NANYANG TECHNOLOGICAL UNIVERSITY

CZ3003 - Software System Analysis & Design

Component Design & Implementation

Project Name: Game of Thrones
Group Name: Team TWO
Lab group: TDDP1
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Group Member	**Matriculation Number**
Chee Jia Yuan	U1921773A
Chong Jie Sheng	U1920968D
Ernest Ang Cheng Han	U1921310H
Joshua Toh Sheng Jie	U1921471F
Koh Tzi Yong	U1920076C
Lek Zhi Ying	U1922765K
Leong Hao Zhi	U1920469K
Li Zheng Jun, Jefferson	U1922429B
Lim Guo Quan	U1920769A
Loo Yi Ying Phoebe	U1921301A
Remus Neo Keng Long	U1922206F
Tan Wei Lun	U1822950L

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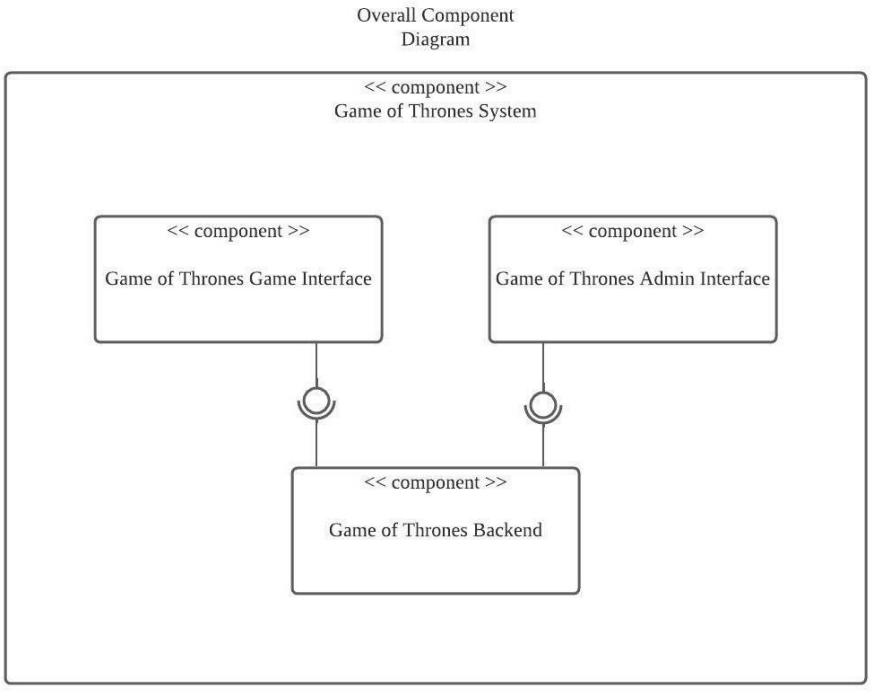
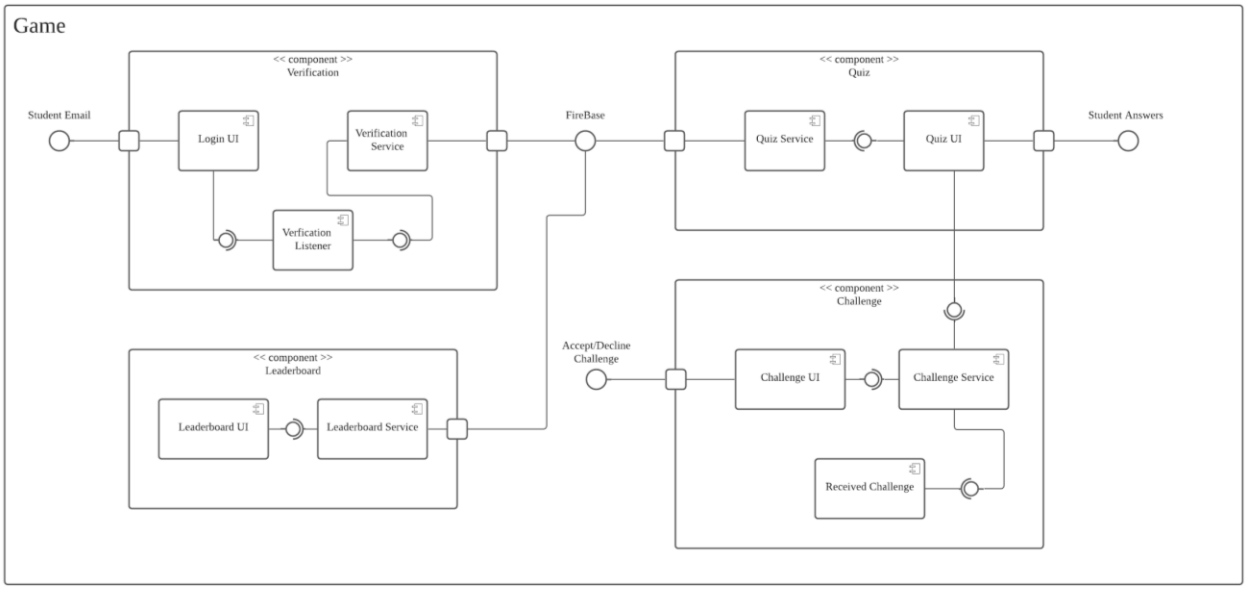
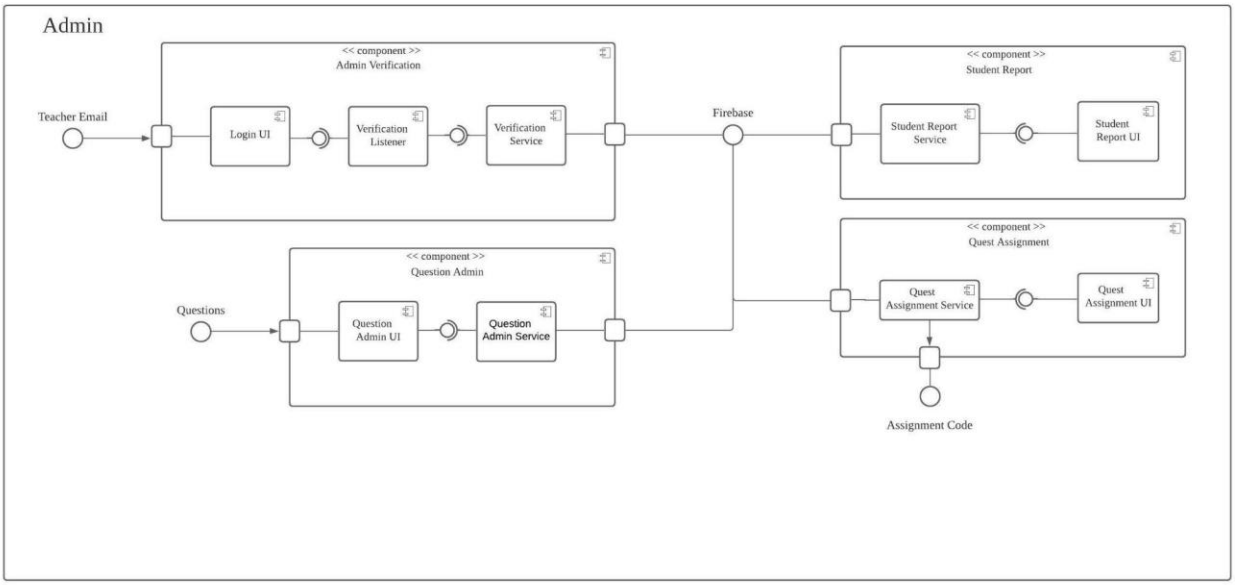
1. Static Models (Component Diagrams)

