

**NANYANG**  
**TECHNOLOGICAL**  
**UNIVERSITY**

# CZ3003 Software System Analysis and Design

## Software Requirements Specification

### Good Game Well Played (GGWP)

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## Table of Contents

<b><i>Introduction</i></b>	<b>6</b>
Purpose	6
Document Conventions	7
Intended audience and reading suggestions	7
Product scope	8
<b><i>Product Description</i></b>	<b>8</b>
Product Perspective	8
Product Function	8
User Classes and Characteristic	9
Operating Environment	10
Design and implementation Constraints	10
User Documentation	11
Assumptions and Dependencies	11
<b><i>Functional Requirements</i></b>	<b>12</b>
Register	12
User Login	12
Reset Password	13
Main Screen View	13
View Profile Page	14
Map Interaction	14
Leadership Interaction	15
Question NPC Interaction	16
<b><i>Use Case Diagram</i></b>	<b>17</b>
<b><i>Use Case Description</i></b>	<b>18</b>
<b><i>External Interface Requirements</i></b>	<b>28</b>
User Interfaces	28
User login page	28
Front Loading Screen	29
Main Menu	29
“Play game” - local map	30
Hardware Interface	33
<b><i>Non-Functional Requirements</i></b>	<b>33</b>
<b><i>Appendix A: Data Dictionary</i></b>	<b>34</b>
<b><i>Appendix B: Analysis Model</i></b>	<b>36</b>
Decision table for game mechanism (awarding of points)	36

<b>State machine Diagram</b>	<b>38</b>
<b>Context Diagram</b>	<b>38</b>
<b>ER Diagram</b>	<b>40</b>
<b><i>Appendix C: UI Mock Up</i></b>	<b>41</b>
<b><i>Appendix D: Component Design</i></b>	<b>48</b>
<b>Component Diagram</b>	<b>48</b>
<b>Communication Diagram</b>	<b>48</b>

### Revision History

Name	Date	Reason for changes and description	Version
Everyone	11/03/2020	Amended software requirement specification documents pull out from wiki. Reason: Changes made after consulting with lab's TA on initial idea (lab 1 deliverables).	1
Wei Cong	31/03/2020	Reason: Changes made to remain more practical and relevant to coding logic.  Changes made to: - Use case description	2
Sam, Alson, Karen	2/04/2020	Reason: To update the rest of the documents based on updated use case description.  Changes made to: - Functional requirements - Use case diagram - Use case description - Data dictionary	3
Karen	3/04/2020	Reason: Amend format of report.  Changes made to: - Add in updated decision table - Add in UI mockup (Draft version) - Amend external interface requirements	4
Sam	8/04/2020	Reason: Diagram updates and reviews overall cleanliness of report  Changes made to: - Changes made in SMD are reflected appropriately - Clean weird text and alignment	5
Alson	12/04/2020	Reason : Update Analysis Model  Changes made to: - Added Component Diagram - Added Communication Diagram - Added ER Diagram - Removed DFD Diagram	6
Sam, Alson, Karen	15/04/2020	Reason : Slight changes to game mechanism and synchronize changes base on development team  Changes made to: - Data Dictionary added new terms - Product scope reflect more accurately - Decision Table truth table and flow diagram - Use Case Description - Use Case Diagram	7

Alson, Kare, Sam , Leroy	22/04/2020	Reason : Review and added missing content, minor diagram modification  Changes : <ul style="list-style-type: none"> <li>- Decision Tables description correction</li> <li>- Component Diagram</li> <li>- SMD Diagram removed remarks</li> </ul>	8
Alson,Sam,Karen	23/04/2020	Reason: Enhanced document readability, fixed formatting bugs, UI updates.  Changes: <ul style="list-style-type: none"> <li>- Indentation error fixed</li> <li>- Rephrase or remove ambiguous terms used.</li> <li>- Standardized terminologies</li> <li>- Update UI mockup with actual screen shot</li> <li>- Added indexing in data dictionary</li> </ul>	9
Sam,Karen,Alson, Wei Cong, Leroy	24/04/2020	Reason: Final Revision and wrap up for submission Changes: <ul style="list-style-type: none"> <li>- Data dictionary in ascending alphabet order</li> <li>- Resizing Images</li> <li>- Standardized font</li> <li>- Fixed line spacing</li> <li>- English grammar error</li> </ul>	10

# 1 Introduction

## 1.1 Purpose

The information age that we are currently in has led to a higher demand for science and technology professionals. As such, many schools have gradually introduced STEM(Science Technology Engineering and Mathematics) topics into their curriculum. However, in this shift to equip our next generation to become scientists and engineers, many students in our next generation have become badly equipped with General Knowledge from other subjects. The shift of emphasis to STEM has caused many education curriculums to focus less on subjects such as Humanities and Arts.

Having a holistic education while equipped with STEM knowledge would provide multiple benefits. One of the benefits is that it will be easier to converse with other individuals from other disciplines. The other benefit is that it can promote exposure and interest for other disciplines of studies, the understanding of other subjects would also help to produce cross-disciplinary approaches to problems.

The purpose of this document is to specify the software requirements for Good Game Well Played (GGWP) Application. GGWP is an application that aims to impart general knowledge on its users through the usage of visual communications and interactive teaching where application will provide subject specific questions and explanation of solution to players using a gamification concept.

This document will also contain the use cases descriptions and diagrams, functional and non-functional requirements of the software system and also the different diagrams from analysis of the requirements.

## 1.2 Document Conventions

This Document was created based on the IEEE template for Software Requirement Specification Document.

The fonts used for this document is as follows:

Representation	Format & Style
Main Section Heading	<ul style="list-style-type: none"> <li>• Font: Times New Roman</li> <li>• Face: Bold</li> <li>• Size: 16</li> </ul>
Subsection Heading	<ul style="list-style-type: none"> <li>• Font: Times New Roman</li> <li>• Face: Bold</li> <li>• Size: 14</li> </ul>
Text	<ul style="list-style-type: none"> <li>• Font: Times New Roman</li> <li>• Face: Normal</li> <li>• Size: 12</li> </ul>
Table	<ul style="list-style-type: none"> <li>• Font: Times New Roman</li> <li>• Face: Normal</li> <li>• Size: 10</li> </ul>

*Table 1 - Document conventions*

## 1.3 Intended audience and reading suggestions

The intended audience for this document is the stakeholders of the project. The suggested reading order is in the order of the document. For non-technical readers, the relevant business requirements related sections are from Section 1 to 6(Up to Other Requirements). For technical readers, the appendix contains draft analysis models that are derived from the use case description and known requirements at the point of this writing.

## 1.4 Product scope

The aim of this application is to allow the user to gain general knowledge and also to inculcate good learning habits. The application offers bit-sized information from a variety of non STEM subjects. The subjects include geography, general, cooking and history.

The game is designed around the “Active Recall and Spaced Repetition” concept, which are principles of efficient learning. GGWP adopted the concept of a Role Playing Game (RPG) with a top down view containing movable characters in a 2D world. The interface design of the game is similar to Stardew Valley and Pokemon (Pre-nintendo versions). Where design will go in a sprite sheet design direction rather than looking for 3D models and assets.

## 2 Product Description

### 2.1 Product Perspective

The motivation of this application is to provide a gamified experience for learning a variety of subjects that may not be taught in the school curriculum. The application makes use of scoring and leadership mechanisms to motivate students to learn and challenge themselves while providing a game interface that they are familiar with.

The target audience of this application are players with basic understanding and reading abilities in English. While the intended audience for the prototype is targeted for secondary school students, the management interface of the application allows administrators to modify the content to provide different sets of question banks when required.

### 2.2 Product Function

The product function is grouped into 2 sets of features, namely Management Features and Gameplay Features. Management features are available to educators/teachers while Gameplay features are available to players. The following is a brief description of the gameplay flow

- Gameplay Screens
  - Main Menu
  - Main Map and Themed classrooms



- NPC Dialog - Leadership Board, Asking Question, Showing Answer
- View Profile
- Management features
  - Create Question
  - Update Question
  - Delete Question
  - List Questions

## 2.3 User Classes and Characteristic

There are 2 different groups of users for our system.

### User Classes

- Student/Player
  - Interested to know more about other subjects
  - Motivated to learn via a gamified environment
  - Able to understand basic english
  - Use Frequency: Often (Up to a few days a week in the secondary school context)
- Teacher/Administrator
  - Involved in the education ecosystem for a group of students
  - Has some content to provide the application in the following format:
    - Question
    - Answers(Up to 4 Answers)
    - Correct Answer(Has to be from 1 of the answers)
    - Additional Information(An explanation to support the correct answer)
    - Difficulty Level
  - Use Frequency: Infrequent(a few times per semester in the secondary school context)

## 2.4 Operating Environment

### Deployment Environment

- Docker Compose has to be installed on the machine
- Internet is required for first time deployment
- Have at least 5GB of space available

### User's Environment

- Web Browser installed
- Network to access application has to be available for duration of user's session
- Facebook API(if using social login)

## 2.5 Design and implementation Constraints

**These are the following constraints in our implementation:**

1. **Web Browser environment** – By building for web browsers, this project can serve to benefit a wide range of computer devices without increasing the implementation effort to build for different operating applications
2. **Design of application** – Design efforts for the application may be outsourced to create an interactive and appealing environment for students to learn
3. **Language Support** – The application has been planned to support only the English language.
4. **Assets** – General Knowledge questions and answers have to be sourced from multiple verified parties, as some of these knowledge is domain knowledge.
5. **Lack of design expertise** - The prototype will be using available game assets or drawn manually, this is due to the lack of design professionals in the development team. The prototype is built to illustrate the concepts and game mechanisms, design style of the game can be improved after requirements for the system are aligned.

