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# Software Requirements Specification

for

# MAZEMATICS

Version 1.0 approved

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**It Works On My Machine**

**3 February 2020**

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## Revision History

Name	Date	Reason For Changes	Version
Everyone	16/02/2020	Initialisation	1.0

# **1. Introduction**

## **1.1 Purpose**

The Teaching, Learning and Pedagogy Division (TLPD) of NTU is attempting to introduce a social game to gamify and socialise teaching and learning of content. As part of TLPD's efforts, we have designed Mazematics. Mazematics is a maze-themed educational game that aims to enhance the learning experience of students and provide an effective teaching platform for teachers. This document will describe the complete features and interface of our game.

## **1.2 Document Conventions**

The format of the software requirement specification is simple. Bold font indicates topic title while the remainder of the document will be written using standard font Times New Roman, size 12. The document uses a multi-level numbered list to provide details for features and requirements.

## **1.3 Intended Audience and Reading Suggestions**

The document is intended for developers, testers and users.

Developers can review the Overall Description, External Interfaces, System Features and Other Non Functional Requirements to understand the constraints and features of this software. This will also allow developers to introduce new capabilities for future improvement.

Testers who intend to use the document as a guideline to formulate test cases are recommended to review System Features and Other Non Functional Requirements. These sections will provide understanding of the requirements of the game.

Users who are interested in reading the software requirement specification document can review Overall Description and System Features to know more about the functionality of the game.

## **1.4 Product Scope**

Mazematics aims to provide a learning and teaching platform which benefits both students and teachers. Mazematics has three main objectives:

1. To engage students to learn educational content via interactive gameplay and friendly peer competition.
2. To provide a teaching platform that provides teachers the flexibility to design topical learning materials for students.
3. To facilitate data analysis of students' progress, allowing teachers to assess each students' progress and improve teaching quality.

## **1.5 References**

Not applicable.

## **2. Overall Description**

### **2.1 Product Perspective**

Mazematics is a new, self-contained product.

### **2.2 Product Functions**

There are 3 main product functions for this project:

- The system shall have an educational gaming system.
- The system shall have a teaching platform for teachers.
- The system shall have an account management system.

### **2.3 User Classes and Characteristics**

There are a total of 3 user classes that will be differentiated based on roles for this project:

1. System Administrator
2. Teacher
3. Student

#### **2.3.1 System Administrator**

The system administrator should manage all the accounts in the system. The system administrator should be able to

- Create accounts
- Delete accounts
- View accounts
- List accounts
- Edit account details, such as the role of an account (Teacher, Student, System Administrator)

#### **2.3.2 Teacher**

The teacher should manage the teaching materials to be viewed by the students. This includes creating a teaching topic and a difficulty level.

After creating the teaching topic, the teacher should be able to

- Edit/delete the topic
- Create levels in the topic

After creating the game level, the teacher should be able to

- Edit/delete the level
- Upload teaching materials (in text, pdf, video)
- Delete uploaded teaching materials
- Make a level playable
- View and download the student report for the level

#### **2.3.3 Student**

The student should be able to

- Access the topics and levels created by the teacher
- View the uploaded learning materials by the teacher
- Play the game upon completion of the learning materials
- Be quizzed in the game to see how much the student has learnt
- View the leaderboard of the level

## 2.4 Operating Environment

The software shall require a minimum of the following hardware to operate:

- CPU - Intel Skylake
- RAM - 4GB DDR3

The software shall require a minimum of the following operating system to operate:

- Windows 10
- Ubuntu 18
- Mac OS 10.12 Sierra

## 2.5 Design and Implementation Constraints

- **Testing constraint:** Might not be able to access the students/teachers/administrators databases of the customer organization due to corporate policies. As such, testing cannot be conducted on the domain of the customer organization.
- **Language constraint:** The application will be implemented in English (Singapore) format. There is currently no support for other languages.

## 2.6 User Documentation

- A developer guide that details the purposes of all the program functions will be provided to the developers to aid them in maintaining the application.

## 2.7 Assumptions and Dependencies

### 2.7.1 Assumptions

The following assumptions are made in the engineering of this product:

- The system administrator, teacher and student know how to access this product from a web browser
- The system administrator, teacher and student are familiar with commonly used icons such as the menu bar
- The system administrator, teacher and/or student are not malicious entities
- The teacher is a professional trained to teach students in Primary One to Six

### 2.7.2 Dependencies

This product has the following dependencies:

- The topics to be included in this product should follow the [Mathematics Syllabus for Primary One to Six](#) as defined by Singapore Ministry of Education
- The webpage of the product should adhere to the [Google Chrome Privacy Notice](#)
- The webpage of the product should adhere to the [FireFox Privacy Policy](#)
- The webpage of the product should adhere to the [Apple Privacy Policy](#)
- The webpage of the product should adhere to the [Microsoft Edge Privacy Policy](#)

### **3. External Interface Requirements**

#### **3.1 User Interfaces**

- The minimum web browser size is 320px x 568px.