The static models focus on the organisation and structure of the system. The component diagrams show the dependencies between the various software components of the system. The overall component diagram shows the dependencies between the system backend and the game or admin interface. The second and third diagrams show the dependencies between different components found within the Game and Admin system respectively.

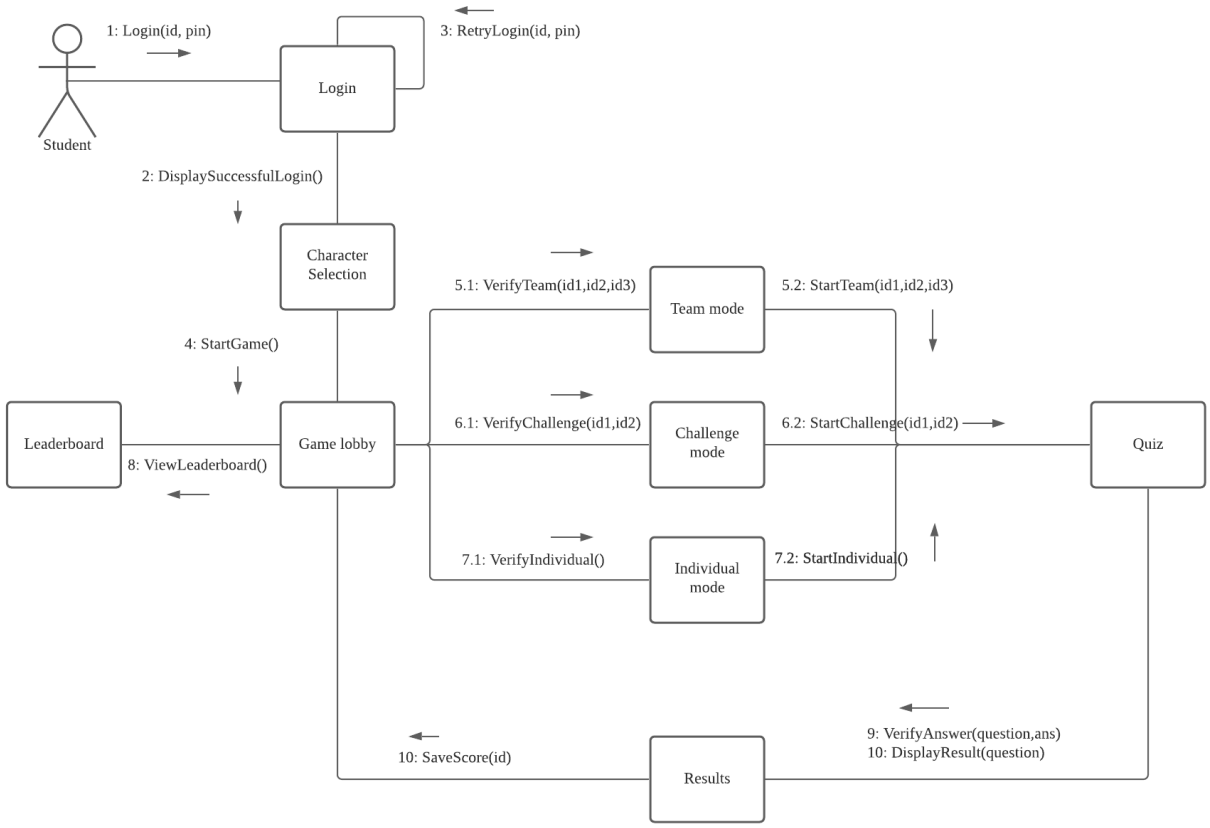


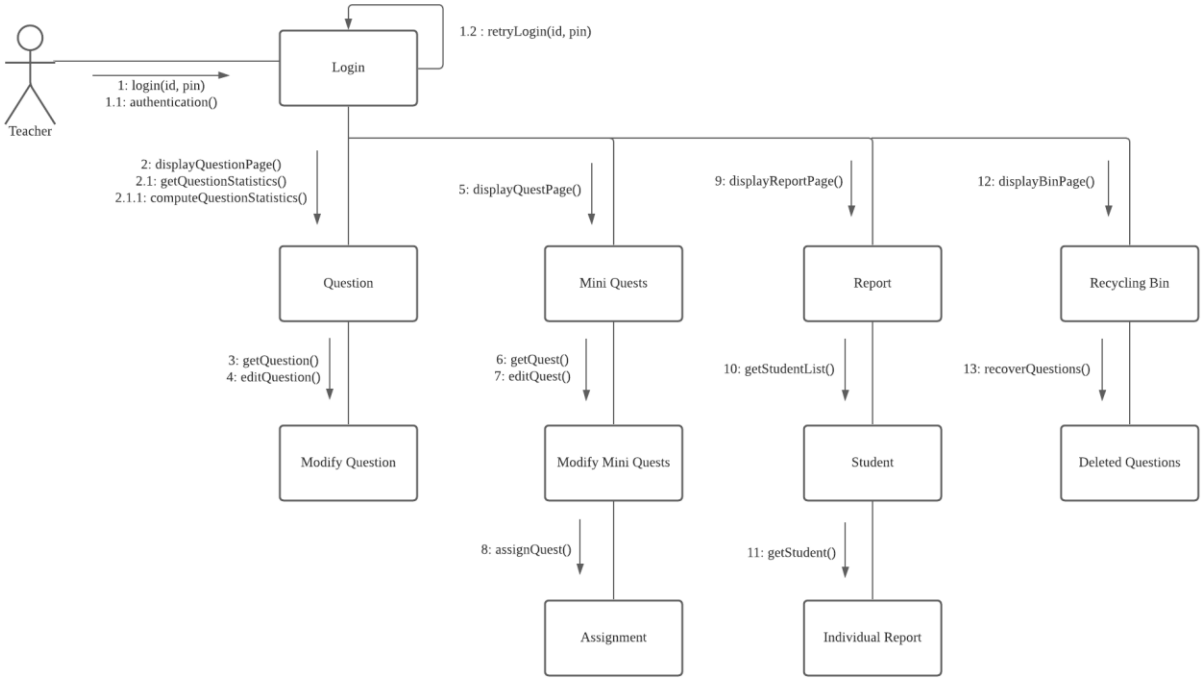



Admin
<< component >>
Admin Verification
Teacher Email
Login UI
Verification Listener
Verification Service
Firebase
<< component >>
Student Report
Student Report Service
Student Report UI
<< component >>
Question Admin
Questions
Question Admin UI
Question Admin Service
<< component >>
Quest Assignment
Quest Assignment Service
Quest Assignment UI
Assignment Code