## **2.6 User Documentation**

There will be a deployment instruction manual for the application in order to set up the application in a new deployment environment.

There will be a video demonstration of the application for first time users. It has a step by step walkthrough on the usage of the application and also an explanation to aid first time users or troubled users. It will also capture walkthrough for the administrators to further aid new administrators on the modifications of the applications.

## **2.7 Assumptions and Dependencies**

Assumptions are stated in the section under User Classes and Operating Environment. No additional assumptions as there are no other components that have not been stated above.

### 3 Functional Requirements

**The functional requirements in this section are listed in the order of usage.**

**Note: Map Interactions describes the player's experience within the game.**

#### 3.1 Register

1. The application must provide the user the option to register for their own local account.
  - 1.1. Email address, username and password must be entered for local account creation.
    - 1.1.1. The application must validate the inputs (email address, username and password and confirm password)
2. Email address must be a valid email address.
3. Username must be unique on the system.
4. The password must be at least 8 characters.
  - 4.1. The confirmed password must be the same as the password input.
    - 4.1.1. If a user does not enter in the required format, the application must show validation error messages

#### 3.2 User Login

1. The application must provide the user the option to register for the application on the login screen.
2. The application must provide the user the option to login to the application using a locally created account.
  - 2.1. The application must provide the option to log in with their registered account via their username.
3. The application must provide an login option through a social login option.
  - 3.1. The application must provide the option to login with their Facebook account.
  - 3.2. The application should redirect users to facebook account login interface upon selecting the option to login through Facebook.
  - 3.3. After Facebook authentication, the application should create a new profile for new players.
  - 3.4. After Facebook authentication, the application should retrieve the profile for existing players.

4. The application must allow the users to login with either a registered account or a Google account, login with both accounts is not allowed.
5. The application must allow the user to logout via the main screen after being logged in.
6. Upon successful login, the application must redirect the user to the main screen.
7. The application must redirect all users who are not logged in to the Login Screen

### **3.3 Reset Password**

1. The application must provide the user the option to reset his/her password at the login page.
2. When the user selects the option to reset password, the application must prompt the user for his/her email address.
  - 2.1. When the user enters the email address and submits the form, the application shall send an email notification to the user, in order to reset the password.
  - 2.2. The email must be sent only to the entered email address.
  - 2.3. The email must contain a link to reset the user's account password.
  - 2.4. When the user clicks the link, the application must prompt the user to set a new password.
3. The user must enter a new password and confirm the new password to reset their password after being redirected to the reset password interface via the link.
  - 3.1. System should validate the new password to contain at least 8 characters
  - 3.2. System should validate both the new password and confirmed password to ensure the new password and the confirmed password matches.
4. The application should update the user's account with the new password

### **3.4 Main Screen View**

1. The application must provide the user the option to start the game
2. The application must provide the user the option to view profile
3. The application must provide the user the option to logout

### 3.5 View Profile Page

1. The user can access the profile page via the main game screen and within the game.
2. The application should display the player's profile information.
  - 2.1. The application should show the account's username
  - 2.2. The application should show the global account's high score.
  - 2.3. The application should show the player's progress bar for each subject.

### 3.6 Map Interaction

1. The application must allow the player to move around the map and with some predefined constraints
  - 1.1. The application must prevent the player from walking over NPC sprites
  - 1.2. The application must prevent the player from walking over wall sprites
  - 1.3. The application must prevent the player from walking over decoration sprites
2. The application must display the appropriate dialog when the player is in range of the respective NPCs
  - 2.1. The application must display the leadership board dialog when the player is in range of a leadership board NPC
  - 2.2. The application must display the question dialog when the player is in range of a question NPC
3. The application must display different sprites for the different NPCs
  - 3.1. The application must display a unique sprite for the leadership board NPC
    - 3.1.1. The application must not display any Question NPC using the leadership board NPC sprite
  - 3.2. The application must display the Question NPC in the following manner to describe the Question NPC's state
    - 3.2.1. The application must display no question mark indicator when the Question NPC has no Question
    - 3.2.2. The application must display a question mark indicator over the Question NPC's sprite when the Question NPC has a question
    - 3.2.3. The application must display a dialog speech indicator over the Question NPC's sprite when the player is being asked a question.

4. The application must load new NPCs when the player enters a new map
  - 4.1. The application must initialize all NPCs, with a 50% chance of all NPCs having a question.
  - 4.2. The application must take into consideration the player's past performance when generating a question, in the specified order.
    - 1.1.1.1. Questions that has not been answered before
    - 1.1.1.2. Questions that has been answered before but answered wrongly

### **3.7 Leadership Interaction**

1. The application must display a leadership board, accessible by the user in the subject-themed maps of the game via a NPC(Non Playable Character)
  - 1.1. The application must display the current top five players
  - 1.2. The application must display each player's ranking, total score and username
2. The score of each player is calculated by adding up levels from all subjects
3. The application must display a subject based leadership board, accessible by the user in the main map of the game via a NPC.
  - 3.1. The application must display the current top five players
  - 3.2. The application must display only scores from that subject
  - 3.3. The application must display each player's ranking, total score and username
4. The score of each player is the level of that subject
5. The application must display the leadership board
  - 5.1. Scores must be displayed in ascending order.
  - 5.2. Scores must be displayed in a numerical form.
  - 5.3. Scores must be displayed as a non-negative number.
  - 5.4. Scores must be displayed in a tabular format.
  - 5.5. Scores display format must indicate player's name and player's score.

### **3.8 Question NPC Interaction**

- 1. The application must display questions in the specified order as explained below.**
  - 1.1. First step: The application must display questions and possible answers.**
- 2. The application must display one question at a time that is the same subject of the map that the player is in.**
- 3. The application must display the possible answers for selection.**
- 4. The application must display the possible answers for that question shown and one of the possible answers has to be correct.**
- 5. The application must provide the option for the user to share a question to facebook.**
  - 5.1. Second Step: The application must display the result of the selection and the correct information.**
- 6. The application must display the result of the selection, regarding if it is correct or wrong**
- 7. The application must display the correct answer.**
- 8. The application must display a short paragraph of the information source, explaining why the answer is correct.**
- 9. The application must update the player's progress and answer record in that subject after the player has selected an option for the question.**
  - 9.1. The application must penalize the player's progress in the question's subject for a wrong answer.**
  - 9.2. The application must add points to the player's progress in the question's subject for a correct answer.**
  - 9.3. The application must update the player's answers records after player has selected an option for the question**
- 10. The application must ensure that the player's progress in that subject must be between 0 (inclusive) to 10 (inclusive)**
  - 10.1. If the player's progress in that subject is negative and the player's level in that subject is more than 10, the application must decrease the player's progress in that subject.**
  - 10.2. If the player's progress in that subject is more than 10, the application must increase the player's level in that subject.**



## 4 Use Case Diagram



Figure 1 - Use Case Diagram for GGWP

## 5 Use Case Description

<b>Use Case ID:</b>	<b>1</b>		
<b>Use Case Name:</b>	<b>Register</b>		
<b>Created By:</b>	<b>Wei Cong</b>	<b>Last Updated By:</b>	<b>Wei Cong</b>
<b>Date Created:</b>	<b>17 Feb 2020</b>	<b>Date Last Updated:</b>	<b>31 March 2020</b>

<b>Actors:</b>	User (Initiating)
<b>Description:</b>	<p>This use case allows users to create an account to access the game application using an email address and password.</p> <p>Account details required:</p> <ul style="list-style-type: none"> <li>• Email address</li> <li>• Username</li> <li>• Password</li> <li>• Confirm Password</li> </ul>
<b>Trigger:</b>	Selection of register account option from the main screen.
<b>Preconditions:</b>	-
<b>Postconditions:</b>	The application creates an account for the user based on the submitted details.
<b>Normal Flow:</b>	<ol style="list-style-type: none"> <li>1. The user selects the registration option in the application's login page</li> <li>2. The application redirects the user to the registration page and prompts the user for the required registration details.</li> <li>3. The user enters required information and submits the form.</li> <li>4. The application validates the input</li> <li>5. The application checks if there is an existing user with the same username or email address.</li> <li>6. The application saves the account registration details.</li> <li>7. The application informs the user that the registration is successful.</li> </ol>
<b>Alternative Flows:</b>	<p>AF-S4: Empty values from any form values submitted</p> <ol style="list-style-type: none"> <li>1. The application informs the user that one of the values submitted is empty and all values are required.</li> <li>2. The application resumes at step 3.</li> </ol> <p>AF-S4: Email Address format not valid</p> <ol style="list-style-type: none"> <li>1. The application informs the user that the email value submitted is not in valid email address format.</li> <li>2. The application resumes at step 3.</li> </ol> <p>AF-S4: Password too short</p> <ol style="list-style-type: none"> <li>1. The application informs the user that the password provided is too short.</li> <li>2. The application resumes at step 3.</li> </ol> <p>AF-S4: Password and Confirm Password does not match</p>

	<ol style="list-style-type: none"> <li>1. The application informs the user that the password and confirm password does not match.</li> <li>2. The application resumes at step 3.</li> </ol> <p>AF-S5: Duplication of username or email found</p> <ol style="list-style-type: none"> <li>1. The application informs the user that the username is taken and to choose another username.</li> <li>2. The application resumes at step 2.</li> </ol>
<b>Exceptions:</b>	<p>1.0.E.1 Application Error</p> <ol style="list-style-type: none"> <li>1. The application informs the user that something went wrong with account creation and to try again later.</li> </ol>
<b>Includes:</b>	-
<b>Priority:</b>	High
<b>Frequency of Use:</b>	Once per new user

<b>Use Case ID:</b>	2		
<b>Use Case Name:</b>	Local Account Login		
<b>Created By:</b>	Leroy	<b>Last Updated By:</b>	Karen
<b>Date Created:</b>	16 Feb 2020	<b>Date Last Updated:</b>	03 April 2020

