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Project Title:

An Online Learning System for Class Management
and Class Interaction

Final Report

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Abstract

In this project, we present a online class management system which has an android platform for students and a website for teachers to help students and teachers solve the following problems. We observed that students of the Open University of Hong Kong helping the absent student record the attendance on the lesson make the attendance record be inaccuracy and teacher needs spend time to handle the record sheet. When students need to download the documents of the lesson, they need login every time to the website to download it and loading the website is slow. It always has no response when teachers ask question in the lesson.

To improve the accuracy and release the work of teacher, a roll call function using QR code and WIFI mac address to ensure the students must be in the school and reduce the works of record management.

The school resource site mainly is a website, students need login many time which cost time, the android application has download materials function to save the login time.

To improve the interaction between teachers and student in the lesson, to encourage students answer the question, it has a real time voting function to help the students give responses and teachers can use the result to improve the teaching plan. The system has a share screen function for teachers share the current page of PowerPoint to the students' android screen to help students look the content clearly.

To conclude, developing a mobile learning management system for tertiary Institutions can solve the improve the current learning environment.

Declaration

I/we, (Wong Chun Kit John s11503002, Chan Ho Tai s1152236, Chan Po Chi s11526027), certify that the work is original and I/we have utilized guidance of my/our supervisor in completing this project, and that any content which is not my/our own has been attributed and referenced appropriately. I/we have retained a copy of this submission (where written or electronic). The total number of words is (13677)

(Signature)

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Chan Po Chi

() () () () (Date)

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1. Problem Definition

1.1 Introduction

A good learning management system (LMS) can help students to learn more efficient. Nowadays, it is hard to find a system to fulfill all the needs for learning.

Some existing systems only can provide the basic needs for class and after-class learning, such as notes review, online quiz. For Android mobile devices, it is hard to find an existing application that containing those functions. Most of the systems can only be used in browser.

The existing systems are not good enough to encourage both teachers and students to interact with each other. In tertiary education, students seldom actively participate in discussion. It is important to improve students' concentration and participation. It is possible to develop a better system through mobile communication technology.

Some systems like E-class published by BroadLearning Education contain real time learning material. For example, they allow teachers to propose some questions and students can answer instantly. However, those systems require a considerable expense on system maintenance and hardware support.

Therefore, it is valuable and marketable to develop an application which is inexpensive and contains more specific functions.

1.2 Project Aim

The aim of this project is to develop a mobile learning management system for tertiary Institutions through mobile communication technology. The system focuses on improving the learning environment in class and after-class. The approach of this project is to improve learning efficiency and increase interactivity. For example, the system simplifies roll call, so that students can have more time to learn. Also, the system includes interesting learning material to encourage students to participate.

1.3 Project Objectives

To achieve the aim, the main objective of the project is to develop a learning management system that can improve the learning environment in the class.

The project has defined a number of sub objectives as follow:

- Develop and create an online platform to share learning materials. The system allows teachers to share learning materials and students can get soft copy in different devices. For example, students can receive notification message and download material by only having a single button click.
- Design and create a faster and more reliable roll call system. The system can simplify the steps in roll call in order to save time for student learning. Students need to connect the school WI-FI and scan the QR code to roll call.
- Develop real time mobile learning system in lesson. The system will provide real time question and real time screen sharing to improve interaction between students and teachers.
- Build a communication platform for teachers and students, such as online quiz, notes review, inbox chat and discussion board.

1.4 Impact and Value of this Project

In this project, our target users are teachers and students in tertiary Institutions.

The main approach of this project is to improve learning efficiency and increase interactivity.

In terms of interactivity, students are always shy about asking questions in class. Students will be more willing to participate through their mobile device. Also, real time question and screen sharing can increase their concentration in class.

Students spend a lot of time to take attendance by queuing. The system can help students to spend less time by handling the roll call automatically. Students only need to connect the school WI-FI and scan the QR code to roll call.

Moreover, the system can encourage students to study. The system is more simplify to obtain materials or information through mobile learning application. This project has a benefit to grow into more convenient.

In teachers' perspective, they can efficiently analyze students' learning progress. They

can review online materials that answered by students such as online quiz. The system can summarize the result of online quiz. Teachers can more easily point out common mistakes that students made.

In terms of attendance record, this project allows teachers to manage the attendance record more easily. Teachers can keep the attendance record in server to reduce the risk of missing the record.

In terms of interactivity, students can ask questions online through their mobile device. Teaching is become more elasticity. Teachers can adjust their teaching depending on the response from students.

Besides, the tertiary institution can also be beneficial by reducing the hardware required. It only needs a projector and Wi-Fi device to provide the roll call function in school without using additional hardware.

2. Literature Review

2.1 Roll Call

To manage the student attendance, we need to record the roll calls of the students. Now, the universities always use NFC or write on a paper. Therefore, the universities need to buy NFC readers to handle NFC or use the paper which may lose it if keeping it roughly. Thus, we decide to use mac address and QR code to manage the roll call record.

2.1.1 NFC technology:

It needs NFC reader and a tag. Students need to bring the matric cards for taking the attendance. [8] If the students may lose the card, students will lose the attendance or needs the teachers manage it on website which is adding an extra work to teachers. In addition, students can bring their friends' matric cards to help them taking roll call. Thus, NFC is expensive and not reliable in recording roll call.



Figure 1 - NFC

Teachers often pass the paper to students for recording their roll call themselves or students need to go front to record it. In passing the paper, students may lose it. It may lose all the records of a semester. Also, students may cheat the record, like taking roll call of their friends. In addition, teachers need to input the record to computer. Thus, using paper is not a good method to handle the attendance.

2.1.3 Conclusion

As NFC/ using paper to handle the roll call record is not reliable. To achieve a more reliable solution in roll call, we decide using mac address to check the location of students and QR code to handle the record. The system can help teachers keep the record and students are hard to cheat the roll call.

2.2 Unstructured Material Platform

The materials are stored in different sites. Different teachers saved the materials in different servers. Students need to go many sites to download the materials which are inconvenience. Also, some site show the material is not clear. Students cannot know the type of material quickly. For example, OLE always uses the attachment icon to present the material which needs students spend time to read the name of material to find the type.[13]

2.2.1 Softcopy:

Nowadays, smart phone is popular, most of students is using. Students can download the softcopy in anywhere. Thus, students can mobile study on class or after-class. [7] In addition, it can reduce the paper waste on printing a lot of notes for students. It also can help teachers prevent not enough hardcopy for students.

2.2.2 Conclusion

To download the teaching materials more convenience, we decide the platform for teachers to upload their materials. Students can use one system to get all materials. Also, it should be using different icons to present different type of materials like Moodle. [3] It can help students to know the material's type easily. Also, ordering by date, students can easy to find the notes of different week. [1][2][3] We will use different icons to present different types of material, like pdf, YouTube.

2.3 Poor Interaction

Most of students are shy to ask question in class. Therefore, the teachers may not know the students who are misunderstanding the chapter. Thus, we decide using real time quiz, voting and sharing screen to improve the interaction between students and teachers.

2.3.1 Real Time Quiz [1][3]:

Real time quiz can help teachers to test the students suddenly. Thus, it can help teachers to know how much students understood in the lesson and the concept students learnt.

2.3.2 Real Time Voting [1][4]:

Nowadays, there are many apps can make a real time voting, like Mentimeter.[4] It help the commercial decision making faster and easier. It also can help in education. Teachers can hold a voting in class. Students can use their mobile phone to vote it easily and will not feel shy. Also, the result will show immediately. Teachers can know how the students think in the topic immediately. It can help teachers to find out the concept in their mind.

2.3.3 Sharing Screen

It decided to share the PowerPoint screen to students. As the classroom may too big for the students sitting beside or short sight, it can help them watching the screen.

2.3.4 Conclusion

By using sharing screen, real time quiz and voting, the system can improve the interaction in class. Real time voting can avoid the students not actively answering the question. Real time quiz can help teachers know about the students understanding. Sharing screen can help students who are the short sight or too far to the screen to watching the screen.

2.4 E-Learning

E-learning is the system which is using information technologies. User can access the system for studying/teaching by Internet. [13] E-learning can divide into two basic types, computer-based and internet based. [13]

Computer-based learning includes all devices and applications that can use information and communication technology for learning purpose. [13] And it includes the use of computer management instruction and computer assisted learning.

In our system, we are developing a computer assisted-learning [13] which provides interactive function to be a tool to help student studying. It will provide a voting function for teacher to get the student response and a share-screen function for teacher sharing the PowerPoint slide to student mobile phone to help student look clearly. It will provide the tool for self-learning in after class which is the online quiz function. It can help student review the content of learning after class. Teacher can view the statistic to know the weakness of student.

We are developing the computer-managed-instruction [13] system for admin and teacher manage the course and class information. For student user, it is an internet-based learning system. [13] Student can use mobile application to access the system to retrieve materials. Student can download the learning material through the android application. Even if they cannot go to school to attend the lesson, they can use share-screen function to know the lesson content in the same time to the lesson.

E-learning gives student the chances to choose the place and time to study. Thus, the problem of time and place limitation can be solved by e-learning. Student can choose the place and time which suits to him/her. [13] Even if attending school is essential, Doing and reviewing homework can be more flexible by e-learning.

3. Methodology

3.1 Use Case Diagram

In this project, it will develop two platforms (Android application, Web application). Android application is for students to get the course information and materials easily. Web application is for teachers to manage the course. They will have following functions:

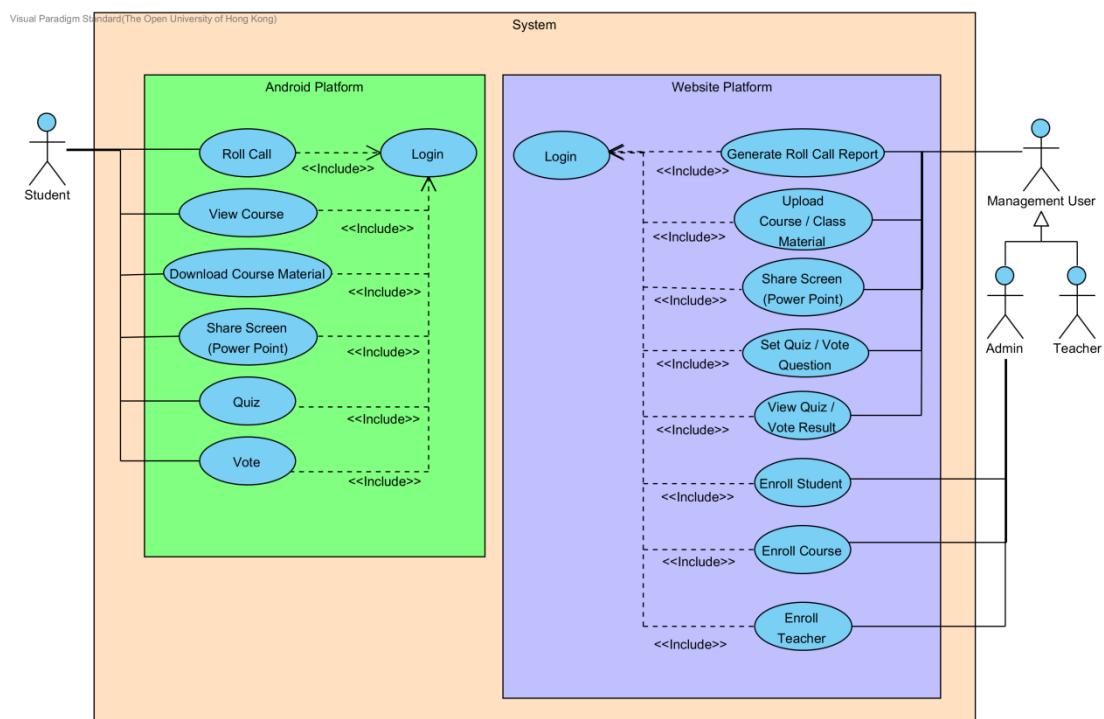


Figure 2 - Use Case Diagram

Android Application Function

3.1.1 Roll call

It provides an easy way to help teachers to record the student attendance.

When students arrived to school, they use the android mobile device to connect the school Wi-Fi network. It require Wi-Fi access point Mac address [3] . Then, they open the application scanner to scan the QR Code on projecting screen. (QR code [6] content with course and class information also include timestamp).



Figure 3 - QR-Code

After Scanning the QR code, the system will check the connection. If the connection is school's Wi-Fi network, it will take the attendance and store the record to the database.

3.1.2 View course

Students who are already enrolled can view his/her courses.

3.1.3 Download course materials

In View Course, it will show courses and the uploaded course materials such as PowerPoint / Word / PDF file. Students can download the materials via the android application.

3.1.4 Share screen - Android

When teachers use PowerPoint to teach students, the system can have a slide content synchronization from teacher computer to student android mobile device. This function can let the students who are sitting far away from the screen can still look clearly the slide content and catch up the progress easily.

3.1.5 Quiz/Vote

When teachers require students to vote or do the quiz, students can use the android mobile device to finish the online quiz or vote.

Web Application Function

3.2.1 Generate Roll Call Report

Students take the Roll Call in the lesson. Teachers can view their course student attendance and generate a roll call report for references.

3.2.2 Upload the Course Material

It allows the teachers to upload the course materials to their teaching classes. Besides that, it provides the management of course materials such as deleting the file, showing the file in specific time or hiding the file in specific time

3.2.3 Share Screen - Website

The start of the lesson, teachers use PowerPoint for teaching. Teachers need to click the start share screen, then students via the android application to view the PowerPoint slide.



Figure 4 - Share Screen Device

3.2.4 Set Quiz or Vote

It provides a function for teachers setting the quiz and vote. Teachers also can set up the start date, due date, start time and end time.

3.2.5 View Quiz or Vote Result

Teachers can view the quiz/vote status (not start, processing or end) in anytime. Also, Teachers can view the task result or who has not finished the task

3.2.6 Enroll Function

Administrator can easily enroll teachers, students, courses from a file which store the related data (like csv format file).

3.2 System Architecture

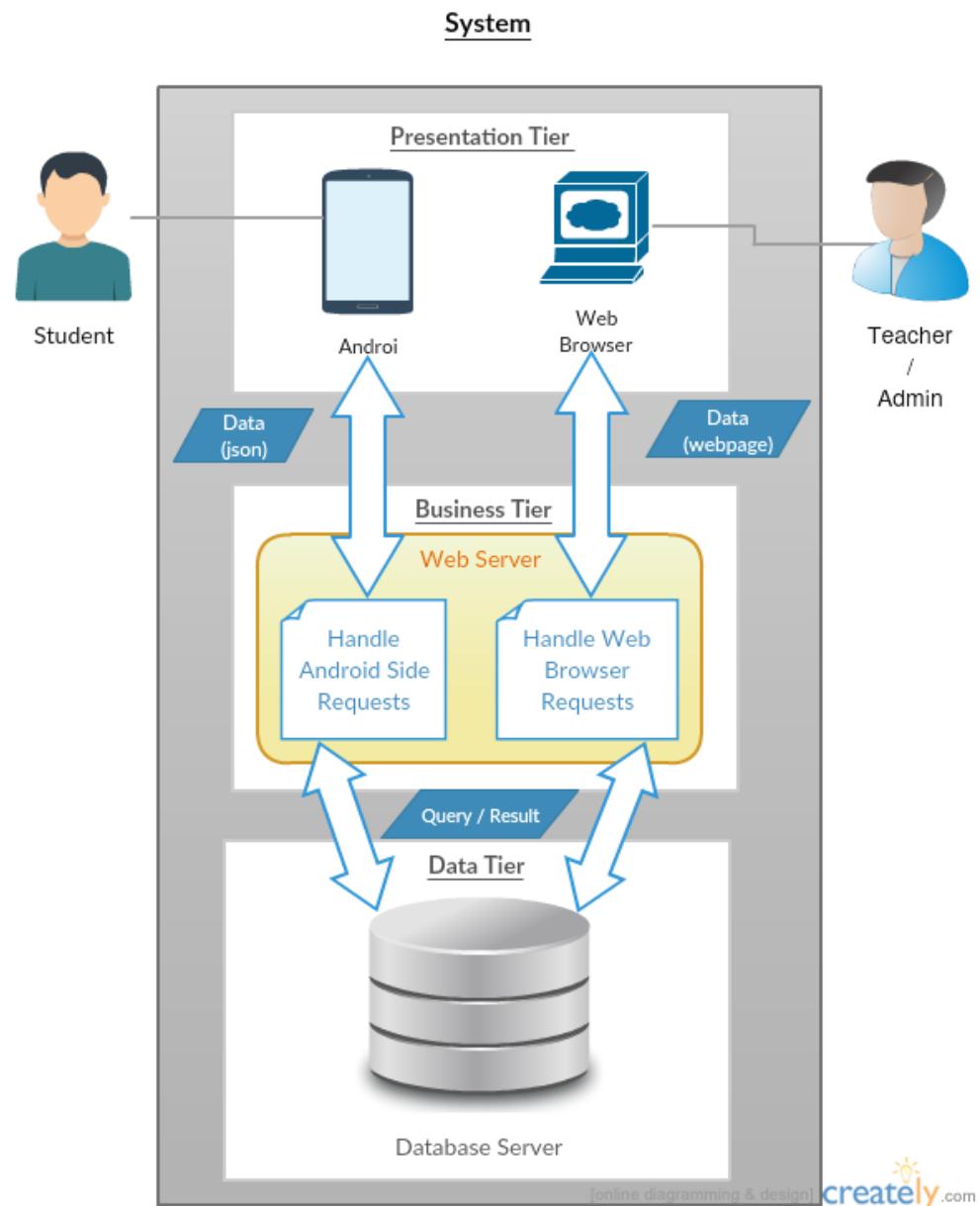


Figure 5 - 3-tier System Architecture

In the 3-tier System Architecture, the teachers / administrator can use the web browser to login the system for management. Students can use the android mobile device to login the system for getting the course materials.

The web server will handle android device or web browser request separately, because transferring required data is different. After that, the web server needs interact with database.

For the Data Tier, it is for the data storage, retrieval and updating on the DBMS.

3.3 ERD Diagram

This is our Database Design:

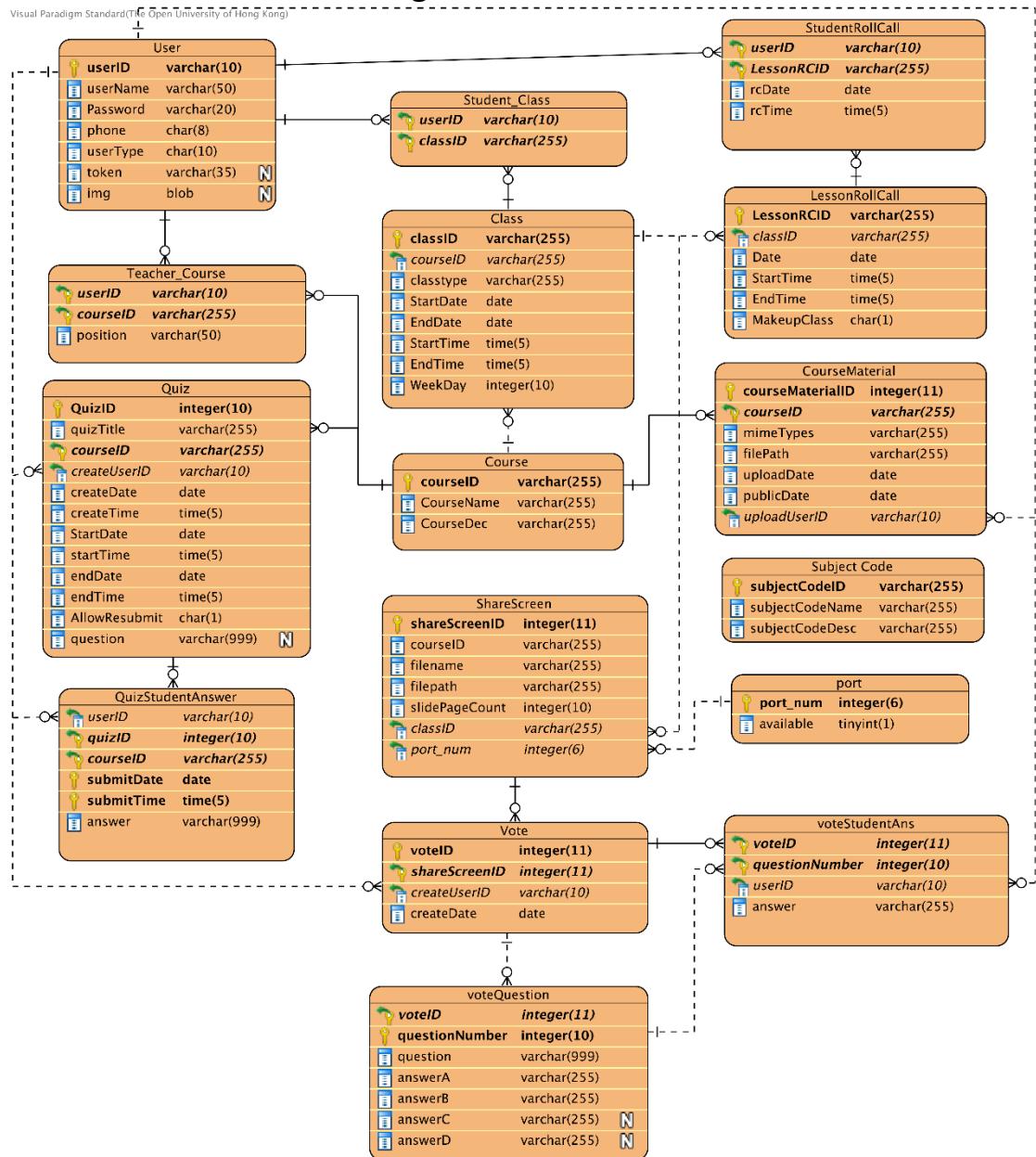


Figure 6 - ERD Diagram

3.3.1 User table

User Table stores administrator, teacher and student user information.

userID	userName	Password	phone	userType	token	img
Admin	Administrator	a	88888888	Admin		NULL
s001	Wong Chun Kit John	1	12345678	student	7	NULL
s002	Chan Ho Tai	1	12345678	student	f	NULL
teacher1	teacher1	t	51234567	teacher	2	NULL
teacher2	teacher2	t	55646534	teacher	2	NULL

Figure 7 - User table Example

3.3.2 Course table

Course table stores course basic information e.g. name and description.

courseID	courseName	CourseDec
COMP_S311F	Java Application Development and Programming Langu...	COMP S311F-Java Application Deve
COMP_S358F	Relational Databases	COMP S358F-Relational Databases

Figure 8 - Course Table Example

3.3.3 Class table

Class Table is storage which is contained by course.

Course and class is one to many relations.

For example, one course can have more than one tutorials or lectures.

classID	courseID	classType	StartDate	EndDate	StartTime	EndTime	WeekDay
COMP_S311F_L01_1617	COMP_S311F	L01	2016-09-01	2017-05-30	09:00:00.000000	11:00:00.000000	3
COMP_S311F_T01_1617	COMP_S311F	T01	2016-09-01	2017-05-30	11:00:00.000000	13:00:00.000000	4
COMP_S358F_L01_1617	COMP_S358F	L01	2016-09-02	2017-05-26	09:00:00.000000	11:00:00.000000	1
COMP_S358F_T01_1617	COMP_S358F	T01	2016-09-02	2017-05-26	11:00:00.000000	13:00:00.000000	2

Figure 9 - Class Table Example

COMP_S311F Lecture01	COMP_S311F_L01
COMP_S311F Tutorial01	COMP_S311F_T01

3.3.4 Student_Class Table

Student_Class Table contains enrolled student belong to class

userID	classID
s001	COMP_S311F_L01_1617
s001	COMP_S311F_T01_1617
s001	COMP_S358F_L01_1617
s002	COMP_S311F_L01_1617
s002	COMP_S358F_L01_1617

Figure 10 - Student_Class Table Example

3.3.5 Teacher_Course Table

Teacher_Course Table contains teacher who assigned to the course.

userID	courseID	position
teacher1	COMP_S311F	teacher
teacher2	COMP_S358F	teacher

Figure 11 - Teacher_Course Table Example

3.3.6 LessonRollCall Table

LessonRollCall Table contains the lessons of the class in a semester

lessonRCID	classID	Date	StartTime	EndTime	MakeUpClass
COMP_S311F_L01_1617_01	COMP_S311F_L01_1617	2017-01-04	09:00:00.00000	11:00:00.00000	0
COMP_S311F_L01_1617_02	COMP_S311F_L01_1617	2017-01-11	09:00:00.00000	11:00:00.00000	0
COMP_S311F_T01_1617_01	COMP_S311F_T01_1617	2017-01-05	11:00:00.00000	13:00:00.00000	0
COMP_S311F_T01_1617_02	COMP_S311F_T01_1617	2017-01-12	11:00:00.00000	13:00:00.00000	0
COMP_S358F_L01_1617_01	COMP_S358F_L01_1617	2017-01-02	09:00:00.00000	11:00:00.00000	0

Figure 12 - LessonRollCall Table Example

Example:

COMP_S311F Lecture01 class:	COMP_S311F_L01_1617_01
COMP_S311F - First Lecture Lesson	COMP_S311F_L01_1617_01
COMP_S311F - Second Lecture Lesson	COMP_S311F_L01_1617_02
COMP_S311F Tutorial01 class:	COMP_S311F_T01_1617_01
COMP_S311F - First Tutorial Lesson	COMP_S311F_T01_1617_01
COMP_S311F - Second Tutorial Lesson	COMP_S311F_T01_1617_02

Figure 13 - LessonRollCall Table Explain

3.3.7 StudentRollCall Table

- StudentRollCall Table is containing Student take roll call information in the lessons

userID	lessonRCID	rcDate	rcTime
s001	COMP_S311F_L01_1617_01	2017-01-04	09:01:30.00000
s002	COMP_S311F_L01_1617_01	2017-01-04	09:17:04.00000

Figure 14 - StudentRollCall Tabel Example

- rcDate full name is Take roll call date.
- rcTime full name is Take roll call time.

3.3.8 CourseMaterial table

- CourseMaterial table is containing course material which is uploaded by teacher. E.g. PowerPoint, PDF etc. (filePath)

courseMaterialID	courseID	mimeTypes	filePath	uploadDate	publicDate	uploadUserID
1	COMP_S311F	application/vnd.openxmlformats-officedocument.presentation+xml	/course/COMP_S311F/material/L01.ppt	2017-01-21	2017-01-22	teacher1
2	COMP_S311F	application/vnd.openxmlformats-officedocument.presentation+xml	/course/COMP_S311F/material/L02.ppt	2017-01-22	2017-01-22	teacher1
3	COMP_S311F	application/pdf	/course/COMP_S311F/material/L01.pdf	2017-01-22	2017-01-22	teacher1
4	COMP_S358F	application/pdf	/course/COMP_S358F/material/COMPS358F-ch01.pdf	2017-01-22	2017-01-22	teacher2

Figure 15 - CourseMaterial Table Example

3.3.9 Quiz Table

- Quiz Table is containing course which course quiz created by teacher. Each quiz containing question JSON format

Table 1 - Quiz Table Description

Name	DataType	Constraints	Nullable	Documentation
quizID	Integer(10)	PK	No	Quiz ID
quizTitle	Varchar(255)		No	Quiz Title
courseID	varchar(255)	PK, FK (courseID, course)	No	CourseID
createUserID	varchar(10)	FK (createUserID ,user)	No	Create teacher
createDate	Date		No	create quiz ate
createTime	Time		No	create quiz time
StartDate	date		No	Start quiz allow student submission
startTime	Time(5)		No	End quiz time
EndDate	date		No	End of Quiz submission
endTime	Time(5)		No	End quiz time
AllowResubmit	Char(1)		No	Allow Student can do it again
Question	Varchar(999) / Text		No	Storage question as JSON Format

quizID	quizTitle	courseID	createUserID	createDate	createTime
1	java quiz 1	COMP_S311F	teacher1	2017-03-13	00:00:00
startDate	startTime	endDate	endTime	allowResubmit	questions
2017-03-13	00:00:00	2017-03-19	23:59:59	N	[{"questionNumber": 1, "type": "mc", "question": "1+1=?", "choice": ["1", "2", "3", "4"], "answer": "2"}, {"questionNumber": 2, "type": "mc", "question": "Which is Central Processing Unit short form?", "choice": ["APU", "GPU", "CPU", "RAM"], "answer": "CPU"}, {"questionNumber": 3, "type": "sq", "question": "Which is Graphics Processing Unit short form?", "answer": ["GPU", "gpu"]}]

Figure 16 - Quiz Table Example

Quiz Table question field data Example (JSON Format):

```
[{
    "questionNumber": 1,
    "type": "mc",
    "question": "1+1=?",
    "choice": ["1", "2", "3", "4"],
    "answer": "2"
}, {
    "questionNumber": 2,
    "type": "mc",
    "question": "Which is Central Processing Unit short form?",
    "choice": ["APU", "GPU", "CPU", "RAM"],
    "answer": "CPU"
}, {
    "questionNumber": 3,
    "type": "sq",
    "question": "Which is Graphics Processing Unit short form?",
    "answer": ["GPU", "gpu"]
}]
```

Figure 17 - Quiz Table - Question Field Data Explain

- Each Quiz Table question field is storage all question as JSON Format

3.3.10 QuizStudentAnswer Table

- QuizStudentAnswer Table stores students' answer.

Name	DataType	Constraints	Nullable	Documentation
userID	varchar(255)	PK, FK (userID, user)	No	Student ID
QuizID	Integer(10)	PK ,FK (QuizID, quiz)	No	Quiz ID
courseID	varchar(255)	PK, FK (courseID, course)	No	CourseID
submitDate	Date		No	Submission Date
submitTime	Time(5)		No	Submission Time
answer	Varchar(999) / Text		No	Storage student quiz answer as JSON Format

Table 2 - QuizStudentAnswer Table Description

userID	quizID	courseID	submitDate	submitTime	answer
s001	1	COMP_S311F	2017-03-14	04:40:13	{ "studentAn

Figure 18 - QuizStudentAnswer Table Example

QuizStudentAnswer answer field data Example (JSON Format)

```
{
  "studentAnswer": [
    {
      "questionNumber": 1,
      "answer": "2"
    },
    {
      "questionNumber": 2,
      "answer": "CPU"
    },
    {
      "questionNumber": 3,
      "answer": "GPU"
    }
  ]
}
```

Figure 19 - QuizStudentAnswer Table - Answer Field Data Explain

3.3.11 ShareScreen Table

- ShareScreen Table is storage that needed ppt to html file for real time presentation.

Table 3 - ShareScreen Table Description

Name	DataType	Constraints	Nullable	Documentation
shareScreenID	Integer(11)	PK	No	shareScreenID
courseID	varchar(255)		No	CourseID
filename	varchar(255)		No	Original ppt file name
filePath	varchar(255)		No	After ppt to html format the storage file/folder path
slidePageCount	Integer(10)		No	How many slide in the Original ppt
classID		FK (classID, Class)	No	classID
Port_num		FK (port_num, port)	No	Let the client know which port is the websocket

shareScreenID	courseID	filename	
1	77 COMP_FINALDEMO1	COMPS311F-10-11-12-web	
filepath	slidePageCount	classID	port
/course/COMP_FINALDEMO1/sharescreen/77/COMPS311F-1...	102	COMP_FINALDEMO1_L1_1617	9001

Figure 20 - ShareScreen Table Example

3.3.12 Port Table

- Port Table is for web socket check which port is using and which port is free to use.
- Port_num = port Number
- Available have 2 state 1 / 0
 - Available = 1 mean the port is free, it can be creating web socket for share screen;
 - Available = 0 is mean the port is using by

port_num	available
9001	1
9002	1
9003	1
9004	1

Figure 21 - Port Table Example

other class for share screen.