2. Dynamic Models (Communication Diagrams)

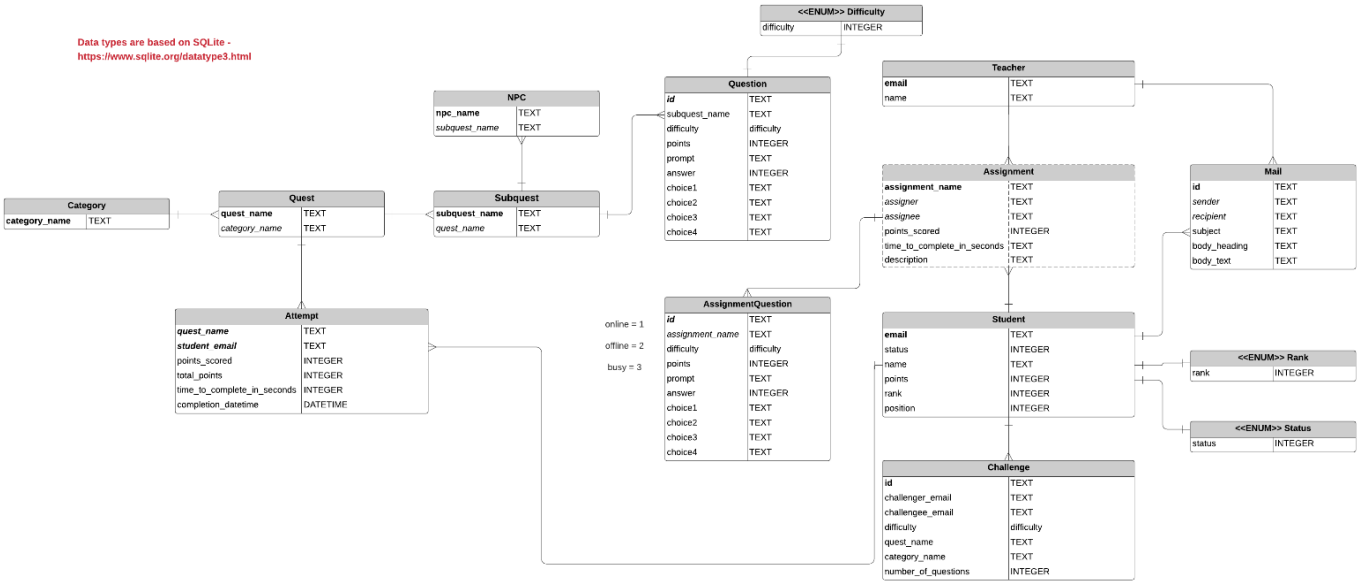
The dynamic model focuses on the behavior of the system. The communication diagram shows the exact messages/requests being shared between the various client and supplier objects in the process. Message text is prefixed by sequence numbers, which indicates the time order of the message. Messages with decimal points are messages nested under the parent message. The top-level message, i.e. Login is numbered 1 for both teacher and student communication diagrams.




Teacher
1: login(id, pin)
1.1: authentication()
Login
1.2 : retryLogin(id, pin)
2: displayQuestionPage()
2.1: getQuestionStatistics()
2.1.1: computeQuestionStatistics()
5: displayQuestPage()
9: displayReportPage()
12: displayBinPage()
Question
Mini Quests
Report
Recycling Bin
3: getQuestion()
4: editQuestion()
6: getQuest()
7: editQuest()
10: getStudentList()
13: recoverQuestions()
Modify Question
Modify Mini Quests
Student
Deleted Questions
8: assignQuest()
11: getStudent()
Assignment
Individual Report

3. Data Persistence Design (Entity-Relationship Diagrams)

The Entity-Relationship Diagram shows the relationship between the data elements stored in the database of our system. Each data element in the diagram is an object, with its attributes and corresponding data type defined in the diagram. The diagram provides a visual reference for database design and implementation and helps determine system requirements.



4. Component Implementation (Code with documentation)

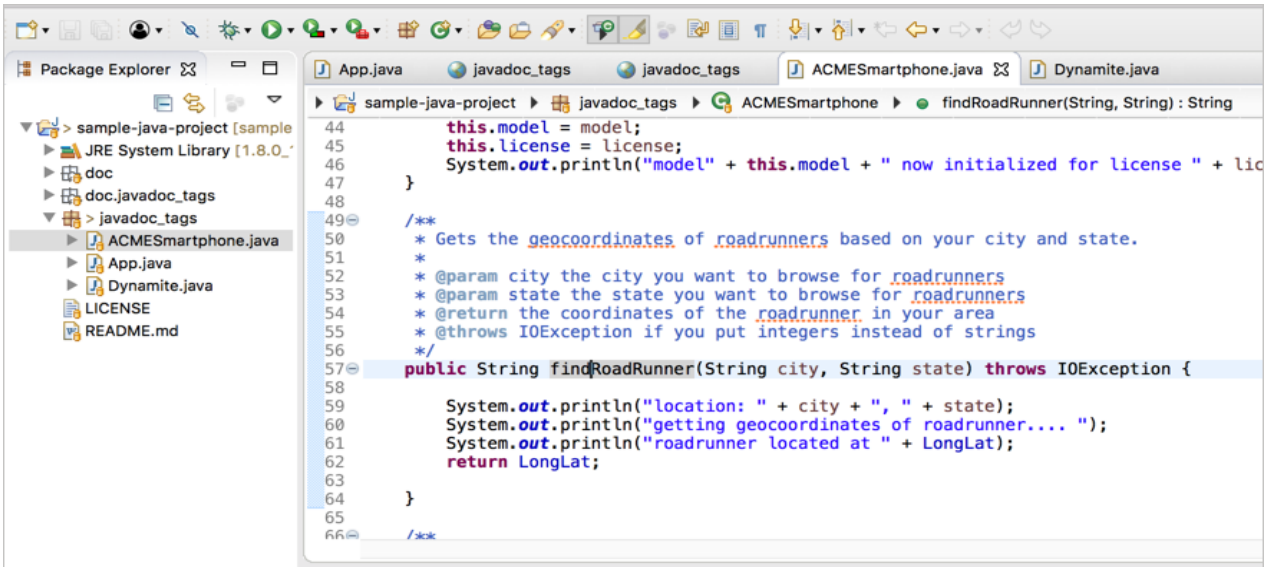
For our backend API used by both the Game interface and the administration user interface, the implementation can be found on GitHub which also happens to be our main tool for source code and version control. Our API is deployed using Okteto Cloud and can be found here.