<b>Actors:</b>	User (Initiating)
<b>Description:</b>	<p>This use case allows the user to login to the application through a locally created account on the platform via registered email address.</p> <p>Required login details:</p> <ul style="list-style-type: none"> <li>• Username</li> <li>• Password</li> </ul>
<b>Trigger:</b>	Selection of login on the main screen for unauthenticated users.
<b>Preconditions:</b>	<ol style="list-style-type: none"> <li>1. The user should have a registered local account created through the Register Account Use Case</li> <li>2. User is not already authenticated through the Login use case.</li> </ol>
<b>Postconditions:</b>	User is successfully authenticated
<b>Normal Flow:</b>	<ol style="list-style-type: none"> <li>1. The user enters the login page.</li> <li>2. The application displays the login page and prompts the user for the required login details.</li> <li>3. The user enters the required login details and submit the form.</li> <li>4. The application validates the submitted login details</li> <li>5. The application checks the provided login details against the set of existing users.</li> <li>6. The application informs the user that login is successful and provides an option to start the game.</li> </ol>
<b>Alternative Flows:</b>	<p>AF-S4: Password too short</p> <ol style="list-style-type: none"> <li>1. The application informs the user that the password provided is too short.</li> </ol>

	2. The application resumes at step 3. AF-S5: Login details not valid, login not successful 1. The application informs the user that login is not successful due to wrong password or username. 2. The application resumes at step 3. AF-S6: Login as Management Staff 1. The application provides an option to go to the management interface instead.
<b>Exceptions:</b>	2.0.E.1 Application Error 1. The application informs the user that something went wrong with account authentication and to try again later.
<b>Includes:</b>	-
<b>Priority:</b>	High
<b>Frequency of Use:</b>	Once per user's session

<b>Use Case ID:</b>	<b>3</b>		
<b>Use Case Name:</b>	<b>Logout</b>		
<b>Created By:</b>	<b>Alson</b>	<b>Last Updated By:</b>	<b>Alson</b>
<b>Date Created:</b>	<b>17 Feb 2020</b>	<b>Date Last Updated:</b>	<b>02 April 2020</b>

<b>Actors:</b>	User
<b>Description:</b>	This use case allows the users to logout of his current account.
<b>Trigger:</b>	Selection of logout on the main screen.
<b>Preconditions:</b>	User is authenticated via the Login Use Case.
<b>Postconditions:</b>	User is no longer authenticated
<b>Normal Flow:</b>	1. The user selects the option to logout on the main page 2. The application logouts the user 3. The application updates all authentication information that the user is no longer logged in. 4. The application informs the user that he/she has been logged out.
<b>Alternative Flows:</b>	-
<b>Exceptions:</b>	-
<b>Includes:</b>	-
<b>Priority:</b>	High
<b>Frequency of Use:</b>	Once per user's session

<b>Use Case ID:</b>	4		
<b>Use Case Name:</b>	Reset Password		
<b>Created By:</b>	Alson	<b>Last Updated By:</b>	Alson
<b>Date Created:</b>	17 Feb 2020	<b>Date Last Updated:</b>	02 April 2020

<b>Actors:</b>	User (initiating) Email Service(participating)
<b>Description:</b>	This use case allows the user to reset the account's password.
<b>Trigger:</b>	Selection of the reset password on the login page.
<b>Preconditions:</b>	User has a local account created via the Register Use Case
<b>Postconditions:</b>	The user's account password will be updated
<b>Normal Flow:</b>	<ol style="list-style-type: none"> <li>1. The user selects the forget password option at the login page.</li> <li>2. The application redirects the user to the forget password page and prompts for email address of the account to be reset.</li> <li>3. The user enters the email address and submits the form.</li> <li>4. The application validates the submitted input and checks if there is an account with the entered details.</li> <li>5. The participating Email Service Actor sends an email to the email address.</li> <li>6. The user selects the reset password option in the email that has sent</li> <li>7. The application redirects the user to the reset password page to prompt the user for a new password and a confirm password.</li> <li>8. The user enters the new password and confirm password and submits the form</li> <li>9. The application validates that submitted password.</li> <li>10. The application updates the user's account with the submitted password and informs the user that the user account has been updated with the new password.</li> </ol>
<b>Alternative Flows:</b>	<p>AF S-5: No email exists in the application</p> <ol style="list-style-type: none"> <li>1. The application informs the user that no account has been created with the submitted email address.</li> <li>2. The application informs the user to verify his/her submitted email address.</li> <li>3. The application resumes at Step 1</li> </ol> <p>AF S-9: Password and confirm password does not match</p> <ol style="list-style-type: none"> <li>1. The application informs the user that the enter password and confirm password does not match.</li> <li>2. The application informs the user to verify that the password and confirm password has been entered correctly.</li> <li>3. The application resumes at Step 8</li> </ol>
<b>Exceptions:</b>	-
<b>Includes:</b>	-

<b>Priorit y:</b>	High
<b>Freque ncy of Use:</b>	Not frequent per user's session

Use Case ID:	5		
Use Case Name:	Social Login		
Create d By:	Wei Cong	Last Updated By:	Cole
Date Created:	18 Feb 2020	Date Last Updated:	03 April 2020

<b>Actors:</b>	User (initiating) Facebook API(Participating)
<b>Description:</b>	This use case allows the user to login via Facebook.
<b>Trigger:</b>	Selection of login option on Login page.
<b>Precondit ions:</b>	User has a valid Facebook account.
<b>Postcondi tions:</b>	User is given option to start game
<b>Normal Flow:</b>	<ol style="list-style-type: none"> <li>1. The user selects the login option on the login page.</li> <li>2. The application redirects the user to the facebook login page and prompts the user for login details.</li> <li>3. The user enters the login details and submits the form.</li> <li>4. The participating Facebook API actor authenticates the login and redirects the user back to the login page after successful authentication.</li> <li>5. The application retrieves the player's profile.</li> <li>6. The application informs the user that login is successful and provides an option to start the game.</li> </ol>
<b>Alternativ e Flows:</b>	AF-S2 User has already been logged into a Facebook account <ol style="list-style-type: none"> <li>1. The participating Facebook API Actor redirects the user back to the login page</li> <li>2. The use case ends.</li> </ol> AF-S4 Unsuccessful Login <ol style="list-style-type: none"> <li>1. The participating Facebook API Actor informs the user the login is not successful.</li> <li>2. The application resumes at step 3.</li> </ol> AF-S5 Create profile for new player <ol style="list-style-type: none"> <li>1. If the social login details does not belong to a existing player, the application creates and initializes the player's account and profile with the provided login information.</li> </ol>
<b>Exception s:</b>	-
<b>Includes:</b>	-
<b>Priority:</b>	Low
<b>Frequenc y of Use:</b>	Not frequent per user

<b>Use Case ID:</b>	<b>6</b>		
<b>Use Case Name:</b>	<b>View profile</b>		
<b>Created By:</b>	<b>Karen</b>	<b>Last Updated By:</b>	<b>Karen</b>
<b>Date Created:</b>	<b>18 Feb 2020</b>	<b>Date Last Updated:</b>	<b>03 April 2020</b>

<b>Actors:</b>	User (initiating)
<b>Description:</b>	This use case allows the users to view its account's profile.
<b>Trigger:</b>	Selection of view login on the main screen.
<b>Preconditions:</b>	User is authenticated via the Login Use Case.
<b>Postconditions:</b>	User is redirected to the view profile page and is able to view profile details.
<b>Normal Flow:</b>	<ol style="list-style-type: none"> <li>1. The user selects the option to view the profile.</li> <li>2. The application retrieves account details and displays account information on the view profile UI. Information to be displayed: <ul style="list-style-type: none"> <li>- Username</li> <li>- Subject name, Level and Progress for each subject</li> <li>- Total score</li> </ul> </li> </ol>
<b>Alternative Flows:</b>	-
<b>Exceptions:</b>	6.0.E.1 Application Error <ol style="list-style-type: none"> <li>1. The application informs the user that profile information could not be retrieved at the moment.</li> </ol>
<b>Includes:</b>	-
<b>Priority:</b>	Low
<b>Frequency of Use:</b>	Not frequent per user

<b>Use Case ID:</b>	<b>7</b>		
<b>Use Case Name:</b>	<b>Move and Interact with Map and NPCs</b>		
<b>Created By:</b>	<b>Wei Cong</b>	<b>Last Updated By:</b>	<b>Karen</b>
<b>Date Created:</b>	<b>16 Feb 2020</b>	<b>Date Last Updated:</b>	<b>03 April 2020</b>

<b>Actors:</b>	User (initiating user)
<b>Description:</b>	<p>This use case describes the general flow of player interaction with NPCs and map transition. Requirements for getting questions and map interactions can be found in Map Interaction and Question NPC Interaction sections under Functional Requirements.</p> <p>As the game is designed to be a free roaming world, the actual user's flow might deviate from the flow presented.</p>

