Public Awareness through game-based learning

Project ID: 2020-054

Project Proposal Report

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Declaration

I declare that this is my own work and this proposal 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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Signature of the supervisor: Date

24/02/2020

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.

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1 INTRODUCTION

Nowadays, we live in a technologically advanced third world country.as these countries progress, new problems will emerge. Health security is One of the major problems facing by these categories of countries. Sri Lanka is one of developing third world country. In that past decades Sri Lanka Facing many types of health security problems. Dengue Fever is at the top of that list. People have died of dengue in past decades more than the thirty years of war. Dengue fever is an acute infectious viral disease also known as break bone fever. dengue is transmitted by several species of mosquitoes, principally A. aegypti. infection with one type usually gives lifelong immunity. But short time immunity for others. And there is no commercially available vaccine. The main reason for the spread of dengue is disposal garbage in unwanted places. [Ex: Rivers, Water Tanks and Drains]

Divisional Secretariat Health Departments used different strategies to make people aware about these topics. Awareness sessions are conducted in Schools, Government Sectors as well as private sectors to make people aware about what is dengue fever, what are the methods we can use to prevent dengue fever. Unfortunately, when inquiring the public about to get an idea about how effective the awareness sessions are, they woke up the voice and said that sessions are exactly similar, bored to listen the sessions. awareness sessions are not effective for educate people about any problem. And we think effective method using game-based learning which leads to improve the abilities and aware people is the best solution.

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. Divisional Secretariat health departments encourage the public to participate to their awareness sessions to get an idea about, how to prevent from the dengue.

Dengue fever is a mosquito-borne tropical disease caused by the Dengue Virus. Symptoms are begins after three to fourteen days after infection. They may include high fever, headache, muscle and joint pains, skin rashes as well [2]. Mainly *A. aegypti* mosquito is the main vector that's transmit the virus that cause dengue. Virus past the human through by bites. Female species of *Aedes Aegypti* is the main vector that infect this virus in to human body. This female species can fly over radius of 400m, this means that people, rather than mosquitoes rapidly move the virus within and between communities and places [3]. According to the WHO reports mainly people are responsible for the spread of this deadly menace. Therefore, the public should be vigilant for all types of mosquito breeding sites and destroy it as soon as possible.

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 [4].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.

As a solution for the above-mentioned problems we are on the process of implementing game base learning platform for increasing the public awareness. Mainly we are focusing on identifying the abilities should improve by the public. We

are using suitable mechanisms [Questionnaire's] for collect the required data from the public. After the data processing part, we are implementing games for improve their abilities. Mainly we are educating public about How to prevent dengue fever, how to response when dengue affected and how to recover from the dengue fever using this platform.

1.2 Literature Survey

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 Buchinger 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 awareness. 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

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 Bremo Barbadosa. They published this research paper in 2006. These two mainly used gamification techniques to stimulate the motivation of there target audience. This game-based learning platform divided their tasks in to 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 go 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-efficiency for dengue prevention among the school children. researchers are 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. Its 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.

Table 1. 1: Differences between proposed project and other Systems

Features	Sherlock Dengue Game [1]	Good Bye Dengue Game [2]	Design and development Serious Dengue game [3]	Dengue homeorhetic 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	X	X	√
Using Mobile Application	√	√	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. 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?

