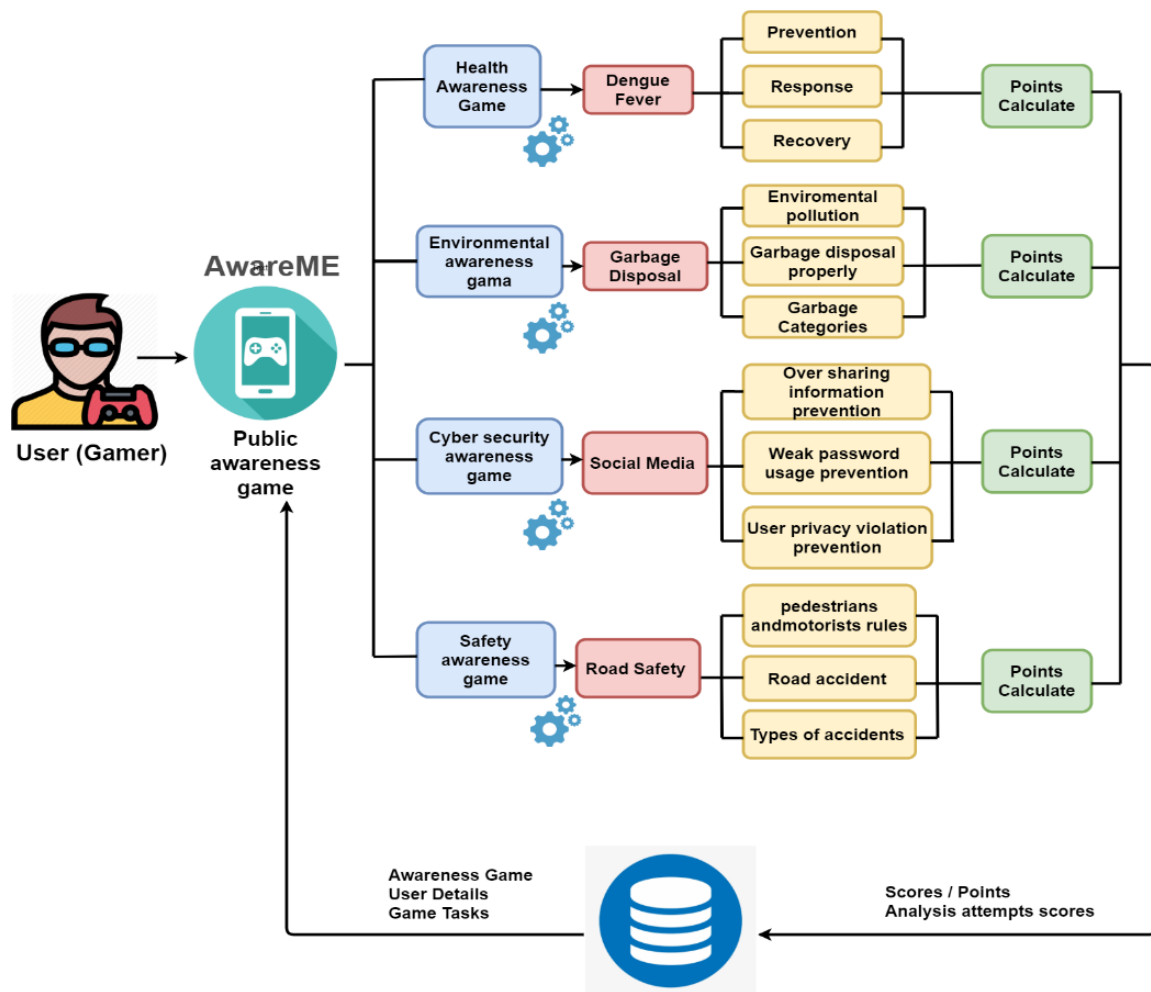


Figure 2. 8 System overview diagram

2.4 Commercializing aspect

The AwareME Health Awareness module is designed to provide an interactive solution for increasing dengue awareness among the public that is more interesting and practical for modern society. Although some dengue awareness enhancement apps and platforms are available, they have only focused on stages of dengue prevention, not dengue response and recovery. Some platforms do not apply to Sri Lankan society and the lifestyle of Sri

Lankans [12]. Hence, the Dengue based AwareME health awareness module focuses on all stages of dengue and is designed for the Sri Lankan society.