<b>Trigger :</b>	Selection of the start game option after selecting the start game in the main screen.
<b>Preconditions:</b>	<ol style="list-style-type: none"> <li>1. User is authenticated through the Login Use Case</li> <li>2. User has selected the start game option through the main screen.</li> </ol>
<b>Postconditions:</b>	User's score and progress has been updated for that subject they play.
<b>Normal Flow:</b>	<ol style="list-style-type: none"> <li>1. The user selects the option to start the game on the main screen.</li> <li>2. The application redirects the user to the school compound map in the game.</li> <li>3. The user navigates around the school compound and enters a classroom.</li> <li>4. The application loads the map.</li> <li>5. The application loads player information and initializes the Question NPCs based on the player's profile.</li> <li>6. The application displays the map.</li> <li>7. The user gets near to a Question NPC and interacts with the Question NPC.</li> <li>8. The application displays the question via the included use case Answer Question NPC.</li> <li>9. The user completes the included use case</li> <li>10. The user talks to the leadership NPC and interacts with the Leadership NPC.</li> <li>11. The application displays the question via the included use case Talk to Leadership NPC.</li> </ol>
<b>Alternative Flows:</b>	AF-S3: Player does not enter any classroom <ol style="list-style-type: none"> <li>1. The same steps from Step 4 to 11 will take place but the subject will be General Knowledge instead. Leadership NPC will be Leadership NPC for the global leadership board.</li> </ol>
<b>Exceptions:</b>	7.0.E.1 Application Error <ol style="list-style-type: none"> <li>1. The application informs the user that the initialization of the map failed and to try again later.</li> </ol>
<b>Includes:</b>	Answer Question NPC, Talk to Leadership NPC
<b>Priority:</b>	High
<b>Frequency of Use:</b>	Frequent per user's session

<b>Use Case ID:</b>	8		
<b>Use Case Name:</b>	Answer Question NPC		
<b>Created By:</b>	Norman	<b>Last Updated By:</b>	Alson
<b>Date Created:</b>	18 Feb 2020	<b>Date Last Updated:</b>	03 April 2020

<b>Actors:</b>	Users
<b>Description:</b>	This use case describes the interaction with a question NPC. More details on the requirements can be found in Question NPC Interaction section in Functional Requirements
<b>Trigger:</b>	Interaction with Question NPC
<b>Preconditions:</b>	User is authenticated via the Login Use Case



<b>Postconditions:</b>	User's progress in the subject is updated accordingly.
<b>Normal Flow:</b>	<ol style="list-style-type: none"> <li>1. The user interacts with a question NPC</li> <li>2. The application loads and displays the question that was initialized during map initialization.</li> <li>3. The user makes selection of one of the possible options</li> <li>4. The application informs the user regarding whether the answer is correct or wrong.</li> <li>5. The application displays the information source/explanation that explains the reason why the answer is correct or wrong.</li> <li>6. The application displays the option to end question dialog.</li> <li>7. The application updates the player's progress for the question's subject.</li> <li>8. The application updates the player's answer records for the question.</li> <li>9. The user selects the close dialog option.</li> </ol>
<b>Alternative Flows:</b>	-
<b>Exceptions:</b>	8.0.E.1 Application Error <ol style="list-style-type: none"> <li>1. The application informs the user that the updating of player information has failed and to try again later.</li> </ol>
<b>Includes:</b>	-
<b>Priority:</b>	High
<b>Frequency of Use:</b>	Once per user's session

<b>Use Case ID:</b>	<b>9</b>		
<b>Use Case Name:</b>	<b>Talk to Leadership NPC</b>		
<b>Created By:</b>	<b>Jing Herng</b>	<b>Last Updated By:</b>	<b>Jing Herng</b>
<b>Date Created:</b>	<b>16 Feb 2020</b>	<b>Date Last Updated:</b>	<b>16 Feb 2020</b>

<b>Actors:</b>	User (initiating)
<b>Description:</b>	This use case describes the interaction with a leadership NPC. More details on the requirements can be found in the Leadership NPC Interaction section in Functional Requirements.
<b>Trigger:</b>	Interaction with Leadership NPC
<b>Preconditions:</b>	User is authenticated via the Login Use Case
<b>Postconditions:</b>	The application displays the leadership information to the user.
<b>Normal Flow:</b>	<ol style="list-style-type: none"> <li>1. The user interacts with a Leadership NPC.</li> <li>2. The application loads and displays the leadership information for the subject or globally.</li> <li>3. The user selects the close dialog option.</li> </ol>
<b>Alternative Flows:</b>	-
<b>Exceptions:</b>	9.0.E.1 Application Error <ol style="list-style-type: none"> <li>1. The application informs the user that the loading of leadership information has failed and to try again later.</li> </ol>

<b>Includes :</b>	-
<b>Priority :</b>	Low
<b>Frequen cy of Use:</b>	Not frequent

<b>Use Case ID:</b>	<b>10</b>		
<b>Use Case Name:</b>	<b>Share Question</b>		
<b>Created By:</b>	<b>Sam</b>	<b>Last Updated By:</b>	<b>Sam</b>
<b>Date Created:</b>	<b>18 Feb 2020</b>	<b>Date Last Updated:</b>	<b>18 Feb 2020</b>

<b>Actors:</b>	User (initiating user) Facebook API(participating actor)
<b>Description:</b>	This use case allows users to share questions to social media.
<b>Trigger:</b>	-
<b>Preconditions:</b>	The user must have either Facebook linked to their account.
<b>Postconditions:</b>	The user successfully shared their question on Facebook.
<b>Normal Flow:</b>	<ol style="list-style-type: none"> <li>1. The user selects the sharing option.</li> <li>2. The application redirects the user to Facebook API.</li> <li>3. The participating Facebook API Actor prompts the user for the content to share.</li> <li>4. The user submits the form.</li> </ol>
<b>Alternative Flows:</b>	-
<b>Exceptions:</b>	10.0.E.1 User ends the sharing process after being redirected. <ol style="list-style-type: none"> <li>1. No sharing is done.</li> </ol>
<b>Includes:</b>	-
<b>Priority:</b>	Low
<b>Frequency of Use:</b>	Not frequent per user's session

## 6 External Interface Requirements


### 6.1 User Interfaces

#### 6.1.1 User login page

Login page should allow the user to choose if they want to login using a Google account or locally created account using his/her login credentials. Which will then be checked against the information stored in the database.

Upon successful login, the user will be redirected to the respective interface based on the information used to log in. For example, the administrator will be redirected to the management page. Normal users will then be directed to the main page.

Login page should contain an option for users to register for an account as well as an option to reset password using “Forget your password?” option.




Game Name

Username

Password

LOGIN

or


 Sign in with Google

[Forget your password?](#)

---

Don't have an account?

REGISTER



Game Name

Username

Password

[Forget your password?](#)

LOGIN

---

Don't have an account?

REGISTER

### 6.1.2 Front Loading Screen

Throughout the application, whenever there is a need to load items, the application should provide a loading screen to show loading progress.

**Below are the requirements for the loading screen:**

1. The application must be able to show the loading progress.
2. Loading progress must be displayed in a numerical form.
3. Loading progress must be in a percentage form.
4. Loading progress must progress over time.
5. Loading progress must progress relative to loading of assets.

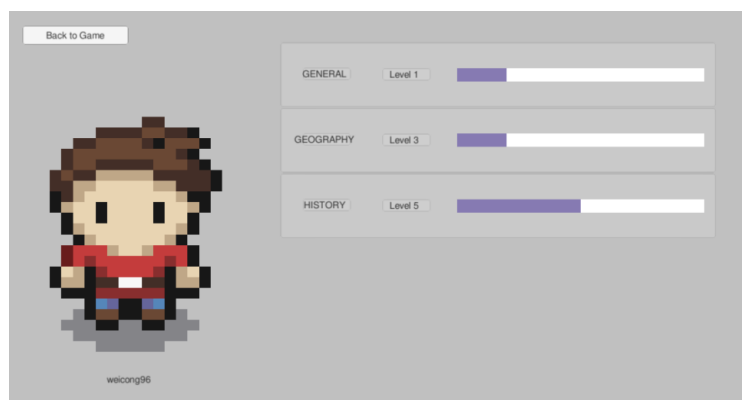
### 6.1.3 Main Menu

Once the player successfully login into the GGWP application, the interface should provide the following options in the form of clickable buttons:

1. **Play Game** - to access the “local map” where players can explore the game world and interact with NPC to answer quiz questions and collect points. More information on it will be explained below. (section 6.4)

2. **View Profile** - Redirect the player to view his/her profile.

Profile should include the avatar image, username and the level and experience bar for each “subject”.



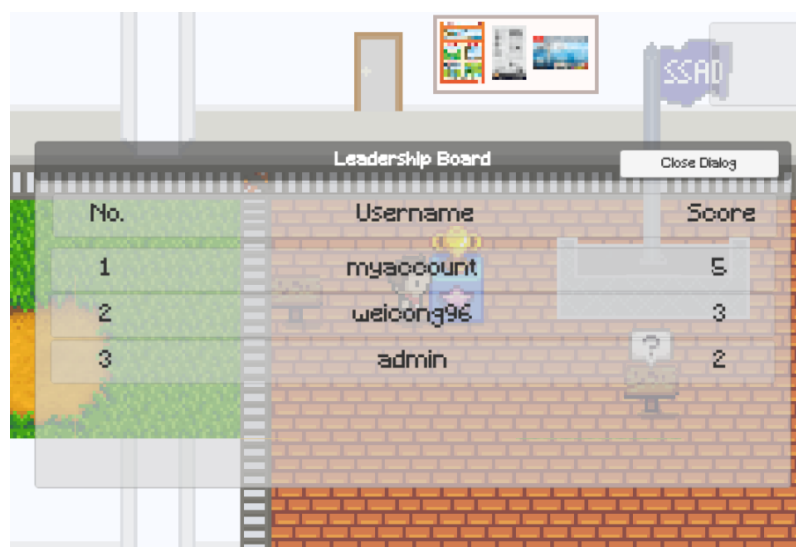
3. **Logout** - End player’s current session and redirect the player back to the login page.

#### 6.1.4 “Play game” - local map

Once the player successfully login and access the “play game” option. The system should display a “local map” with the player’s avatar. An example of the interface is shown below where user is randomly placed in an area on the local map.



NPC are objects located on the map. There are 2 forms of NPC in this application. One of them is a trophy display which will display the leadership board when the player approaches it. If the player approaches the trophy display in the local map, it will show the ranking, username and score for the “general knowledge” topic. If the trophy display is approached by the player in the building map of a subject, the subject’s leadership information should be displayed in a similar format.