3.3.13 Vote Table

- Vote Table is for teacher when use the share-Screen system to set the a vote to increase the interaction between teacher and student

Table 4 - Vote Table Description

Name	DataType	Constraints	Nullable	Documentation
VoteID	Integer(11)	PK, FK (userID, user)	No	voteID
ShareScreenID	Integer(11)		No	shareScreenID
CreateUserID	varchar(10)		No	Create teacher
CreateDate	date		No	Create vote date

voteID	shareScreenID	createUserID	createDate
16	77	teacher1	2017-05-01

Figure 22 - Vote Table Example

3.3.14 Vote Question Table

- VoteQuestion table is storage vote each question.

voteID	questionNumber	question	answerA	answerB	answerC	answerD
16	1	Which Code editor you prefer.	NetBeans	Atom	Notepad	Eclipse
16	2	Which programming language you like?	java	Node.js	PHP	Python

Figure 23 - Vote Question Table Example

3.3.15 Vote StudentAnswer Table

- VoteStudentAnswer table is record the student vote result.

voteID	questionNumber	userID	answer
16	1	s001	NetBeans
16	2	s001	Node.js

Figure 24 - VoteStudentAnswer Table Example

3.4 Package Diagram

We use PHP language to build a web server and implement our function.

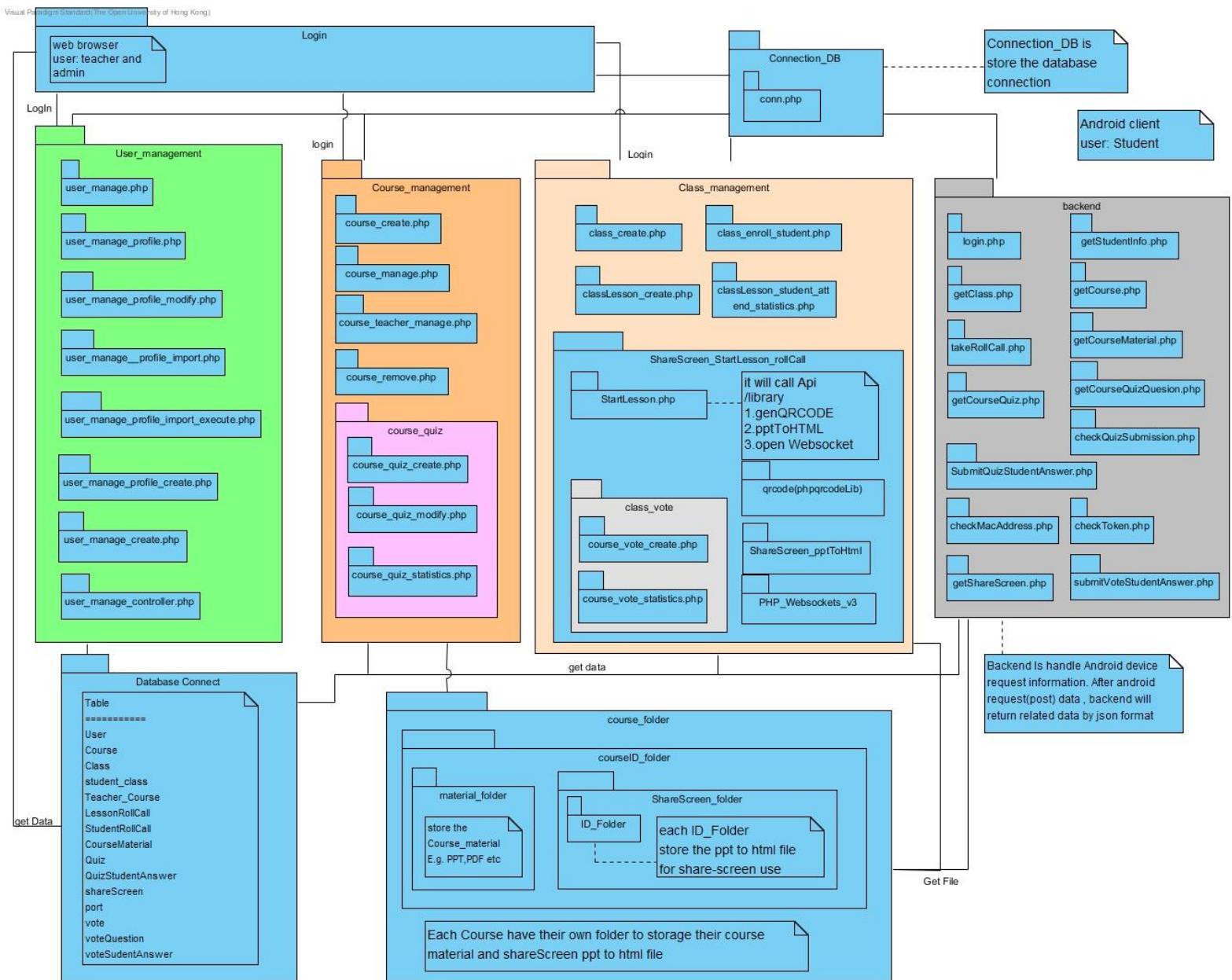


Figure 25 - Our System Package Diagram

3.4 Package Diagram(Cont'd)

3.4.1 Login Package

It allows user login to the system through web browser.

3.4.2 User management package

It is containing all user management function create, modify, delete user.

3.4.3 Course Management package

It is containing course management function create, modify, delete Course.

Also, it includes two packages quiz and vote.

1. Quiz package is containing course quiz function e.g. create, modify, quiz and view student quiz statistics.

3.4.4 Class Management package

It is containing Class Management Function

1. create Class and Lesson
2. enroll student to a class
3. View the student roll call statistics.
4. Vote package is containing course Vote function
5. ShareScreen_Start Lesson
 - Grenade QrCode for Roll Call function
 - Also, ShareScreen_PptToHtml converts the PowerPoint file to html format.
 - PHP_WebSocket is open network port for synchronize teacher shareScreen to student android screen

3.4.5 Backend package

It is API structure.

It allows android device to get data from database through web services and responses in JSON format.

3.4.6 Connect_DB Folder

This folder stores the information to make a connection to database.

3.4.7 Course folder

This folder stores the course documents e.g. material, share-Screen (ppt to html)file.

3.5 Class Diagram

3.5.1 Mobile Application (Android-intro)

Mobile Application is created by Java language using Android Studio.

The development of the application is applied the MVC(Model–view–controller) model.

The roles of the server are the model, Controller.

The server side will provide the Web Service in terms of JSON format.

Table 5 - Backend Example - getStudentInfo.php

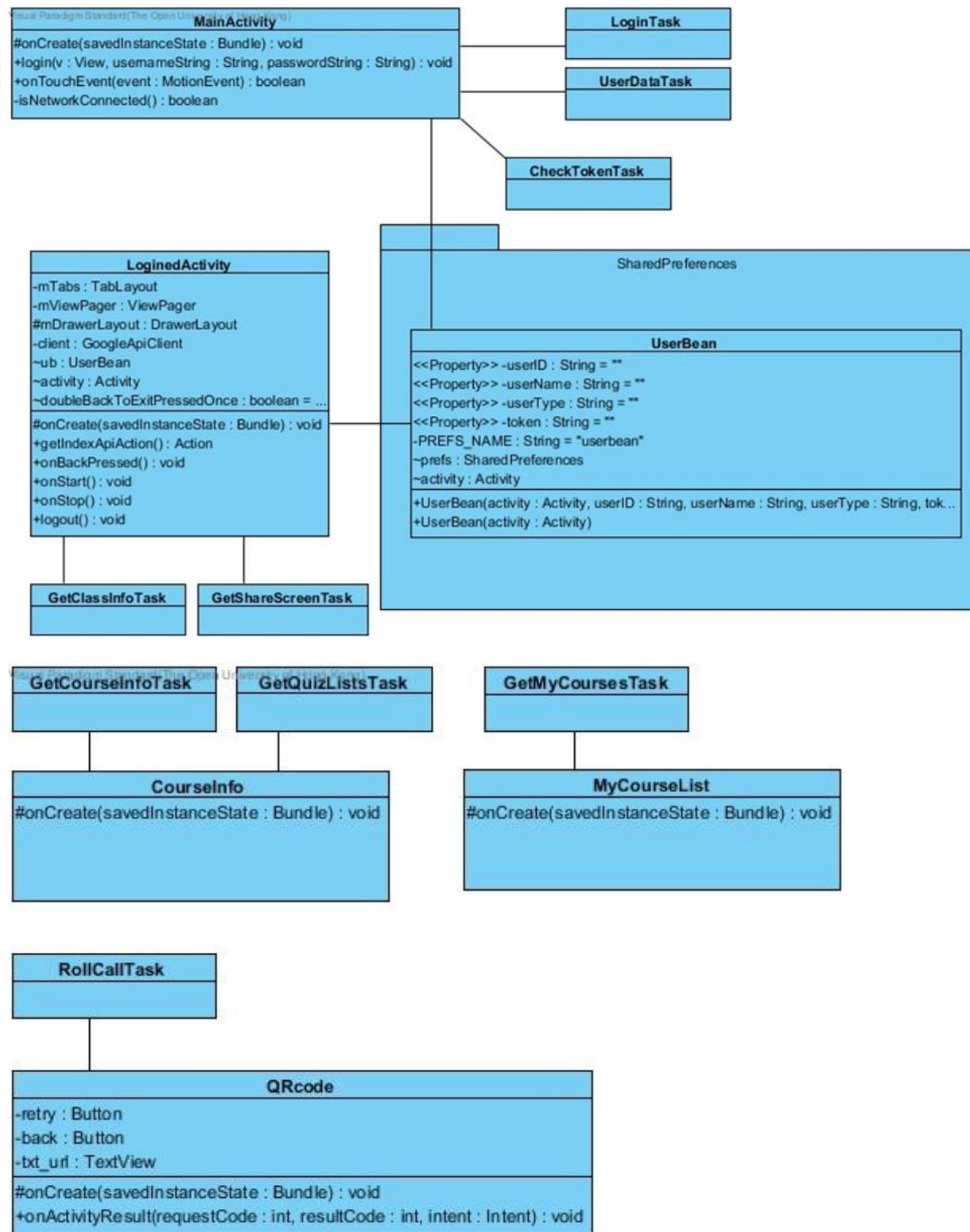
getStudentInfo:	
Post	userid and token
Return	{user info}
success	<pre>{ "userID": "s001", "userName": "Wong Chun Kit John", "userType": "student", "phone": "12345678", "success": "1" }</pre>
Fail	<pre>{ "success": 0, "msg": "Wrong user id or token" }</pre>

The View is created by the Activity of Android library.

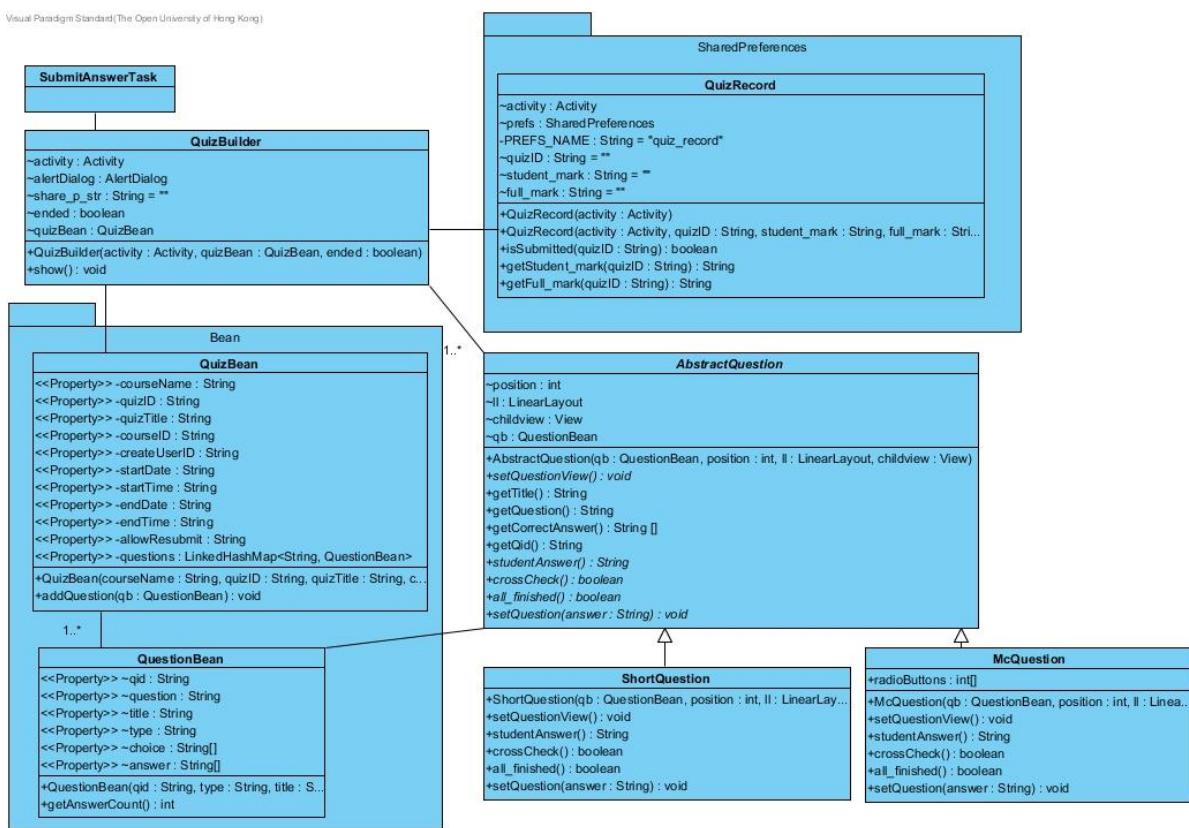
AsyncTask is one of the Controller that retrieve data from server side Controller.

In below class diagram, it shows the structure of view, controller.

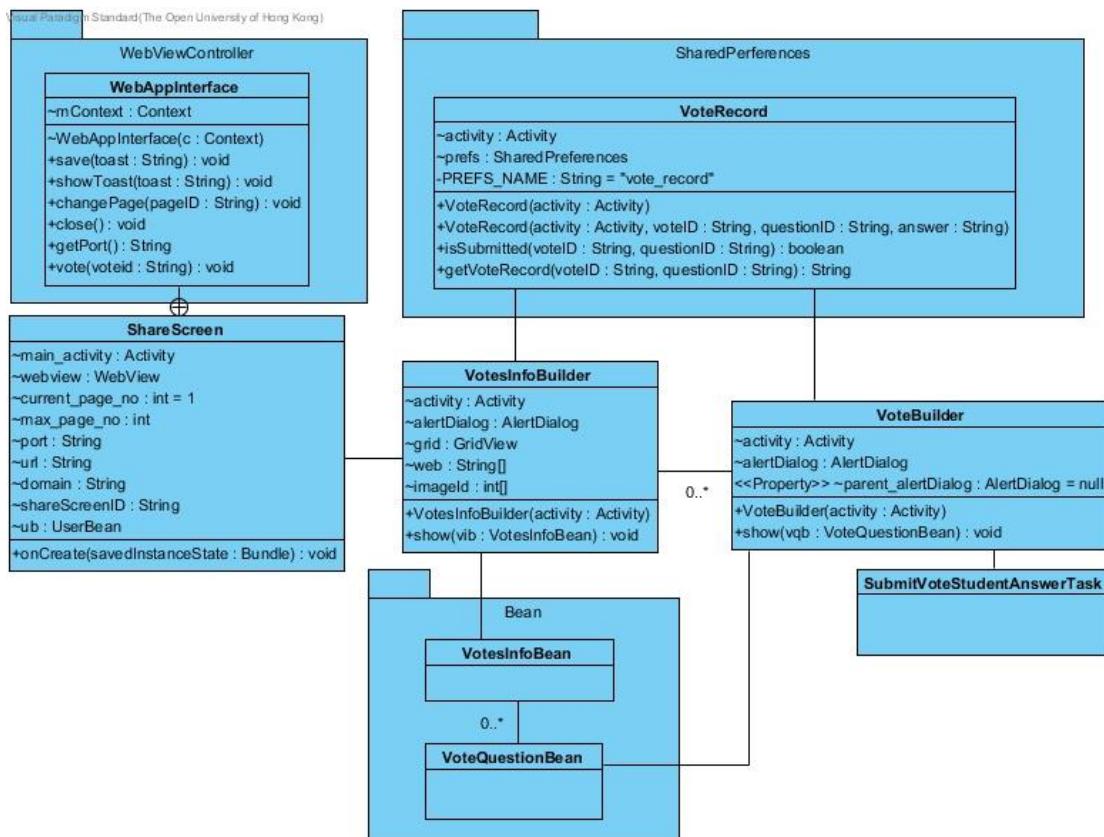
3.5.2 Mobile Application (Class Diagram)



Visual Paradigm Standard(The Open University of Hong Kong)



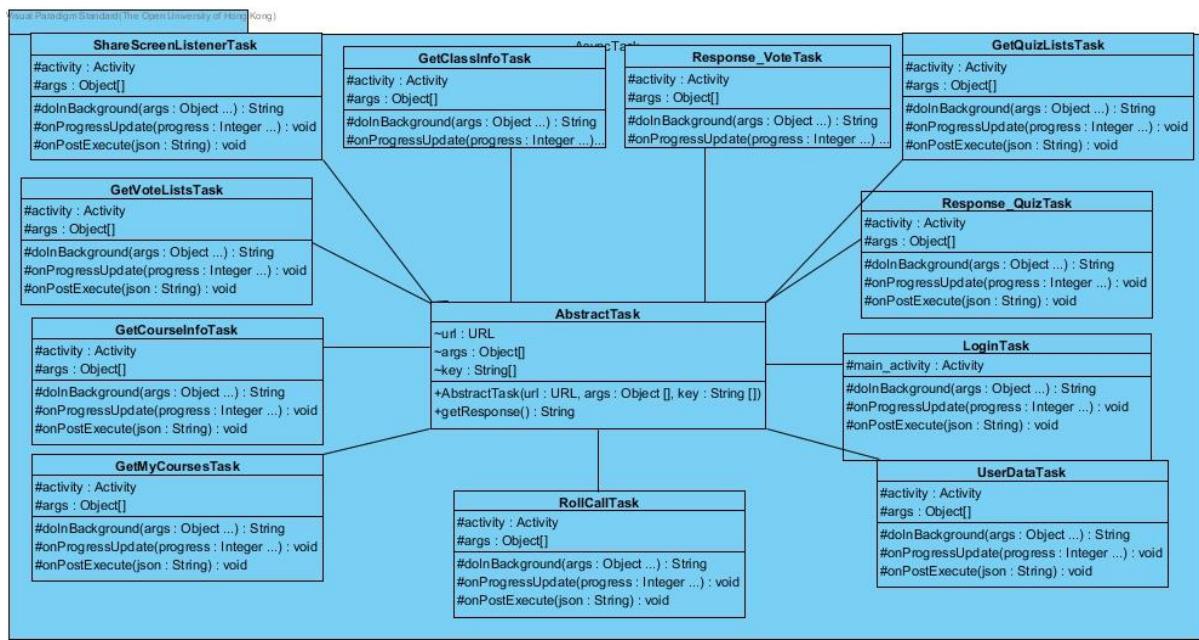
Visual Paradigm Standard(The Open University of Hong Kong)



3.5.3 Mobile Application - Class Diagram (Cont'd)

Polymorphism is a good design pattern. Unfortunately, AsyncTask is already extend android.Activity. The limitation of Java is Java cannot extend two class to one child class.

The solution is that the AbstractTask has an associate with another Task (eg. RollCallTask, LoginTask). AbstarctTask contains the connection coding like Uri.Builder, BufferedReader. In terms of Object oriented programming, it is more easily to extend the application without modify the original code.



3.6 Sequence Diagram

3.6.1 Mobile application and backend

There are two types of Controller in below sequence diagrams. Mobile Controller is part of mobile application development. Backend Controller is part of server side application development.

Common API structure:

Student control the UI in the mobile application. Secondly, the controller of mobile application post request to Backend Controller. Backend Controller accesses the database model and return data to the mobile Controller through JSON format. UI will be updated.

Login - Success

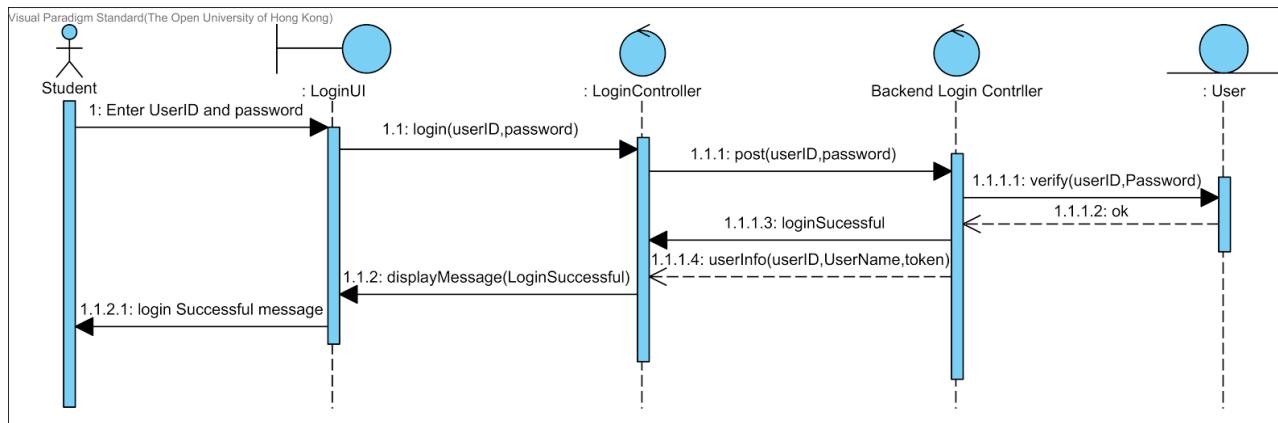


Figure 26 - Login Success

Login - Failed

When wrong password.

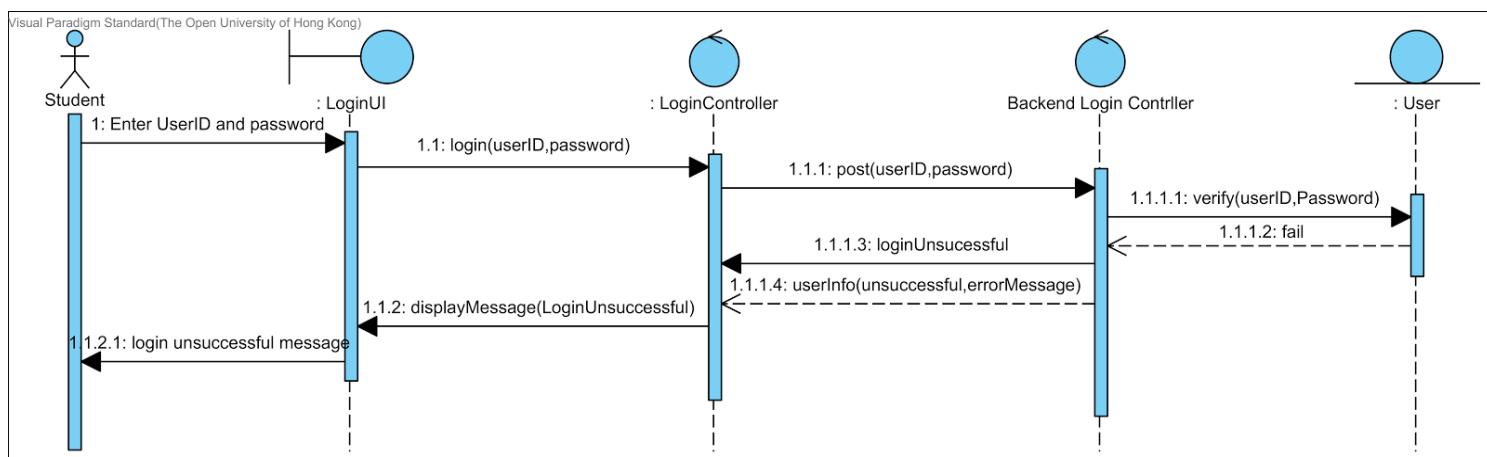


Figure 27 - Login Failed

Roll Call -Success

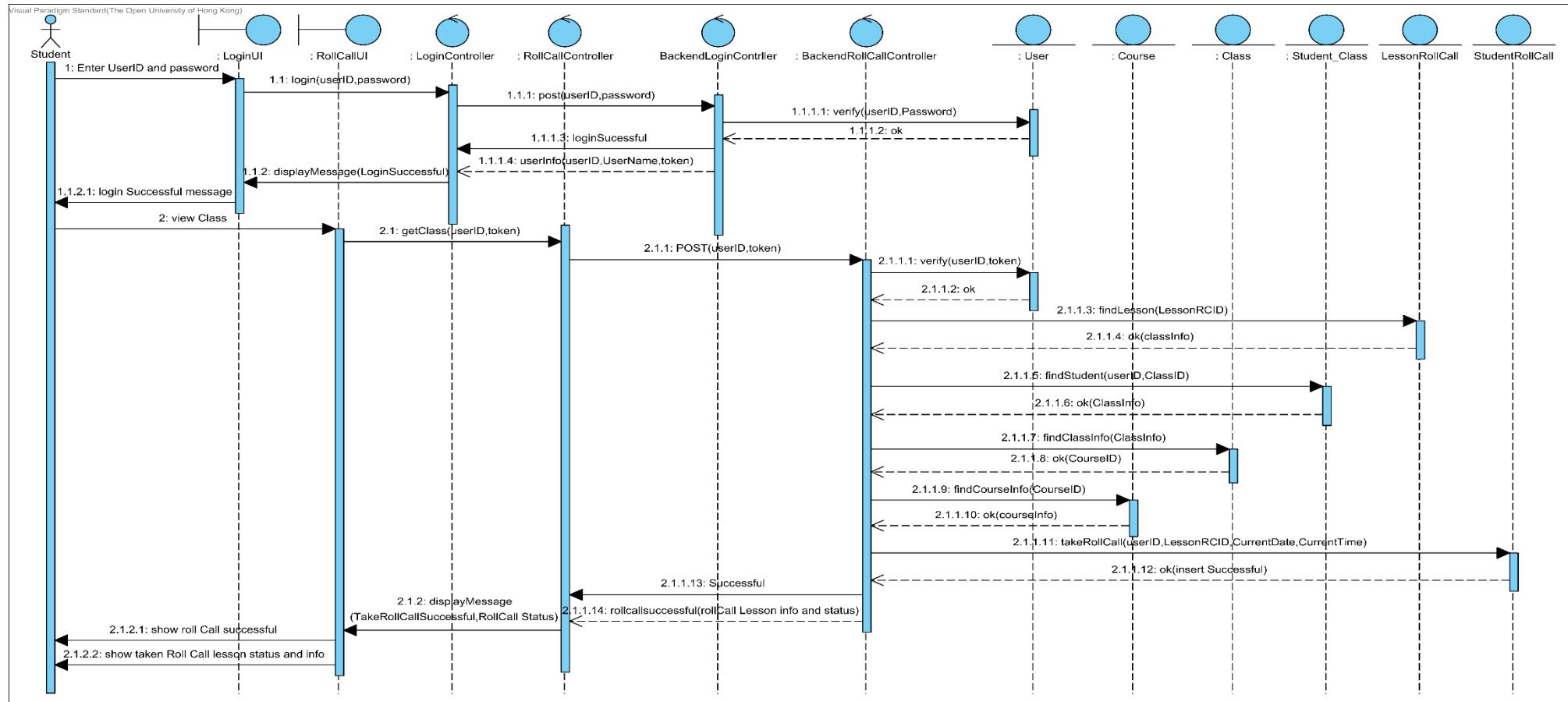


Figure 28 - Roll Call Success

Roll Call -Failed (cont'd)

When student enroll twice in same lesson.

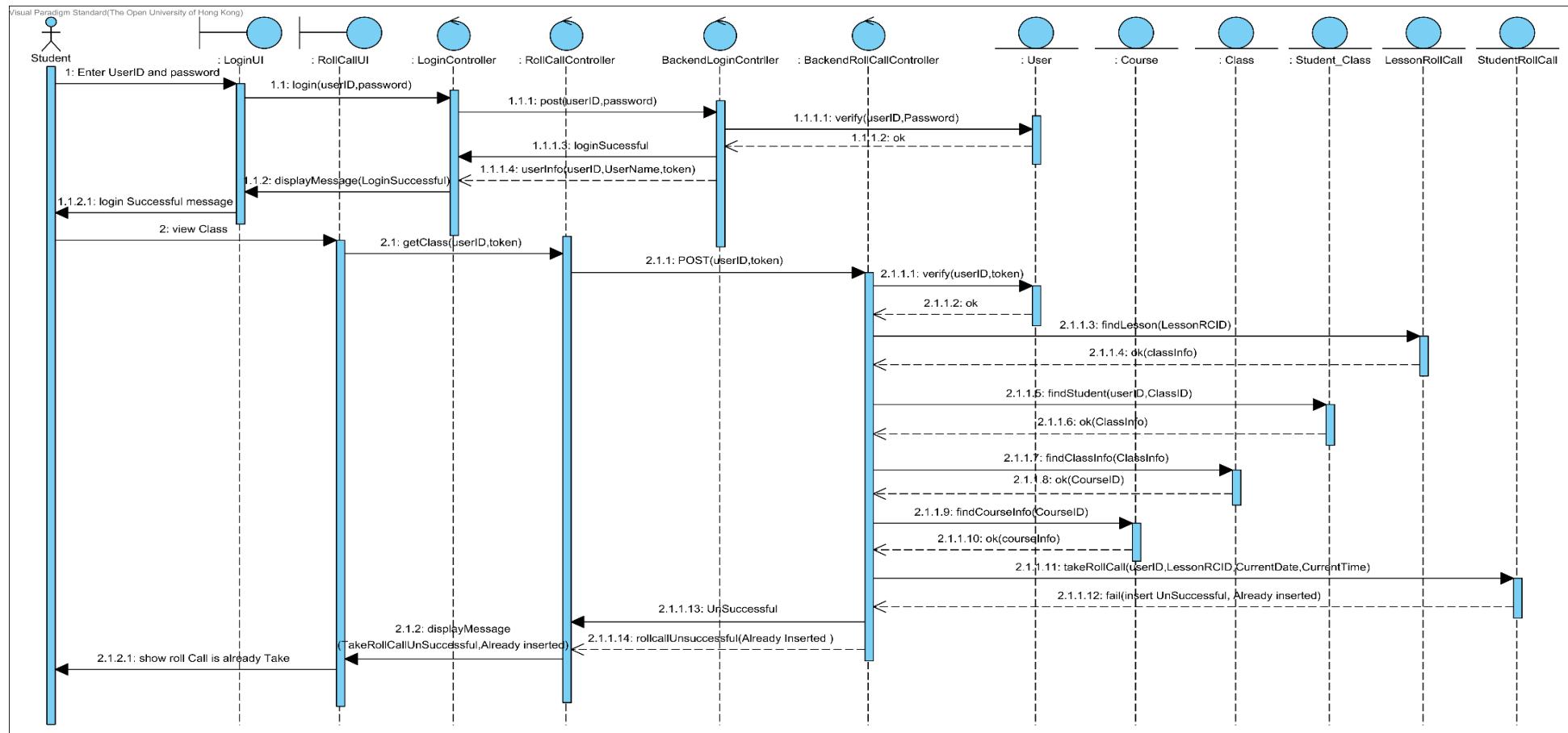


Figure 29 - Roll Call - Failed

Get the Students course - Success

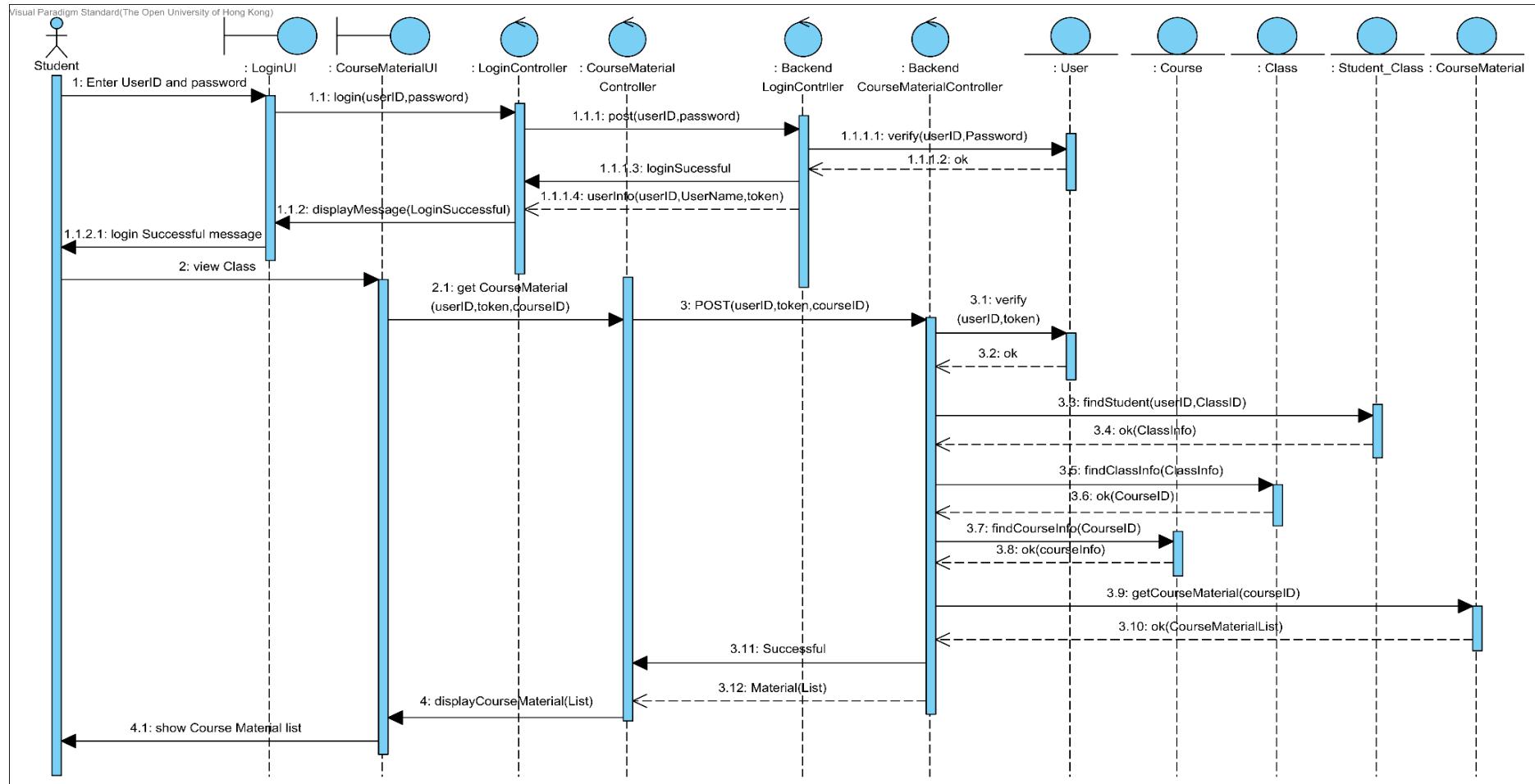


Figure 30 – Backend - Get the Students course - Success

Get the Students course- Fail-No course (Cont'd)

When Student did not enroll any class.