The implementation for our Admin interface used by teachers can also be found on GitHub in another branch as we are using Git Branch Workflow to manage the development of this huge project with many interfaces and within each interface, many different features to meet the plethora of requirements specified in our Software Requirement Specification document. A branch in our repository represents a feature being developed by a fellow groupmate, only to be merged into the main branch once it is well tested and ready to be integrated into the project.

On the other hand, our Game interface implementation is not found on Github but on Unity Collaborate, which is our alternative tool for source control and version control optimized for Unity based projects. At the end of our project, we will separately attach the source code for our game in another file and link it in the documentation for your perusal.

For both the Game interface and Admin interface, the source codes are both well documented in a format similar to Javadoc as it is clear, concise and thorough, which will give other developers quick context on any particular class, method or segment of the code, speeding up their understanding of the source code and hence the overall development process from even newer or junior members of the team in the setting of a professional software engineering team.

Relevant documentation for all interfaces has been exported to html files to provide a nice user interface for developers when they are referring to documentation. Click here to access documentation (not uploaded to MediaWiki as files were to huge >8MB). On Github, directories labelled `docs.zip` or `doc.zip` are likewise zipped up folders of our documentation which you can unzip and refer to.



5. Test Cases

For our game, we have tested the functionalities of every subsystem that exists across all platforms and interfaces. Below, you can observe a compilation of all of our testing that we have carried out and completed: each table represents the system being tested and each row within the table represents the test case, containing information on the inputs, expected results and actual results.

For each interface, we used the following open-sources softwares to write the respective platform's test cases, allowing us to validate the functionality and behavior of our scripts:

- Admin interface: Jest and Enzyme
- Game interface: Unity Testing Framework
- Backend API: Pytest

5.1 Game Interface

Verification Scene

Get verification code

Email Account	Expected result	Actual result
	Empty input	Empty input
abc123	Invalid email	Invalid email
admin@example.com	Sent verification code to admin@example.com	Sent verification code to admin@example.com

Check verification code

Verification Code	Expected result	Actual result
123456	Verified! Redirect to Lobby	Verified! Redirect to Lobby
111111	Verification Code and email does not match	Verification Code and email does not match

Pause Menu

Action	Pause Menu	Expected result	Actual result
Press ESCAPE key	Closed	Open pause menu	Open pause menu
Press any other key	Closed	Nothing happens	Nothing happens
Press "Exit Game"	Displayed	Application ends	Application ends

Press “Resume”	Displayed	Close pause menu	Close pause menu

Game Lobby

NPC Interaction

Action	Distance	Interactable	Expected result	Actual result
Press E key	< 1m	True	Start dialogue	Start dialogue
Press any other key	< 1m	True	Nothing happens	Nothing happens
Press E key	< 1m	False	Nothing happens	Nothing happens
Press any other key	< 1m	False	Nothing happens	Nothing happens
Press E key	> 1m	True	Nothing happens	Nothing happens
Press any other key	> 1m	True	Nothing happens	Nothing happens
Press E key	> 1m	False	Nothing happens	Nothing happens
Press any other key	> 1m	False	Nothing happens	Nothing happens

Mail Menu

Action	Mail Menu	Expected result	Actual result
Press R button	Closed	Display mail menu	Display mail menu
Press any other button	Displayed	Nothing happens	Nothing happens
Press the “refresh” button	Displayed	Check for new mail	Check for new mail
Press R button	Displayed	Close mail menu	Close mail menu

Challenge Menu

Action	Challenge Menu	Expected result	Actual result
Press R button	Closed	Display challenge menu	Display challenge menu
Press any other button	Displayed	Nothing happens	Nothing happens
Press the button	Displayed	Open Challenge Creator menu	Open Challenge Creator menu
Press R button	Displayed	Close challenge menu	Close challenge menu

Press the “refresh” button	Displayed	Check for new issued challenges	Check for new issued challenges

Mini Quest Menu

Action	**Mini Quest Menu**	**Expected result**	**Actual result**
Press R button	Closed	Display mini quest menu	Display mini quest menu
Press any other button	Displayed	Nothing happens	Nothing happens
Press the “refresh” button	Displayed	Check for new issued mini quests	Check for new issued mini quests
Press R button	Displayed	Close mini quest menu	Close mini quest menu
Press mini quest slot	Displayed	Start mini quest (Quest UI)	Start mini quest (Quest UI)