#### **3.2 Hardware Interfaces**

- No hardware interfaces have been identified.

#### **3.3 Software Interfaces**

- The system shall communicate with a database to manage the data for the operations of the system.

#### **3.4 Communications Interfaces**

- The system shall run on a web browser using the HTTPS protocol.
- The communication protocol is encrypted using Secure Sockets Layer.



## 4. System Features

### 4.1 Educational Gaming System

#### 4.1.1 Description and Priority

The system shall have an educational gaming system. The educational gaming system is a maze-based game whereby students will attempt to navigate through the maze within the shortest period of time.

- Priority: High
- Benefit: 10
- Penalty: 10
- Cost: 8
- Risk: 5

#### 4.1.2 Stimulus/Response Sequences

Stimulus: The student logs in.

Response: The system verifies the login.

Stimulus: The student selects a world corresponding to the teaching topic the student intends to learn about.

Response: The system displays the list of game levels.

Stimulus: The student selects a game level.

Response: The system loads the maze game for the game level.

#### 4.1.3 Functional Requirements

REQ 1: The gaming system shall have multiple worlds.

REQ 1.1: Each world shall correspond to a teaching topic.

REQ 1.2: Each world shall have multiple game levels.

REQ 1.2.1: Each game level shall correspond to a difficulty level of the teaching topic.

REQ 1.2.2: The system shall automatically generate a map for each game level, based on the number of questions in the difficulty level.

REQ 2: A student shall select which world and game level they want to play by selecting a teaching topic and a difficulty level of the teaching topic.

REQ 2.1: The system shall require students to view the learning materials for the difficulty level before they can unlock the corresponding game level in the gaming system.

REQ 2.2: The student shall be able to enter the maze if the learning materials have been viewed.

REQ 3: The gaming system shall be based on a maze.

REQ 3.1: A student shall be able to navigate within the maze.

REQ 3.2: A student shall be able to move up, down, left or right.

REQ 3.3: A student shall move only if the path ahead is clear.

REQ 3.4: A student shall not be able to move through the wall.

REQ 3.5: A student shall not be able to move through an obstacle.

REQ 3.5.1: The gaming system shall ask the student a question when the student encounters an obstacle.

REQ 3.5.2: The questions shall come from the set of questions set by the teachers.

REQ 3.5.3: The student shall be able to clear the obstacle if they answered the question correctly.

REQ 3.5.4: The student shall re-attempt the question if they answered the question incorrectly.

REQ 3.5.5: The system shall require the student to answer the question again until they answer the question correctly.

REQ 3.6: A student shall move from the start tile to the goal tile.

REQ 4: The gaming system shall record the time a student takes to escape the maze.

REQ 4.1: The gaming system shall stop the time while a student is answering a question.

REQ 4.2: The total timing taken for a student to complete the maze will be recorded and ranked on the leaderboard.

REQ 4.3: The gaming system shall add a 10 seconds time penalty whenever a student answers incorrectly.

REQ 5: The gaming system shall have a leaderboard for each game level.

REQ 5.1: The leaderboard shall display the names and timings of the students with the top 10 timings for the game level.

## **4.2 Teaching Platform**

### **4.2.1 Description and Priority**

The system shall have a teaching platform for teachers. The teaching platform provides teachers the flexibility to create their own mazes based on subject topic.

- Priority: High
- Benefit: 10
- Penalty: 3
- Cost: 6
- Risk: 5

### **4.2.2 Stimulus/Response Sequences**

Stimulus: The teacher logs in.

Response: The system verifies the login.

Stimulus: The teacher clicks the “Manage Teaching Topics” button.

Response: The system displays the list of teaching topics.

### **4.2.3 Functional Requirements**

REQ 1: A teacher shall be able to create and manage the teaching topics.

REQ 1.1: Within each topic, a teacher shall be able to create and manage difficulty levels.

REQ 1.1.1: Within each difficulty level, a teacher shall be able to upload and manage learning materials for each difficulty level.

REQ 1.1.2: Within each difficulty level, a teacher shall be able to create and manage a set of questions.

REQ 2: A teacher shall be able to view and download a student’s report.

REQ 2.1: A teacher shall be able to see the number of attempts a student has made for each question.

## **4.3 Account Management System**

### **4.3.1 Description and Priority**

The account management system ensures the roles and permissions of every user account are strictly controlled.