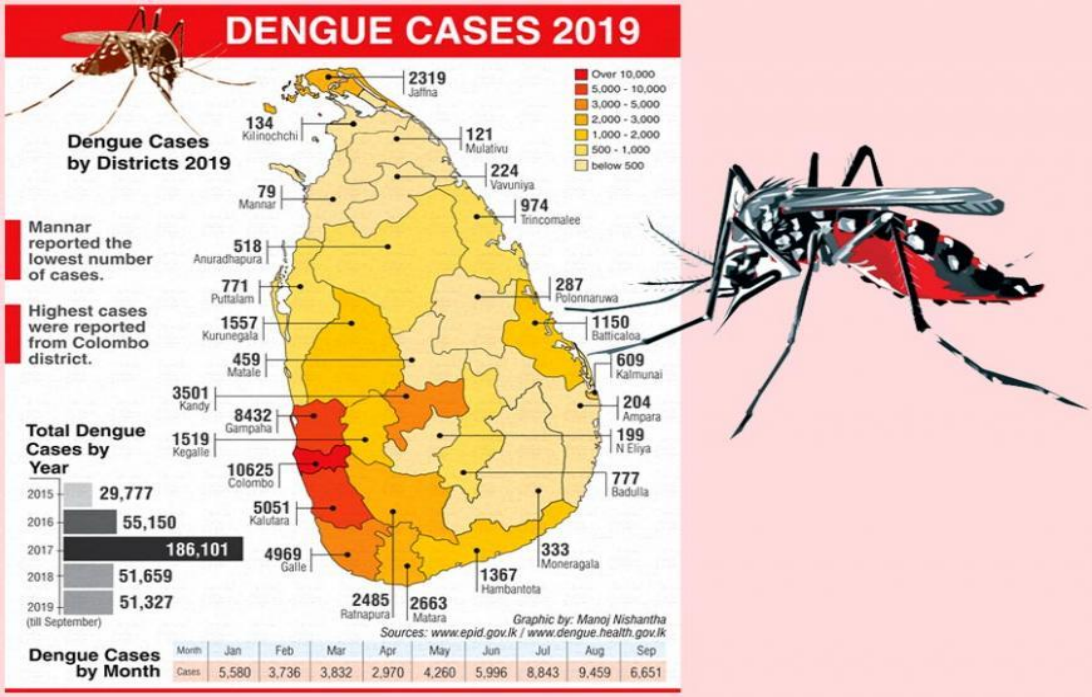

Figure 1. 1: Sri Lankan Health Ministry Dengue Cases Chart releasing on 2019

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.

This Increases of numbers show People are not much aware about these Deadly Menace.

2 OBJECTIVES

2.1 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 come 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.

2.2 Specific Objectives

- Gathering information to identify the current awareness level and current abilities of the people related to dengue menace.
- Determination the audience of this research [basically focusing on School Children, middle class people and educated people in the society].
- Identifying the most suitable games for improve the low-level abilities.
- Learning about Gama 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.
- Design the AwareME Gaming platform using Virtual Reality Technology.
- Identifying the improvements of the users by testing their awareness levels using score levels.