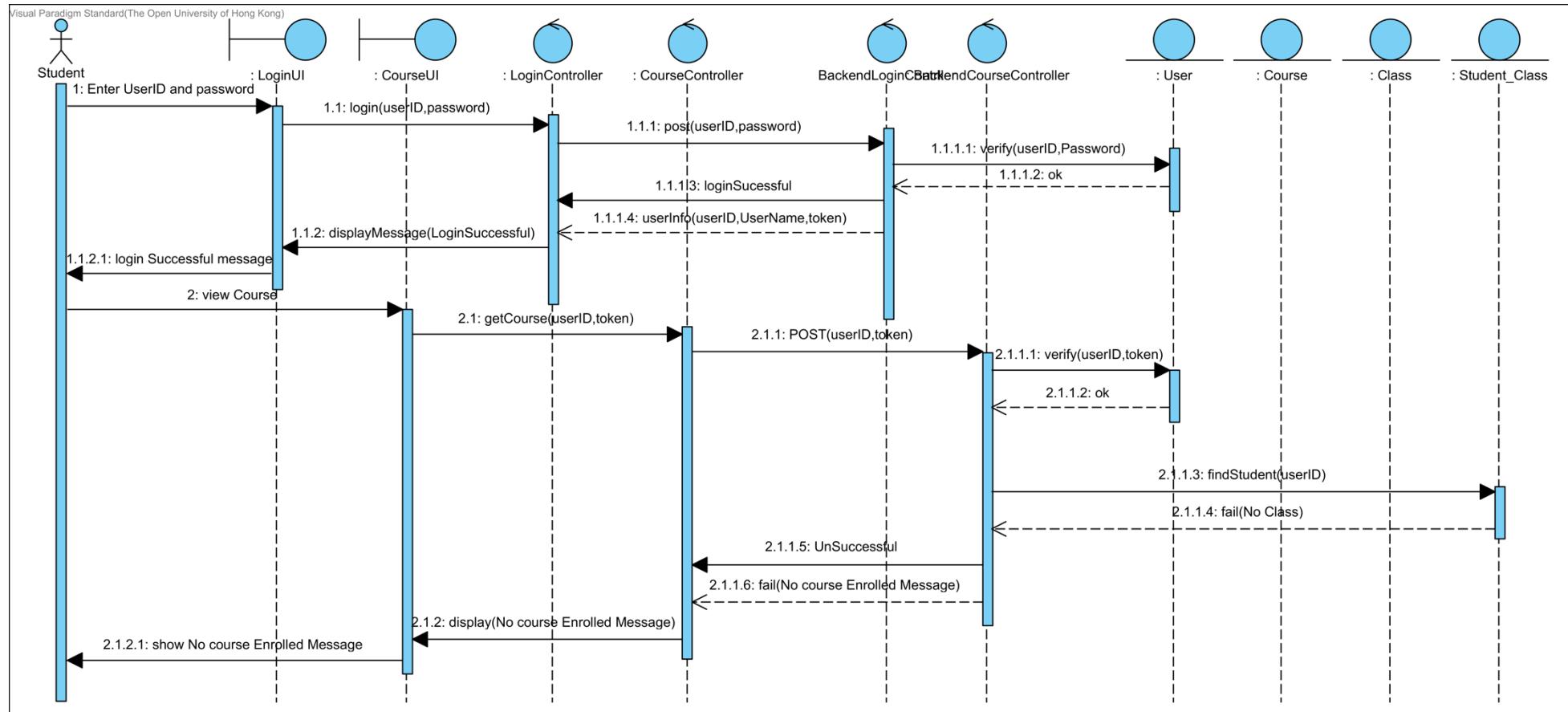


Figure 31 -Backend - Get the Students course- Fail- Student Not enroll Any Class

Get course material and information(Success)

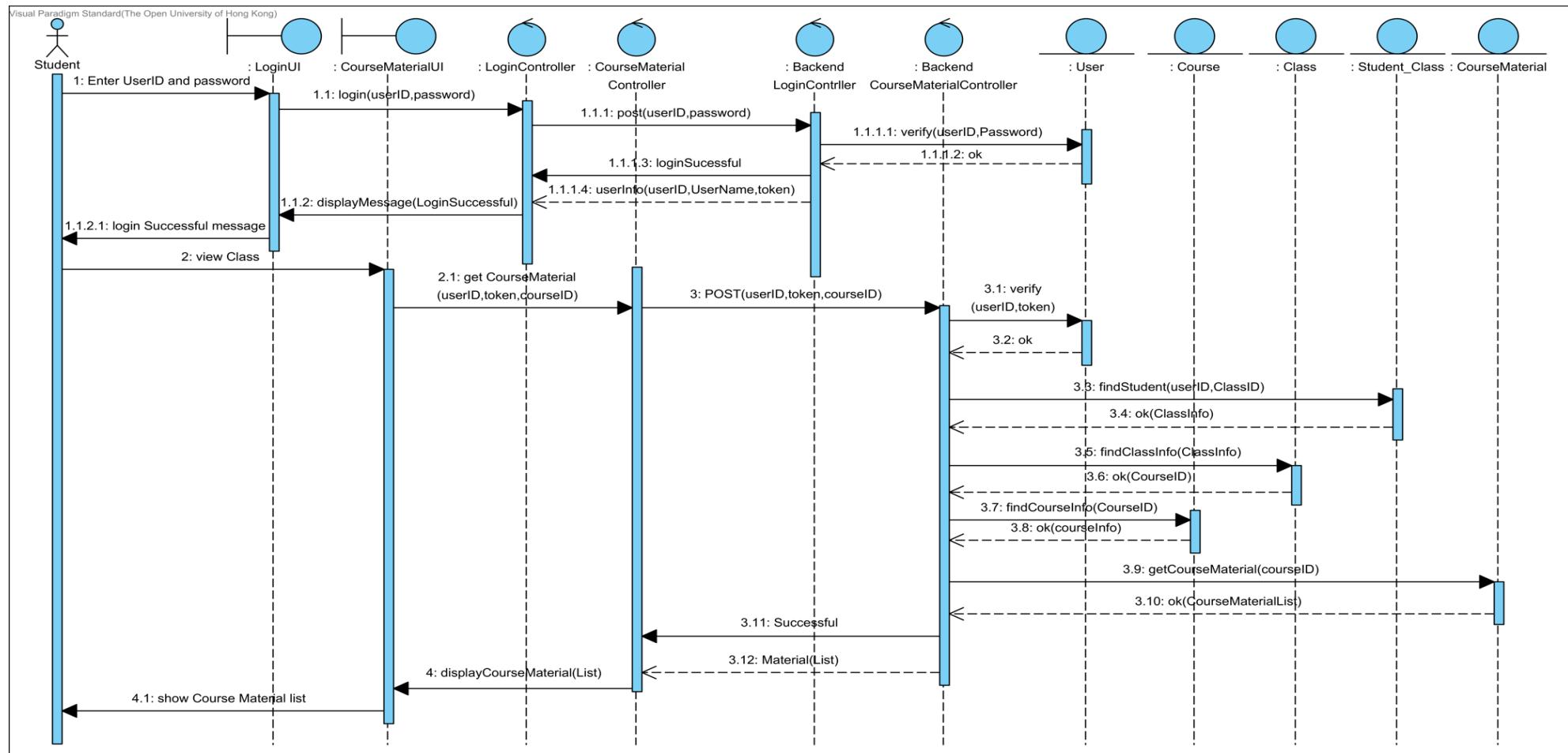


Figure 32 -Backend- Get course material and information Success

Get course material and information (Failed) (Cont'd)

When empty course material

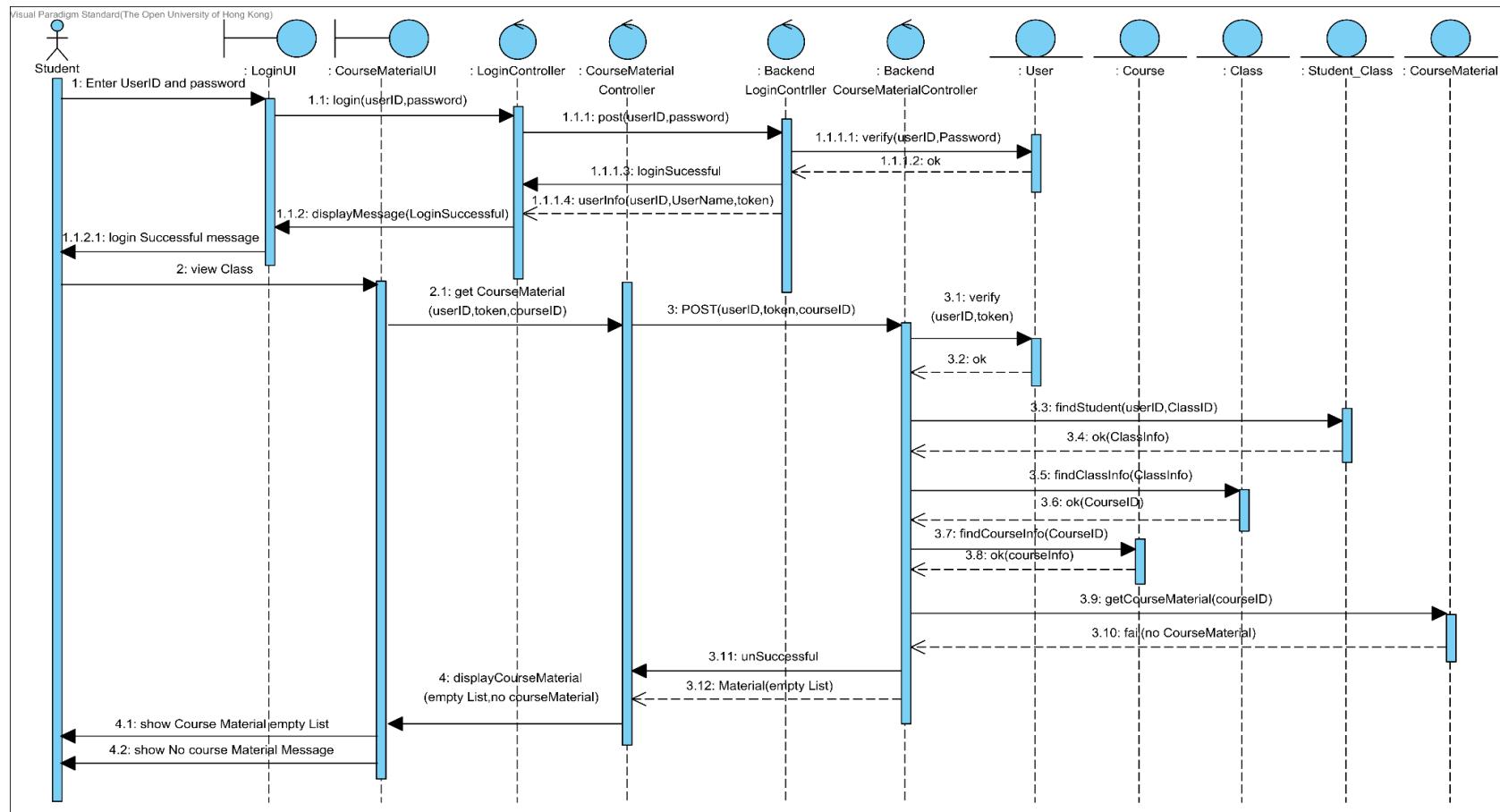


Figure 33 -Backend - Get course material and information - Failed Empty Course Material

Get student information (Success)

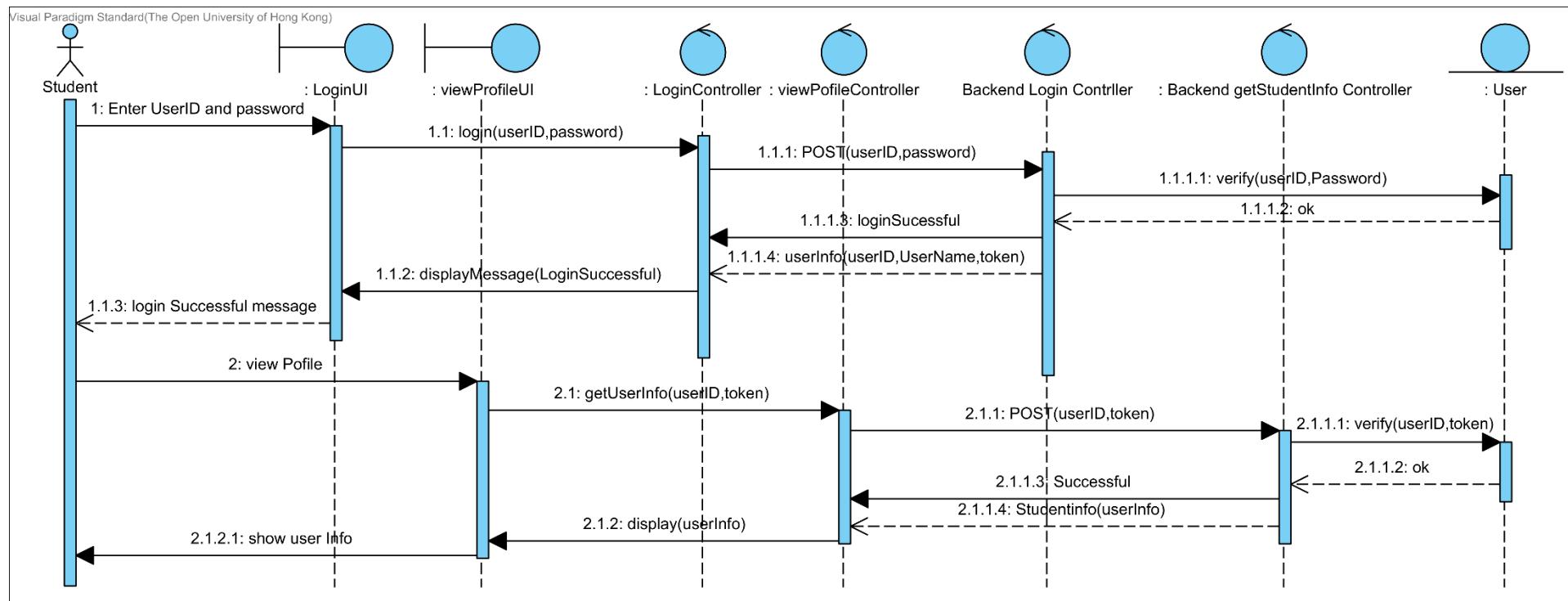


Figure 34 - Get Student information - Success

Get student information – Failed (Cont'd)

When Student token invalid

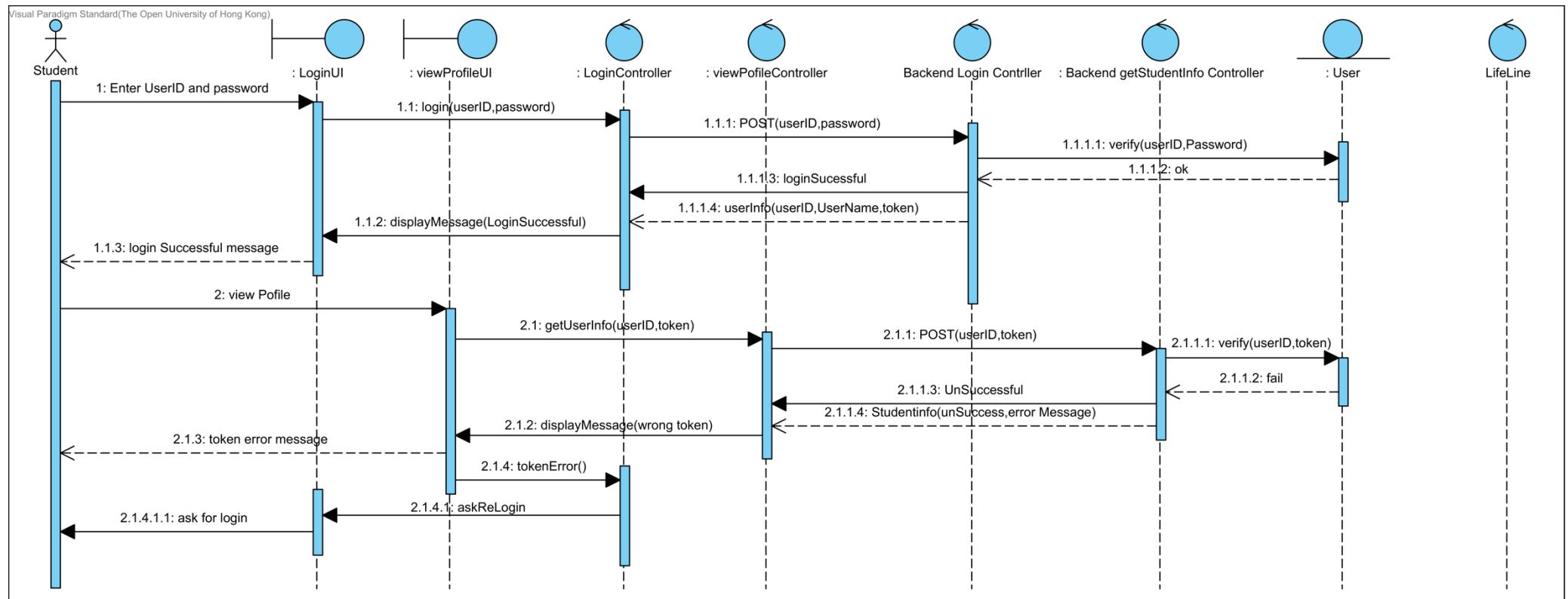


Figure 35 - Get Student Information - Failed - Student token invalid

Get class information(Success)

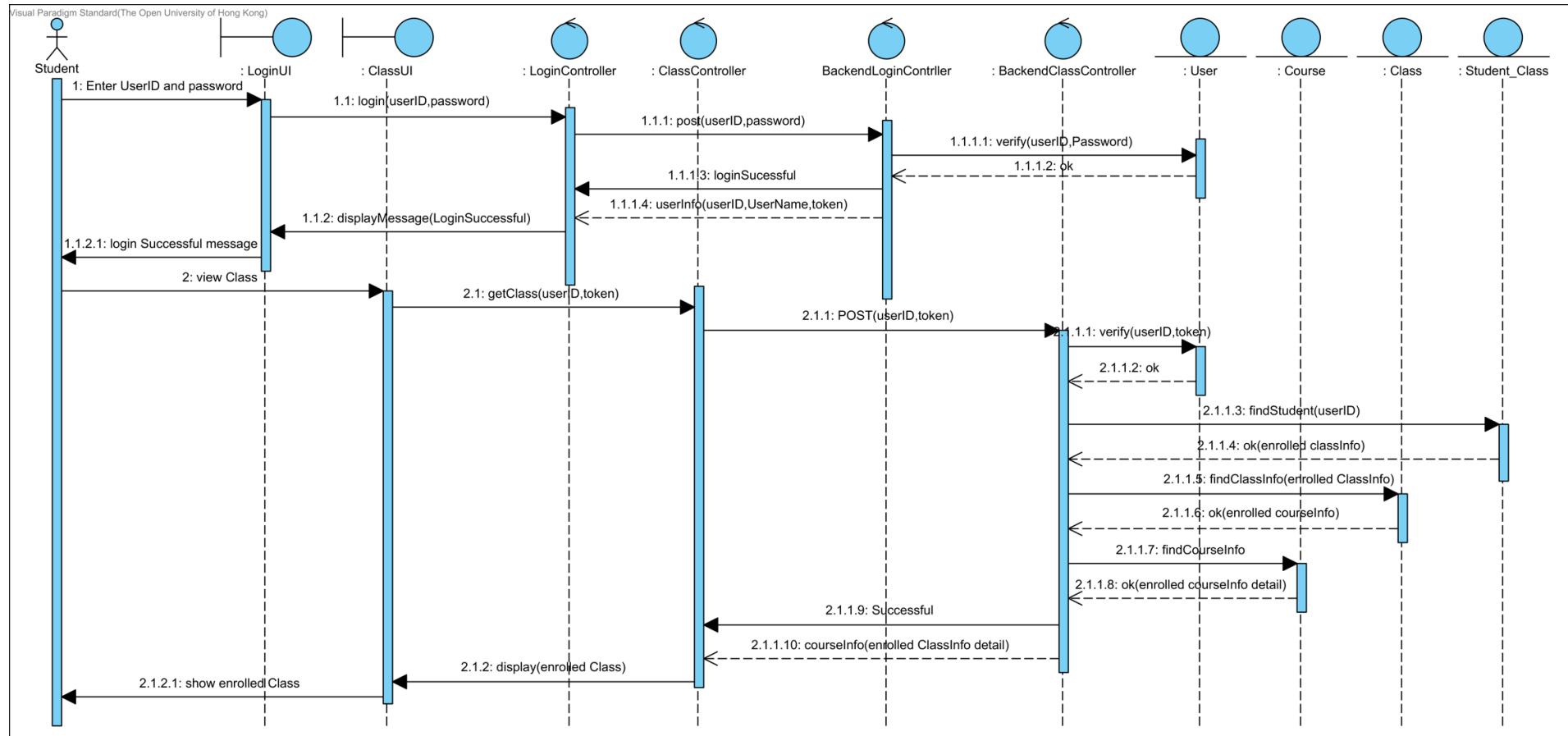


Figure 36 - Backend Get class information - Success

Get class information - Failed(Cont'd)

When Token is invalid.