This solution offers advantages for several parties in the country. From the government's perspective, they can cut the cost of organizing awareness programs.

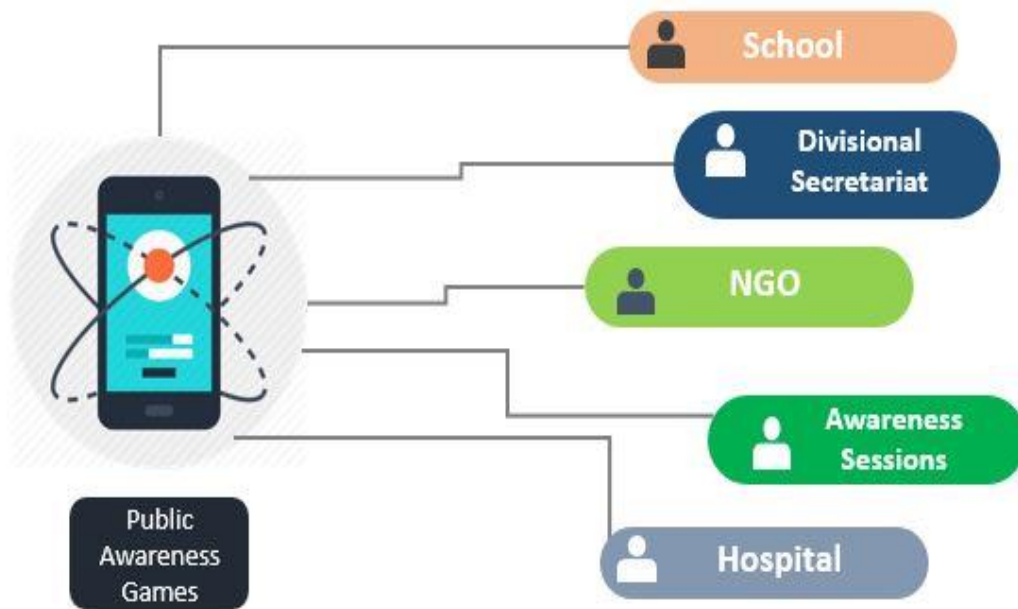


Figure 2. 9 Commercial aspects

3 RESULTS AND DISCUSSION

3.1 Health Awareness – Results

Table 3. 1 AwareME kiddies' dengue 2D action game results

Player [Kids 2D puzzle game]	Results			
	Attempt 1 [puzzle game]	Attempt 2 [Puzzle game]	Attempt 1 [Questionnai re]	Attempt 1 [Questionnaire]
01	60	70	60	60
02	50	40	50	30
03	80	80	60	90
04	70	70	70	100
05	50	70	60	90

Table 3. 2 AwareME adults dengue 3D action game results

Player [Adults 2D puzzle game]	Results			
	Attempt 1 [3D game]	Attempt 2 [3D game]	Attempt 1 [Questionnaire]	Attempt 1 [Questionnaire]
01	19.2s	17.9s	70	90
02	23.5s	21.9s	60	100
03	34.3s	29.3s	90	100
04	29.2s	29.8s	80	90
05	30.2s	26.6s	60	80

3.2 Research Findings

Gathered Data from 50 Participants include school children's, undergraduates, graduates, employee, non-employees.