With reference to the above image, the second type of NPC available in this application is NPC with a quest for the player where it will ask the player subject specific questions and award points if the player answers the questions correctly. They are represented by a dialog box on top of them with “?”. If the player approaches the NPC and the player is attempting the question, the dialog box on top of the NPC should be changed to “...”



Interface should display the question and provide 4 options for the player to select and submit as the correct answer. There should be an option for the player to share the question on his/her facebook page as shown below.

### 5.6.



After selecting the answer, the application should validate to inform the player if it is correct and provide an explanation associated with the question.



**Below are the requirements for the play game screen:**

1. Allow the player to navigate around the area.
2. Allow the player to interact with NPC in the game.
3. If the player approaches the trophy display, a pop up of the ranking, username and points of the top 5 players for that particular subject should be displayed.
4. If the player is allowed to take on quest, the NPC located in the area must display a dialog box with “?” .
5. If the player is answering the question, NPC’s dialog box should be changed to “...”
6. The player should only be allowed to access questions when he/she interacts with NPC displaying “?” sign.
7. When the player answers a question, he/she should be able to select any of the options.
8. The system should display if the player answers correctly and show additional information about the question.
9. When the player is in the room or accesses another interface, it should have an “exit” option to return to the previous screen.
10. Allow the player to view its profile whenever possible.



## 6.2 Hardware Interface

The application will be web based, The device must support internet connectivity and web browser. These browsers are Google Chrome, Mozilla Firefox, Microsoft Edge and Internet Explorer.

6.

## 7 Non-Functional Requirements

The chosen non-functional for GGWP application will be on performance. Performance was chosen because it is an important factor which retain user's interest in the game.

**Below are the performance requirements for GGWP:**

1. The application must respond to user requests within 1 second.
2. The application must be able to support 2000 queries request and still respond within 3 seconds.
3. The application must be able to support a minimum of 2000 users online concurrently.
4. Email notification for password reset must reach the user within 1 minute.

software quality attributes

Specify any additional quality characteristics for the product. Write these to be specific, quantitative, and verifiable when possible. At the least, clarify the relative preferences for various attributes, such as ease of use over ease of learning

## 8 Appendix A: Data Dictionary

#	Term(A-Z)	Definition
1	Admin	Human user of the application who is registered. They have access and authorized privileges to perform management tasks in the application.
2	Application	The application refers to the game application.
3	Building	It is an accessible object that the user may access/interact. Once a player enters one of the accessible buildings, the player will transit into a “local map”. Each building has a unique subject related to the secondary school subject. It is populated throughout the ‘world map’.
4	Chat Box	It consists of question content and clickable answers, actions.
5	Exclamation Mark	It is an interactive element. It is randomly populated throughout all kinds of maps. Once the user interacts with it, it will popup a question.
6	Experiences Bar	Points earned by players based on answering questions based on subject. There are a total of 10 units per experience bar. When the progress bar is full (10 units acquired), the players will be able to increase 1 level for the subject and receive more challenging questions, the experience bar will reset back to 0 units. When the progress bar is empty and points are detected, the play will decrease 1 level for the subject and receive less challenging questions, the experience bar will reset back to 10 units.
7	Game	The application that players interact with.
8	Leadership board	This is a function that displays the application users top ranking based on points collected from playing the game. It is reset daily or weekly based on display options. The leadership board consists of 2 types. Firstly, subject specific leadership boards where points are generated within the scope of the subject, it is available in the local map. Secondly, a global leadership board where points are generated from all the subjects, it is available in the main map.
9	Level	Level defines a player’s mastery level. As players answer more questions correctly, the application will increase its level. Level is used to determine the question difficulty given to users. The level starts from level 1 and will never go below 1.
10	Local Map	It is a map accessible from the building, when the player is inside a local map, the player can exit at the entrance point, the player will transit into ‘main map’. Below depicts the local map.
11	Main Map	It refers to the game environment situated in a school compound, with different variety of buildings accessible to the user.
12	NPC	It is also known as a non-player character. Individual NPC may have question marks appear over them. They are represented by characters, equipment or items related to the subject.
13	Player	The student using this application.
14	Point	Points earned when players answer the questions correctly. The point will also be detected in the experience bar, this is vice versa for answering the question wrongly if the player's level is below level X. Used to determine the players position in the leadership board. It is also associated with an experiences bar and a level indicator for each subject

<b>15</b>	Progression	It is a progress that refers to points earned by players based on answering based on the subject thus far. it will be tracked using the experience bar and a level indicator.
<b>16</b>	Question	Each question consists of one correct answer. The questions offered to each are unique to his/her progression. When the user chooses not to answer the question, the question will be prompted again.
<b>17</b>	Question Format	Multiple Choice Questions(MCQ) and/or text based input questions. Each question only has 4 choices of answer.
<b>18</b>	Question Mark	It is a map accessible from the building, when the player is inside a local map, the player can exit at the entrance point, the player will transit into 'main map'. Below depicts the local map.
<b>19</b>	Rank	Ranks in the game given based on mastery of the student on the topic and the amount of points they have accumulated.
<b>20</b>	Sharing on Social Media	This function allows users to share a question on social media platforms such as Facebook to seek help on questions or simply share the question.
<b>21</b>	Student	Human user of the application who is registered. They are the end user or target audience during the prototype phase.
<b>22</b>	Subject	Subjects of interest for students to learn from. It could be history, social science, geography and others. Miscellaneous knowledge that does not belong to any specific subject will be placed under General Knowledge.
<b>23</b>	Teacher	Human user of the application who is registered. They are the administrator during the prototype phase.
<b>24</b>	UI	It is also known as user interface. Interface where the player interacts with the Application.
<b>25</b>	User	Human user of the application who is registered. The Users include Teachers, Students and Administrator.

## 9 Appendix B: Analysis Model

In this section, the decision table, state machine diagram and context diagram will be provided to provide more explanation on the working of GGWP.

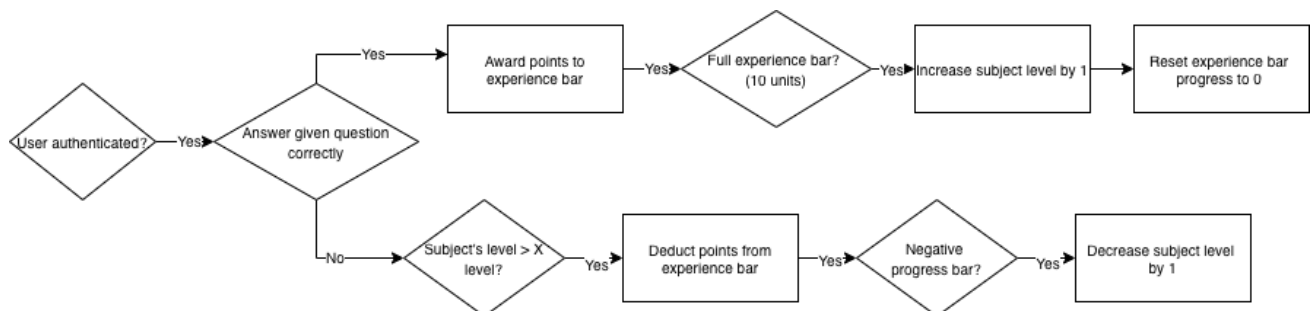
### 6.1.

#### 9.1 Decision table for game mechanism (awarding of points)

This decision table and diagram shows the system's flow for tracking the subject's points and level during its interaction with the user during game play. When players access the quiz questions, the system will keep track of the answer given to determine if points are to be awarded or deducted as well as if there are any changes to the player's level for that particular subject.

#### Requirements:

1. Players must log in via a registered account or locally created account to access the game mechanism.
2. If the player answers the given question correctly, points will be awarded to the subject's experience bar.
3. If the player answers the given question incorrectly and the subject's level is more than level X, points will be deducted from the subject's experience bar.
4. When the subject's experience bar contains 10 units (points), subject level will increase by one. Experience bar will be reset to 0 when the level increases.
5. When the subject's experience bar is negative, subject level will decrease by one level.



	R1	R2	R3	R4	R5	R6
C1: Authenticated player (logged in)	F	T	T	T	T	T
C2: Question answered correctly	-	T	T	F	F	F
C3: Player's subject level is more than X	-	-	-	F	T	T
C5: Experience bar is filled (10 units)	-	F	T	-	-	
C6: Experience bar is negative	-	-		-	F	T
A1: Point awarded to experience bar		X	X			
A2: Point deducted to experience bar					X	X
A3: Subject level increase by 1			X			
A4: Reset experience bar to 0 points			X			X
A4: Subject level decrease by 1						X