3 METHODOLOGY

3.1 Flow of the Project

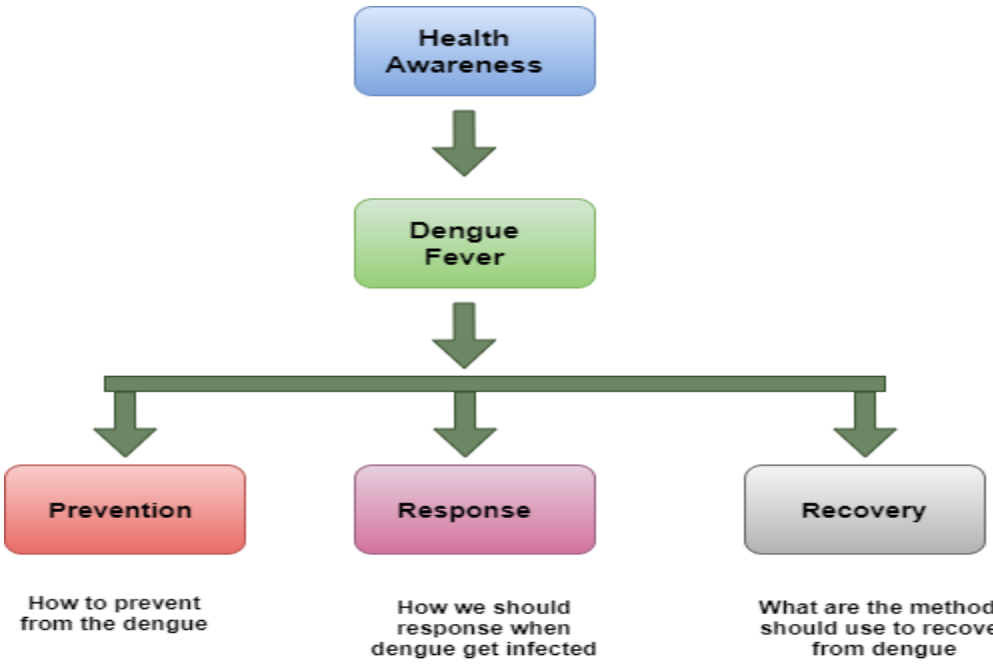

Figure 3 1: Process of Health Awareness based on Dengue Fever

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.

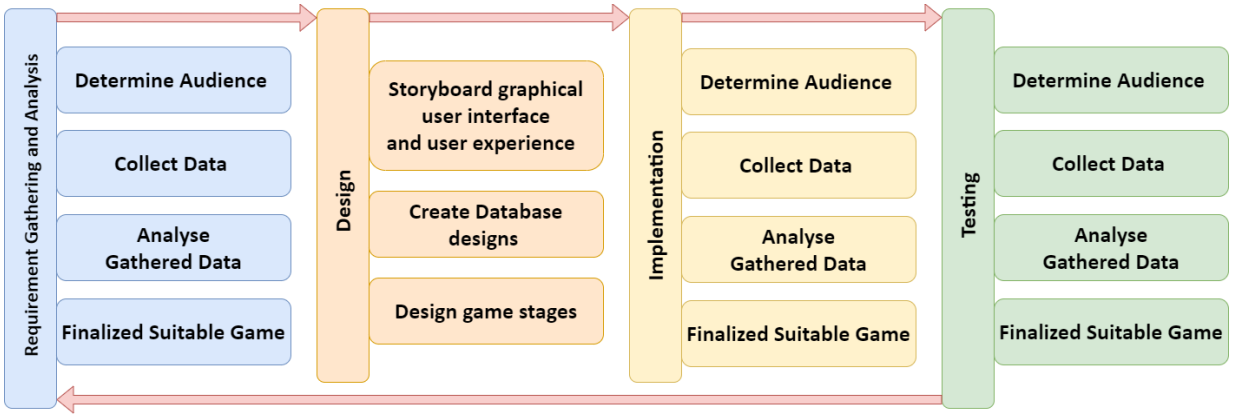

Figure 3 2: Process of the System

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.

3.1.1 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.

3.1.2 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.

3.1.3 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.

3.1.4 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.

3.2 Tools and Technologies

3.2.1 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 consolecons umers 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.

3.2.2 Tools

- **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.