- Priority: High
- Benefit: 5
- Penalty: 5
- Cost: 5
- Risk: 5

### **4.3.2 Stimulus/Response Sequences**

Stimulus: The system administrator logs in.

Response: The system verifies the login.

Stimulus: The system administrator clicks the “Edit Account” button of a selected account.

Response: The system displays editable fields for the selected account.

Stimulus: The system administrator changes the necessary field and clicks the “Confirm” button.

Response: The system displays an updated list of account details.

### **4.3.3 Functional Requirements**

REQ 1: The system shall allow users to login and logout.

REQ 2: The system shall have three types of accounts.

- REQ 2.1: The system shall allow teacher accounts to be created.
- REQ 2.2: The system shall allow student accounts to be created.
- REQ 2.3: The system shall allow system administrator accounts to be created.
- REQ 3: The system shall allow system administrators to manage accounts.
  - REQ 3.1: The system shall display a list of all accounts and their details.
  - REQ 3.2: The system shall allow system administrators to create teacher, student and system administrator accounts.
  - REQ 3.3: The system shall allow system administrators to delete teacher, student and system administrator accounts.
  - REQ 3.4: The system shall allow system administrators to modify teacher, student and system administrator accounts.
    - REQ 3.4.1: The system shall allow system administrators to modify the username of an account.
    - REQ 3.4.2: The system shall allow system administrators to modify the email of an account.
    - REQ 3.4.3: The system shall allow system administrators to modify the password of an account.
  - REQ 3.5: The system shall not display password of any account.

## **5. Other Nonfunctional Requirements**

### **5.1 Performance Requirements**

- The system shall run on Chrome 57 and newer.
- The system shall run on Firefox 52 and newer.
- The system shall run on Microsoft Edge 16 and newer.
- The system shall run on Safari 10.1 and newer.

### **5.2 Safety Requirements**

- Only teachers are allowed to modify learning materials and the maze game.
  - Teachers shall login to their account to modify resources.
- Account management is strictly done by administrators.
  - Administrators can create and modify permissions and roles for each user account.
  - Accounts without the permission of an administrator cannot modify another account.

### **5.3 Security Requirements**

- Web Browser
  - The system shall run on a web browser using the HTTPS protocol.
- Account
  - Only system administrators are allowed to create accounts and set passwords.
  - Users will login to their personal account to use the software.
  - Users shall not share their password with others.

### **5.4 Software Quality Attributes**

- Usability
  - 80% of users must be able to navigate the teaching and learning within 3 minutes
  - The application must enable the user to return to the main menu within 3 touches at any time.
  - The application must be able to update and publish the updated leaderboard within 3 seconds after a student has completed a maze.
  - The application's help button must be findable by at least 95% of first-time users within 30 seconds without prompt by the application.
  - The application must inform users that the application is still running if it does not return results within 30 seconds.
  - The application must inform users within 30 seconds if it is unable to return the appropriate results.
- Supportability

- The application must allow the user to open the following file with these formats:
  - Microsoft Powerpoint, Word, Excel (.ppt, .doc, .xlsx)
  - Text Files (.txt, .csv)
  - Media (.mp4, .avi, .wmv, .mov, .mp3)

## **5.5 Business Rules**

- All teaching materials shall only be created and modified by the teachers.
- No one other than teachers shall be allowed to directly edit any teaching materials.
- The content within the system shall adhere to Singapore Ministry of Education guidelines

## **6. Other Requirements**

Not applicable.

## 7. Appendix A: Glossary

<b>Maze</b>	A maze is a network of paths, walls and obstacles that is designed as a puzzle through which the student has to find a way out of.
<b>World</b>	The gaming system has multiple worlds. Each world corresponds to one teaching topic.
<b>Game Level</b>	A world consists of multiple game levels. Each game level corresponds to one difficulty level of the world's teaching topic.
<b>Teaching Topic</b>	A teaching topic refers to a chapter in the Mathematics syllabus, such as addition and subtraction.
<b>Difficulty Level</b>	A teaching topic consists of multiple difficulty levels. A difficulty level is a section of the teaching topic. For example, the teaching topic addition may have difficulty levels such as addition of numbers from 1 to 100 and addition of numbers from 1 to 1000.
<b>Manage</b>	To manage data means to create, edit, delete, view and list the data.