## 9.2 State machine Diagram

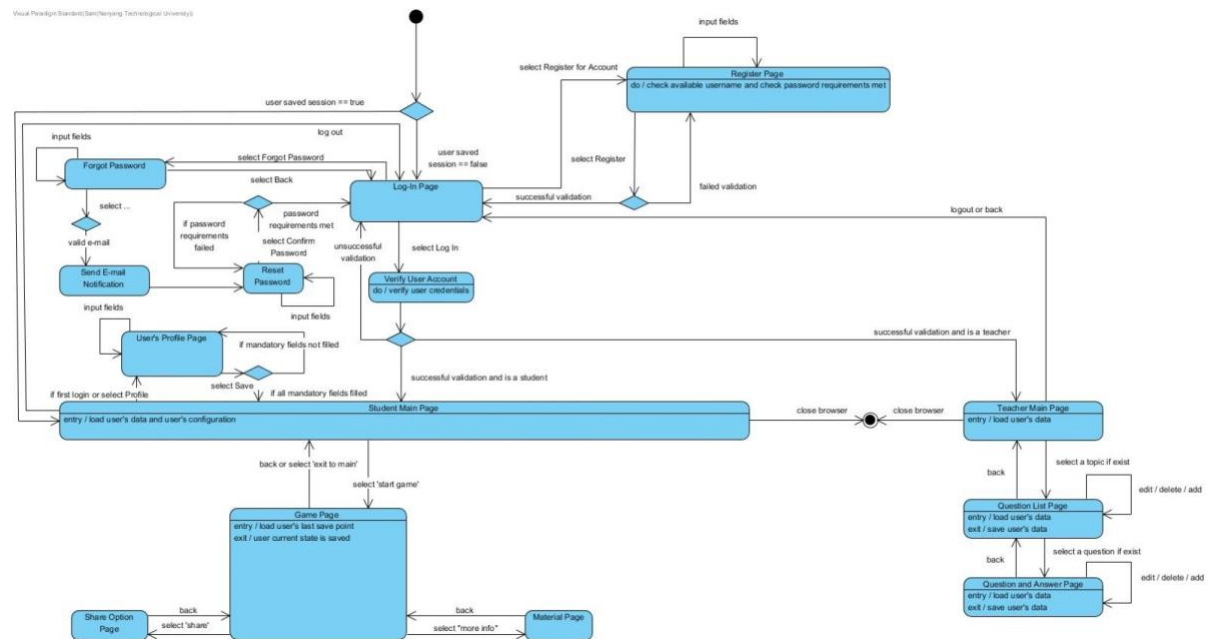


Figure 9 - Overall state machine diagram for GGWP

## 9.3 Context Diagram

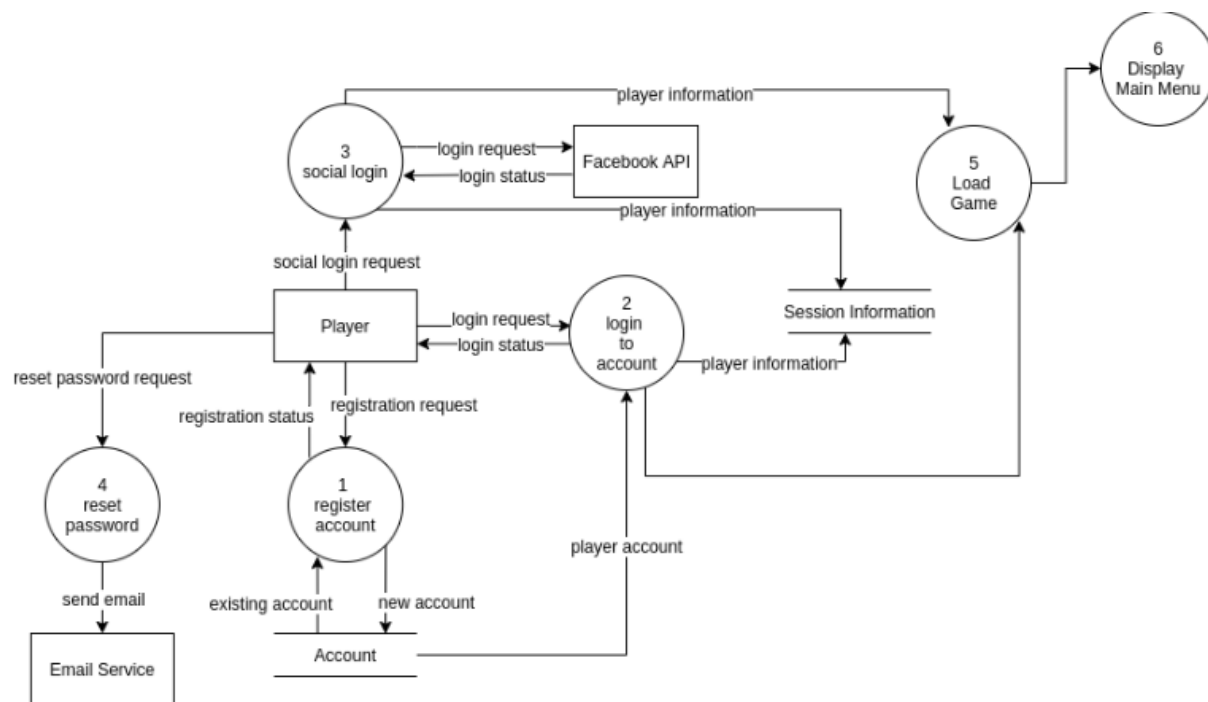


Figure 10 - Context diagram 1 for GGWP

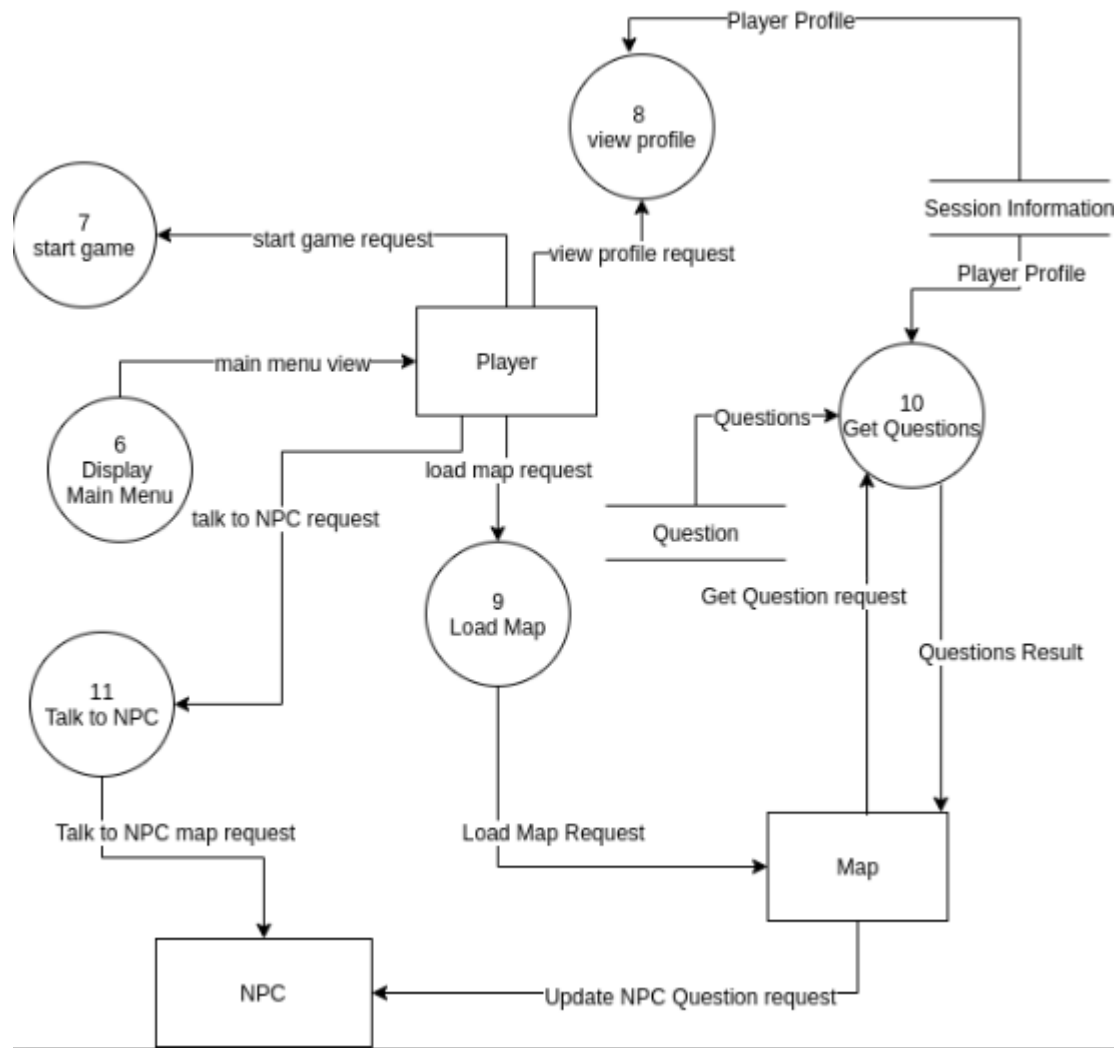


Figure 11 - Context diagram 2 for GGWP

## 9.4 ER Diagram

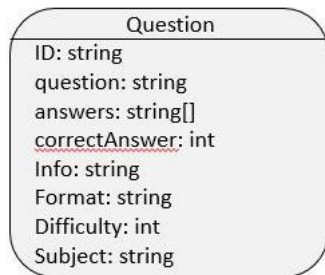


Figure 12 - ER diagram 1 for GGWP

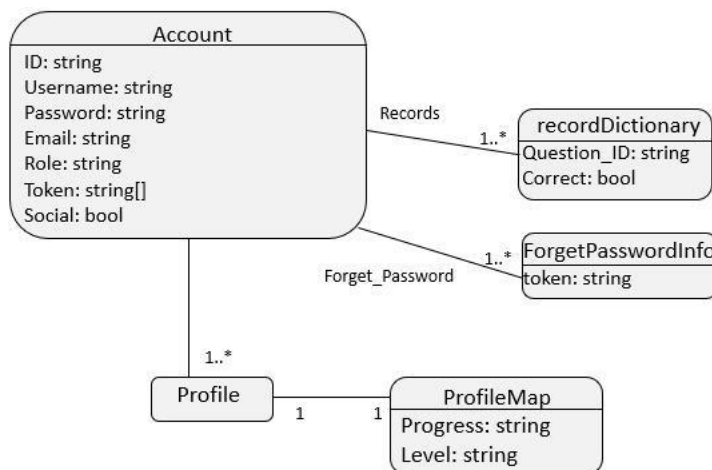
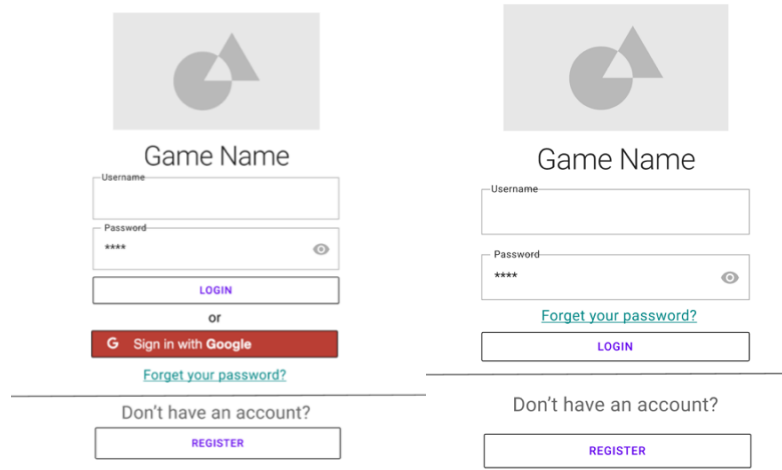