3.3 System Overview Diagram

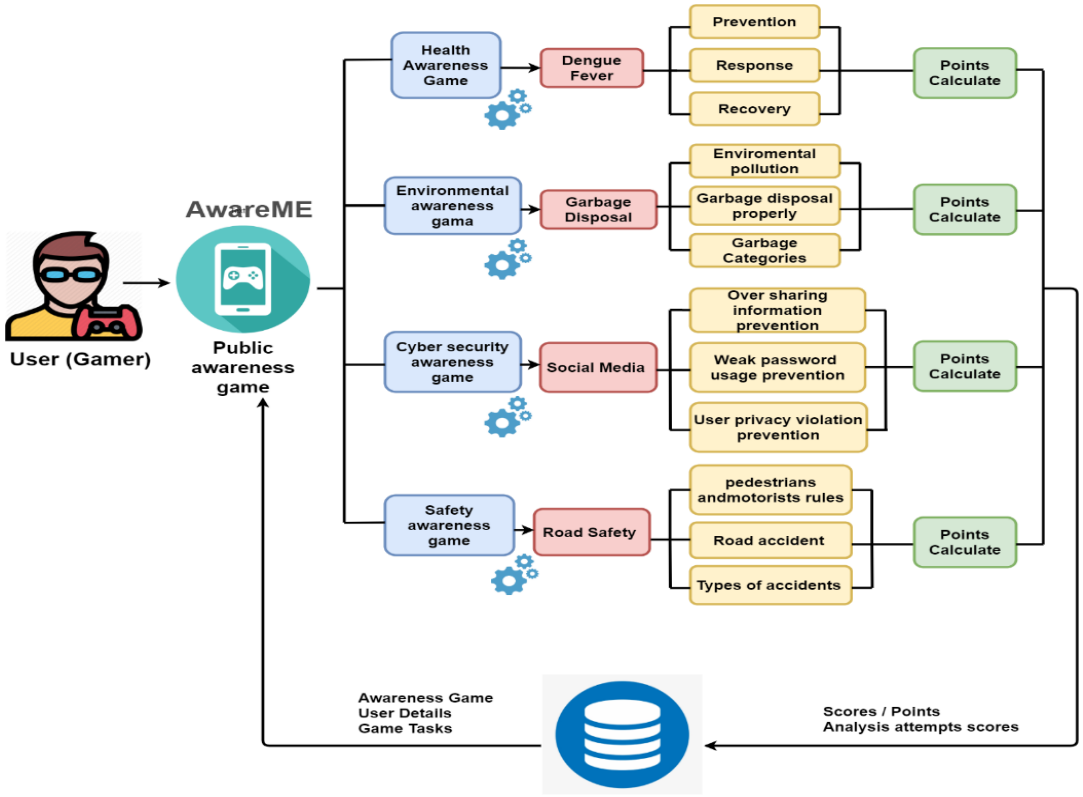

Figure 3 3: System Overview Diagram

3.4 Functional Requirements

Awareness sessions are no more valuable concept to aware people in these decades. As per the survey of the Divisional Secretariat, awareing percentage of public are less than 40% about mentioned module (Health Awareness based on Dengue Fever). According to the requirements of the Divisional Secretariat this research mainly focusing on increasing the awareness percentage and the abilities should be improve by the public about mentioned module and about to be implementing four games in a single platform named [AwareME] using game-based learning concept.

Finally, the output of this AwareME gaming platform is providing public to attractive gaming experience and much better awareness about mentioned problems as well as improvement of the abilities to prevent these kinds of hazards.

3.4.1 Game based functional requirements

1.Programming language and development software

- The games must be implemented with C# Script
- The games must be developed in Unity3D

2. Display control and audio

- The games must be controlled with Xbox Bluetooth controller
- The games must be played on mobile then display resolution will be high. Ex:(1920 X 1080)
- The games must be feature music and sound effects

3. Games must be played on Android Operating System

- Android OS compatible with Virtual Reality

4. Levels, contents and messages

- Games must help user to build strategy
- Games must have 3 Levels for each

- Games must convey four special messages about Health, Environmental, Cyber Security and safety awareness

3.4.2 Non-functional requirements

Performance of the Product – Performance of this product can be determined by its responsive time and the expecting time ranges to complete the given task. According to the AwareME Gaming Platform we are expecting 5 seconds to load the initial screen and about in 15 min to end up the whole tasks as well as user current awareness status.

Scalability of the Product – In this product we are providing an option to the user to select the game user wants to play and improve their current awareness. Then user doesn't need to play all four games and waste their time. And this product recommends to the users about these four games and if user have time to play all four games and improve their current awareness of these four hazards.

Responsiveness of the product - After the user played the game, if user not satisfied of their current awareness status, user can review, what are the mistake they done throughout the game and they have only 3 attempts to face it and improve their abilities to educate about mentioned hazards.