User Menu

Action	**User Menu**	**Expected result**	**Actual result**
Press R button	Closed	Display user menu	Display mini quest menu
Press any other button	Displayed	Nothing happens	Nothing happens
Press R button	Displayed	Close mini quest menu	Close mini quest menu
Press “leaderboard” button	Displayed	Display leaderboard tab	Display leaderboard tab
Press “player settings” button	Displayed	Display settings menu tab	Display settings menu tab
Press “update” button	Displayed	Update player’s settings	Update player’s settings
Press buttons	Displayed	Update player avatar	Update player avatar

Quest Navigation Menu

Category	**Quest to start**	**Last completed quest from category**	**Expected result**	**Actual result**
SDLC	Quest 3	Quest 1	Display “sorry, please complete quest 2 first!”	Display “sorry, please complete quest 2 first!”
SDLC	Quest 3	Quest 2	Start Quiz	Start Quiz

SDLC	Quest 3	Quest 3	Start Quiz	Start Quiz
SDLC	Quest 3	Quest 4	Start Quiz	Start Quiz

Game (Solo Mode)

Start Quiz

Subquest number	Highest completed subquest number	Expected result	Actual result
3	1	Display “Sorry, please complete subquest 2 first”	Display “Sorry, please complete subquest 2 first”
3	2	Quiz begins	Quiz begins
3	3	Quiz begins	Quiz begins
3	4	Quiz begins	Quiz begins

Evaluate player’s performance

Category	Quest	Number of questions in subquest	Number of question attempted correctly by student	Expected result	Actual result
SDLC	1	6	5	Display “Great job, you scored 83.33% for this subquest and attained 50 points for this subquest”	Display “Sorry, please complete subquest 2 first”
SDLC	1	6	6	Display “Great job, you scored 100% for this subquest and attained 60 points for this subquest”	Quiz begins
SDLC	1	6	4	Display “Sorry, you only scored 66.67% and failed this subquest! Score at least 83.33% to proceed.	Quiz begins

Update player points in quest after finishing subquest

Points earned from current subquest	It is a repeat attempt	Highest repeated attempt score	Expected result	Actual result
100	False	-	Add 100 points to the total points player has earned so far from quest	Add 100 points to the total points player has earned so far from quest

100	True	110	Nothing happens	Nothing happens
100	True	100	Nothing happens	Nothing happens
100	True	90	Add 10 points to the total points player has earned so far from quest	Add 10 points to the total points player has earned so far from quest

Finish quest

Total points obtained from quest	**It is a repeat attempt**	**Highest repeated attempt score**	**Expected result**	**Actual result**
500	False	-	Backend updated as follows: add 500 to player's total point attained in game, update player's rank if necessary, update leaderboard if necessary, update player's quest completion history if necessary	Backend updated as follows: add 500 to player's total point attained in game, update player's rank if necessary, update leaderboard if necessary, update player's quest completion history if necessary
500	True	550	Backend updated as follows: add 50 to player's total point attained in game, update player's rank if necessary, update leaderboard if necessary	Backend updated as follows: add 50 to player's total point attained in game, update player's rank if necessary, update leaderboard if necessary
500	True	500	No changes to backend	No changes to backend
500	True	500	No changes to backend	No changes to backend

Game (Challenge Mode)

Challenge Creator Menu

Category (dropdown input)	Quest (dropdown input)	Difficulty (dropdown input)	Challengee Email	Challengee Status	Expected result	Actual result
SDLC (default)	1 (default)	Easy (default)		online	Error, email cannot be empty	Error, email cannot be empty
SDLC (default)	1 (default)	Easy (default)	asd	online	Error, invalid email	Error, invalid email
SDLC (default)	1 (default)	Easy (default)	admin@example.com	online	Display “Sent challenge to admin@example.com”	Display “Sent challenge to admin@example.com”
SDLC (default)	1 (default)	Easy (default)	admin@example.com	offline	Display “Player is offline now, please try again at another time”	Display “Player is offline now, please try again at another time”
SDLC (default)	1 (default)	Easy (default)	admin@example.com	busy	Display “Player is busy now, please try again at another time”	Display “Player is busy now, please try again at another time”

Player to be challenged status

Action by Challenger	Action by Challengee	Expected result	Actual result
Wait for challengee to accept	Accept	Display “Challengee has accepted, starting challenge”	Display “Challengee has accepted, starting challenge”
Wait for challengee to accept	Idle	Idle	Idle
Wait for challengee to accept	Reject	Display “Challengee has rejected”	Display “Challengee has rejected”
Reject	Idle	Display “Challenger has rejected”	Display “Challenger has rejected”

Challenge completion status

Challenger completed	Challengee completed	Challenger score	Challengee score	Expected result	Actual result
True	True	1000	1000	Display “It is a draw!”. Neither player gets additional points, no changes to backend	Display “It is a draw!”. Neither player gets additional points, no changes to backend