## **8. Appendix B: Analysis Models**

### **8.1. Data Flow Diagram**

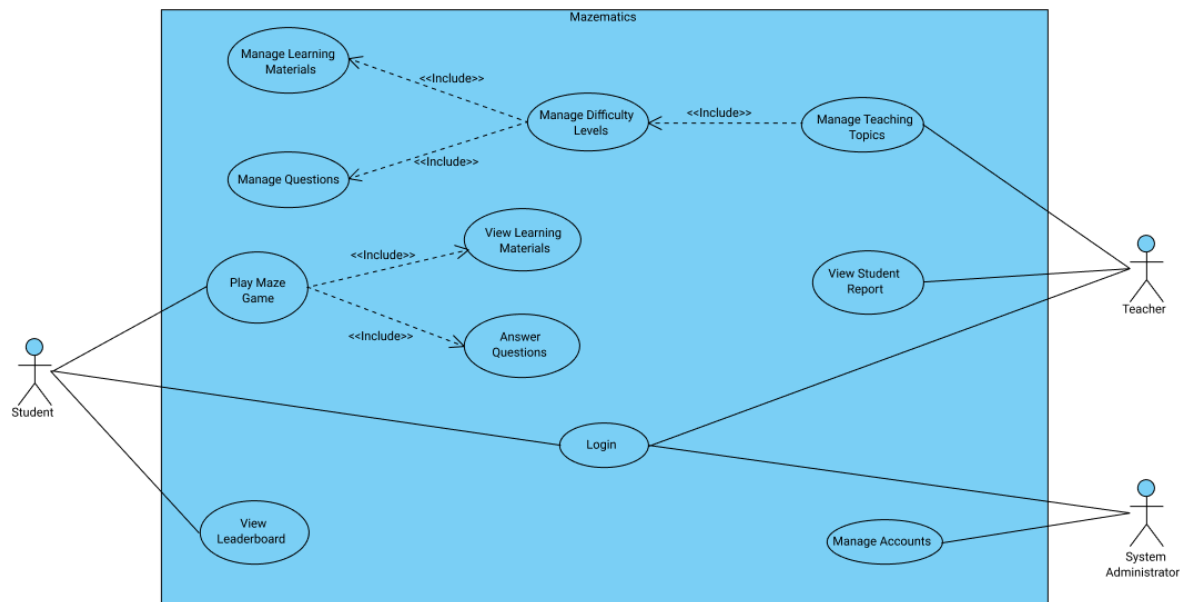


## **8.2. Dialog Map**

encountering with obstacle

## 8.3. Use Case Model

### 8.3.1. Use Case Diagram



**8.3.2. Use Case Descriptions**

Use Case ID:	UC-01		
Use Case Name:	Play Maze Game		
Created By:	Chulpaibul Jiraporn	Last Updated By:	Chulpaibul Jiraporn
Date Created:	10 / 2 / 2020	Date Last Updated:	10 / 2 / 2020

Actor:	Student
Description:	The student will be able to learn while playing a maze game.
Preconditions:	<ul style="list-style-type: none"> <li>• The student has logged in with the student account using UC-11.</li> <li>• The student has selected the world and the game level they want to play by selecting the teaching topic and the difficulty level respectively.</li> </ul>
Postconditions:	<ul style="list-style-type: none"> <li>• The system records the progress of the student if they finished viewing the learning material.</li> <li>• The system records the time that students spend in the maze.</li> <li>• The system records the number of attempts that the students take for each question</li> </ul>
Priority:	High
Frequency of Use:	Very Often
Flow of Events:	<ol style="list-style-type: none"> <li>1. If the student has selected a new game level, the system will display learning material corresponding to that game level.</li> <li>2. The student views learning material using the included use case UC-02.</li> <li>3. The system displays the maze and timer starts after the student has viewed all learning material.</li> <li>4. In the maze, the student chooses to move up, down, left or right.</li> <li>5. If the student encounters an obstacle in the maze, the timer will stop and the student will have to answer questions using the included use case UC-03.</li> <li>6. The student passed the game level if they escaped the maze.</li> </ol>
Alternative Flows:	
Exceptions:	
Includes:	UC-02, UC-03
Special Requirements:	
Assumptions:	
Notes and Issues:	

Use Case ID:	UC-02		
Use Case Name:	View Learning Materials		
Created By:	Chulpaibul Jiraporn	Last Updated By:	Leong Ko Rixie Tiffany
Date Created:	10 / 2 / 2020	Date Last Updated:	12 / 2 / 2020