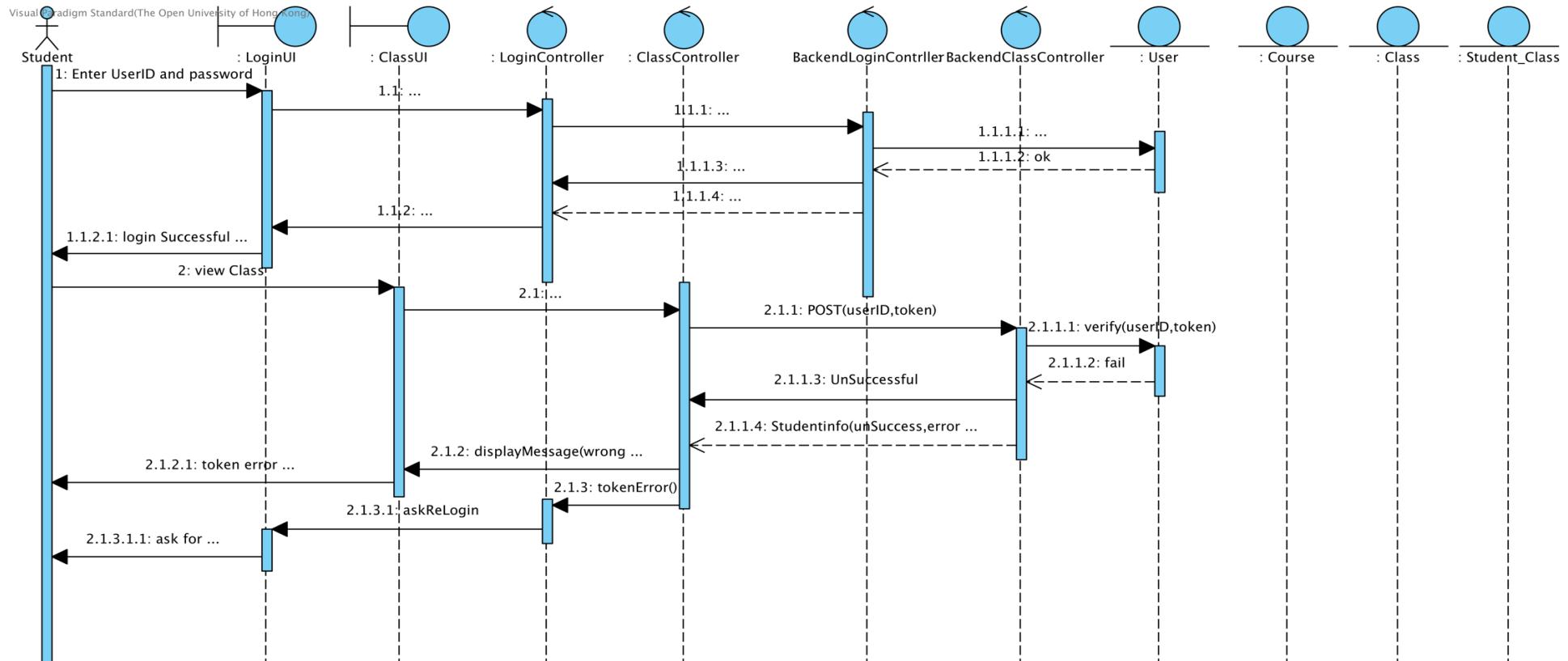


Figure 37 - Backend - Get class information - Failed -Token invalid

Get Course Quiz - Success

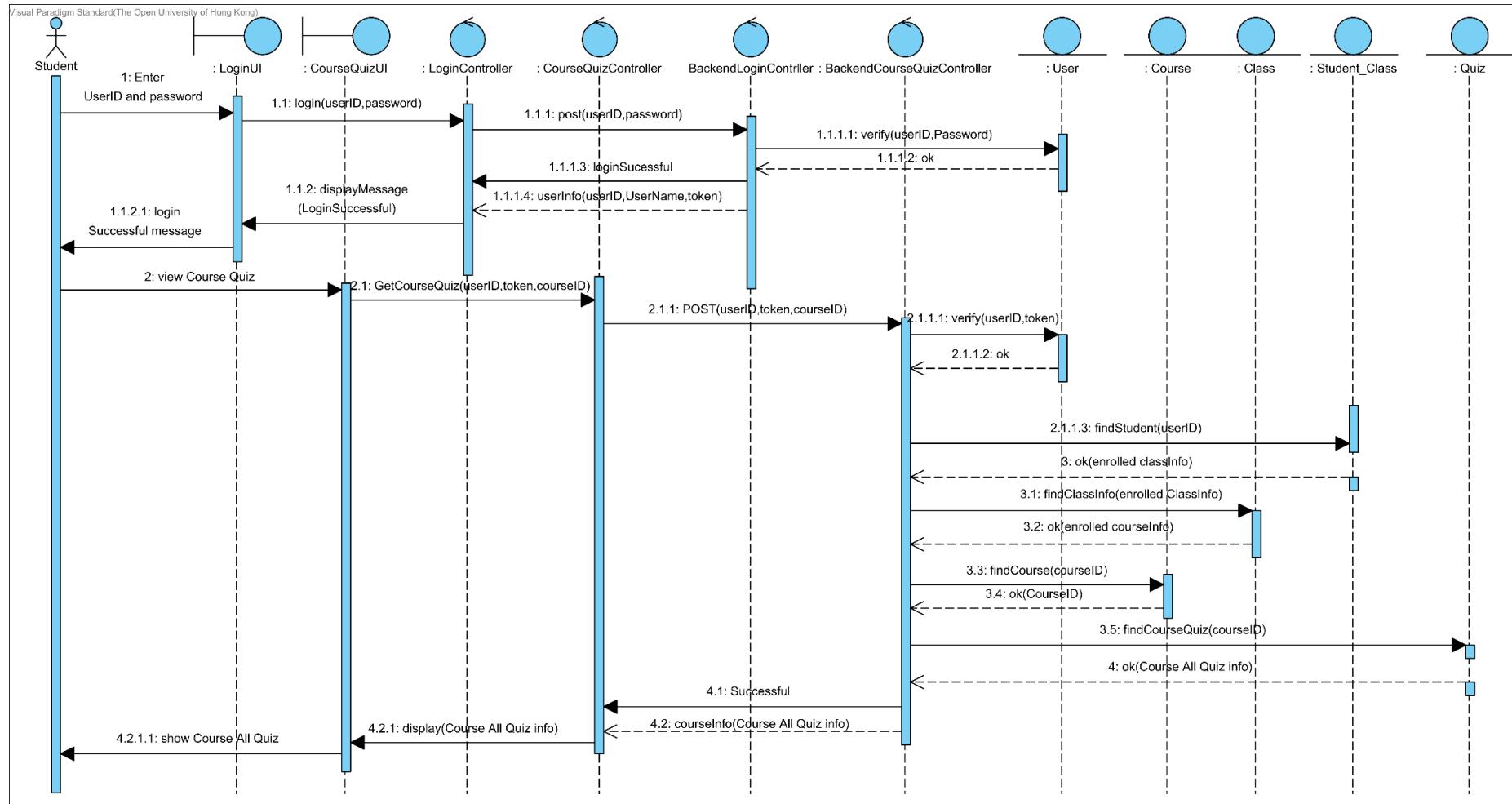


Figure 38 - Backend - Get Course Quiz - Success

Get Course Quiz-Fail

When the course Not have any quiz

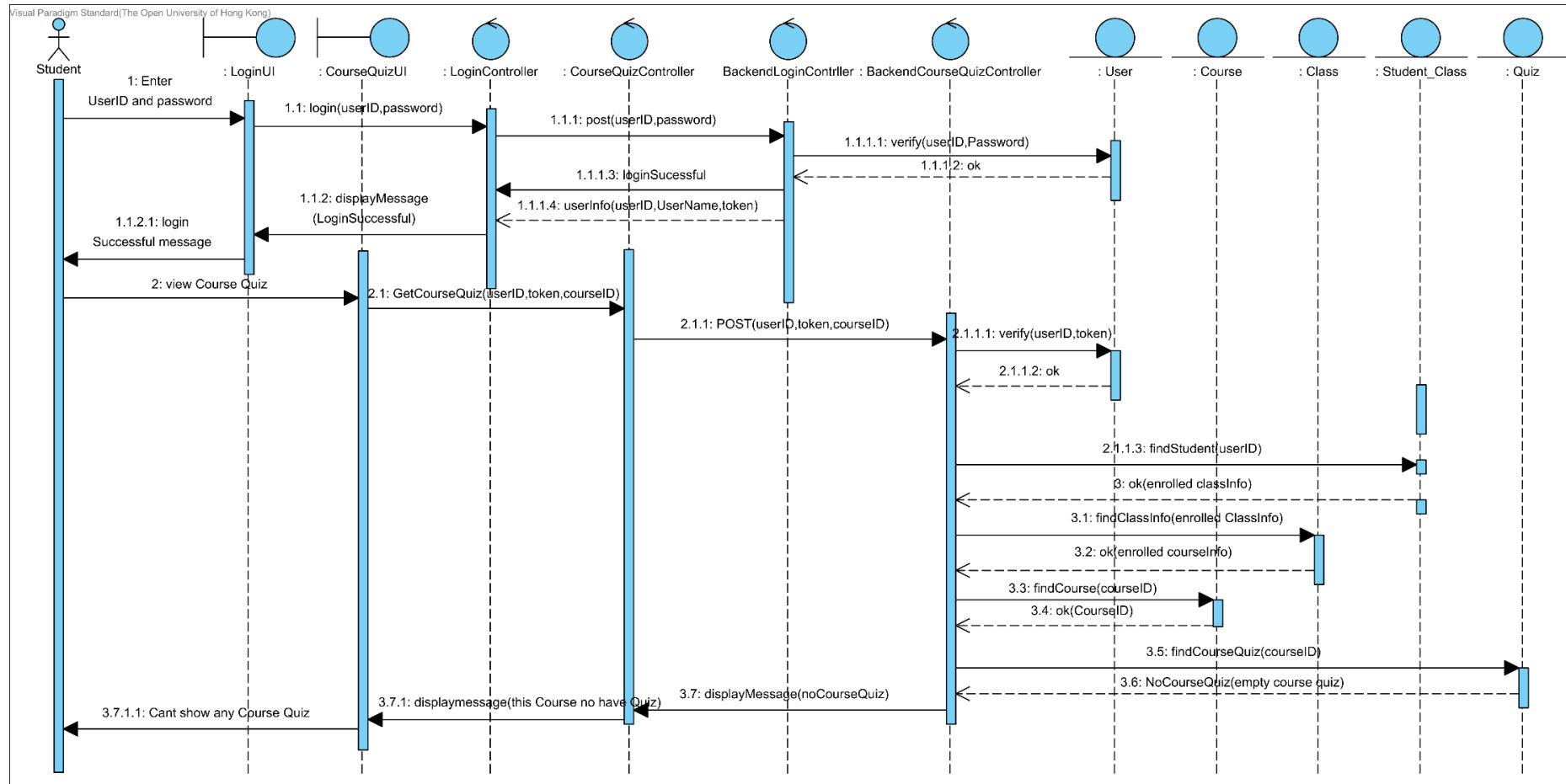


Figure 39 – Backend - Get Course Quiz - Fail - Course not have any Quiz

Get Course Quiz Question - Success

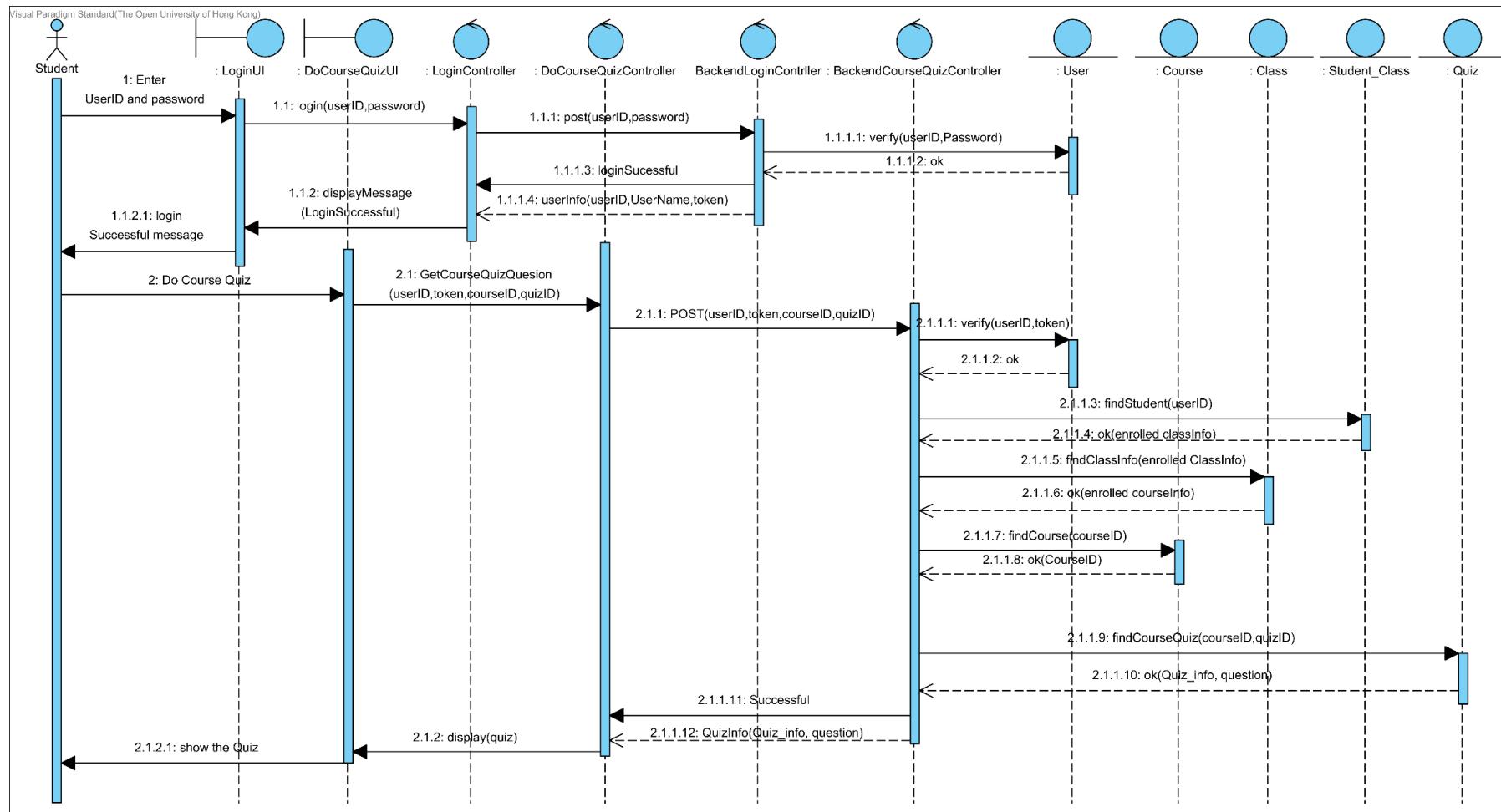


Figure 40 -Backend - Get Course Quiz Question - Success

Submit Quiz Student Answer - Success

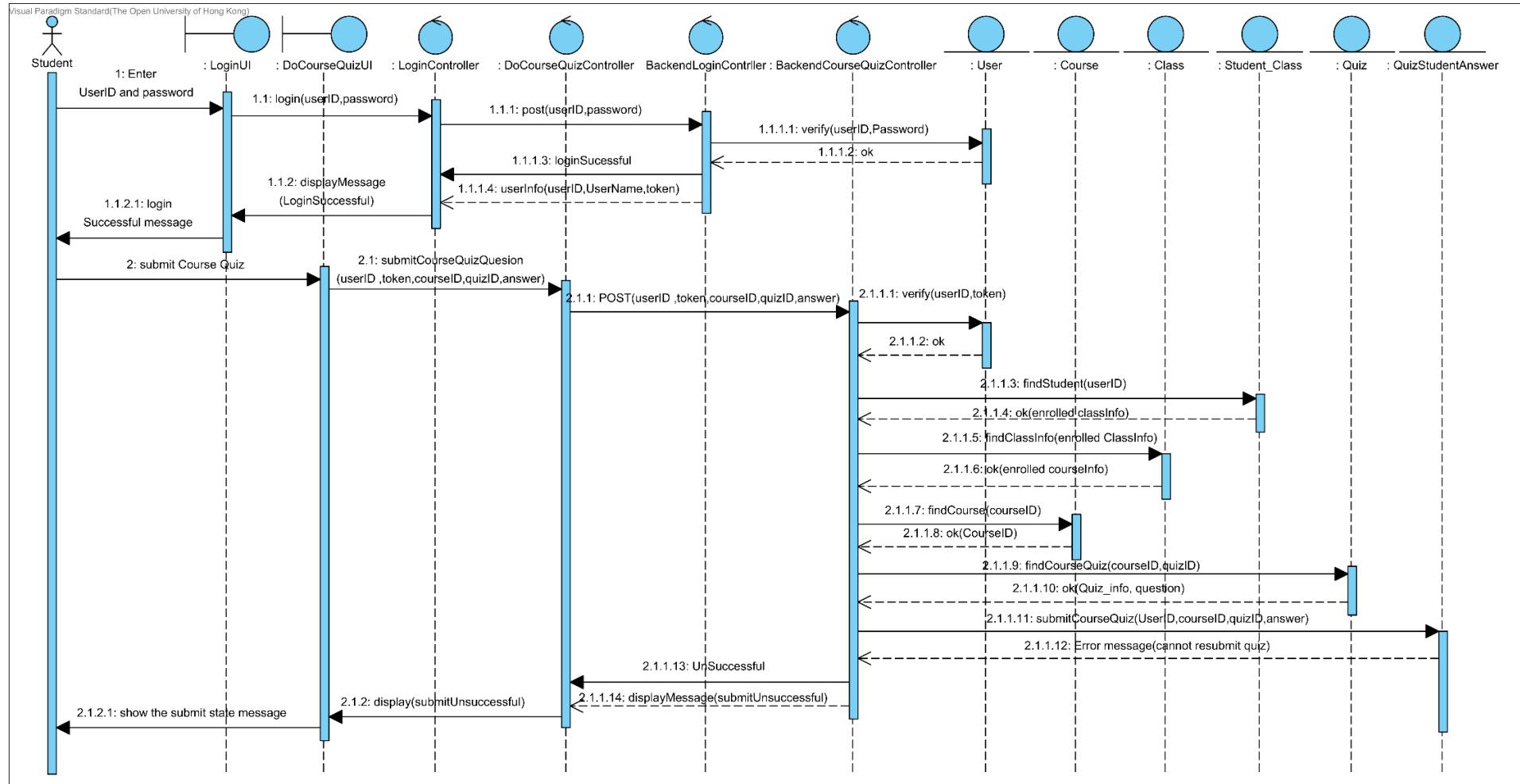


Figure 41 - Submit Quiz Student Answer - Success

Check Quiz Submission -Success

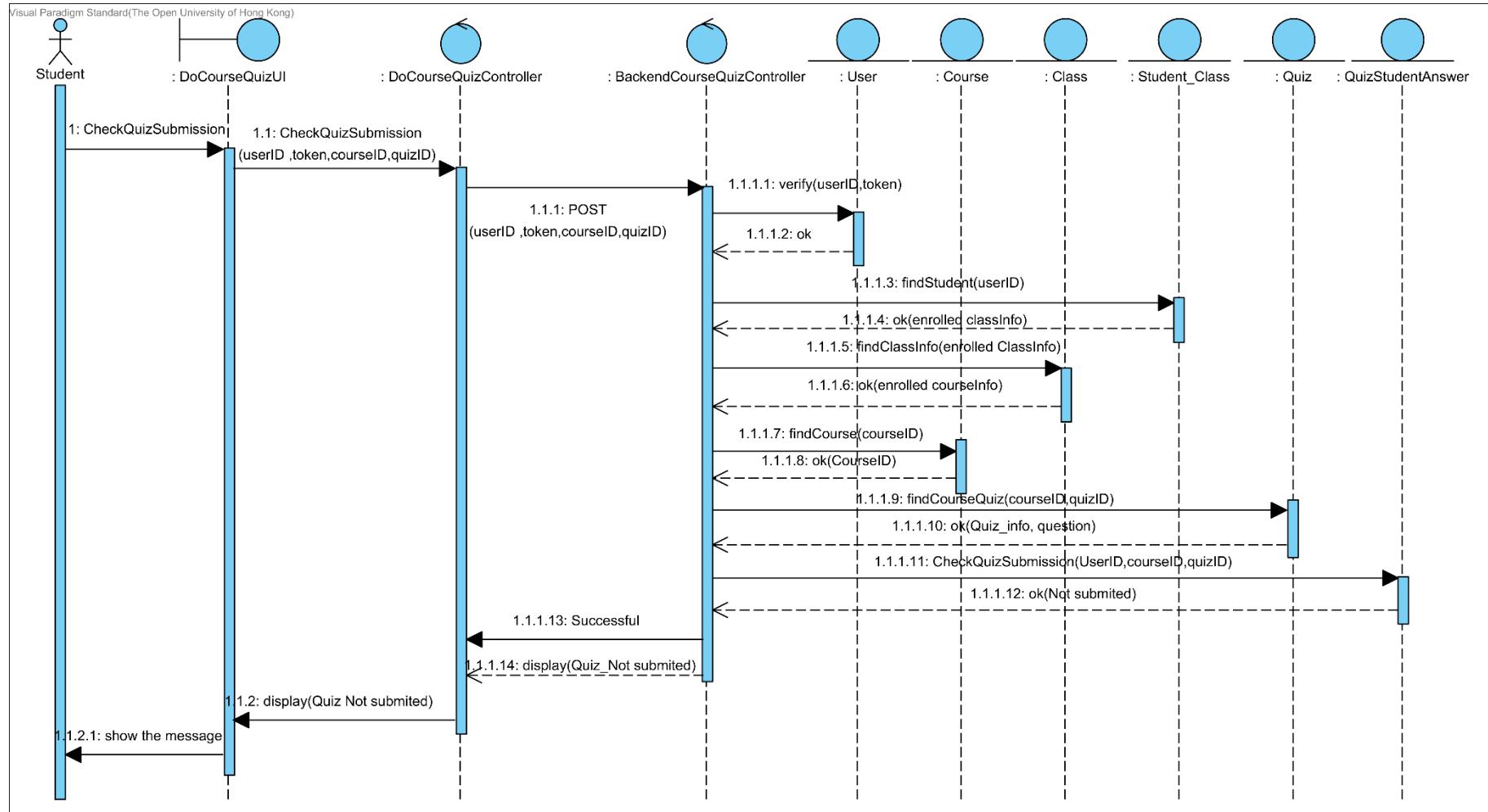


Figure 42 - Backend - Check Quiz Submission -Success

Check WIFI Mac Address- Success

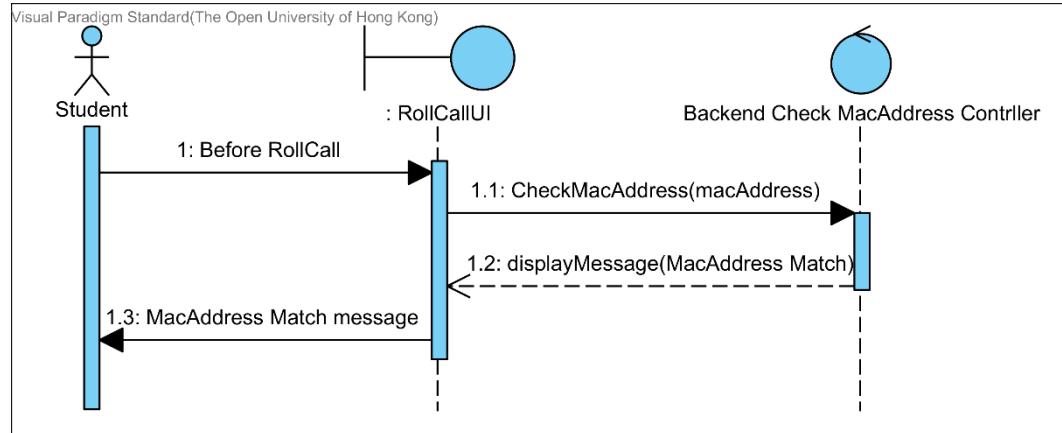


Figure 43 -Backend Check

WIFI Mac Address- Success

Check WIFI Mac Address- Fail

When the Mac Address is not school WIFI AP Mac Address

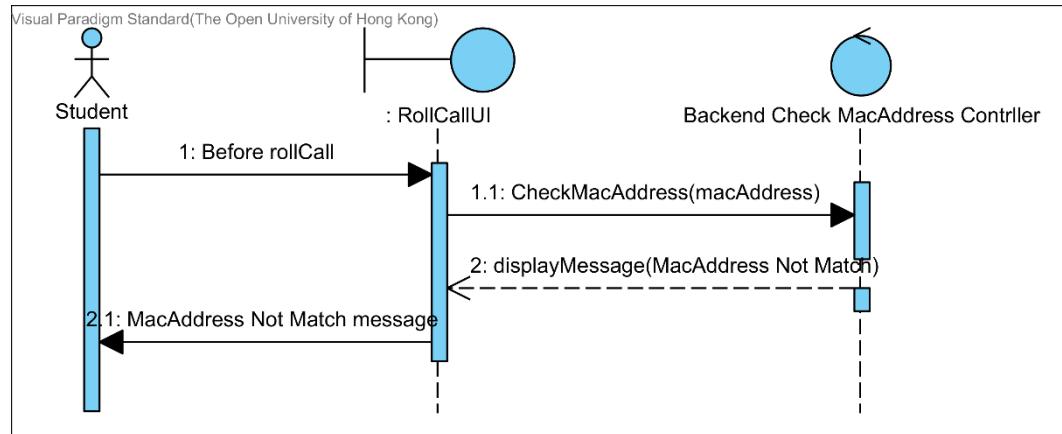


Figure 44 - Backend - Check

WIFI Mac Address - Fail

Check Token - Success

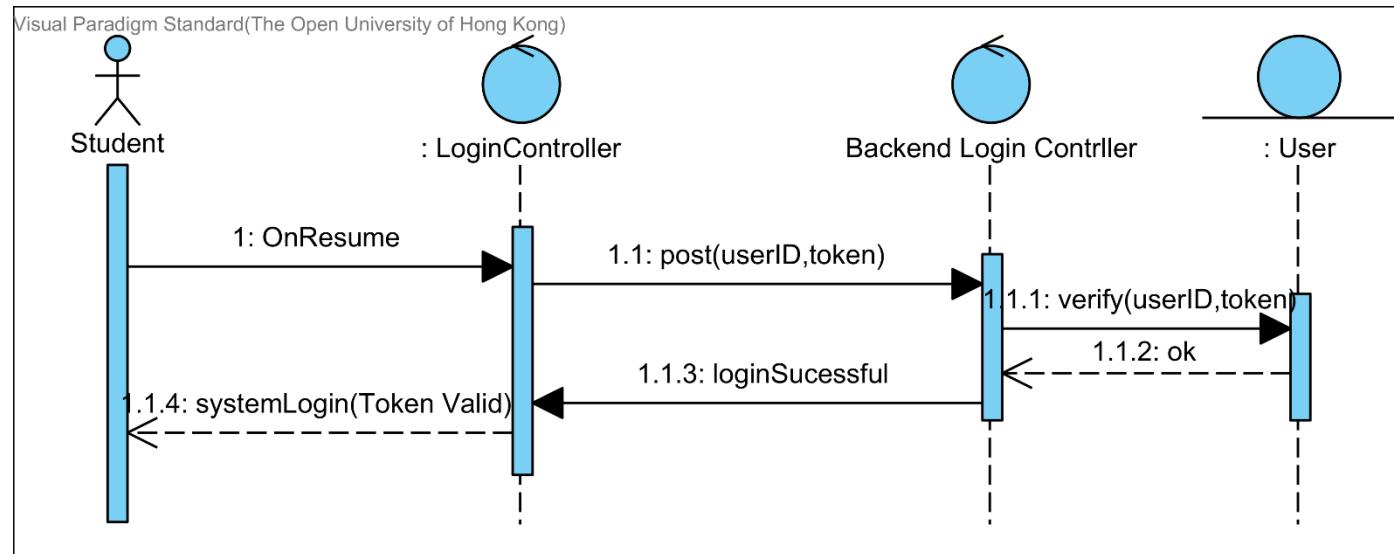


Figure 45 -Backend - Check Token - Success

Check Token – Fail

When user Token is updated , or other device login , it will make the token is not match.

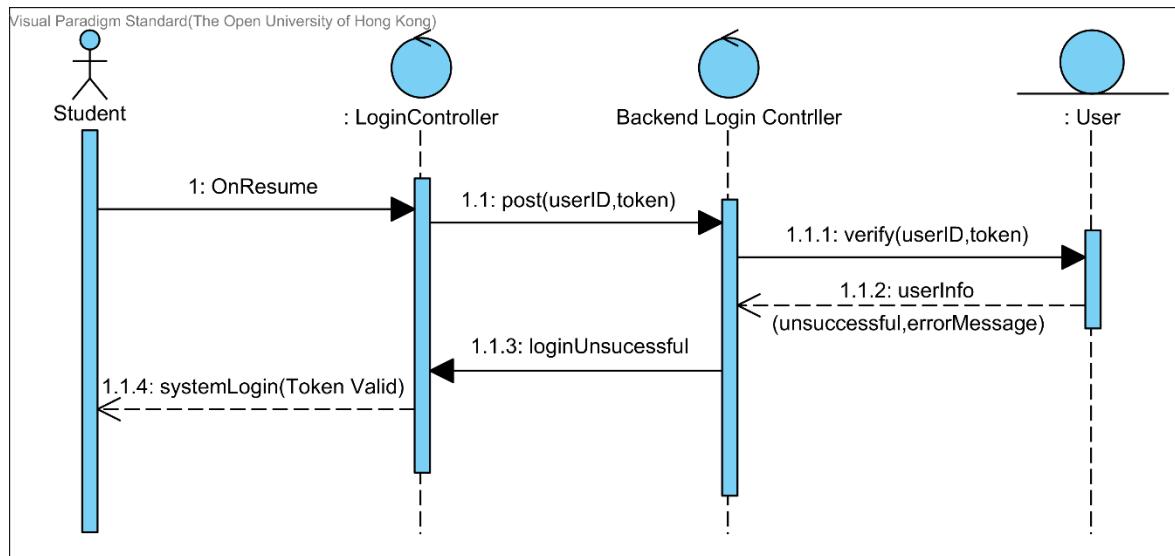


Figure 46 -Backend - Check Token - Failed

Get Vote information / Question - Success

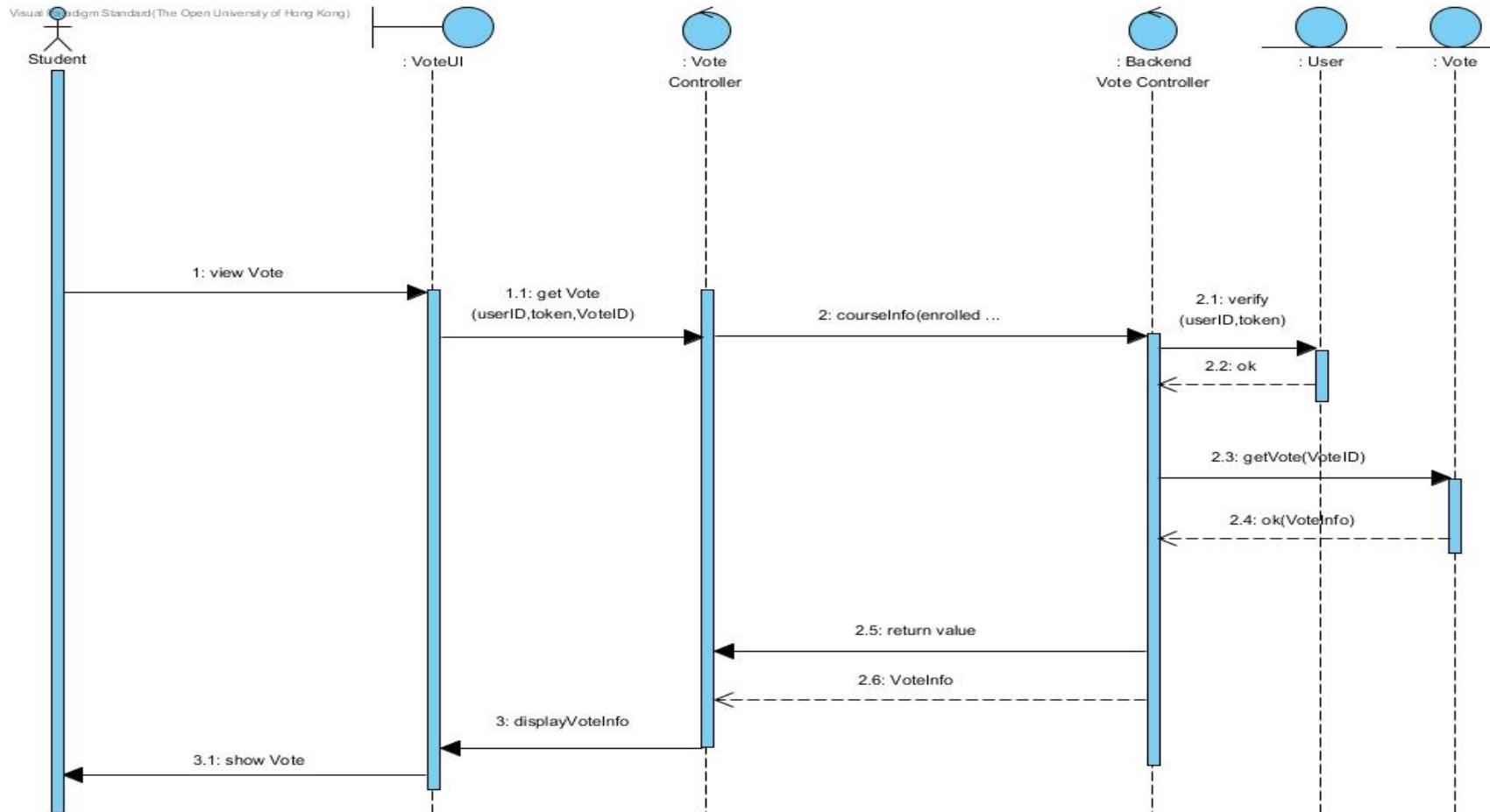


Figure 47 - Get Vote information / Question - Success

Submit Vote Student Answer – Success

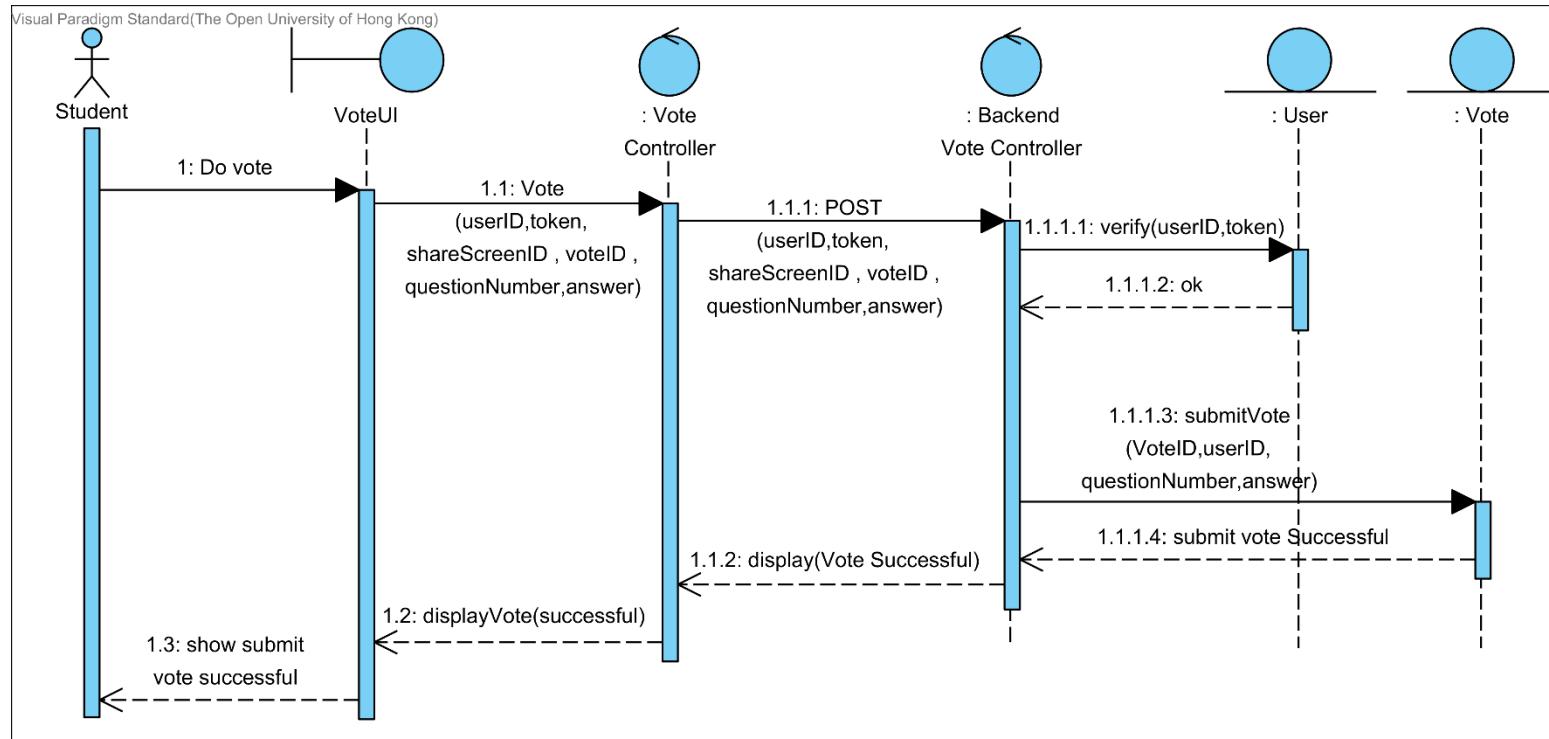


Figure 48 - Submit Vote Student Answer – Success

Subscribe to share screen - Lesson

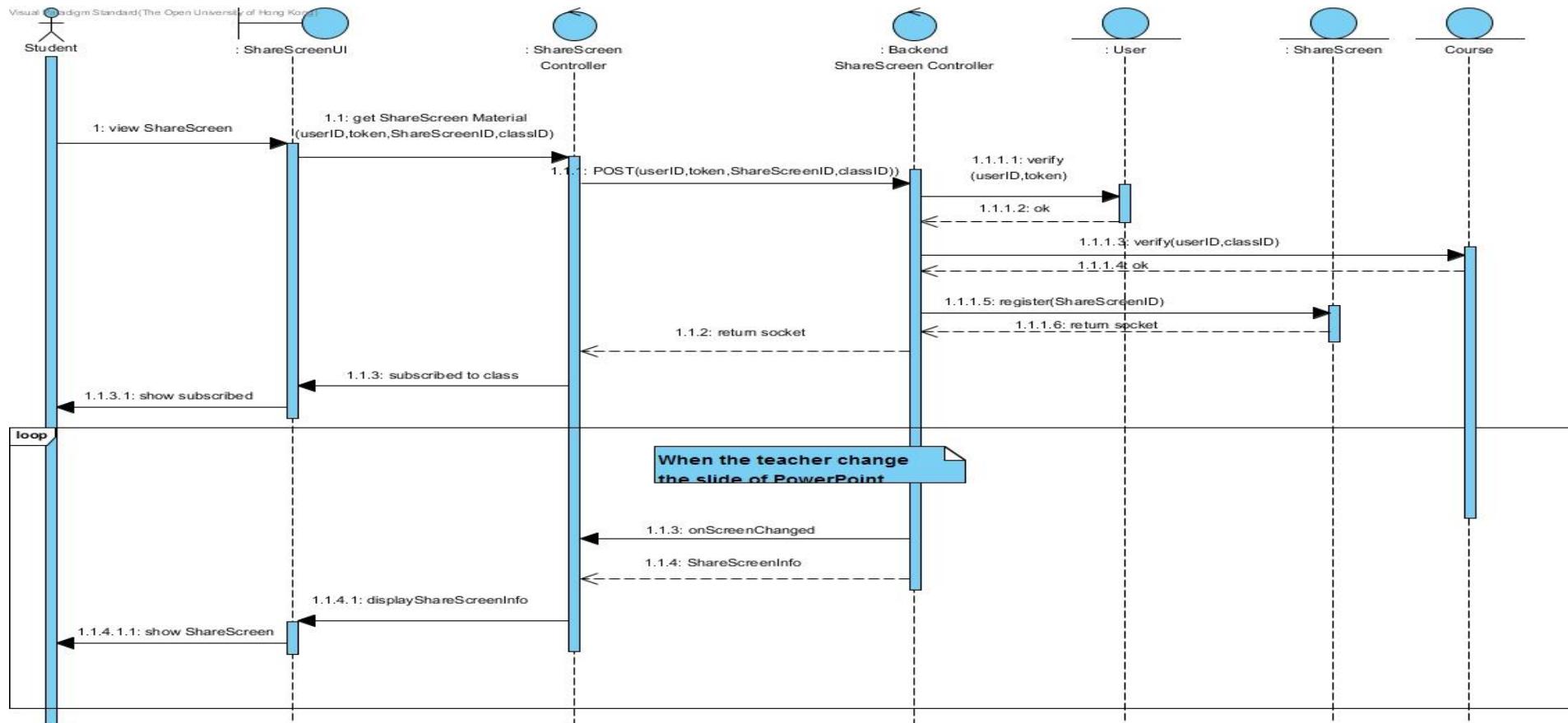


Figure 49 - Subscribe to share screen - Lesson

Subscribe to share screen – Lesson(Cont'd)

Assumption:

Student logged in already

sharescreenID is already given in Class information.