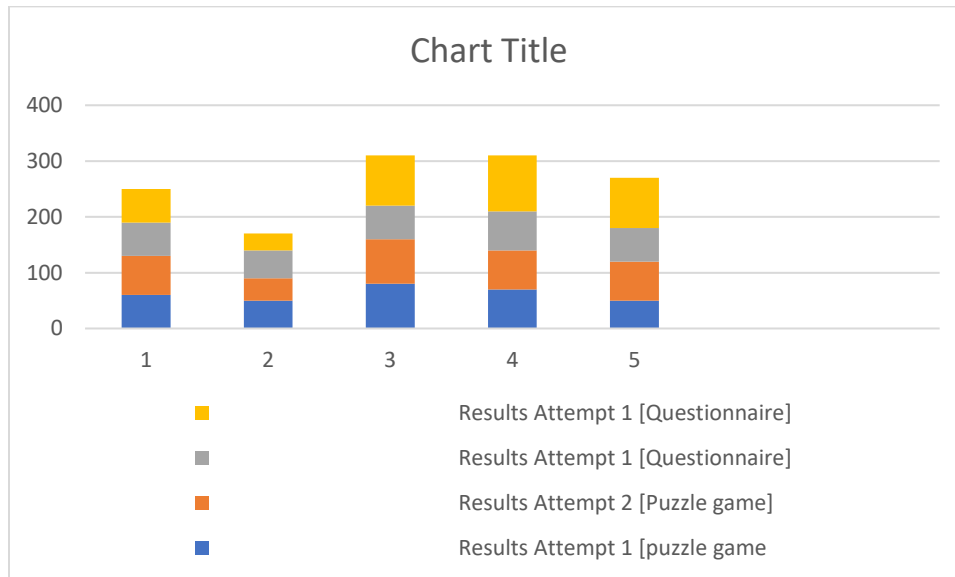


Figure 3. 1 Bar chart for the result finding of the 2D puzzle game

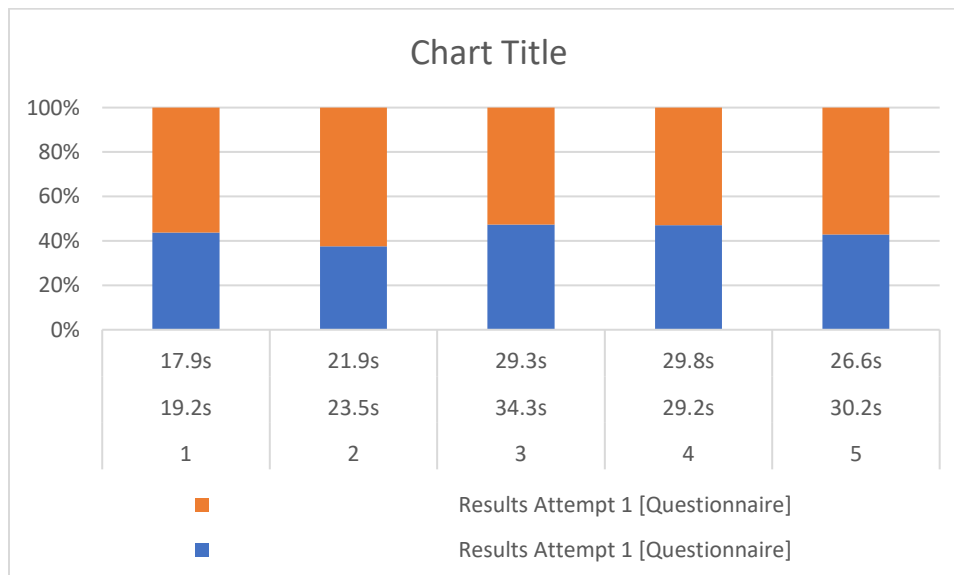


Figure 3. 2 Bar chart for the result finding of the 3D action game

3.3 Discussion

After obtaining data from 50 people, many conclusions can be drawn. The game is changed from level to level and the grades are changed as well. It is clear that the accuracy rate has increased more than 87% and the game is successful. 13% of the results are unsuccessful. While most of them scored more points.

4 Summary of Students Tasks

Table 4. 1 Summary of Students Tasks

Member	Component	Task
Dassanayake D.K.M.P.M.M [IT17160308]	Implementing the health awareness module based on dengue fever-AwareME Gaming platform	<ul style="list-style-type: none"> • Identify the skills that prevent, respond to, and recover from dengue • Identify the most suitable game to be implemented • Design and implement a 2D puzzle game for kids to improve thinking and recalling ability. • Design and implement a 3D Action game for adults to improve decision making ability. [Children also encourage to play the 3D Game] • Awareness of dengue prevention is measured based on the number of attempts and grades of the standard questionnaire

5 CONCLUSIONS

According to reports from the Ministry of Health, dengue fever is the most prevalent fever in Sri Lanka over the past few decades. The general public is not very aware of this deadly threat based on reports from the Divisional Secretariat's health departments. The Divisional Secretariat's health departments encourage the public to attend their awareness-raising sessions to get an idea of how dengue fever can be prevented.