Reliability of the product – after user played the game of his 3 attempts user can see a notification summary of their current awareness and list of the mistake, he/she done through the game.

Availability of this Product – Users can download this game-based application in the Play Store and can be rate it. And share among the friends, and recommend to the friends who has less awareness of these topics. Available for School Children and the Elder Generation in the society.

Screen Adaption: In these days lot of mobile phones comes with different sizes and different layouts.in this application we are render it for different screen sizes. And automatic adjustments of gaming screen to different screen sizes.

3.5 Work Break Down Chart

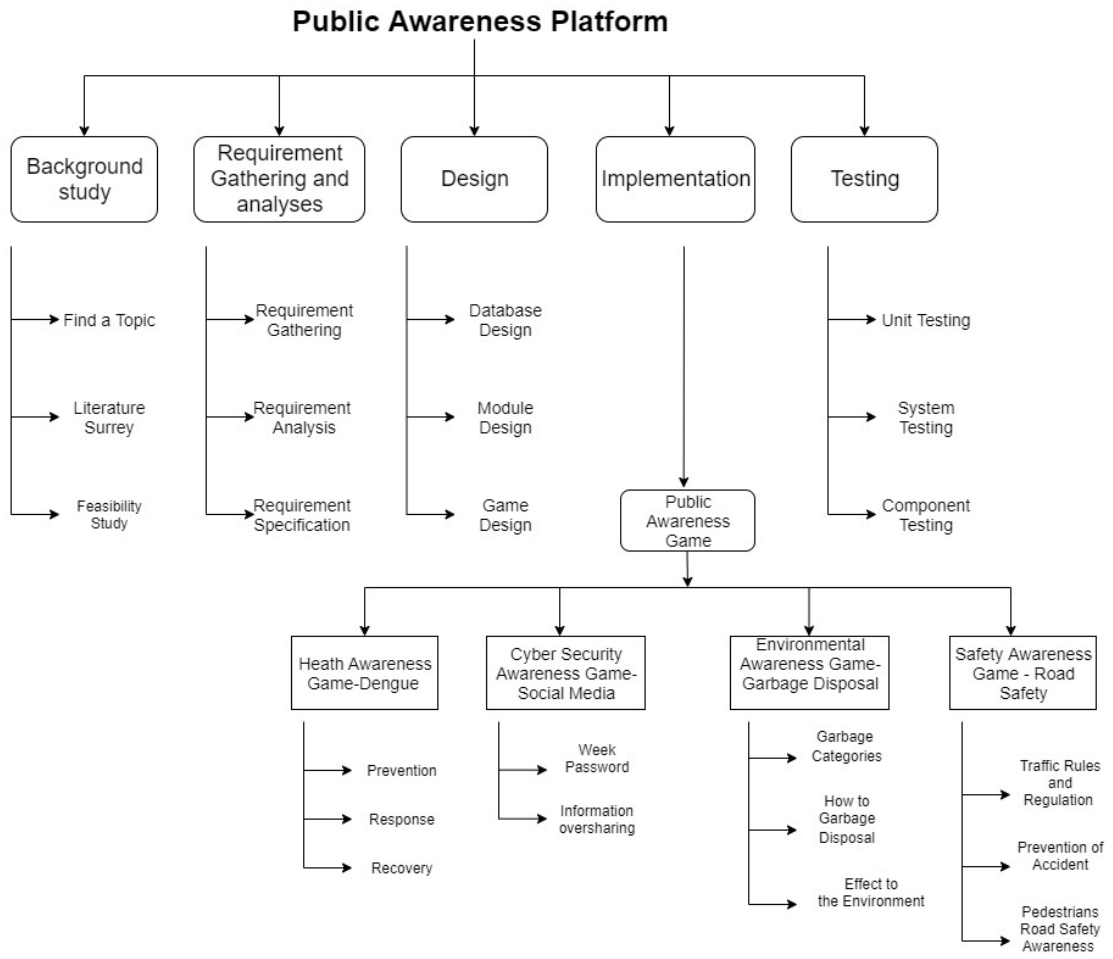

Figure 3 4: Work Break Down Chart

3.6 Gantt Chart

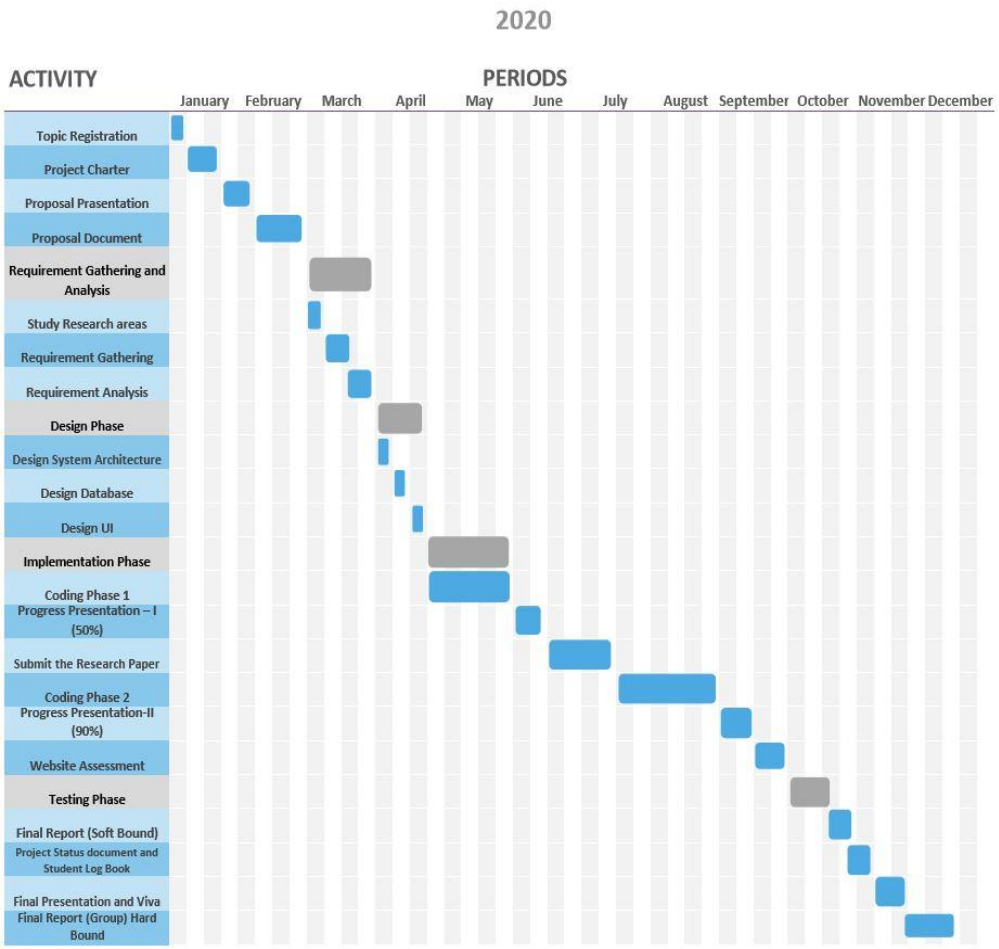

Figure 3 5: Gantt chart

4 BUDGET AND BUDGET JUSTIFICATION

Table 4. 1: Budget Justification

Requirement	Description	Price Per Unit	Quantity	Total (Rs.)
Special Software and Hardware	**VR Box and joystick**	**15000.00**	**1**	**15000.00**
Document and binding	**Documents and Hard copy printings**			**3500.00**
	Binding cost			**1500.00**
Total Cost				**20000.00**

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