No error in verify the user validation

1. Student click join lesson
2. The UI pass the sharescreenID to ShareScreenController
3. ShareScreenController post request to BackendShareScreenController
4. BackendShareScreenController execute the query to verify the user and course validation
5. BackendShareScreenController execute the query to update who subscribe the lesson
6. return socket information and slides to BackendShareScreenController
7. return socket information and slides to ShareScreenController

Subscribe to share screen - Lesson(Cont'd)

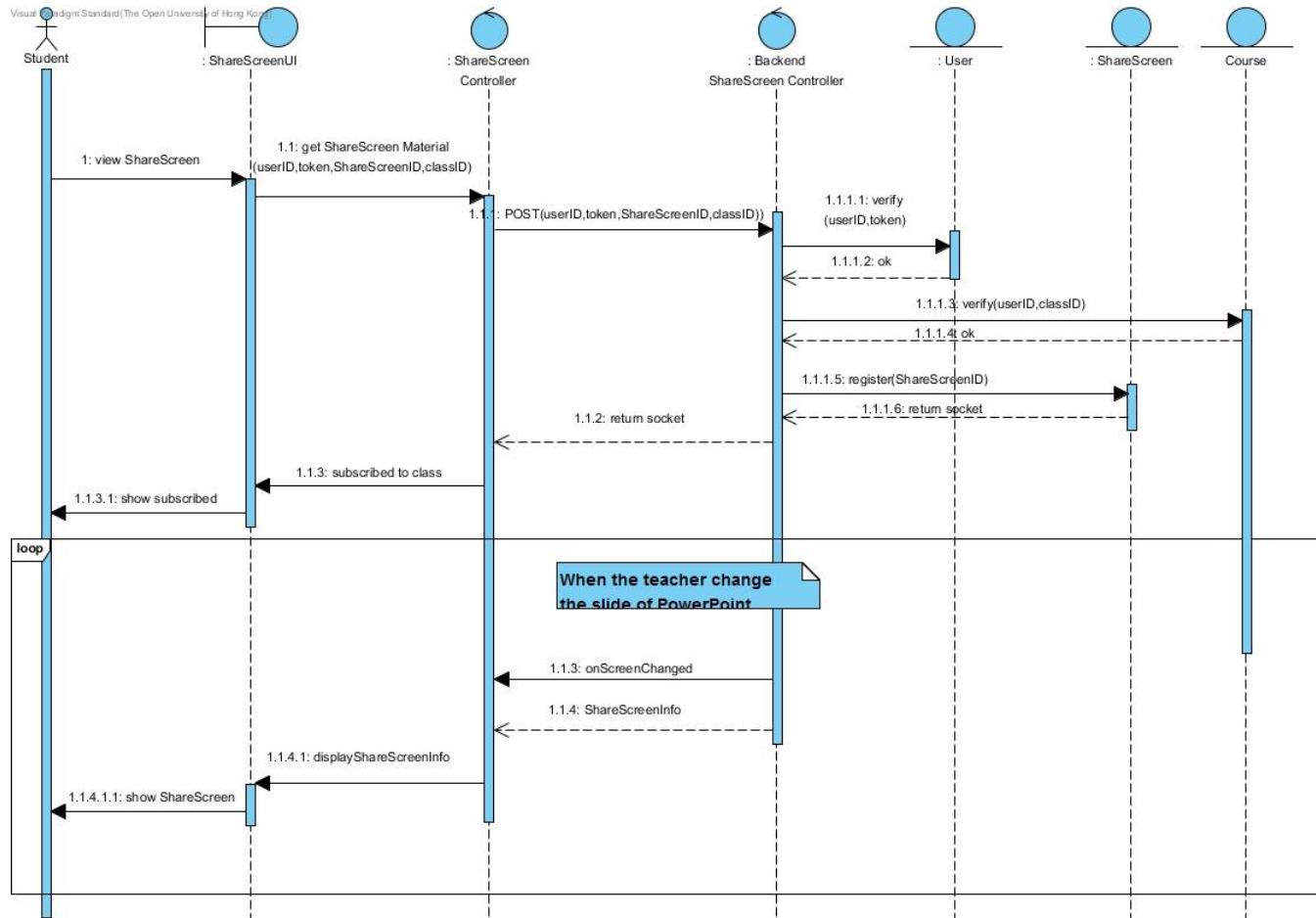


Figure 50 - Subscribe to share screen - Lesson

This part is the socket programming that Server side is Backend Share-Screen Controller and Client side is ShareScreenController)

8. update the UI
9. store slide locally
10. PowerPoint slide changed
11. send slideID to Share Screen Controller
12. ShareScreenController pass the slideID to UI
13. UI update
14. Repeat 9 to 13 until lesson end or terminated