Actor:	Student
Description:	The student will be able to view learning materials.
Preconditions:	<ul style="list-style-type: none"> <li>• The student selected to play a game level of maze game</li> </ul>
Postconditions:	<ul style="list-style-type: none"> <li>• The student has viewed the learning material.</li> <li>• The system displays an error message if the learning materials cannot be retrieved.</li> </ul>
Priority:	High
Frequency of Use:	Very Often
Flow of Events:	<ol style="list-style-type: none"> <li>1. The system fetches the learning materials corresponding to the game level.</li> <li>2. The system displays the selected learning materials.</li> <li>3. After the student has finished viewing the learning material, the student clicks the play game button to exit.</li> </ol>
Alternative Flows:	
Exceptions:	<p>EX1: If the system cannot retrieve the learning materials from the database</p> <ol style="list-style-type: none"> <li>1. The system displays an error message “Unable to fetch learning materials”.</li> </ol>
Includes:	
Special Requirements:	
Assumptions:	
Notes and Issues:	

Use Case ID:	UC-03		
Use Case Name:	Answer Questions		
Created By:	Chulpaibul Jiraporn	Last Updated By:	Chulpaibul Jiraporn
Date Created:	10 / 2 / 2020	Date Last Updated:	10 / 2 / 2020

Actor:	Student
Description:	The student will answer questions based on what they have learnt from the learning material.
Preconditions:	<ul style="list-style-type: none"> <li>• The student has encountered an obstacle in the maze.</li> <li>• The student has viewed the learning materials for the game level using UC-02.</li> </ul>
Postconditions:	<ul style="list-style-type: none"> <li>• The system records the score of the student.</li> <li>• The system records the number of tries taken by the student</li> </ul>
Priority:	High
Frequency of Use:	Very Often
Flow of Events:	<ol style="list-style-type: none"> <li>1. The system retrieves a set of multiple-choice questions corresponding to the difficulty level and teaching topic of the maze from the database.</li> <li>2. The system randomly chooses one question from the set of questions.</li> <li>3. The system displays the question and the list of possible options.</li> <li>4. The student selects the option which they think is the correct answer.</li> <li>5. If the student selected the correct answer, the maze will be displayed again and the obstacle will be cleared.</li> <li>6. The system displays the maze and immediately resumes the timer.</li> </ol>
Alternative Flows:	AF-S5: If the student selected the incorrect answer. <ol style="list-style-type: none"> <li>1. The system increases the incorrect attempt count by 1.</li> <li>2. The system adds a penalty of 10 seconds to the timer.</li> <li>3. The system returns to step 4.</li> </ol>
Exceptions:	EX1: If the system cannot retrieve questions from the database <ol style="list-style-type: none"> <li>1. The system displays an error message “Unable to fetch questions”.</li> </ol>
Includes:	
Special Requirements:	

Assumptions:	
Notes and Issues:	

## 8.5.

Use Case ID:	UC-04		
Use Case Name:	View Leaderboard		
Created By:	Rajeswari Bose	Last Updated By:	Rajeswari Bose
Date Created:	12 / 2 / 2020	Date Last Updated:	12 / 2 / 2020

Actor:	Student
Description:	The student will be able to view leaderboards.
Preconditions:	<ul style="list-style-type: none"> <li>• The student is viewing a game level for a teaching topic.</li> </ul>
Postconditions:	<ul style="list-style-type: none"> <li>• The leaderboard is displayed</li> </ul>
Priority:	Low
Frequency of Use:	Rarely
Flow of Events:	<ol style="list-style-type: none"> <li>1. The student clicks the “View Leaderboard” button.</li> <li>2. The system sorts the student’s timings for the game level.</li> <li>3. The system displays the names and timings of the students with the top 10 timings for the game level.</li> </ol>
Alternative Flows:	
Exceptions:	EX1: If there are no students who have played the game level yet. <ol style="list-style-type: none"> <li>1. The system displays the message “No results found”.</li> </ol>
Includes:	
Special Requirements:	
Assumptions:	
Notes and Issues:	



## 8.6.

Use Case ID:	UC-05		
Use Case Name:	Manage Teaching Topics		
Created By:	Rajeswari Bose	Last Updated By:	Leong Ko Rixie Tiffany
Date Created:	12 / 2 / 2020	Date Last Updated:	14 / 2 / 2020