The health awareness module consists of three phases: dengue prevention, response, and recovery. In order to improve dengue awareness at each stage, various skills need to be improved. Nowadays, people are more dependent on mobile devices, who spend most of their time doing tasks like playing games on a daily basis. Mobile applications already exist to alert people to deadly fevers like dengue fever. However, there is no suitable solution to raise awareness in all four stages of the dengue threat

According to existing research and modules, researchers believe that among the various types of interactive solutions, puzzle games are the most suitable game for improving a person's thinking skills. Action games help people improve their effective decision-making skills.

This health awareness module provides an interactive solution to increasing dengue awareness in public using game-based learning techniques and interactive game design. This module mainly focuses on people who are infected with dengue and are not infected with dengue fever. The game-based learning solution consists of various activities that will help improve the thinking and decision-making skills in preventing, responding and recovering from this deadly fever.

A data set was generated using information that have collected through a Google form. basically, focusing on School Children, middle class people and educated people in the society including 50 participants participated for the online survey.

Data gathered from the Division Secretariat reports were used as a requirement for this health awareness module. The mobile game was made available to a group of respondents who completed the online survey. The results were collected as percentages.

based on the 2D puzzle game and the timing for the 3D action game. The test results show an improvement in the player's scores as further attempts are made, and participants should complete a standard questionnaire to check their current brand awareness before playing the game. This concludes that a person's relevant skills and awareness of dengue fever can be gradually improved with the help of the proposed solution

References

- [1] p. Pinterest, ""Lord Buddha Quotes,"",
<https://www.pinterest.com/pin/470766967270515990/>, 2019.,
2019.
- [2] ""Dengue Fever,"" *Wikipedia*, p.
https://en.wikipedia.org/wiki/Dengue_fever., 2019.
- [3] L. M. Pei Zheng, "Smart phones and next generation
mobilecomputing,"p.
"[https://www.researchgate.net/deref/http%3A%2F%2Fwww.
sciencedirect.com%2Fscience%2Fbook%2F9780120885602](https://www.researchgate.net/deref/http%3A%2F%2Fwww.sciencedirect.com%2Fscience%2Fbook%2F9780120885602)
", 2006.
- [4] J. K. Carr, "Knowledge, Awareness and Practices
Regarding Dengue Fever among the Adult," *US National
Library*, p.
"<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2440812/>",
2008.
- [5] M. d. S. H. Diego Buchinger, "Sherlock Dengue 8: A
Serious Game for Teaching about Dengue Fever Prevention
with Collaboration and Competition," *ResearchGate*, p., p.
- [6][https://www.researchgate.net/publication/271705698_She
rlock_Dengue_8_A_Serious_Game_for_Teaching_about_D
engue_Fever_Prevention_with_Collaboration_and_Competit
ion](https://www.researchgate.net/publication/271705698_Sherlock_Dengue_8_A_Serious_Game_for_Teaching_about_Dengue_Fever_Prevention_with_Collaboration_and_Competition), 2014.

- [7] J. a. D.Coombs, "the good bye to dengue game," *researchgate*, pp. https://www.researchgate.net/publication/258183902_The_good-bye_to_dengue_game_Debriefing_study., 2005.
- [8] T. a. B.Barbosa, "Playing against dengueDesign and development of a serious game to helptackling dengue,," *ResearchGate*,p. https://www.researchgate.net/publication/317423246_Playin_g_against_dengue_design_and_development_of_a_serious_game_to_help_tackling_dengue, 2016.
- [9] J. L. L. a. D. W. Coombs, "The utility of a board game fordengue haemorrhagic feverhealth education," *Research Gate*, pp. https://www.researchgate.net/publication/228673452_The_u_tility_of_a_board_game_for_dengue_haemorrhagic_fever., 2006.
- [10] F. P.D.N.N Sirisena, "Evolution of dengue in Sri Lanka—changes in the virus, vector, and climate," *International Journal for Infectious Diseasus*, vol. 19, no. "https://www.sciencedirect.com/science/article/pii/S1201971213003421", pp. 6-12, 2014.
- V. S. ., N. R. T Kumanan1, "The impact of population mobility on dengue fever: an experience from," *Sri Lankan Journal of Infectious Diseases*, vol. 9, no. "https://idhjournal.com/article/S2468-0451(18)30021-X/fulltext", pp. 98-102, 2019.