True	True	1000	1100	Display “Challengee wins!”. Backend updated as follows: add 1100 to challengee total point obtained in game, update challengee rank if necessary, update leaderboard if necessary, update challengee challenge history if necessary	Display “Challengee wins!”. Backend updated as follows: add 1100 to challengee total point obtained in game, update challengee rank if necessary, update leaderboard if necessary, update challengee challenge history if necessary
True	True	1100	1000	Display “Challenger wins!”. Backend updated as follows: add 1100 to challenger total point attained in game, update challenger rank if necessary, update leaderboard if necessary, update challenger challenge history if necessary	Display “Challenger wins!”. Backend updated as follows: add 1100 to challenger total point attained in game, update challenger rank if necessary, update leaderboard if necessary, update challenger challenge history if necessary
True	False	1000	-	Wait for challengee to complete	Wait for challengee to complete
False	True	-	1000	Wait for challenger to complete	Wait for challenger to complete
True	Abandon game	1000	-	Display “Challenger wins!”. Backend updated as follows: add 1000 to challenger total point attained in game, update challenger rank if necessary, update leaderboard if necessary, update challenger challenge history if necessary	Display “Challenger wins!”. Backend updated as follows: add 1000 to challenger total point attained in game, update challenger rank if necessary, update leaderboard if necessary, update challenger challenge history if necessary
Abandon game	True	-	1000	Display “Challengee wins!”. Backend updated as follows: add 1000 to challenger total point attained in game, update challenger rank if necessary, update leaderboard if necessary, update challenger challenge history if necessary	Display “Challengee wins!”. Backend updated as follows: add 1000 to challenger total point attained in game, update challenger rank if necessary, update leaderboard if necessary, update challenger challenge history if necessary

Storyline

Update player progress

PlayerProgress	Completed	Expected result	Actual result
World 1, Section 1, Level 3	World 1, Section 2, Level 1	Updates player progress to reflect the new section. World 1, Section 2, Level 1	Updates player progress to reflect the new section. World 1, Section 2, Level 1
World 1, Section 5, Level 3	World 2, Section 1, Level 1	Updates player progress to reflect the new world. World 2, Section 1, Level 1	Updates player progress to reflect the new world. World 2, Section 1, Level 1
World 1, Section 1, Level 3	World 1, Section 1, Level 3	Does not update player progress. Updates player score for World 1, Section 1, Level 3	Does not update player progress. Updates player score for World 1, Section 1, Level 3

Solo Mode

Check player progress

PlayerProgress	SectionDifficulty	Expected result	Actual result
World 1, Section 1, Level 1	World 1, Section 1, Level 1	True	True
World 1, Section 1, Level 1	World 2, Section 1, Level 1	False	False
World 1, Section 1, Level 1	World 1, Section 2, Level 1	False	False
World 1, Section 1, Level 1	World 1, Section 1, Level 3	False	False

Challenge Mode

Process winner - where PlayerA_Score and PlayerA_Score are the number of questions that player A and player B answered correctly, respectively.

PlayerA_Score	PlayerB_Score	Expected result	Actual result

3	2	“Win” notification is sent to player A & points are given. “Lose” notification is sent to player B.	“Win” notification is sent to player A & points are given. “Lose” notification is sent to player B.
2	3	“Win” notification is sent to player B & points are given. “Lose” notification is sent to player A.	“Win” notification is sent to player B & points are given. “Lose” notification is sent to player A.
3	3	“Tie” notification sent to both players. Points are given to both players.	“Tie” notification sent to both players. Points are given to both players.

Update SoloHistory - handles cases where a quiz has been successfully completed. Thus, world and section are valid.

PlayerProgress	**SectionDifficulty**	**Expected result**	**Actual result**
World 1, Section 1	World 1, Section 1	Score is added to SoloHistory, World 1, Section 1	Score is added to SoloHistory, World 1, Section 1
World 1, Section 1	World 1, Section 2	Score is set for SoloHistory, World 1, Section 1	Score is set for SoloHistory, World 1, Section 2

Update ChallengeHistory

Challenge	**ChallengeSelected**	**Expected result**	**Actual result**
World 1, Section 1	World 1, Section 1	Score is added to ChallengeHistory, World 1, Section 1	Score is added to ChallengeHistory, World 1, Section 1
World 1, Section 1	World 1, Section 2	Score is set for ChallengeHistory, World 1, Section 1	Score is set for ChallengeHistory, World 1, Section 1

Check AssignmentHistory

Assignment Done	**Assignment Selected**	**Expected result**	**Actual result**
Assignment1	Assignment2	Begin Assignment2	Begin Assignment2

Assignment1	Assignment1	Display “Assignment has already been submitted.”	Display “Assignment has already been submitted.”

Update AssignmentHistory

AssignmentCompleted	**Expected result**	**Actual result**
False	Assignment results are added to AssignmentHistory	Assignment results are added to AssignmentHistory
True	Assignment results are not added. Display “Assignment has already been submitted.”	Assignment results are not added. Display “Assignment has already been submitted.”

Start assignment

Assignment Code	**Assignment Entered**	**Expected result**	**Actual result**
Assignment1	Assignment1	Begin Assignment1	Begin Assignment1
Assignment1	abc123	Display “Assignment not found. Please enter code again.”	Display “Assignment not found. Please enter code again.”