3.6.2 Web Application

User Function

Get User list

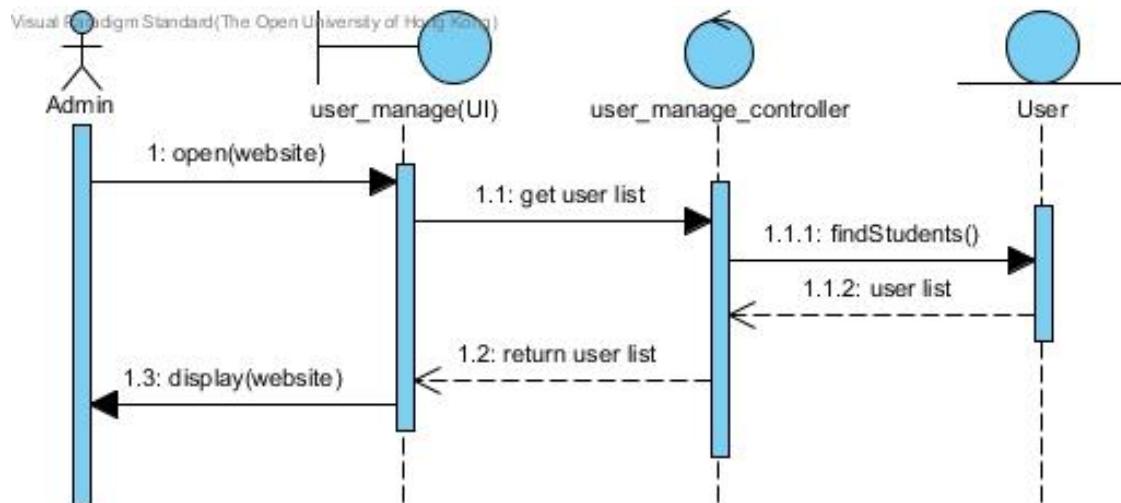


Figure 51 - Get User List

Create User

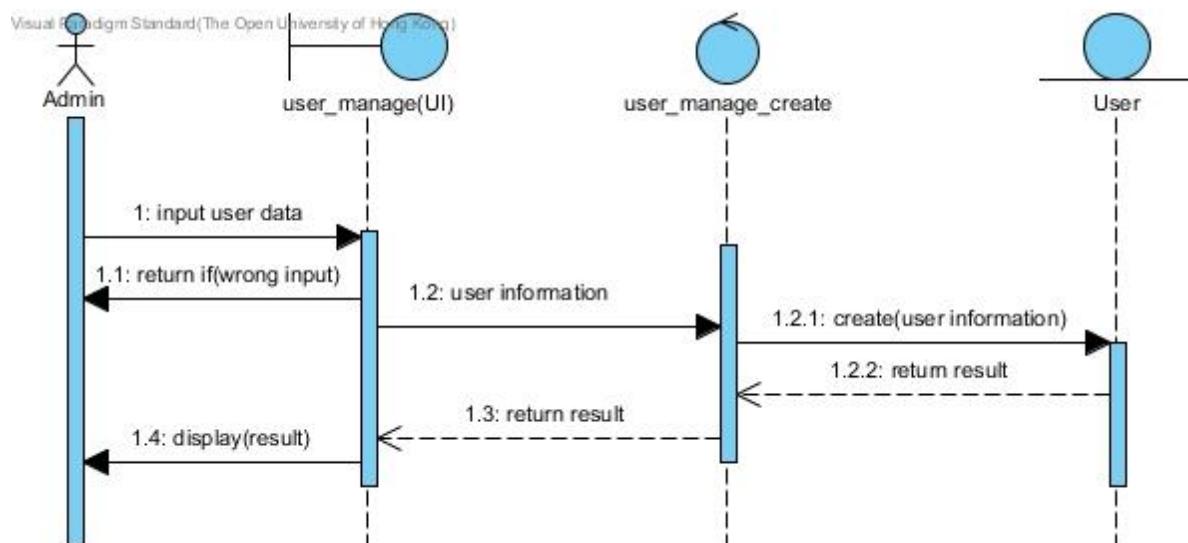


Figure 52 - Create User

Delete User

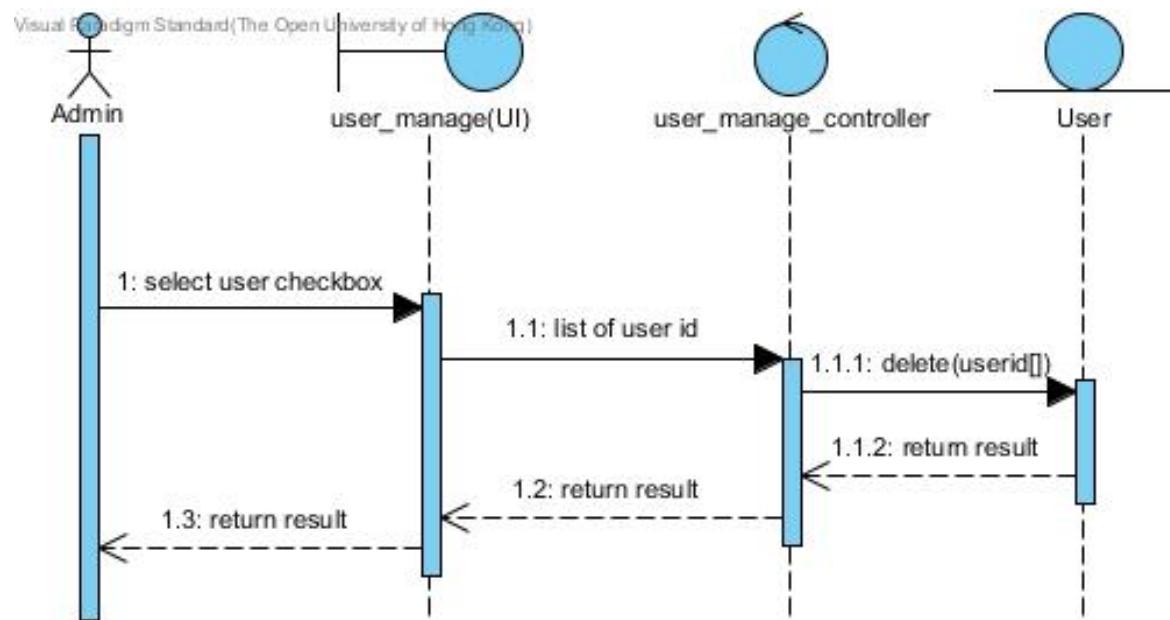


Figure 53 - Delete User

Import User

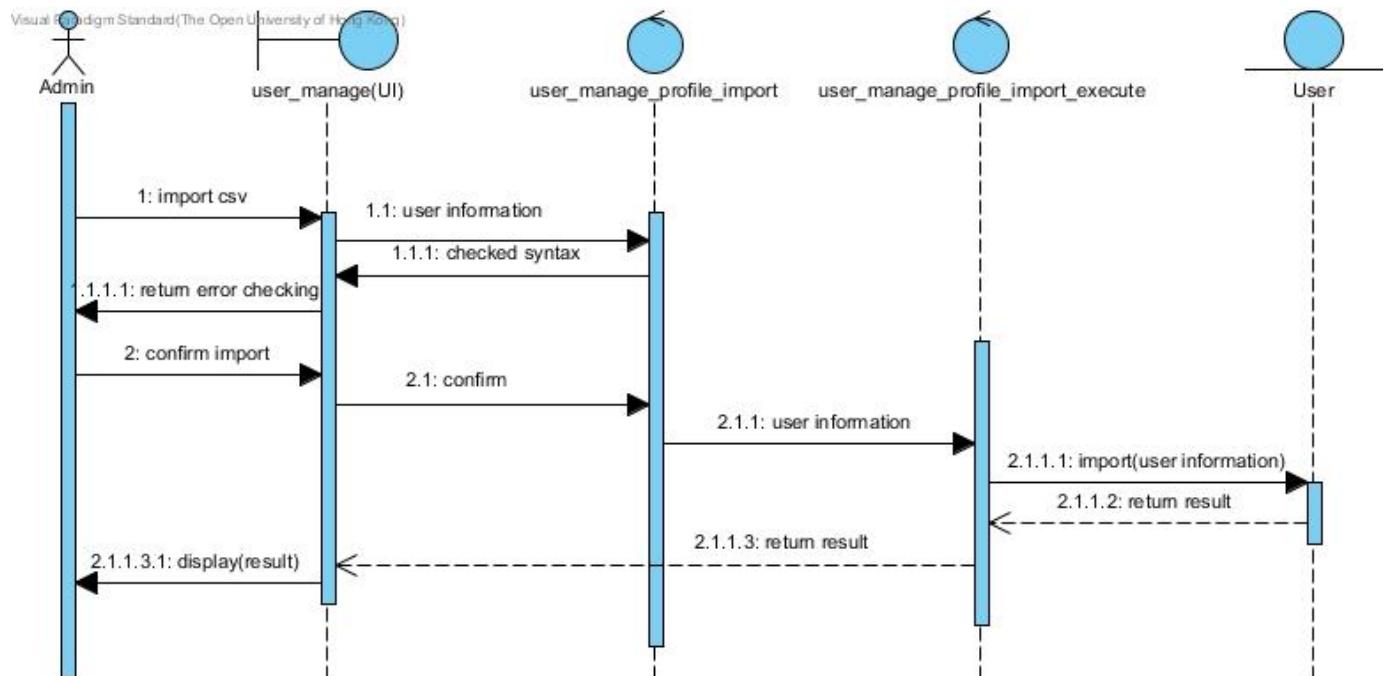


Figure 54 - Import User

Modify User

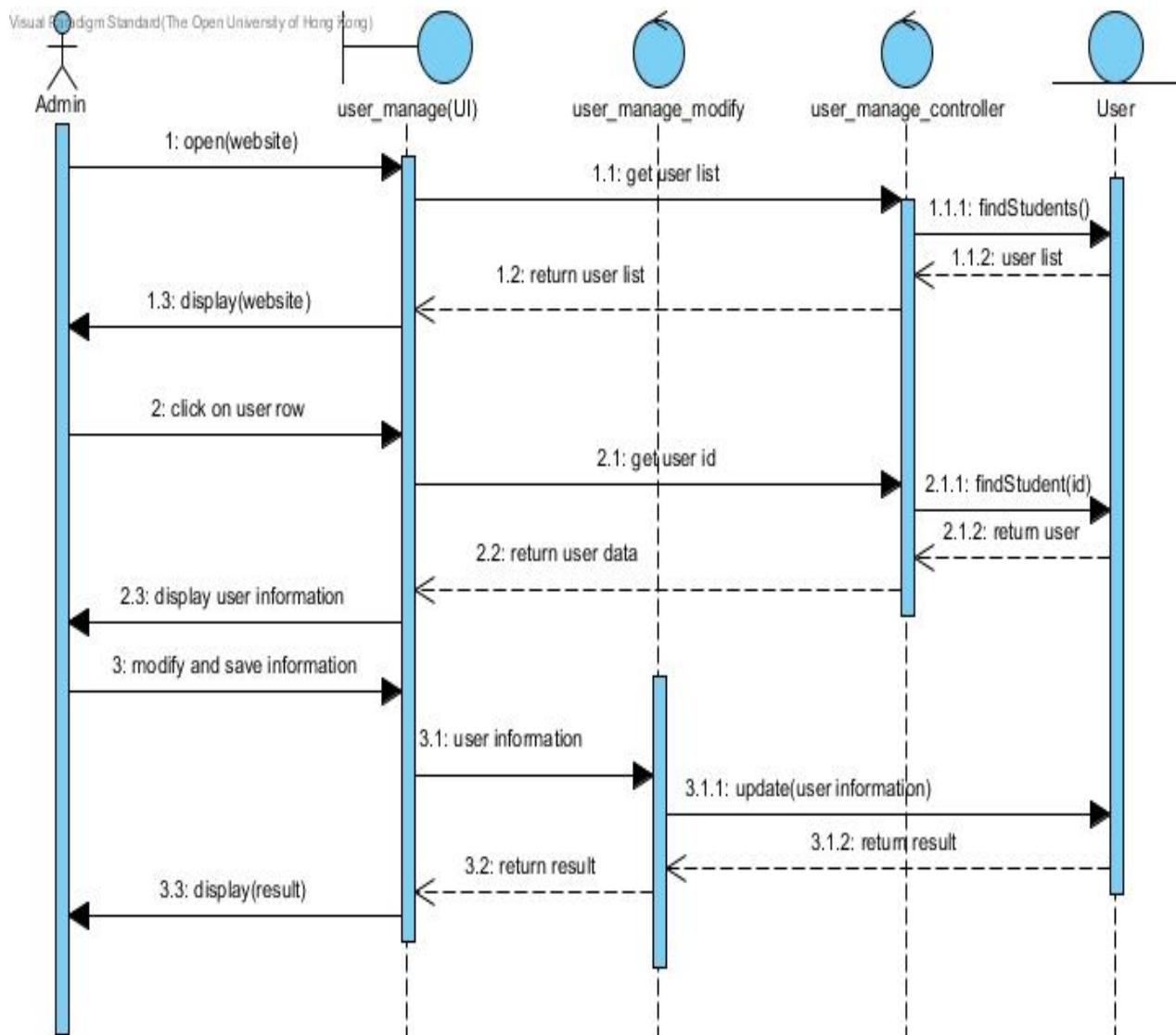


Figure 55 - Modify User

Course Function

Creation of course

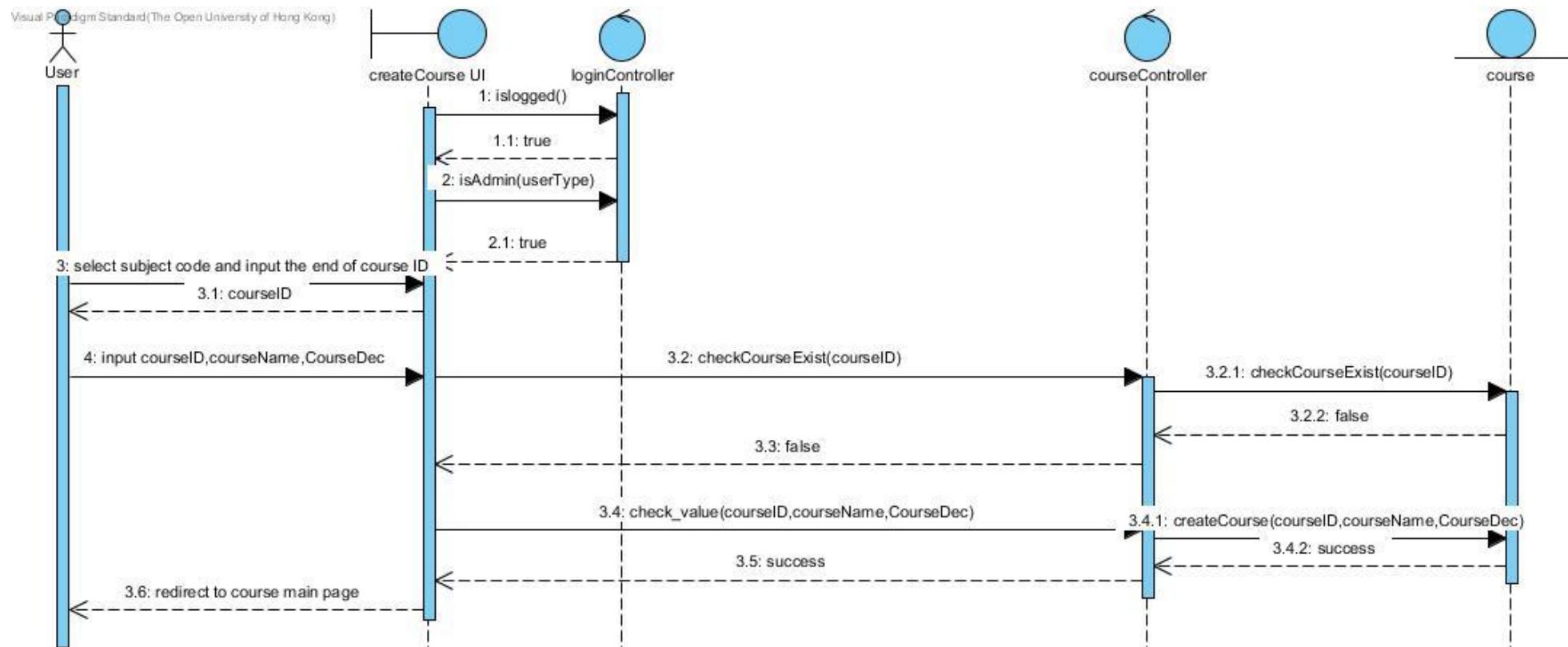


Figure 56 - Creation of course

Update information of course

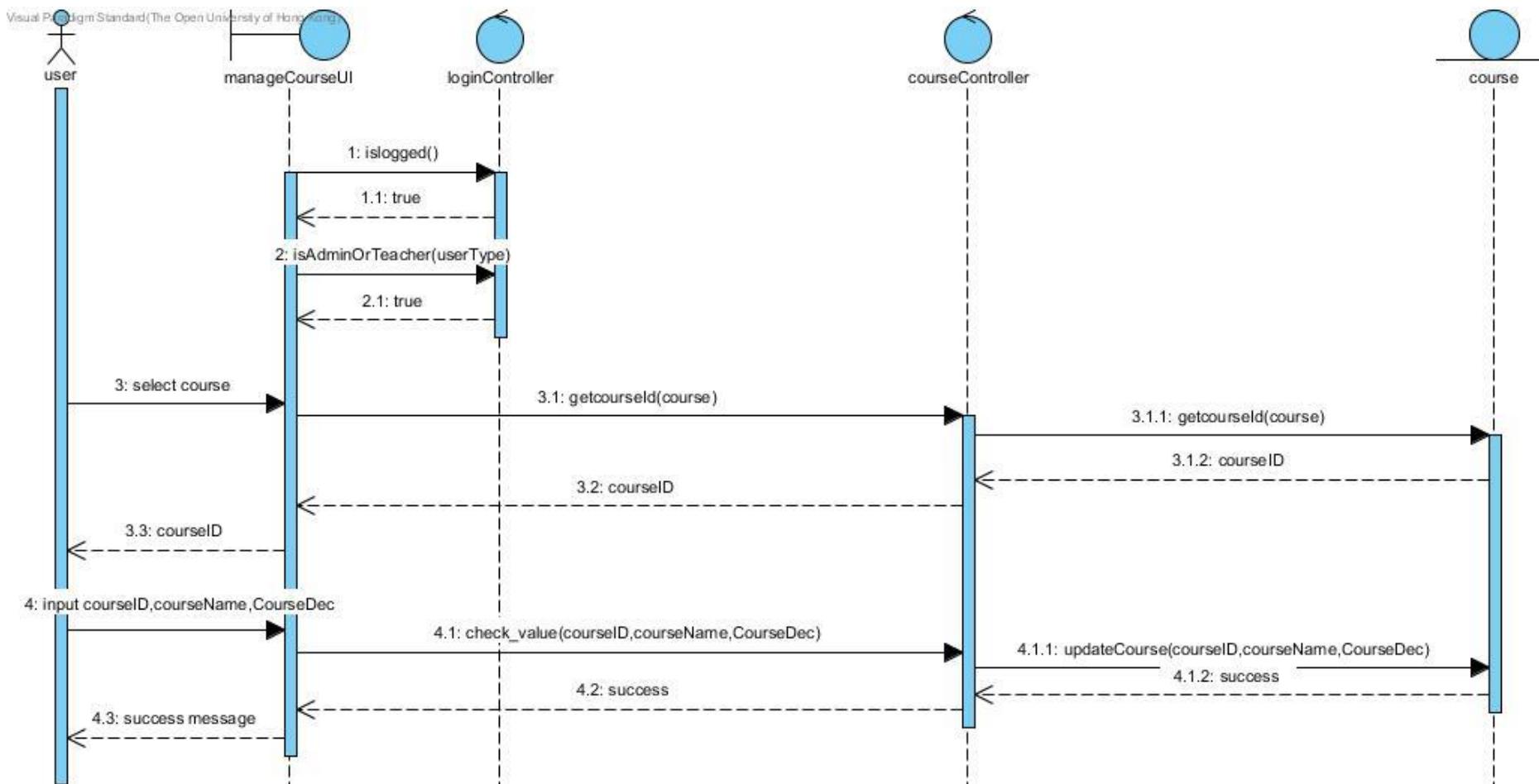


Figure 57 - Update course information

Delete the course

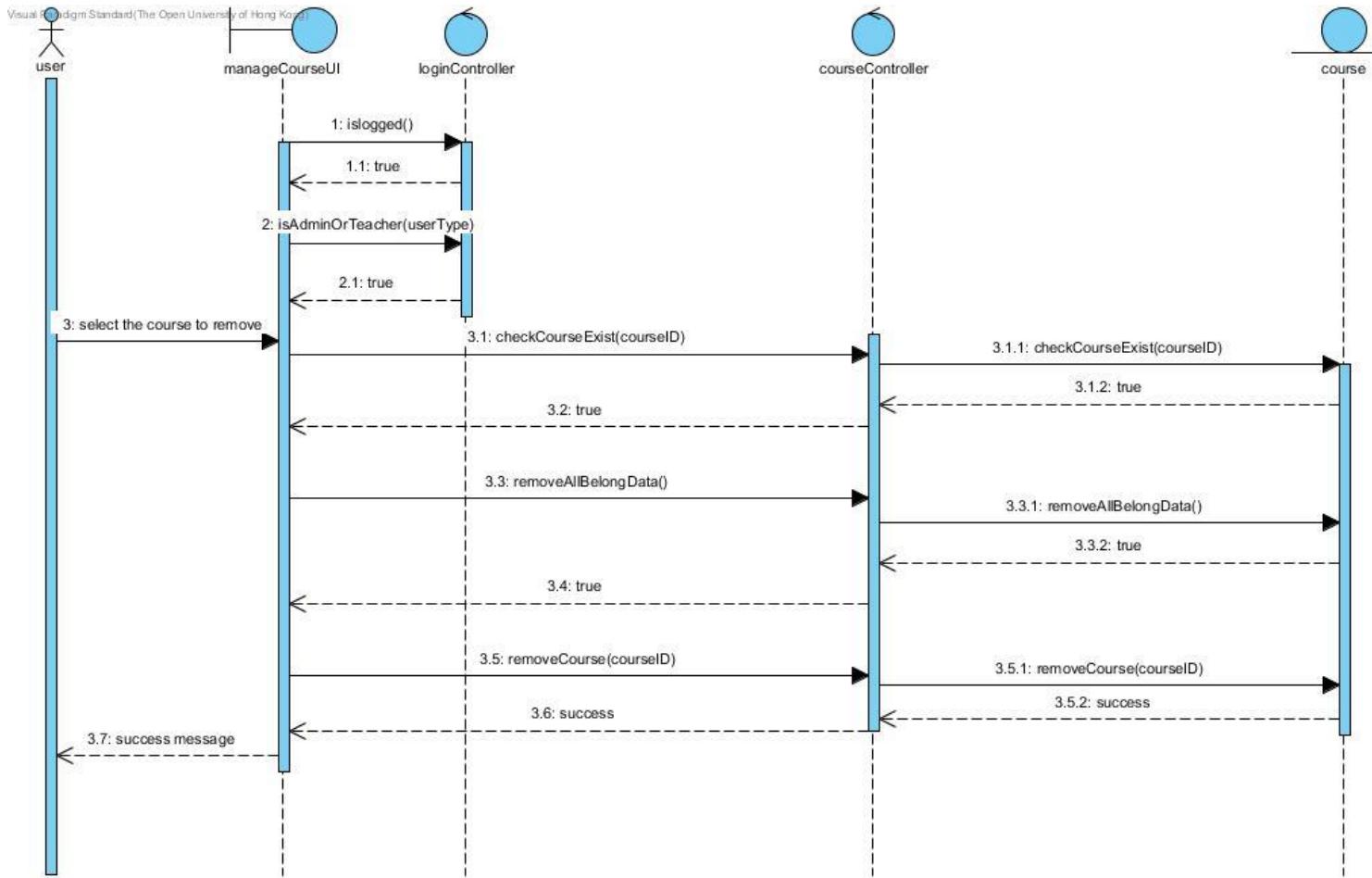


Figure 58 - Delete Course

Adding teacher to course

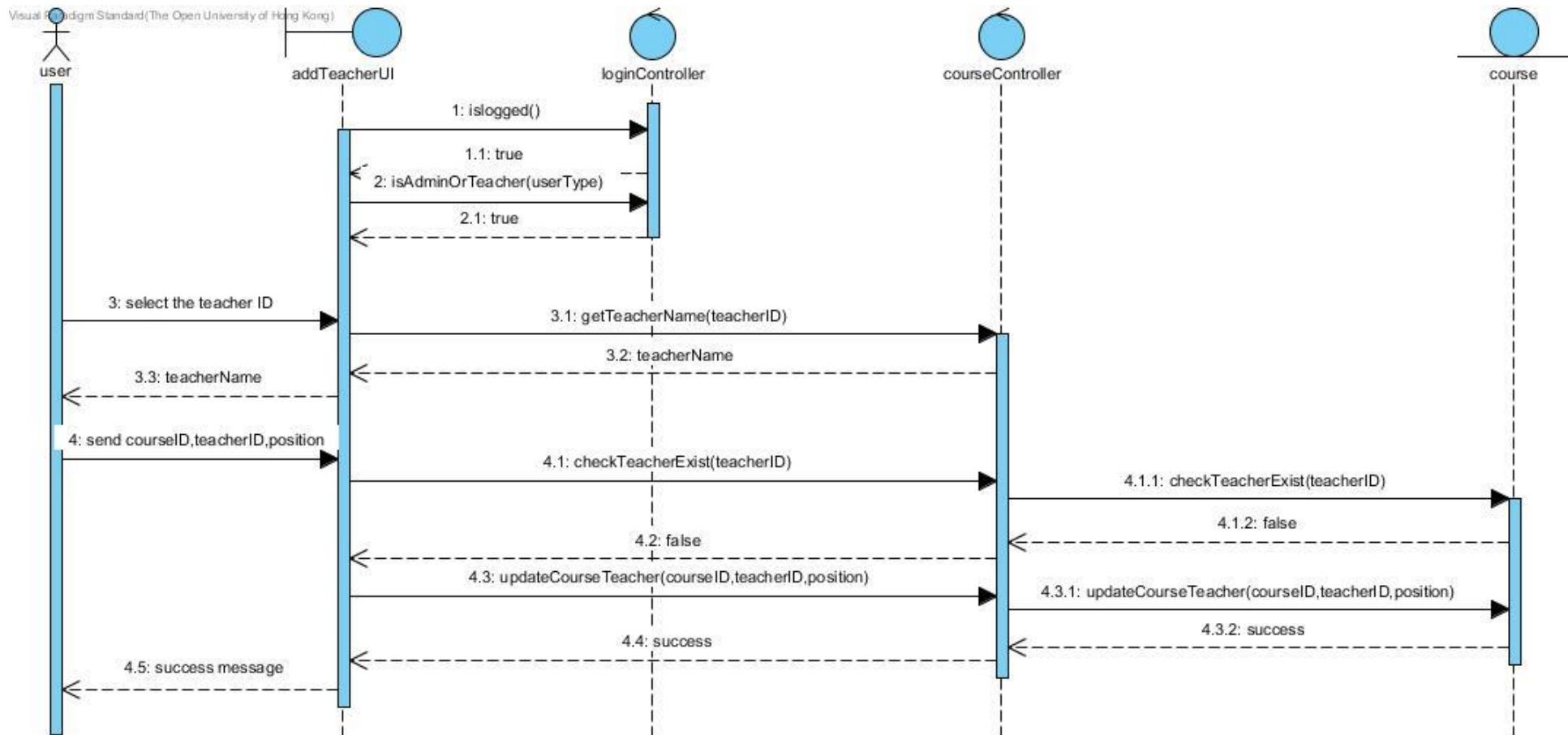


Figure 59 - Add Course Teacher

Remove teacher from course

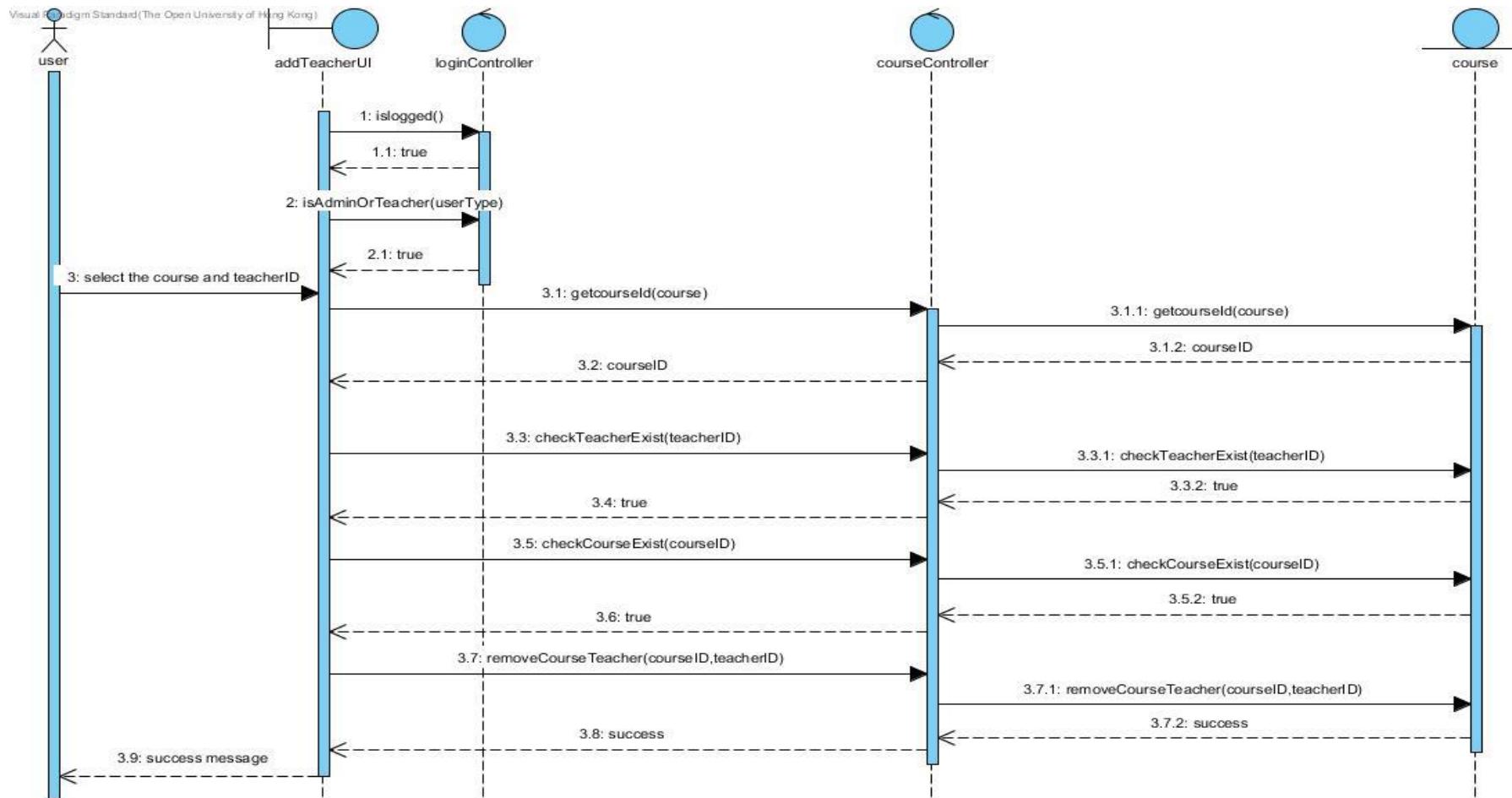


Figure 60 - Remove Course Teacher

Class Function

Create Class

When teacher input correctly, it will do the creation on class. And it will calculate the date of each lesson and create the lessonRollCall data.

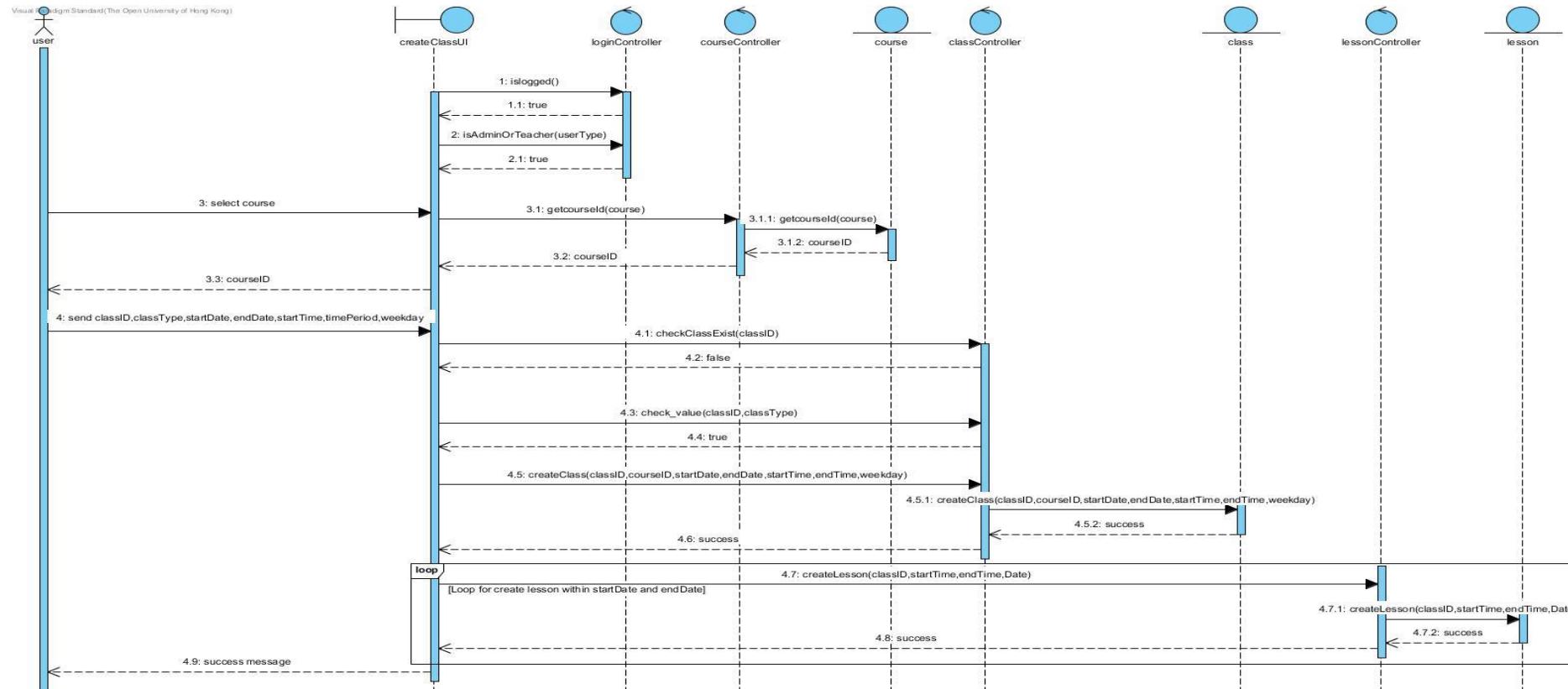


Figure 61 - Create Class

Create make-up class

The flow on teacher create a make-up class. It will match the date within the class date and create the lessonRollCall data.

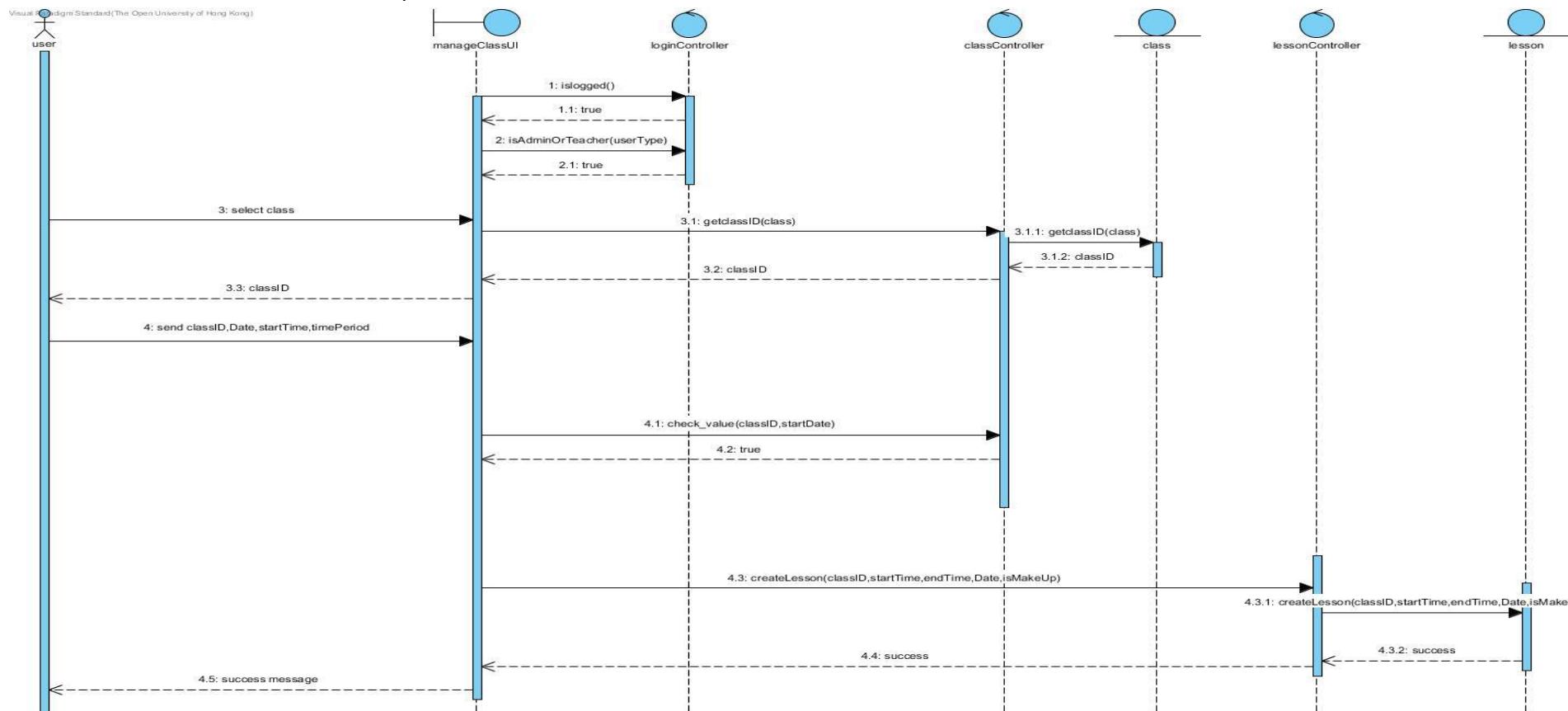


Figure 62 - Create make-up class

Update Class information

The flow on update class data. If the teacher change the end date, it will calculate the lesson to find any lesson is need to add or delete. Then it will make the changing on the database.

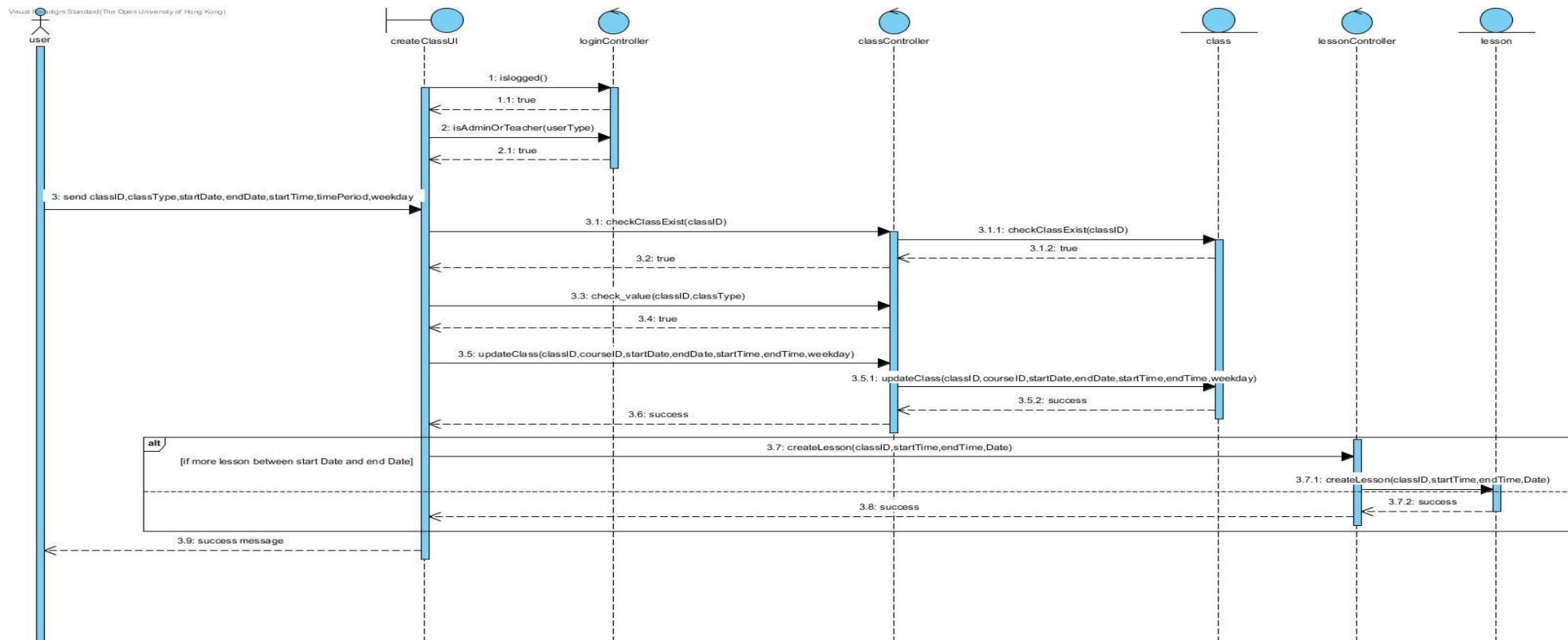


Figure 63 - Update Class information

Update Lesson information

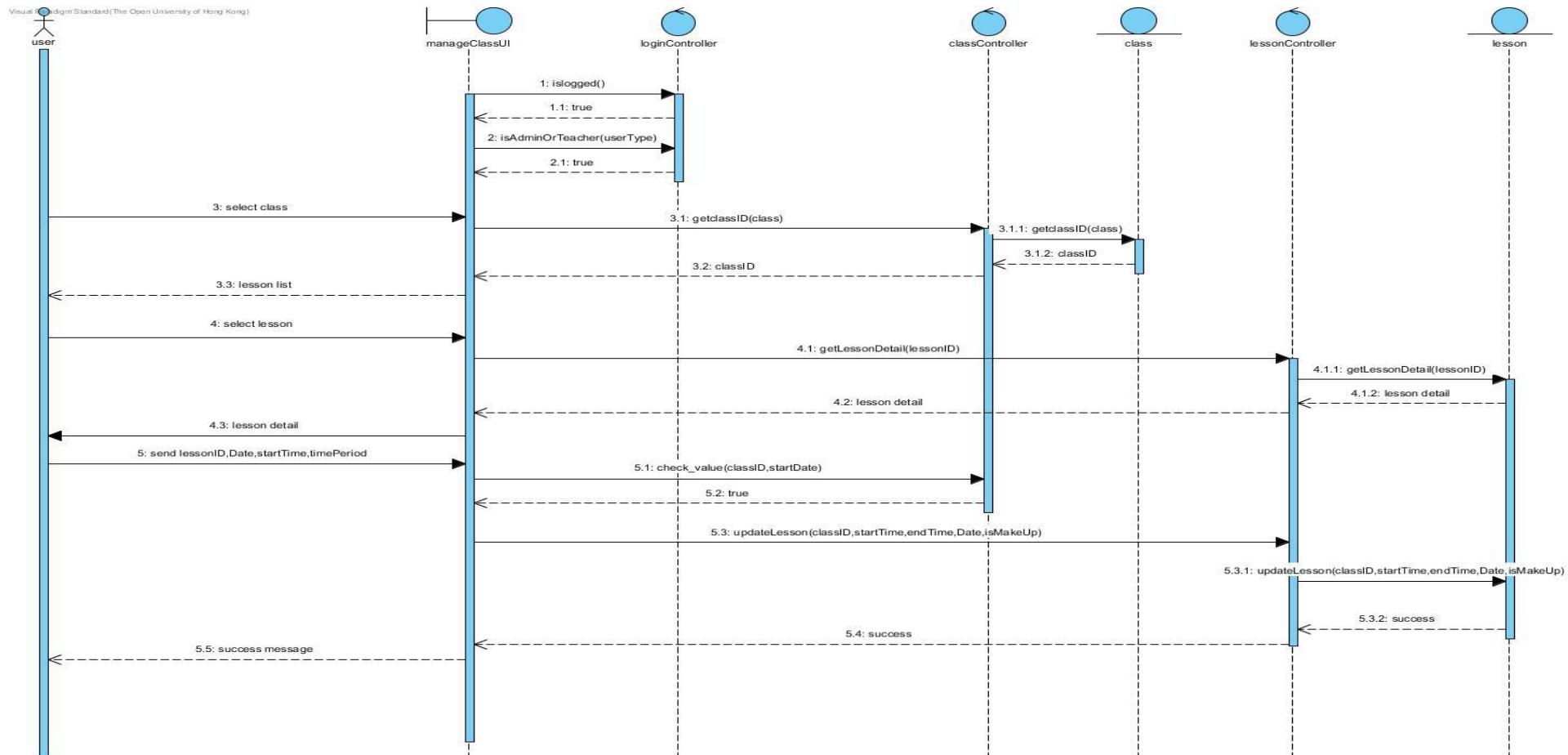


Figure 64 - Update Lesson information

Delete Class

The deleting class. It will delete the data in student roll call in this class lesson and remove all lesson of this class. Then, it will remove this class.

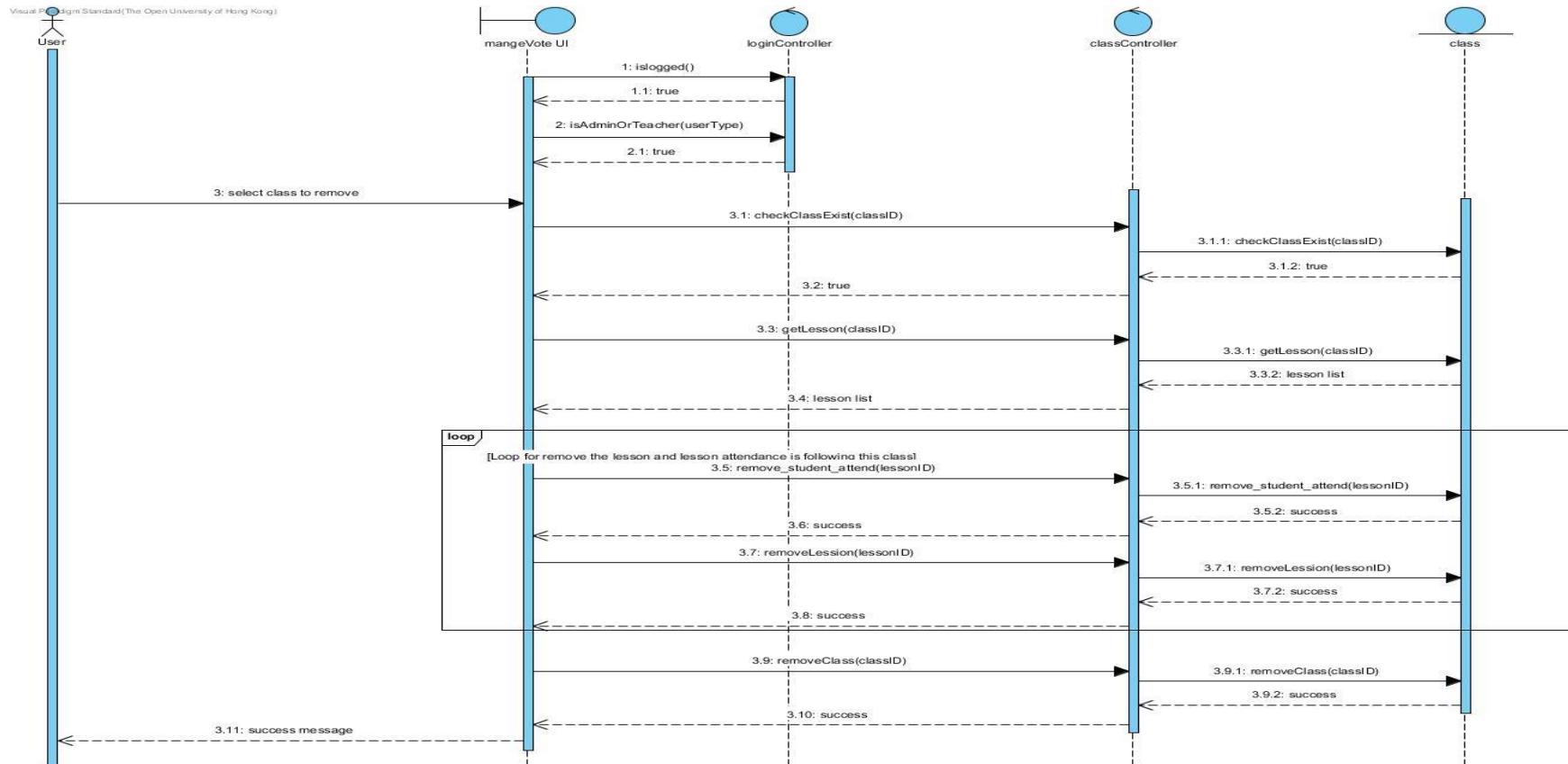


Figure 65 - Delete Class

Remove student from class

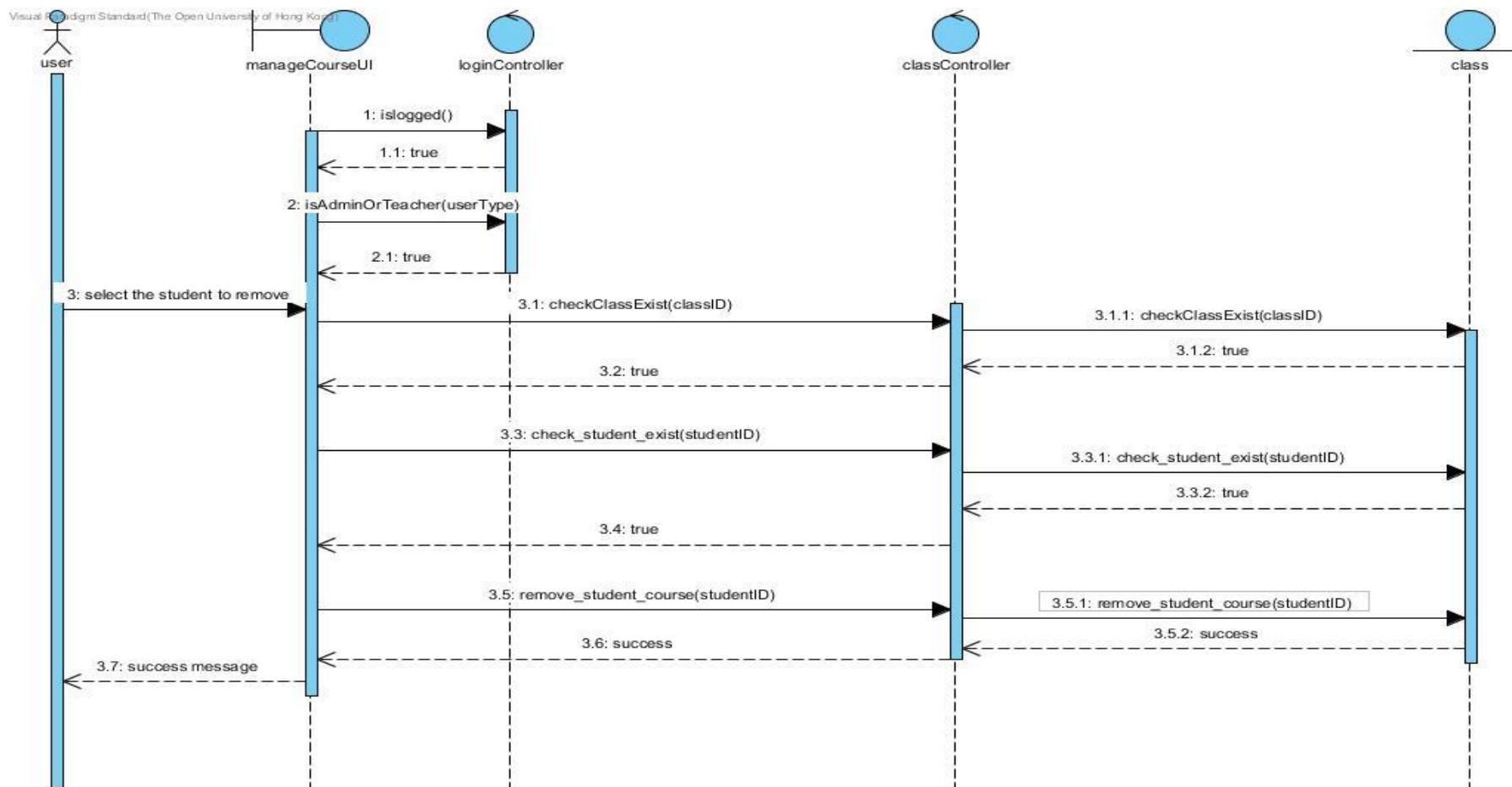


Figure 66 - Remove student from class

Delete Lesson

The deleting the selected lesson. It will delete the data in student roll call in this class lesson. Then, it will remove this lesson.