6 Appendences

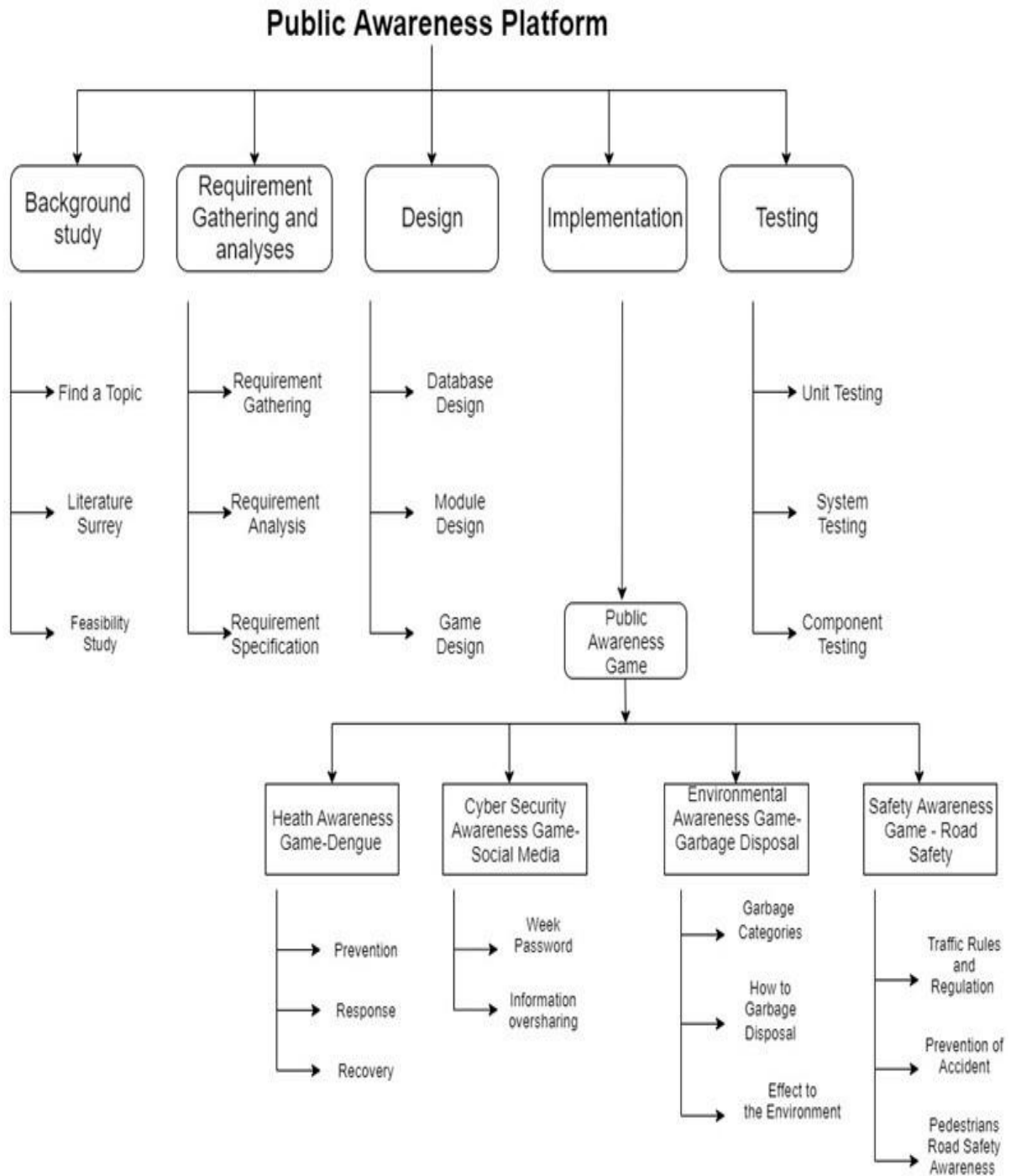


Figure 6. 1 Public awareness platform flow chart

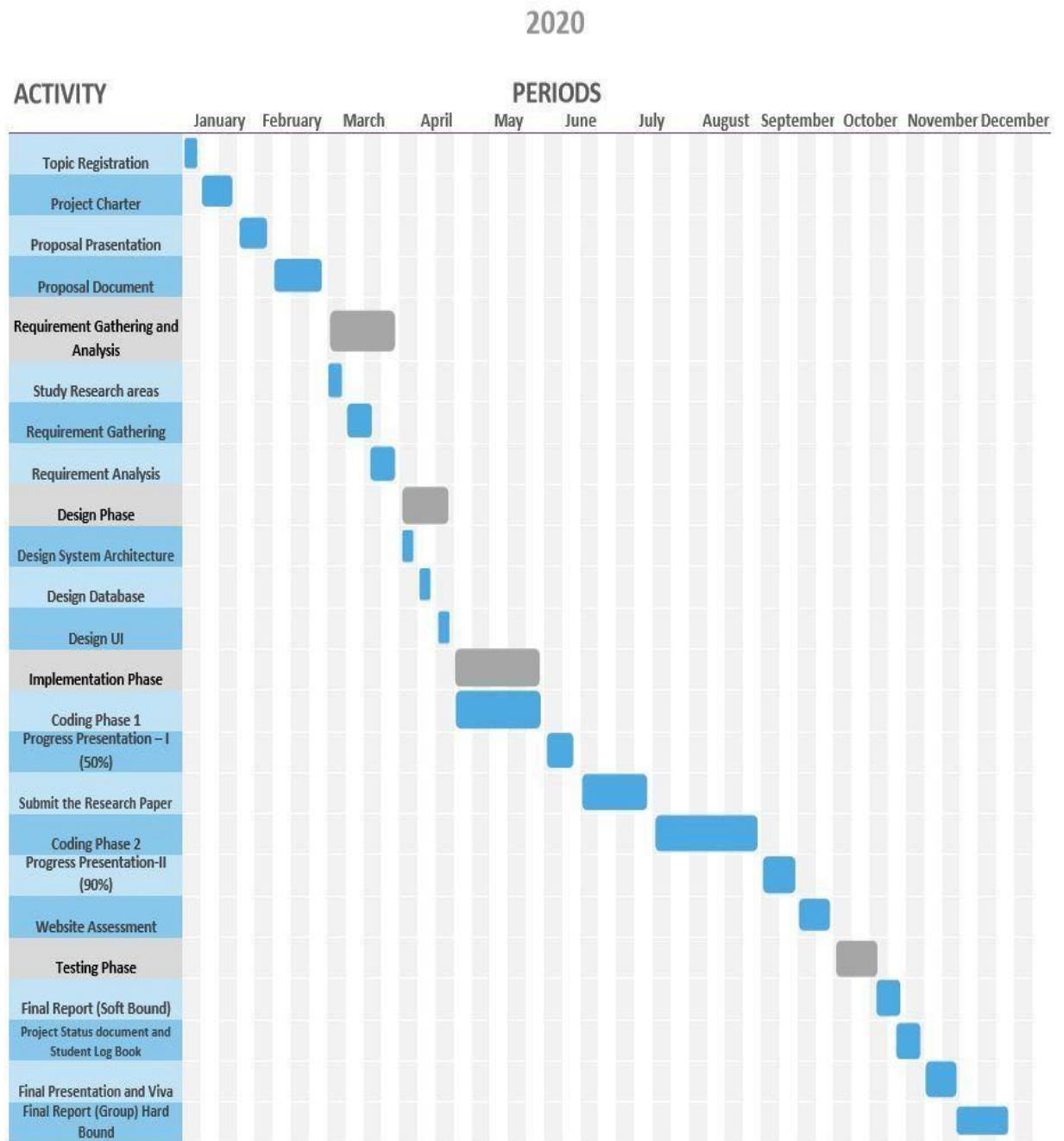


Figure 6. 2 Grant chart of the entire system

7 Budget and Budget Justification

Table 7. 1 Budget and Budget Justification

Requirements	Description	Price per Unit	Quantity	Total (Rs.)
Special Software & Hardware	VR Box & Joystick	15000.00	1	15000.00
Document and binding	Document and hard copy printings			3500.00
	Binding Cost			1500.00
Total Cost				20000.00