Actor:	Teacher
Description:	The teacher will be able to create, edit or delete teaching topics.
Preconditions:	<ul style="list-style-type: none"> <li>• The teacher has logged in with the teacher account using UC-11.</li> <li>• The teacher has clicked the “Manage Teaching Topics” button.</li> </ul>
Postconditions:	<ul style="list-style-type: none"> <li>• The teaching topics are modified.</li> </ul>
Priority:	High
Frequency of Use:	Often
Flow of Events:	<ol style="list-style-type: none"> <li>1. The system displays all teaching topics.</li> <li>2. The system displays “Create”, “Edit” and “Delete” buttons for each teaching topic.</li> <li>3. If the teacher clicks the teach topic’s title, the system will display the name of the teaching topic and a list of its difficulty levels.</li> <li>4. If the teacher wants to manage the list of difficulty levels, the teacher uses the included use case “Manage Difficulty Level”.</li> </ol>
Alternative Flows:	<p>AF-S3: If the teacher clicks the “Delete” button for a teaching topic.</p> <ol style="list-style-type: none"> <li>1. The system prompts the teacher to click either the “Confirm” or “Cancel” button.</li> <li>2. If the teacher clicks “Confirm”, the system will delete the teaching topic.</li> <li>3. If the teacher clicks “Cancel”, the system will not delete the teaching topic.</li> <li>4. The system returns to step 2.</li> </ol> <p>AF-S3: If the teacher clicks the “Create” button.</p> <ol style="list-style-type: none"> <li>1. The system prompts the teacher to enter the title and description of the teaching topic.</li> <li>1. The teacher enters the title and description of the teaching topic.</li> <li>2. The teacher clicks the “Save” button.</li> <li>3. The system creates a new teaching topic.</li> <li>4. The system returns to step 2.</li> </ol>

	AF-S3: If the teacher clicks the “Edit” button. <ol style="list-style-type: none"><li>1. The system prompts the teacher to enter the new title and description of the teaching topic.</li><li>2. The teacher enters the new title and description of the teaching topic.</li><li>3. The teacher clicks the “Save” button.</li><li>4. The system updates the name of the teaching topic.</li></ol>
Exceptions:	
Includes:	UC-06
Special Requirements:	
Assumptions:	
Notes and Issues:	

## 8.8.

Use Case ID:	UC-06		
Use Case Name:	Manage Difficulty Levels		
Created By:	Rajeswari Bose	Last Updated By:	Leong Ko Rixie Tiffany
Date Created:	12 / 2 / 2020	Date Last Updated:	14 / 2 / 2020

Actor:	Teacher
Description:	The teacher will be able to create and modify the difficulty levels.
Preconditions:	<ul style="list-style-type: none"> <li>The teacher has clicked the “Manage Difficulty Levels” button in UC-05.</li> </ul>
Postconditions:	<ul style="list-style-type: none"> <li>The difficulty levels are modified.</li> </ul>
Priority:	Medium
Frequency of Use:	Rarely
Flow of Events:	<ol style="list-style-type: none"> <li>The system displays “Create”, “Edit” and “Delete” buttons for each difficulty level.</li> <li>If the teacher clicks the title of the difficulty level, the system will display the name of the difficulty level and a list of its learning materials and questions.</li> <li>If the teacher clicks the “Manage Learning Materials” button, the teacher will use the included use case “Manage Learning Materials” to manage the learning materials.</li> <li>If the teacher clicks the “Manage Questions” button, the teacher will use the included use case “Manage Questions” to manage the questions.</li> </ol>
Alternative Flows:	<p>AF-S2: If the teacher clicks the “Delete” button for a difficulty level.</p> <ol style="list-style-type: none"> <li>The system prompts the teacher to click either the “Confirm” or “Cancel” button.</li> <li>If the teacher clicks “Confirm”, the system will delete the difficulty level.</li> <li>If the teacher clicks “Cancel”, the system will not delete the difficulty level.</li> <li>The system returns to step 1.</li> </ol> <p>AF-S2: If the teacher clicks the “Create” button.</p> <ol style="list-style-type: none"> <li>The system prompts the teacher to enter the title and description of the difficulty level.</li> <li>The teacher enters the title and description of the difficulty level.</li> <li>The teacher clicks the “Save” button.</li> </ol>

	<ol style="list-style-type: none"><li>7. The system creates a new teaching topic.</li><li>8. The system returns to step 2.</li></ol> <p>AF-S2: If the teacher clicks the “Edit” button.</p> <ol style="list-style-type: none"><li>5. The system prompts the teacher to enter the new title and description of the difficulty level.</li><li>6. The teacher enters the new title and description of the difficulty level.</li><li>7. The teacher clicks the “Save” button.</li><li>8. The system updates the name of the difficulty level.</li></ol>
Exceptions:	
Includes:	UC-07, UC-08
Special Requirements:	
Assumptions:	
Notes and Issues:	

Use Case ID:	UC-07		
Use Case Name:	Managing Learning Materials		
Created By:	Leong Ko Rixie Tiffany	Last Updated By:	Leong Ko Rixie Tiffany
Date Created:	12 / 2 / 2020	Date Last Updated:	14 / 2 / 2020