Figure 13 - ER diagram 2 for GGWP



## 10 Appendix C: UI Mock Up

### Local Account Login Page



The image shows two side-by-side wireframes of a local account login page. Both wireframes feature a logo at the top consisting of a grey circle and a grey triangle. The left wireframe has a 'Game Name' label above a 'Username' input field, followed by a 'Password' input field with four asterisks and an eye icon. Below the password field is a 'LOGIN' button. Underneath the button is the word 'or' and a red button with a white 'G' icon and the text 'Sign in with Google'. Below that is a link 'Forget your password?'. At the bottom is a link 'Don't have an account?' and a 'REGISTER' button. The right wireframe is similar but lacks the 'Sign in with Google' button and the 'Don't have an account?' link. It has a 'Game Name' label, a 'Username' input field, a 'Password' input field with four asterisks and an eye icon, a 'LOGIN' button, a 'Forget your password?' link, and a 'REGISTER' button.

Game Name


Username

Password

\*\*\*\*

LOGIN

or

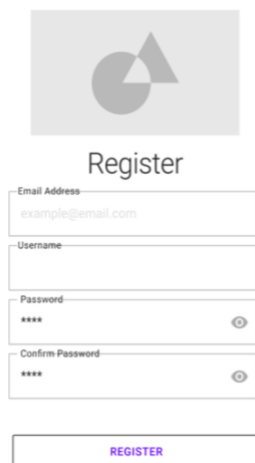
 Sign in with Google

[Forget your password?](#)

Don't have an account?

REGISTER

### Local Account Registration Page



The image shows a wireframe of a local account registration page. It features a logo at the top consisting of a grey circle and a grey triangle. Below the logo is the word 'Register'. There are four input fields: 'Email Address' with the placeholder text 'example@email.com', 'Username', 'Password' with four asterisks and an eye icon, and 'Confirm Password' with four asterisks and an eye icon. Below the input fields is a 'REGISTER' button.

Register

Email Address

example@email.com

Username

Password

\*\*\*\*

Confirm Password

\*\*\*\*

REGISTER

## Local Account - Forget Password Page



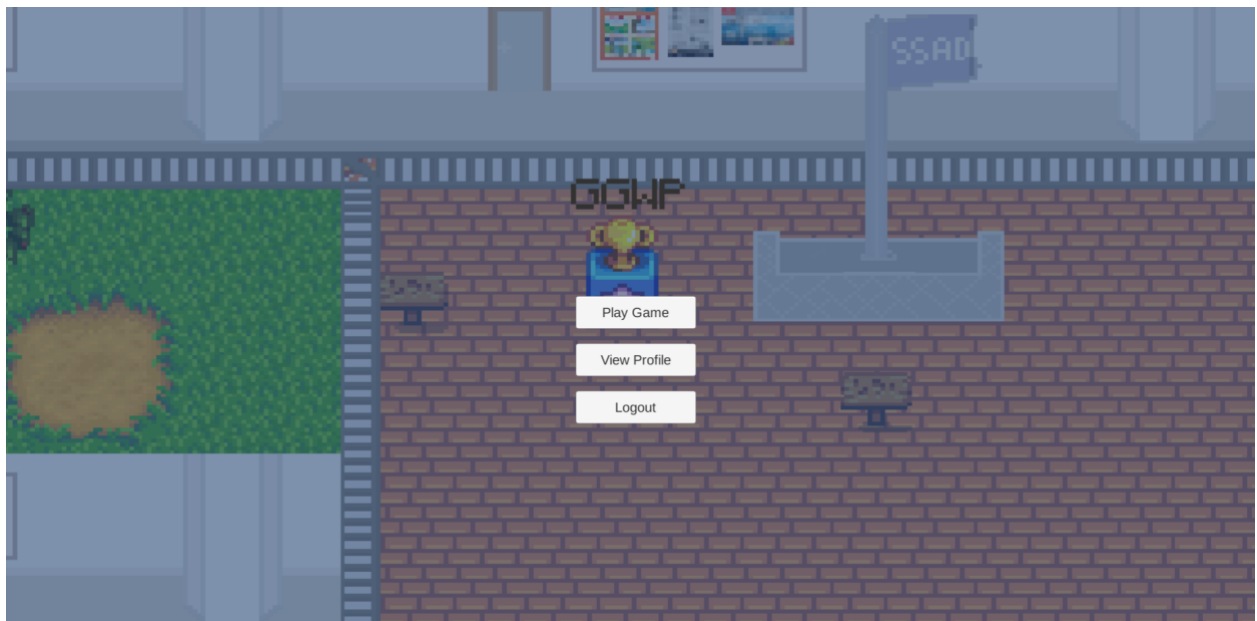
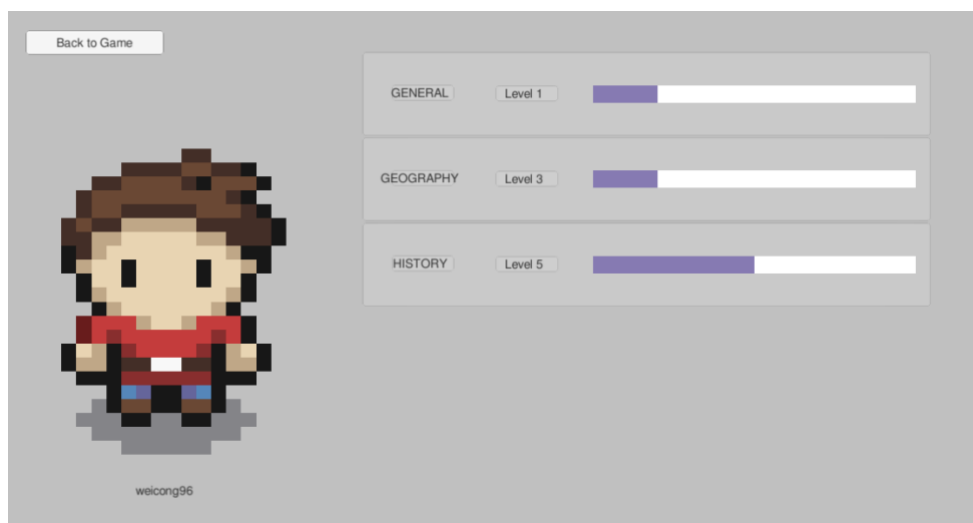
 Forgot Password	 Forgot Password
<input type="text" value="Username"/>	<input type="text" value="Username"/> weicong96
<input type="button" value="SEND VERIFICATION EMAIL"/>	<input type="button" value="SEND VERIFICATION EMAIL"/> Reset Password Email has been Sent

Figure 14 - Forget passwords interface

## Main Menu Page



## Player's Profile Page



Default Local Map



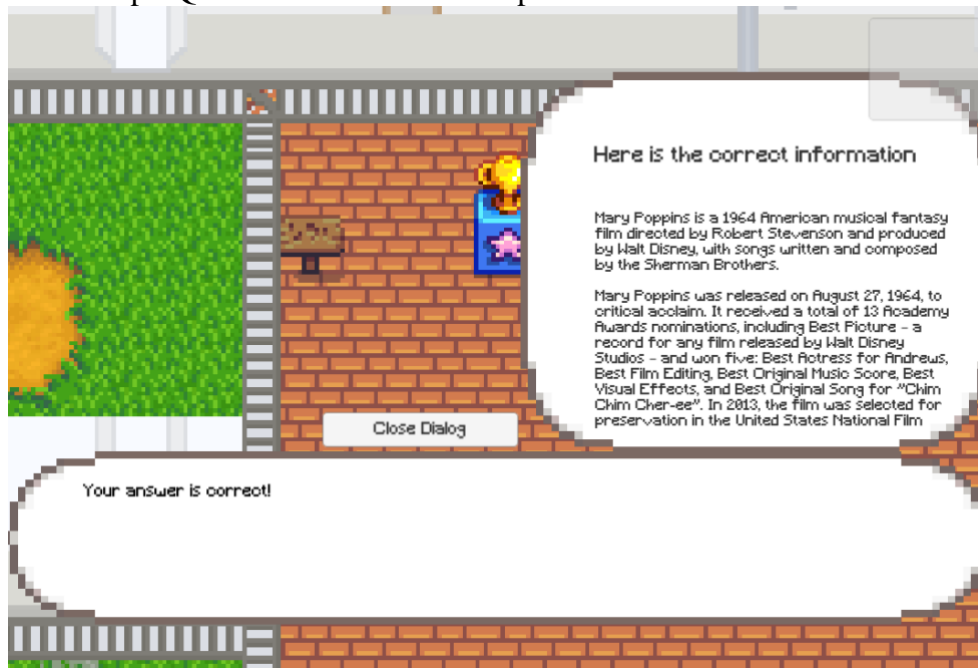
Local Map - NPC with “Quest” for the player