5.2 Admin Interface

Assignments

Create assignment

Assignment Name	**Assigned To**	**Assigned By**	**Expected result**	**Actual result**
Test assignment	Student 1	Teacher 1	Display “Successfully assigned to student!”	Display “Successfully assigned to student!”
-empty-	Student 1	Teacher 1	Display “Unable to assign to student!”	Display “Unable to assign to student!”
Test assignment	*-empty-*	Teacher 1	Display “Unable to assign to student!”	Display “Unable to assign to student!”
Test assignment	Student 1	*-empty-*	Display “Unable to assign to student!	Display “Unable to assign to student!

a. View assignment details (can delete assignment)

Assignment Name	**Delete Assignment Button**	**Expected result**	**Actual result**
0012	Not Selected	Assignment 0012 details will be shown.	Assignment 0012 details will be shown.
as23dsad		No such assignment will be displayed	No such assignment will be displayed
0013	Selected	Display “Are you sure? You are about to delete assignment 0013”	Display “Are you sure? You are about to delete assignment 0013”

Create Assignment Question

Question Details	Number of Questions	Option 1	Option 2	Option 3	Option 4	Answer	Expected Result	Actual Results
This is a test	1	test	test	test	test	1	Assignment successfully created	Assignment successfully created
-empty-	1	test	test	test	test	1	Display error message “Unable to save question!”	Display error message “Unable to save question!”
test	*-empty-*	test	test	test	test	1	Display error message “Unable to save question!”	Display error message “Unable to save question!”
test	*1*	*-empty-*	test	test	test	1	Display error message “Unable to save question!”	Display error message “Unable to save question!”
test	1	test	*-empty-*	test	test	1	Display error message “Unable to save question!”	Display error message “Unable to save question!”
test	1	test	test	*-empty-*	test	1	Display error message “Unable to save question!”	Display error message “Unable to save question!”
test	1	test	test	test	-	1	Display error	Display error

					empty-		message “Unable to save question!”	message “Unable to save question!”
test	1	test	test	test	test	- *empty-*	Display error message “Unable to save question!”	Display error message “Unable to save question!”

Quiz

Generate quiz

World (1 to 5)	**Section (1 to 5)**	**Level (1 to 3)**	**Expected result**	**Actual result**
1	1	1	Quiz for World 1, Section 1, Level 1 is created	Quiz for World 1, Section 1, Level 1 is created
6	1	1	Display “World does not exist.”	Display “World does not exist.”
1	6	1	Display “Section does not exist.”	Display “Section does not exist.”
1	1	4	Display “Difficulty does not exist.”	Display “Difficulty does not exist.”

b. Create question

Question Details	Option A	Option B	Option C	Option D	Answer (1 to 4)	Difficulty (1 to 3)	Points (5/10/15)	Expected Result	Actual Results
This is a test	test	test	test	test	1	1	5	Display “Question is created!”	Display “Question is created!”
test	test	test	test	test	5	1	5	Display error message “Answer out of range”	Display error message “Answer out of range”
test	test	test	test	test	1	4	5	Display	Display error

								error message “Difficulty out of range”	message “Difficulty out of range”
test	test	test	test	test	1	1	16	Display error message “Points out of range”	Display error message “Points out of range”
-empty-	test	test	test	test	1	1	5	Display error message “Compulsory field cannot be empty”	Display error message “Compulsory field cannot be empty”
test	*-empty-*	test	test	test	1	1	5	Display error message “Compulsory field cannot be empty”	Display error message “Compulsory field cannot be empty”
test	test	*-empty-*	test	test	1	1	5	Display error message “Compulsory field cannot be empty”	Display error message “Compulsory field cannot be empty”
test	test	test	*-empty-*	test	1	1	5	Display error message “Compulsory field cannot be empty”	Display error message “Compulsory field cannot be empty”
test	test	test	test	*-empty-*	*1*	*1*	*5*	Display error message “Compulsory field cannot be	Display error message “Compulsory field cannot be empty”

								empty”	
test	test	test	test	test	- *empty* -	*1*	*5*	Display error message “Compulsory field cannot be empty”	Display error message “Compulsory field cannot be empty”
test	test	test	test	test	*1*	- *empty* -	*5*	Display error message “Compulsory field cannot be empty”	Display error message “Compulsory field cannot be empty”
test	test	test	test	test	*1*	*1*	- *empty* -	Display error message “Compulsory field cannot be empty”	Display error message “Compulsory field cannot be empty”

c. Question Page (Filter view)

Question	**Answer (1 to 4)**	**Difficulty (1 to 3)**	**Points (5/10/15)**	**Expected result**	**Actual result**
1	1	1	5	Question 1 is shown	Question 1 is shown
2	5	1	5	No such question will be displayed	No such question is displayed
3	1	4	5	No such question will be displayed	No such question is displayed
4	1	1	16	No such question will be displayed	No such question is displayed

Check player answers

CorrectAnswer	**AnswerGiven**	**Expected result**	**Actual result**
0011	0011	True	True

0011	0100	False	False

Report Generator

Show report (Individual/ Cohort Performance)

Select Report Type	**Expected result**	**Actual result**
Student 1 (Individual)	Report for Student 1 is shown	Report for Student 1 is shown
Cohort Report	Report for entire cohort is shown	Report for entire cohort is shown