Actor:	Teacher
Description:	The teacher will be able to create, edit and delete learning materials.
Preconditions:	<ul style="list-style-type: none"> <li>• The teacher has clicked the “Manage Learning Materials” button in UC-06.</li> </ul>
Postconditions:	<ul style="list-style-type: none"> <li>• The learning material(s) are modified.</li> </ul>
Priority:	High
Frequency of Use:	Rarely
Flow of Events:	<ol style="list-style-type: none"> <li>1. The system displays “Create”, “Edit” and “Delete” buttons for each learning material.</li> <li>2. If the teacher clicks the “Create” button, the system will prompt the teacher to enter the details of the learning material.</li> <li>3. The teacher enters the title, description and link of the learning material.</li> <li>4. The teacher clicks the “Save” button.</li> <li>5. The system creates the new learning material.</li> <li>6. The system displays the updated list of learning materials.</li> </ol>
Alternative Flows:	<p>AF-S2: If the teacher clicks the “Edit” button for a learning material.</p> <ol style="list-style-type: none"> <li>1. The system will prompt the teacher to edit the fields of the learning material, including the title, description and link to the learning material.</li> <li>2. The teacher updates the desired field(s).</li> <li>3. The teacher clicks the “Save” button.</li> <li>4. The system updates the learning material.</li> <li>5. The system returns to step 6.</li> </ol> <p>AF-S2: If the teacher clicks the “Delete” button for a learning material.</p> <ol style="list-style-type: none"> <li>1. The system prompts the teacher to click either the “Confirm” or “Cancel” button.</li> <li>2. If the teacher clicks “Confirm”, the system will delete the learning material.</li> <li>3. If the teacher clicks “Cancel”, the system will not delete the learning material.</li> <li>6. The system returns to step 6.</li> </ol>

Exceptions:	
Includes:	
Special Requirements:	
Assumptions:	
Notes and Issues:	

Use Case ID:	UC-08		
Use Case Name:	Manage Questions		
Created By:	Leong Ko Rixie Tiffany	Last Updated By:	Leong Ko Rixie Tiffany
Date Created:	12 / 2 / 2020	Date Last Updated:	14 / 2 / 2020

Actor:	Teacher
Description:	The teacher will be able to create, edit and delete questions.
Preconditions:	<ul style="list-style-type: none"> <li>• The teacher has clicked the “Manage Questions” button in UC-06.</li> </ul>
Postconditions:	<ul style="list-style-type: none"> <li>• The question(s) are modified.</li> </ul>
Priority:	High
Frequency of Use:	Often
Flow of Events:	<ol style="list-style-type: none"> <li>1. The system displays “Create”, “Edit” and “Delete” buttons for each question.</li> <li>2. If the teacher clicks the “Create” button, the system will prompt the teacher to enter the details of the question.</li> <li>3. The teacher enters the title of the question.</li> <li>4. The teacher enters options to the question.</li> <li>5. The teacher selects which option is correct and the other three options will be incorrect.</li> <li>6. The teacher clicks the “Save” button.</li> <li>7. The system creates the new question.</li> <li>8. The system displays the updated list of questions.</li> </ol>
Alternative Flows:	<p>AF-S2: If the teacher clicks the “Edit” button for a question.</p> <ol style="list-style-type: none"> <li>1. The system will prompt the teacher to edit the fields of the question, including the title and the options.</li> <li>2. The teacher updates the desired field(s).</li> <li>3. The teacher clicks the “Save” button.</li> <li>4. The system updates the question.</li> <li>5. The system returns to step 8.</li> </ol> <p>AF-S2: If the teacher clicks the “Delete” button for a question.</p> <ol style="list-style-type: none"> <li>1. The system prompts the teacher to click either the “Confirm” or “Cancel” button.</li> <li>2. If the teacher clicks “Confirm”, the system will delete the question.</li> <li>3. If the teacher clicks “Cancel”, the system will not delete the question.</li> </ol>

	4. The system returns to step 8.
Exceptions:	
Includes:	
Special Requirements:	
Assumptions:	
Notes and Issues:	



Use Case ID:	UC-09		
Use Case Name:	View Student Report		
Created By:	Li Yan	Last Updated By:	Li Yan
Date Created:	12 / 2 / 2020	Date Last Updated:	12 / 2 / 2020