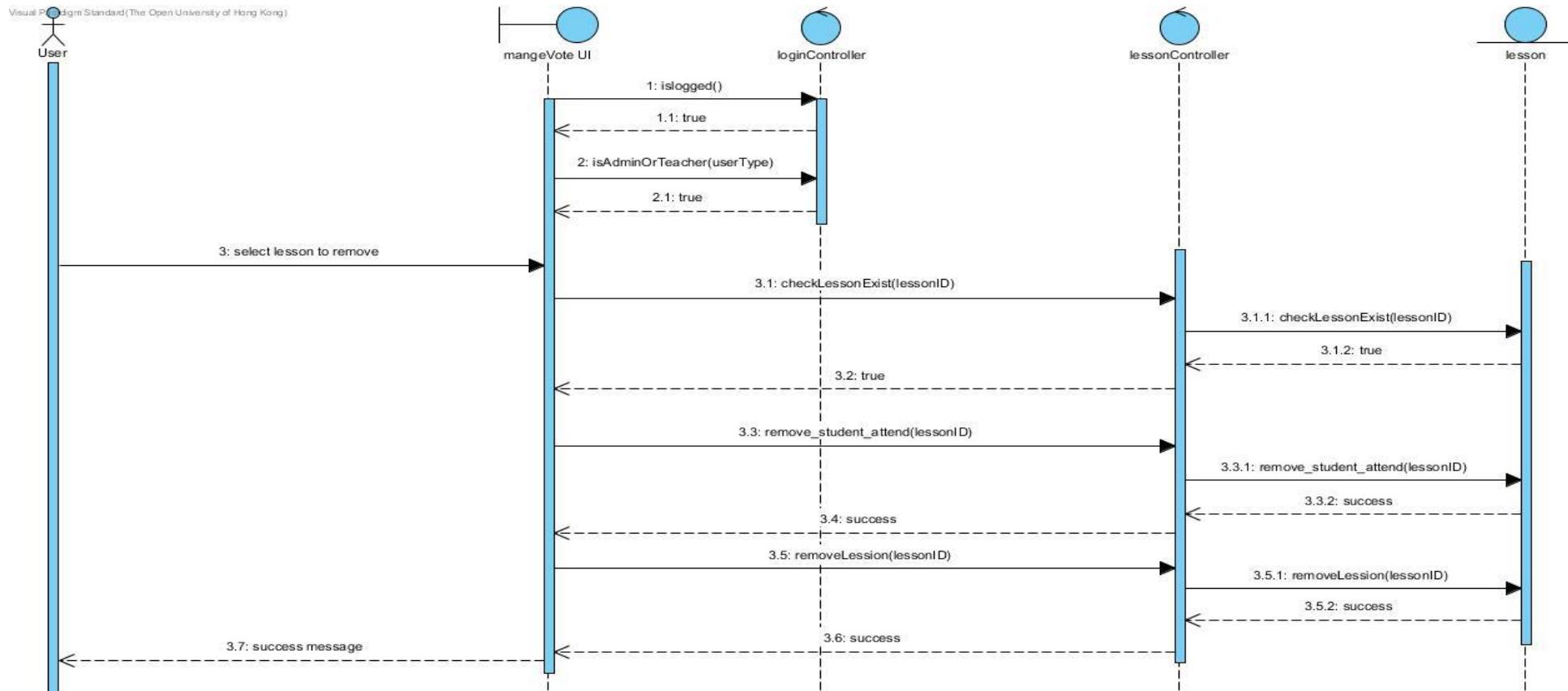
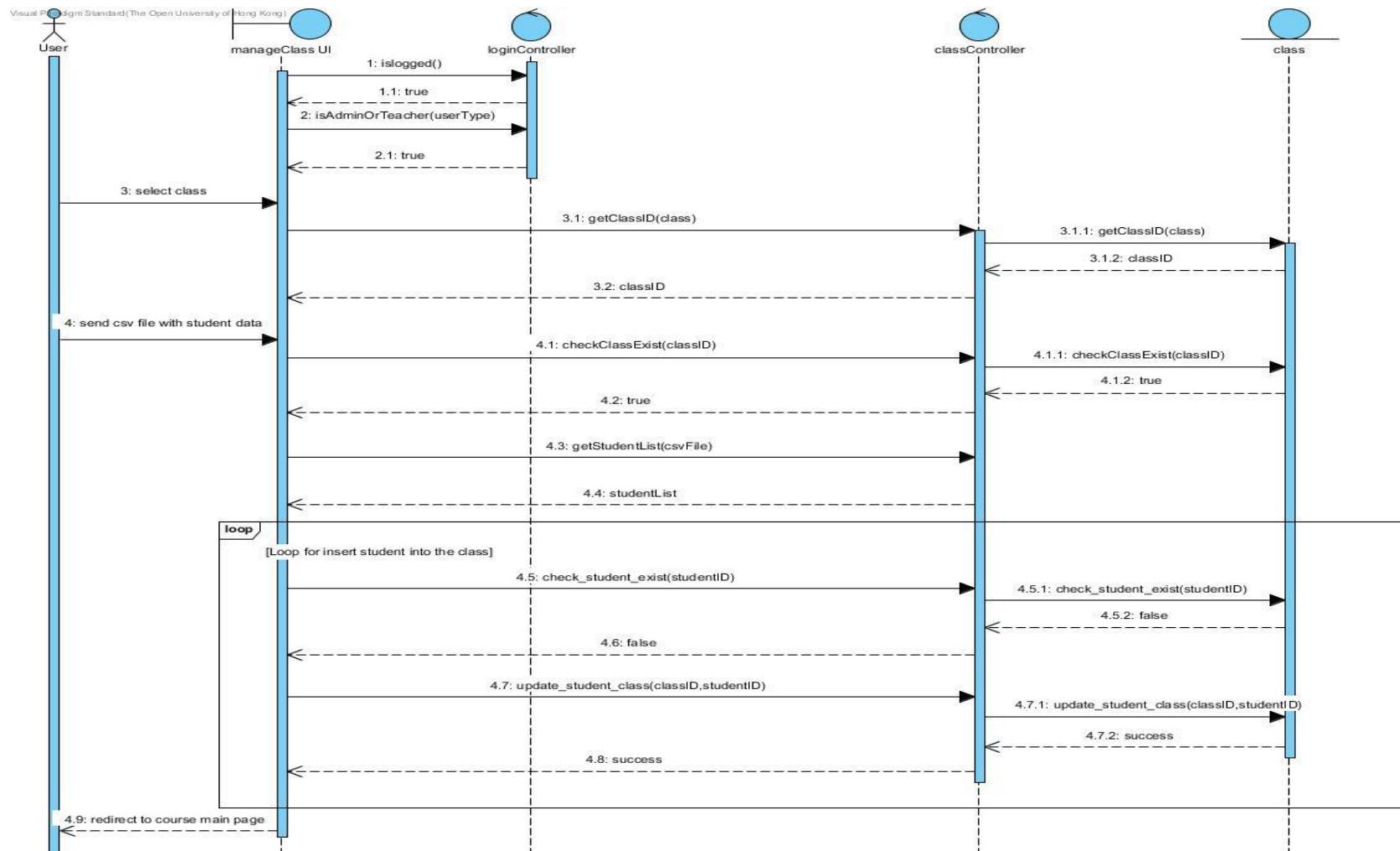


Figure 67 - Delete Lesson

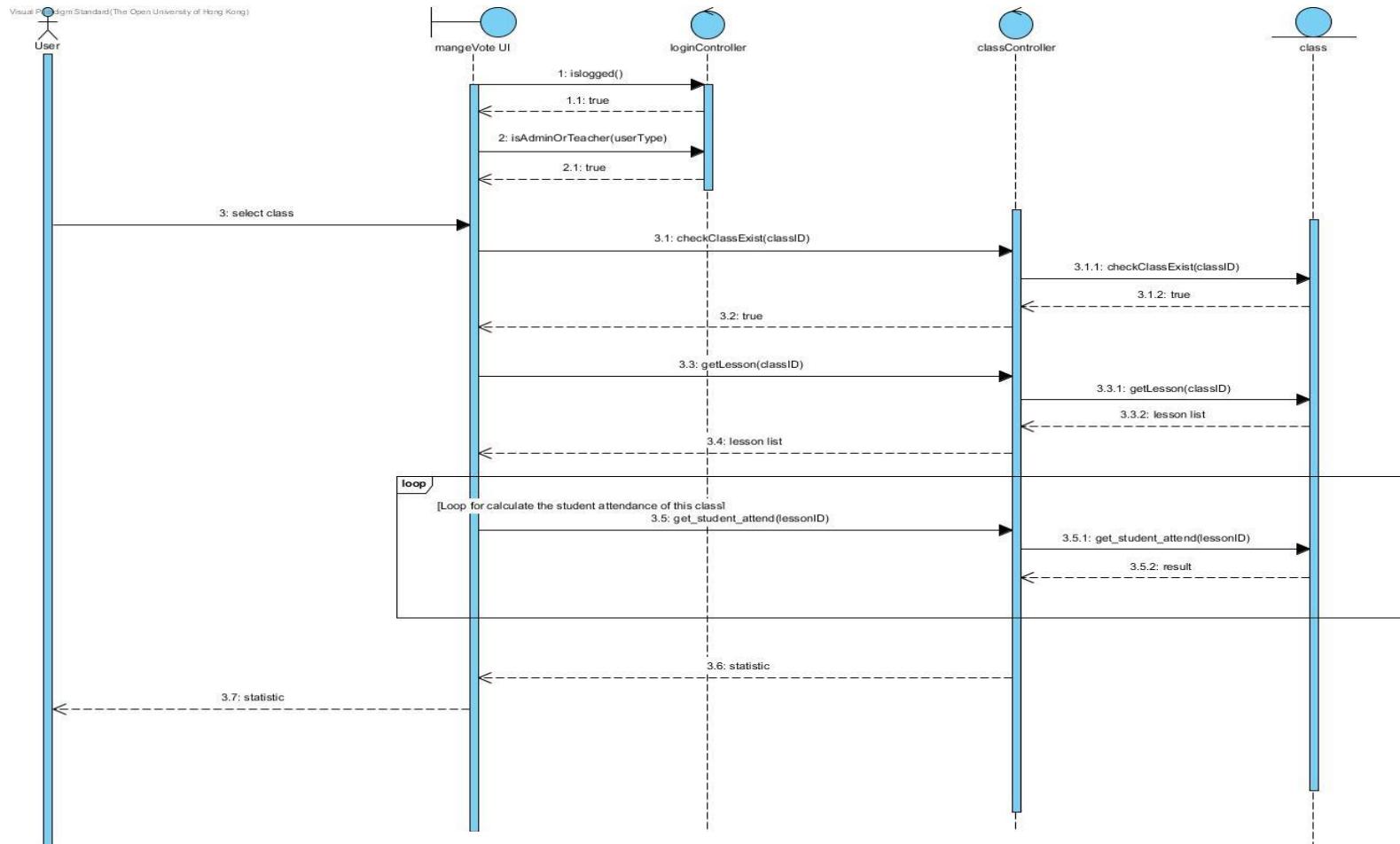
Enroll Student



The adding students to the class.

Figure 68 - Enroll Student

Get attendance Statistic



This shows user to get the statistic of attendance.

Figure 69 - Get attendance Statistic

Quiz

Create Quiz

Teacher uploads the quiz question file and answers file to the database. The system will check the file type. If it is allowed, it will insert into the database.

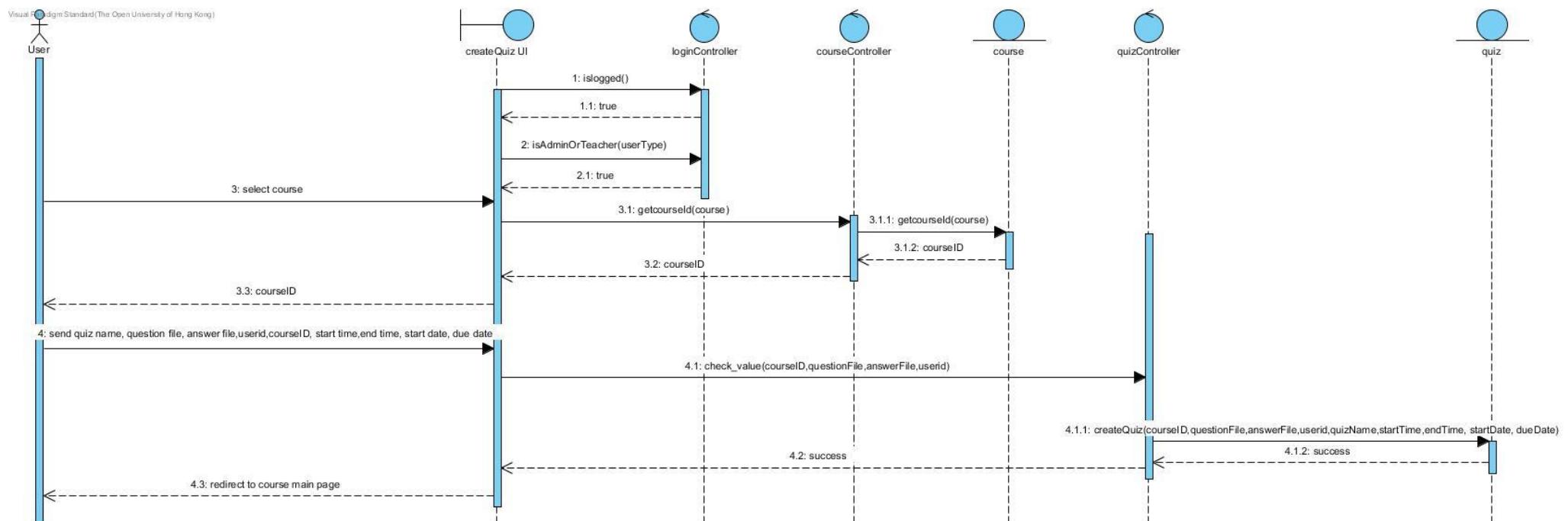


Figure 70 - Create Quiz

Update Quiz

In update, it will check the value of teacher input too.

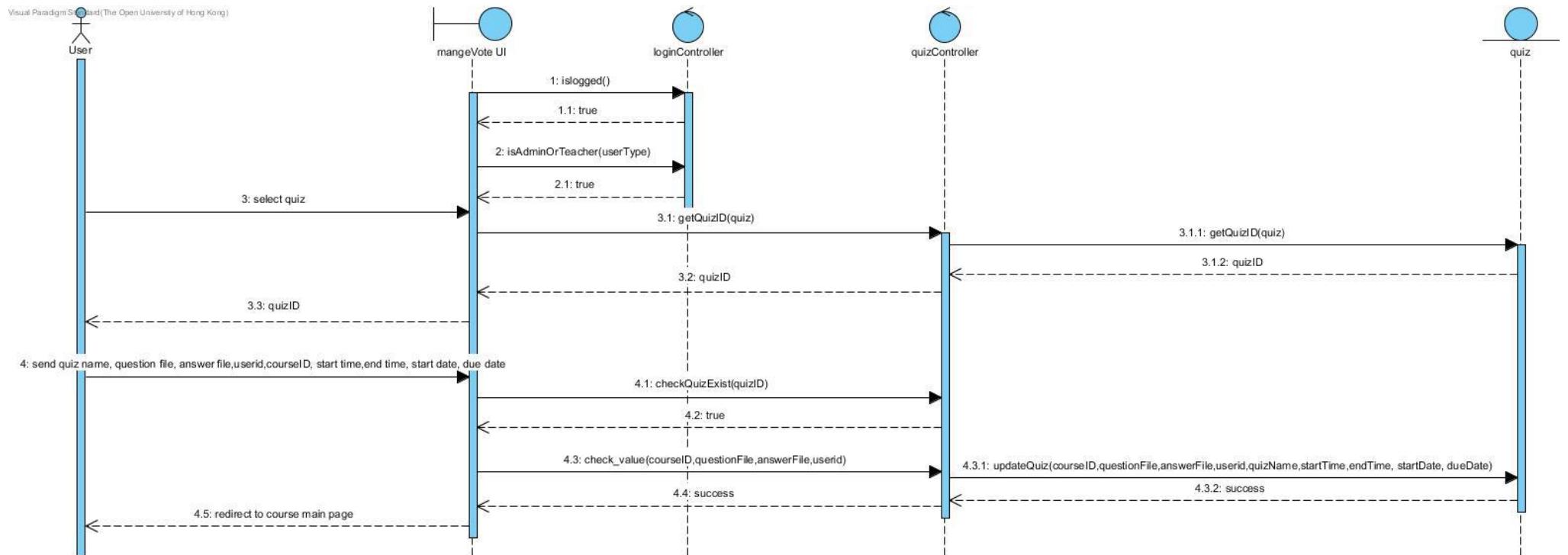


Figure 71 - Update Quiz

Remove Quiz

In removing a quiz, system will remove the answer of student in this quiz and then remove the quiz.

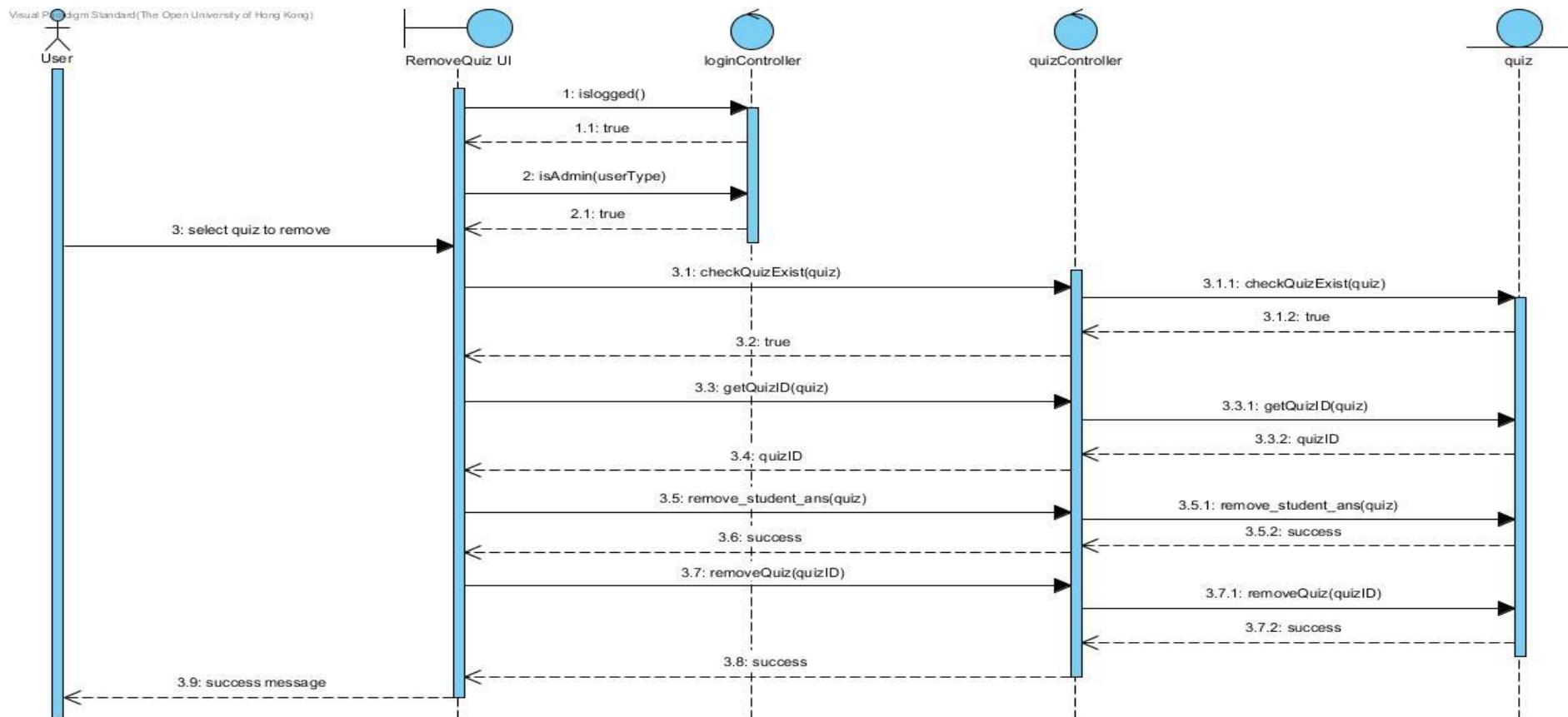


Figure 72 - Remove Quiz

Get Quiz Statistic

In viewing, teacher selects a quiz and the system will get the student answer and calculate the statistic to return to teacher.

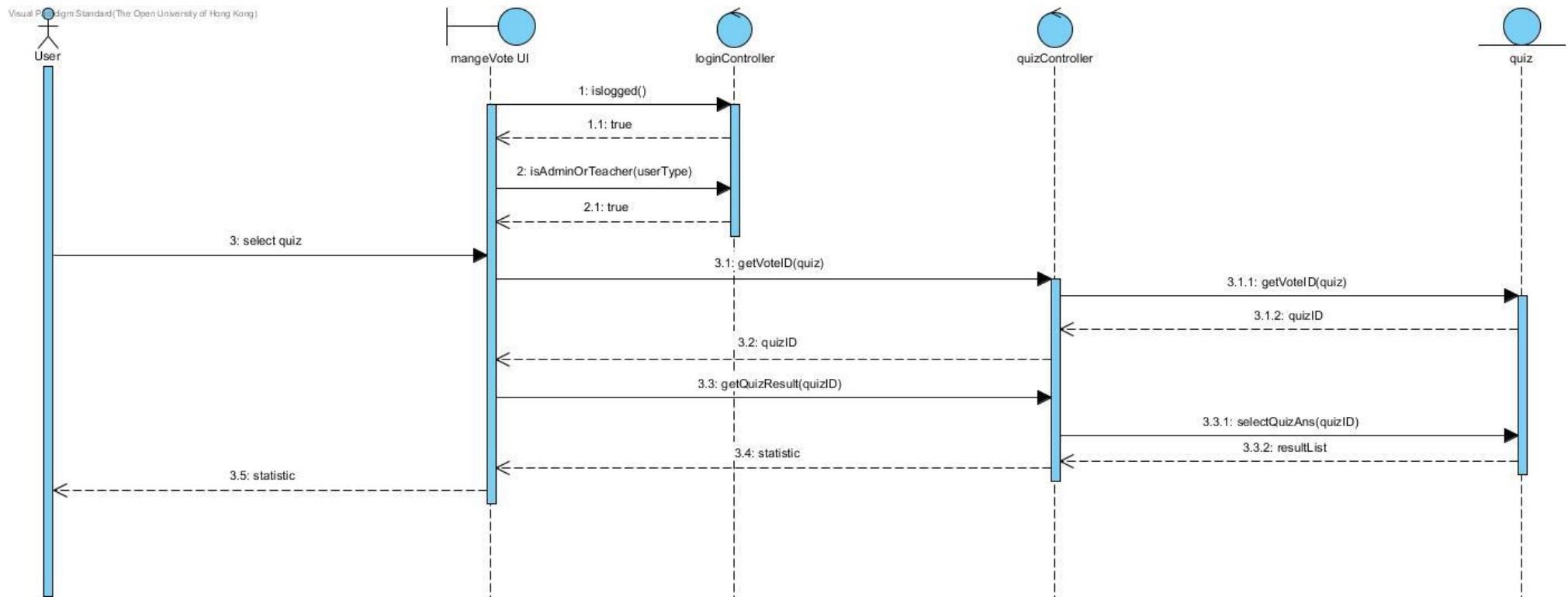


Figure 73 - Get Quiz Statistic

Vote

Create Vote

Teacher uploads the vote question file and answers file to the database. The system will check the file type. If allowed, it will insert into the database.

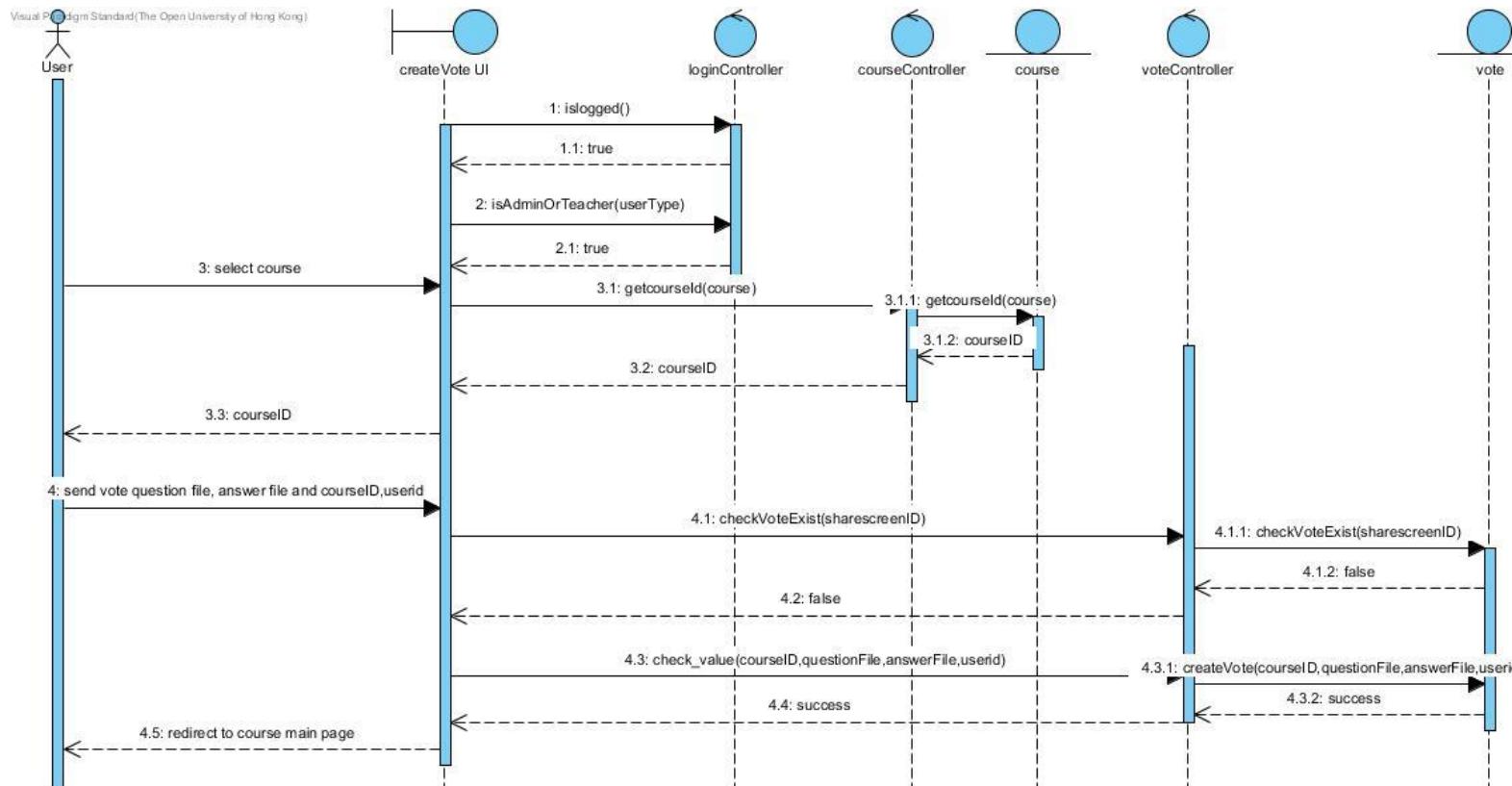


Figure 74 - Create Vote

Update Vote

In update the vote data, teacher needs to select the vote and inputs the new data of vote. System will check the value and insert it if data allowed.

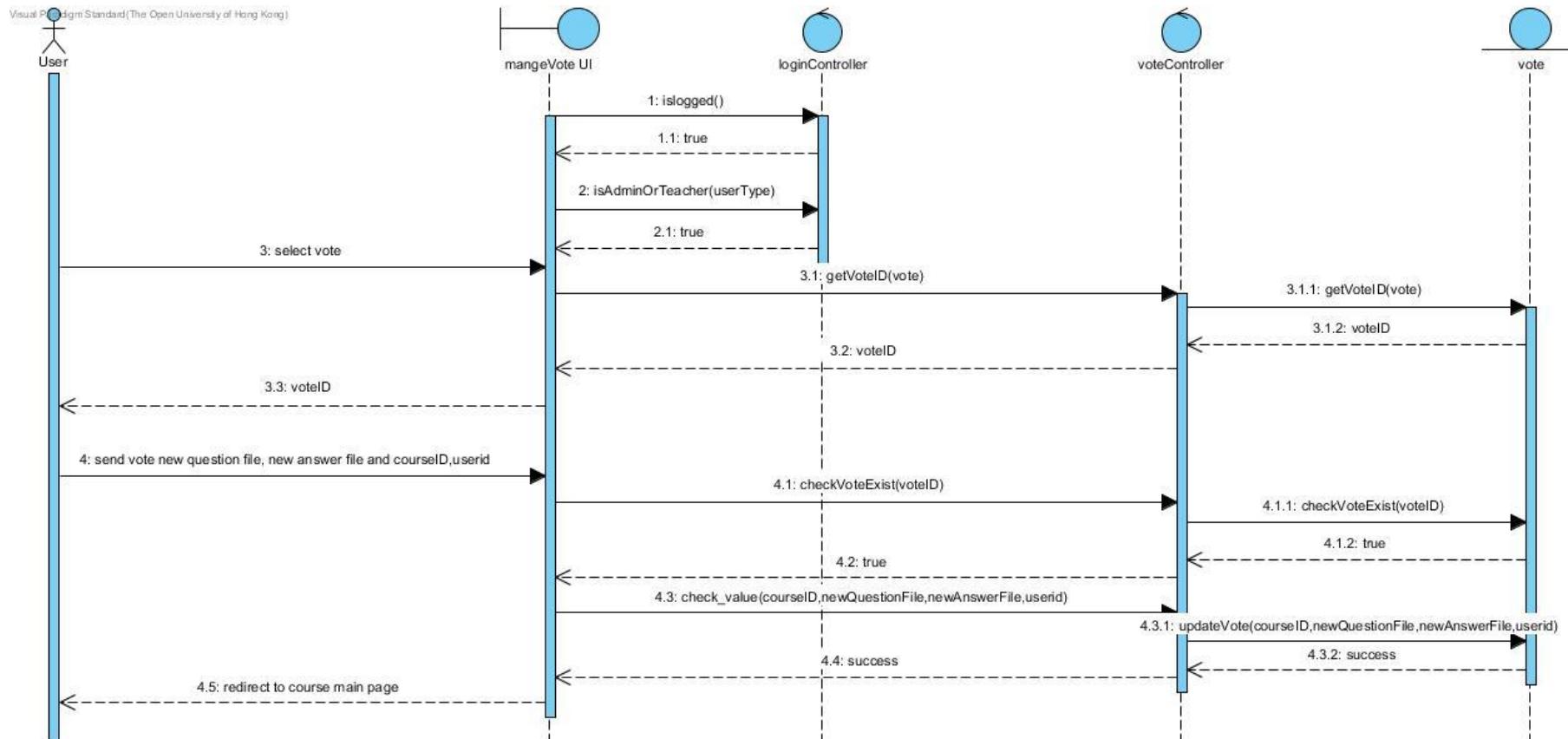


Figure 75 - Update Vote

Delete Vote

In removing a vote, system will remove the answer of student in this vote first and then remove the vote.

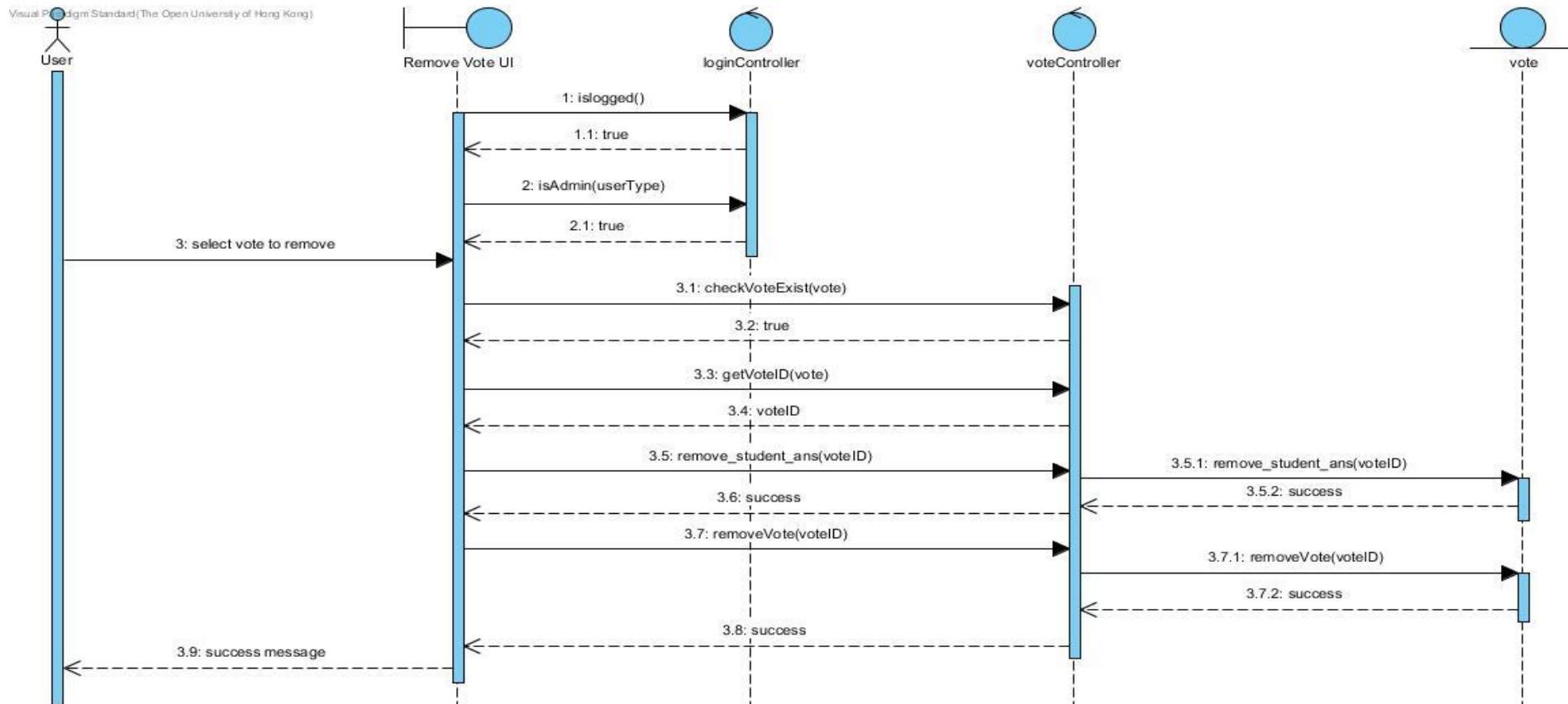


Figure 76 - Delete Vote

Get Vote Statistic

In viewing, teacher selects a vote and the system will get the student answer and calculate the statistic to return to teacher.