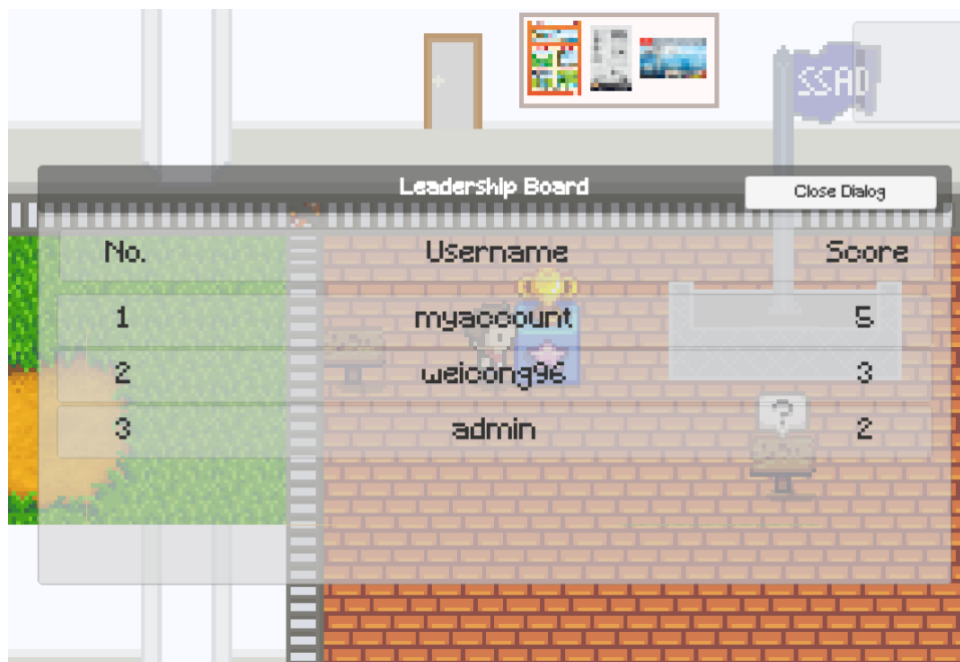
Local Map - Player answering NPC's question



## Local Map - Question validation and explanation



## Local Map - Leadership board



## Teacher's Management Page (Administrator Interfaces)

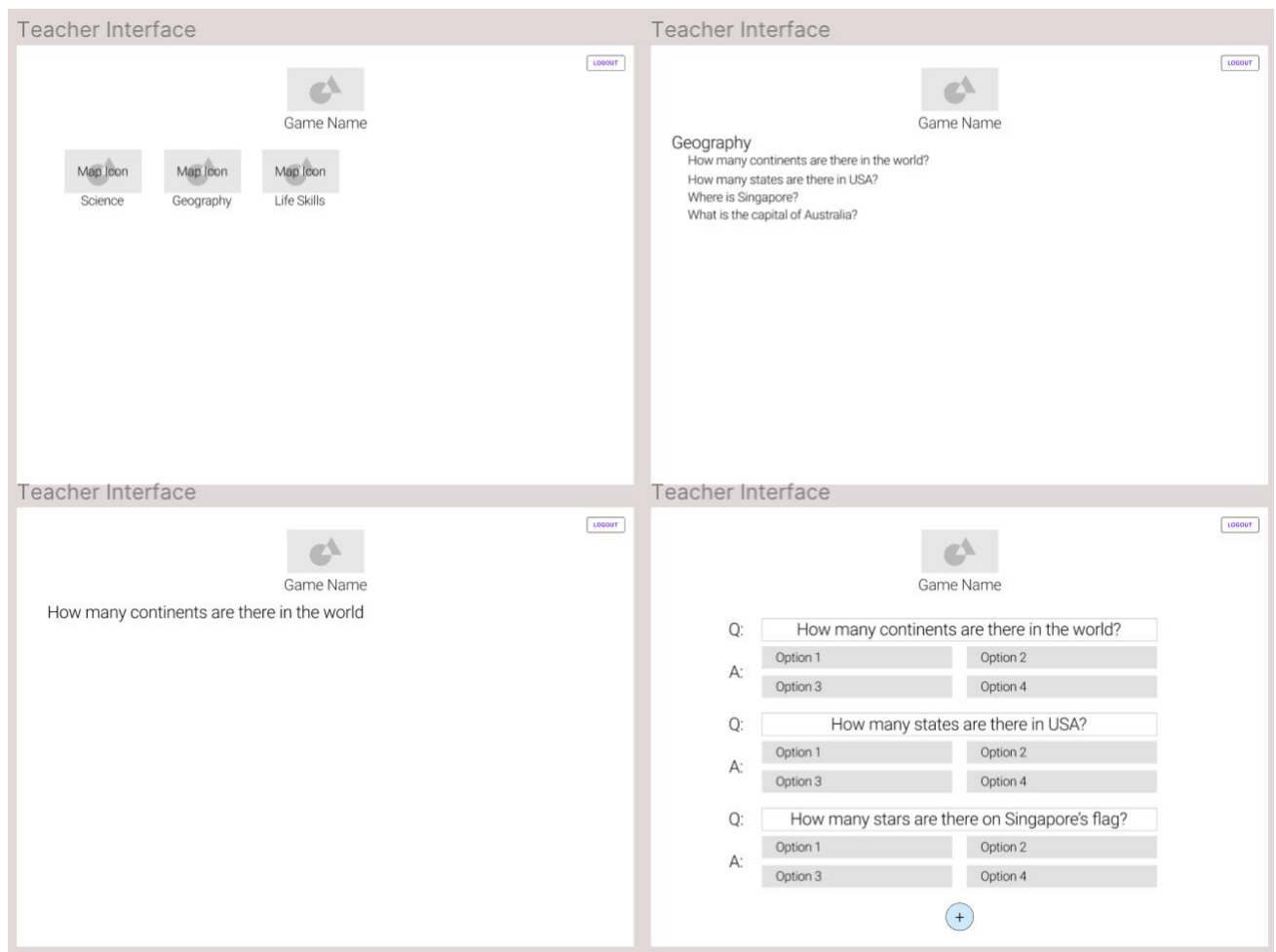


Figure 15 - Administrator or "Teacher" Interface

## 11 Appendix D: Component Design

### 11.1 Component Diagram

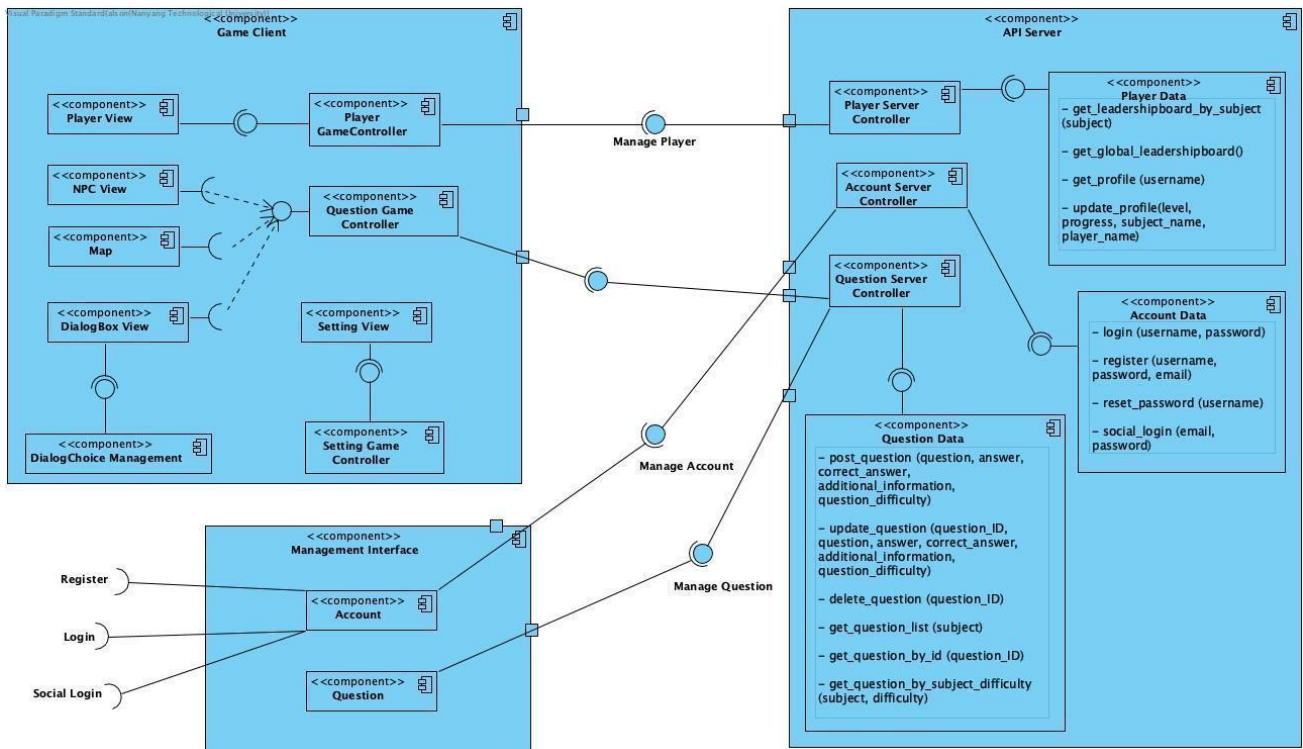


Figure 15 - Component diagram for GGWP

### 11.2 Communication Diagram