Actor:	Teacher
Description:	The teacher will be able to view student report illustrating the students' statistics of learning, containing the aggregated student statistics of the number of attempts per question..
Preconditions:	<ul style="list-style-type: none"> <li>• The teacher has logged in with the teacher account using UC-11.</li> <li>• The teacher clicked the “View Student Report” button.</li> </ul>
Postconditions:	<ul style="list-style-type: none"> <li>• The reports are displayed.</li> <li>• The teacher downloads the full report if they want to download it.</li> </ul>
Priority:	Medium
Frequency of Use:	Often
Flow of Events:	<ol style="list-style-type: none"> <li>1. The teacher clicks the “View Student Report” button.</li> <li>2. The system displays the student report containing the aggregated student statistics of the average number of attempts per question.</li> <li>3. If the teacher wants to download the full report, the teacher clicks the “Download” button to download a CSV file, containing the attempt count for each student and each question.</li> </ol>
Alternative Flows:	
Exceptions:	EX If there are no students that have completed the game. <ol style="list-style-type: none"> <li>1. The system does not display the download button.</li> </ol>
Includes:	
Special Requirements:	
Assumptions:	The topic must contain at least one difficulty level.
Notes and Issues:	

Use Case ID:	UC-10		
Use Case Name:	Manage Accounts		
Created By:	Hei Man	Last Updated By:	Chulbul Jiraporn
Date Created:	13 / 2 / 2020	Date Last Updated:	15 / 4 / 2020

Actor:	System Administrator
Description:	The System Administrator will be able to create,edit or delete student, teacher and system administrator accounts.
Preconditions:	<ul style="list-style-type: none"> <li>• The system administrator has logged in with the system administrator account using UC-11.</li> <li>• The system successfully retrieved account information from the database.</li> </ul>
Postconditions:	<ul style="list-style-type: none"> <li>• Modifications to the account system and database of accounts are executed successfully.</li> </ul>
Priority:	Medium
Frequency of Use:	Rarely
Flow of Events:	<ol style="list-style-type: none"> <li>1. The system displays a list of the student, teacher and system administrator accounts.</li> <li>2. The system displays a “Delete” button for each account and a “Create” button.</li> <li>3. If the system administrator clicks the “Create” button, the system will display a new row which contains editable username, email, password and role fields.</li> <li>4. The system administrator selects the role of the account to be created.</li> <li>5. The system administrator enters the new account’s email, username and password.</li> <li>6. The system administrator clicks the “Save” button.</li> <li>7. The system calls create account API to create the new account.</li> <li>8. The system displays the updated list of accounts.</li> </ol>
Alternative Flows:	<p>AF-S3: If the system administrator clicks the “Edit” button for an account.</p> <ol style="list-style-type: none"> <li>6. The system will prompt the system administrator to edit the fields of the account, including the role, name, username and password.</li> <li>7. The system administrator updates the desired field(s).</li> <li>8. The system administrator clicks the “Save” button.</li> </ol>

	<ol style="list-style-type: none"><li>9. The system calls the update account API to update the account.</li><li>10. The system returns to step 8.</li></ol> <p>AF-S3: If the system administrator clicks the “Delete” button for an account.</p> <ol style="list-style-type: none"><li>5. The system prompts the system administrator to click either the “Confirm” or “Cancel” button.</li><li>6. If the system administrator clicks “Confirm”, the system will call delete account API to delete the account.</li><li>7. If the system administrator clicks “Cancel”, the system will not delete the account.</li><li>8. The system returns to step 8.</li></ol>
Exceptions:	
Includes:	
Special Requirements:	
Assumptions:	
Notes and Issues:	

8.9.

Use Case ID:	UC-11		
Use Case Name:	Login		
Created By:	Chulpaibul Jiraporn	Last Updated By:	Chulpaibul Jiraporn
Date Created:	13 / 2 / 2020	Date Last Updated:	13 / 2 / 2020

Actor:	<ul style="list-style-type: none"> <li>• Student OR</li> <li>• System Administrator OR</li> <li>• Teacher</li> </ul>
Description:	The user signs in to the system with an existing account.
Preconditions:	<ul style="list-style-type: none"> <li>• The user already has an account.</li> </ul>
Postconditions:	<ul style="list-style-type: none"> <li>• The user successfully login to the system.</li> </ul>
Priority:	High
Frequency of Use:	Very Often
Flow of Events:	<ol style="list-style-type: none"> <li>1. The system displays the login page.</li> <li>2. The user enters their username in the username field.</li> <li>3. The user enters their password in the password field.</li> <li>4. The user clicks the login button.</li> <li>5. The system calls authenticate login API to authenticate the credentials.</li> <li>6. If both username and password are valid, the user is successfully logged into the system, and is verified.</li> <li>7. User logs in successfully.</li> </ol>
Alternative Flows:	<p>AF-S6: The user has entered an incorrect combination of his username and password.</p> <ol style="list-style-type: none"> <li>1. The system displays an error message “Unable to login”.</li> <li>2. The system returns to step 1.</li> </ol>
Exceptions:	
Includes:	
Special Requirements:	
Assumptions:	
Notes and Issues:	