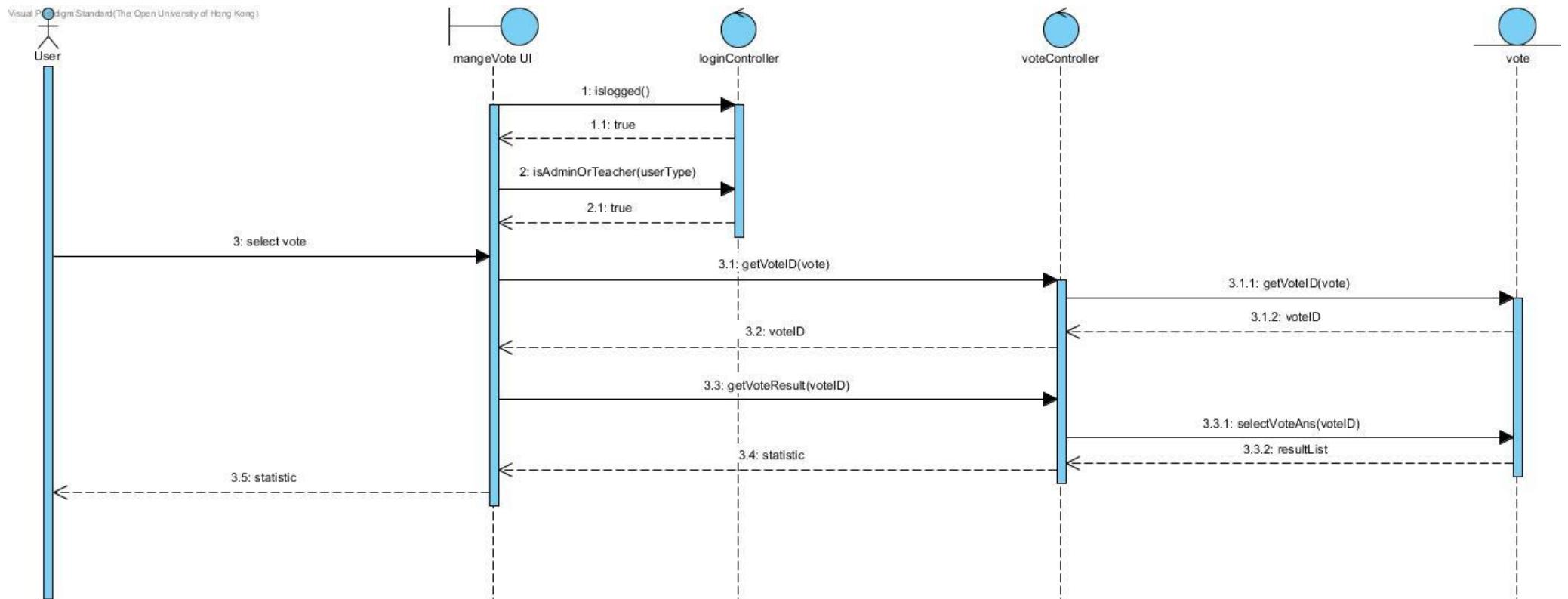
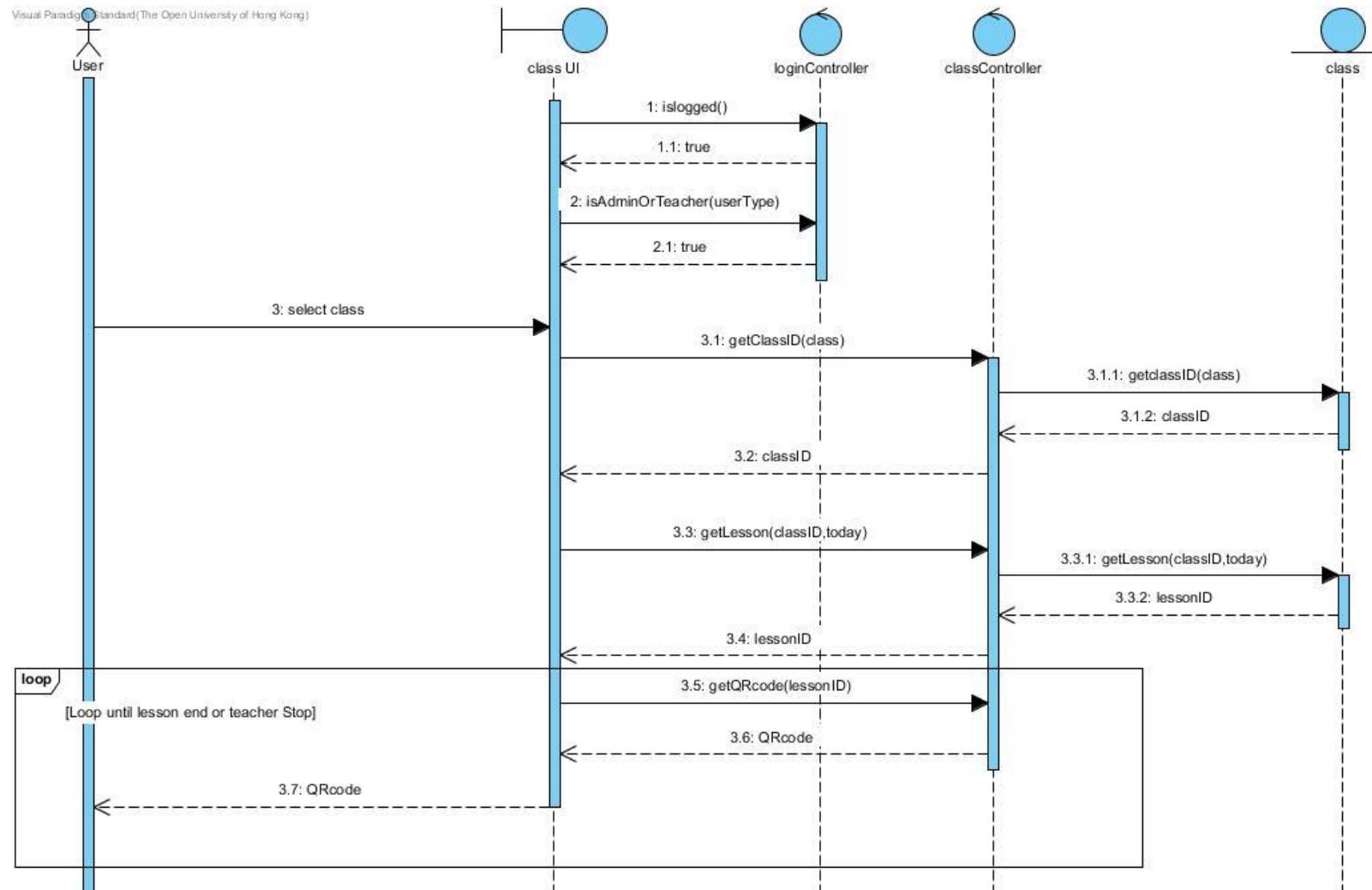


Figure 77 - Get Vote Statistic

Get Roll-Call QR-Code



Teacher selects the class to get roll call QR code. System will auto generate the code to teacher. In each timestamp, the system will change the code and send it to teacher again.

Figure 78 - Get Roll-Call QR-Code

Upload Material

Teacher uploads the materials to server. System will copy it and place in the class folder and insert the path to database.

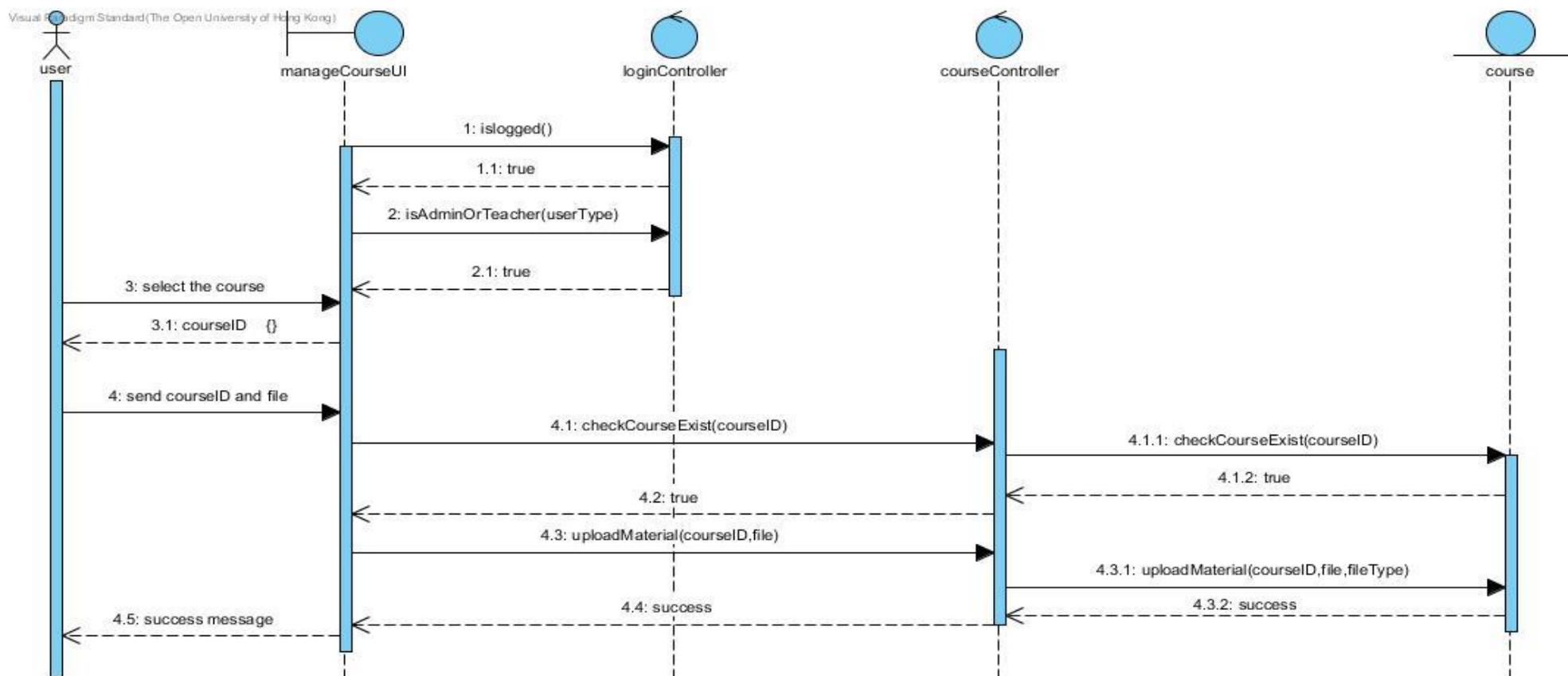
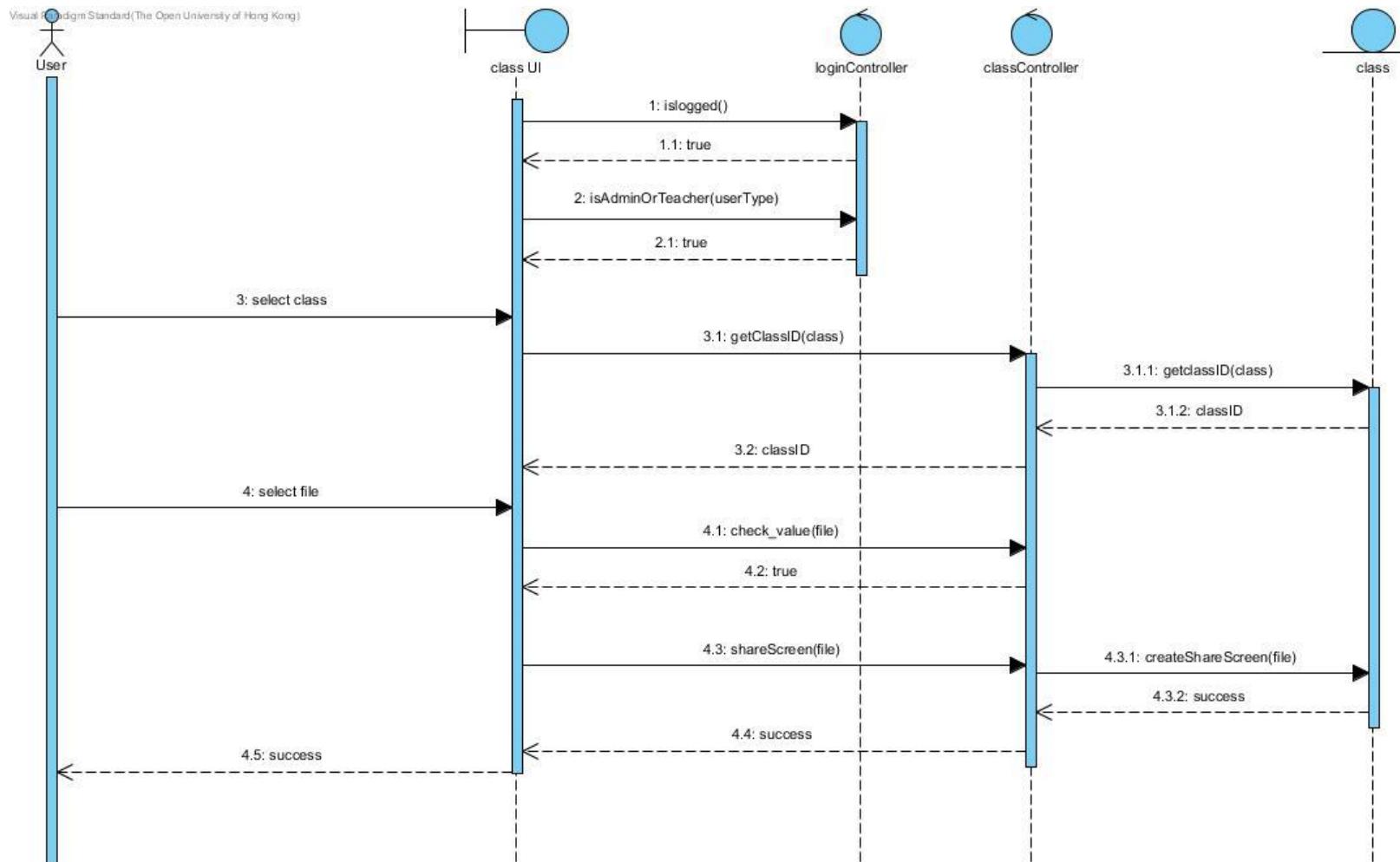


Figure 79 - Upload Material

Create Share Screen



Teacher selects the materials to make share screen. System will check the file type. If it is allowed, system will copy it and place in the class folder and insert the path to database and make the sharing screen to student mobile.

Figure 80 - Create Share Screen

4. Prototype Design & implementation

4.1 Roll Call:

- Where is the QR code from?

Course ID	Course Name	Class ID	Class Type	
COMP_S311F	Java Application Development and Programming Languages	COMP_S311F_L01_1617	L01	Start Lesson

Figure 81 - Start Lesson Web Browser

Start Lesson

When the teacher start the lesson, the QR code will be auto-generated and placed on the screen. The screen is the website for teacher teaching. The QR Code contains the class information and produced time

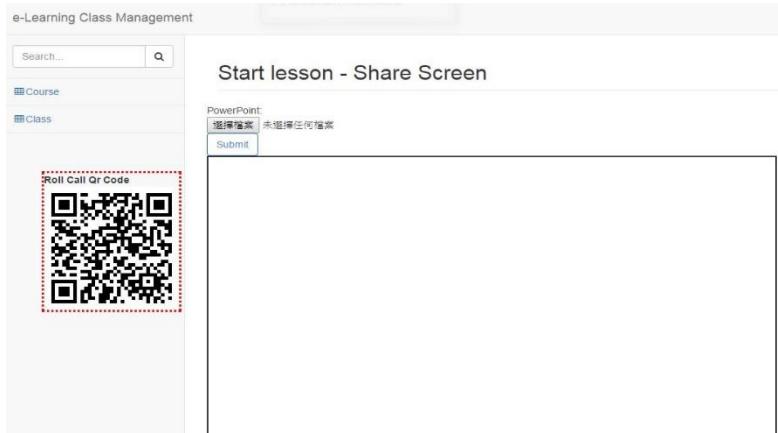


Figure 82 - Start Lesson (Share Screen)

Student Take Roll Call – check location

The following design is to ensure the location of student-and the time is correct. Student use the mobile application to read the QR code, the application send the request to the server which contains the class information, student id, time (server time standard) and mac address of the WIFI connected



Figure 83 - Tall Roll Call Flow

Student Take Roll Call – check location (Cont'd)

Server has a mac address list which contains school MAC addresses. Server will match the address from student and the list it stored. For the web page, it shows the QR Code in the sharing screen page and refreshes every 300 seconds.

If matched, it will have second checking of the time expiring. If the student passes all the checking's, system will save his/her roll call record.

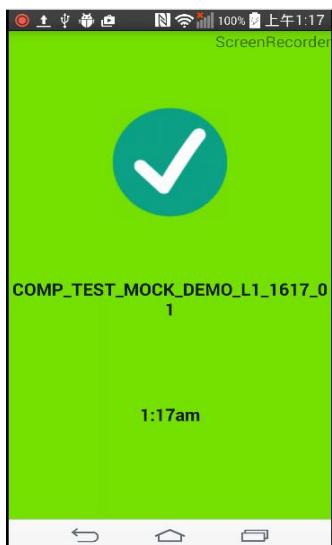


Figure 84 - Success Roll Call



Figure 85 - Roll Call QR-Code

Student Take Roll Call – Fail

Otherwise, request will be rejected. Of course, our system will also consider some special situation. (e.g.. repeat roll call from same student). Most of error handling is considered.



Figure 86 - Roll Call Fail (No using School WIFI)

Teacher View the Attendance

Teacher can also keep the attendance electronic record and view it anytime.

Show Student Attendance

Class COMP_S311F_L01_1617				
Show 10 entries		Search:		
Student	Week1	Week2	Percentage	
s001	Y	N	50%	
s002	Y	N	50%	

Showing 1 to 1 of 1 entries

Previous 1 Next

Figure 87 - Teacher View Attendance

Respect to the original goal (Roll Call), the design increases the accuracy of roll call. Student is hard to cheat the roll call. The roll call record is stored in electronic record also helpful for management and future development. The cost of maintenance is relatively low comparing to NFC system but both have similar function.

4.2 Download / Upload Materials

The design allow teacher to use website for material management.



COMP_FINALDEMO1

Course ID : COMP_FINALDEMO1
Course Name : Final Demo1 Course
Course Description : This is Final Demo1 Course

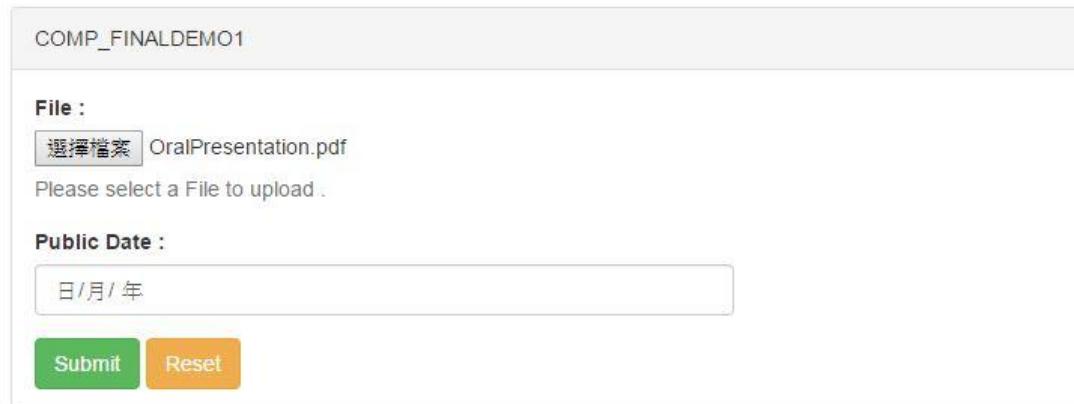
Manage Course Add Teacher Delete Course **Upload File** Create Class Create Quiz Import Student

Figure 88 - Course Page

Course's Material				
File	Upload User	Upload Date	Public Date	
COMPS311F-10-11-12-web.pptx	teacher1	2017-05-01	2017-05-01	
COMP_S380F_Project_2017.pdf	teacher1	2017-05-01	2017-05-01	

Figure 89 - Course Material list

Upload Course Material



COMP_FINALDEMO1

File :
 OralPresentation.pdf
 Please select a File to upload .

Public Date :

Submit **Reset**

Figure 90 - Upload Course Material Page

Student download material

Student can use their mobile application and download material.

The design simplifies the step of download material. Student can just use few simple steps to get the material. Student needs to login and select the course related. Finally, Student clicks the material and it will be downloaded to mobile.



Figure 91 - Student Download Material Flow (Android)

Student download material (advanced)

The advanced design of this application is to save the login status. Once student logged in, application save the login token. In the next time, the application will send the token to server for matching.

If matched, student does not need to login again. Then, server will check the student is it belong to this course, if true, the application will download the material. Thus, it can reduce the login time.

Figure 93 - Android Course Download material list

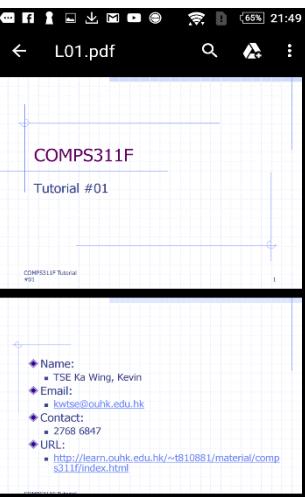


Figure 92 - downloaded file

4.3 Interaction - Sharing Screen

Interaction – Sharing Screen (Teacher – Web application)



Figure 94 - Share Screen

To improve the interaction during the lesson, there is a web page for sharing the PowerPoint screen to student's mobile screen.

After teacher click the start lesson button, the server will start a socket server for handling the sharing screen request and response message in this lesson. Teacher should upload a PowerPoint file to server. Server will check the end of the file name to ensure it is PowerPoint file type.

Then, the system will convert the PowerPoint pages to html files and show it in the share screen content box. Teacher can use the next or previous button to change the page for showing.

After check the next or previous button, it will call a jQuery function to change the path of the share screen content box to show the other page. At the same time, it will call a PHP function to update the share screen command text file.

Interaction – Sharing Screen (Student – Android)



```
public class Count extends HttpServlet {  
  
    protected void doGet(HttpServletRequest request, HttpServletResponse response)  
        throws ServletException, IOException {  
  
        response.setContentType("text/html;charset=UTF-8");  
  
        PrintWriter out = response.getWriter();  
  
        try {  
  
            String count = null;  
  
            Cookie cookie[] = request.getCookies();  
  
            if (cookie != null) {  
  
                for (Cookie c : cookie) {  
  
                    if (c.getName().equals("count")) {  
  
                        count = c.getValue();  
  
                        break;  
  
                    }  
  
                }  
  
            }  
  
            out.print(count);  
  
        } catch (IOException e) {  
  
            e.printStackTrace();  
  
        }  
  
    }  
}
```

Figure 95 - Android Share Screen

In the android application, there is a web view function (JavaScript) to subscribe the socket server of sharing screen and synchronize the screen between teacher and students.

After joining the socket server, the function will load the pages which is sharing.

Then, it always keeps checking to the share screen command text file to see any new command. If yes, it will look up the page number and reload to the page to students.

4.4 Interaction – Voting

Interaction – Voting (Teacher – Web application)

To improve the interaction during the lesson, it is showing on the sharing screen. In the right-hand side of the page, it has a vote button.

After clicking it, it will call a jQuery function to append a vote content in a box. The content of the box will show a question and its answer with the student answer statistics.

In the bottom of the box has next and previous button to control the question showing. In the top of the box, there is a + button. After clicking it, it will call a jQuery function to empty the box and append a form for teacher writer the question detail.

After clicking the submit button of the form, server will be saved the question to this lesson and empty the box.

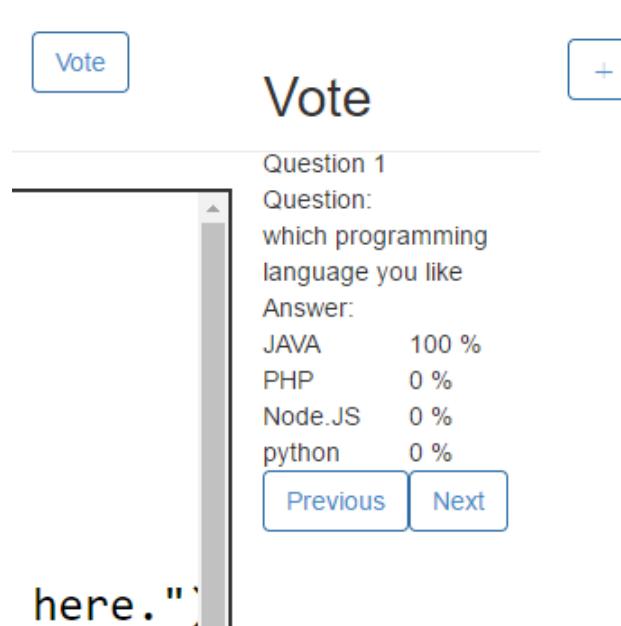


Figure 96 - Teacher View the Voting Statistics

Interaction – Vote (Student – Android)

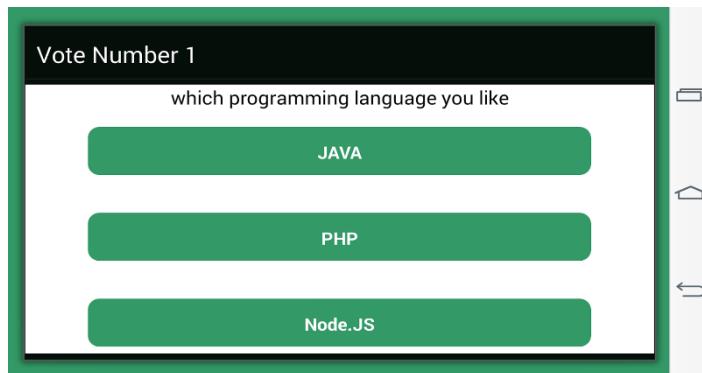


Figure 97 - Student Do Vote (Android)

In the android application, student must need to subscribe to the socket server before voting. The function will check if it is a command is vote.

If yes, it will get the vote question and pop to the screen for student answer. Student can click vote button on right top to vote the question missed or re-answer the question.

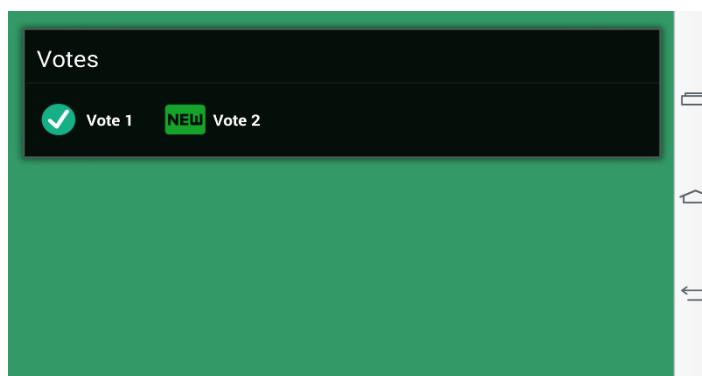


Figure 98 - Voting list (Android)

After student clicking the answer, the application will send the message to server and server will save the record.

4.5 Interaction – Quiz

Interaction – Quiz (Student – Android)

- To increase the flexibility on doing quiz, there is a online quiz function in the android application. When student enter the quiz page, it will send a request message to server to get the list of quiz. Server will check is the student belonged to the course, if yes, it will send back a list of quiz to student. When the student clicks to start a quiz, the application will check the date is it within the public date and end date of the quiz. If yes, it will move to the quiz screen.



Figure 99 - Course Quiz List

- To reduce the marking time on the quiz, after student click the submit button, application will send a student answer message to server and server will saved the student answer record. Then, the application will match the student answer with quiz answer to calculate the score. After that, the screen will back to quiz list and toast a score message to student.

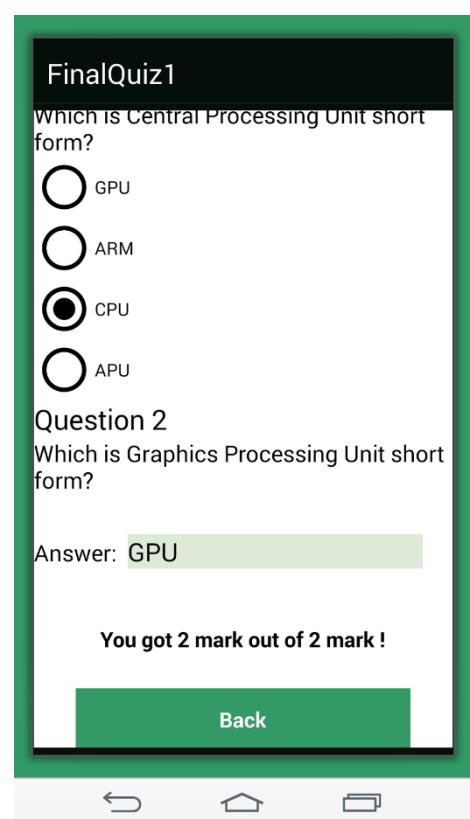


Figure 100 - Student Do Quiz (Android)

Interaction – Quiz (Teacher – Web application)

- In the website, teacher need to write public date of the quiz in the top of the content, and write the question and answer on the question row for create a new quiz.
- Teacher can click the add question button, it will call a jQuery function to append a new question row to the quiz.
- When teacher clicks the submit button, the web page will check all the input box must be filled. If yes, it will send to server and server will save a new quiz record.

Quiz - COMP_FINALDEMO1

The screenshot shows a web-based quiz creation tool. At the top, there are fields for 'Quiz Title' (set to 'FinalQuiz1'), 'Start Time' (set to '27/05/2017 上午 12:00'), and 'End Time' (set to '31/05/2017 下午 11:59'). A 'Resubmit' checkbox is set to 'No'. Below this, 'Question 1' is defined as a 'Short Question' with the question 'Which is Central Processin?' and four choices: GPU, ARM, CPU, and APU. The correct answer 'CPU' is selected. Question 2 is a 'Short Question' with the question 'Which is Graphics Process?' and one choice 'GPU' selected as the answer. An 'Add Question' button is visible at the bottom left, and a '提交' (Submit) button is at the bottom right.

Figure 101 - Teacher Create Quiz

Quiz - COMP_S311F

The screenshot shows a table of student scores for the quiz. The first table has columns 'Student ID' and 'Score', showing one entry for 's001' with a score of '66.666666666667'. The second table has columns 'Student ID' and 'Score', showing one entry for 's002' with a score of '0'.

Student ID	Score
s001	66.666666666667

Student ID	Score
s002	0

Figure 102 - Teacher view Quiz result

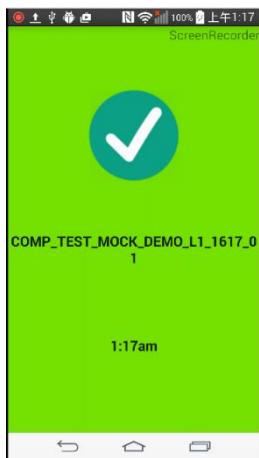
- To understand the student, acknowledge, teacher can view the statistic of the quiz. The statistic will be calculated when teacher enter the page. It will match all student answer with quiz answer to calculate all student score. Then, it will show a score table to teacher.

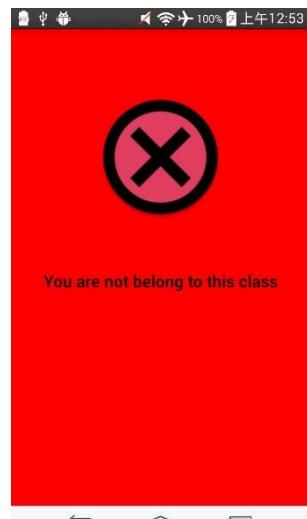
5. Testing & evaluation Results

5.1 Roll Call

➤ Roll Call - System Test

Table 6 - Roll Call System Test

Test Case / Expected output	Result
Success case	
Roll Call Success case 1 : Success Roll Call Expected output : Success Roll Call	
Fail Case	
Roll Call - Fail Case 1 : QR Code Time Out Expected output : Not Allow Taking Roll Call	

<p>Roll Call - Fail Case 2 : Take Roll Call in the Same time</p> <p>Expected output : Not Allow Taking Roll Call</p>	
<p>Roll Call - Fail Case 3 : Wrong WIFI Mac Address (not use School WIFI Network)</p> <p>Expected output : Not Allow Taking Roll Call</p>	
<p>Roll Call - Fail Case 4 :Not Belong to This Class</p> <p>Expected output : Not Allow Taking Roll Call</p>	

Roll Call - Evaluation Testing

➤ Experiment Testing (Roll Call)

Test Group Size: 10 persons

Assumption: Assume all students has downloaded the application and logged in.

Objective: To find the different time between using roll call function and attendance sheet

Control Group: 10 persons write and pass a attendance sheet for taking roll call.

Step:

1. Start the app
2. Start roll call function
3. Read QR code

Result:

	Testing Group	Control Group
Total Time for all students taking roll call	6 s	68 s

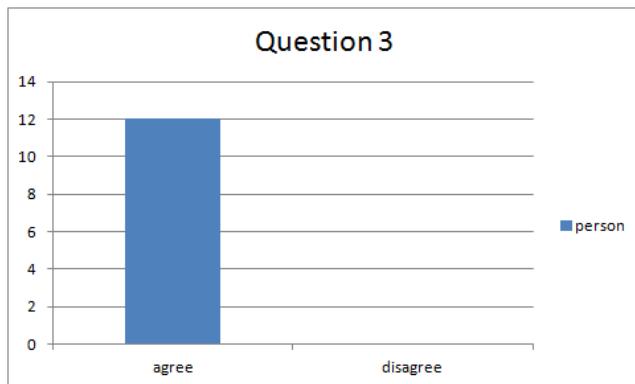
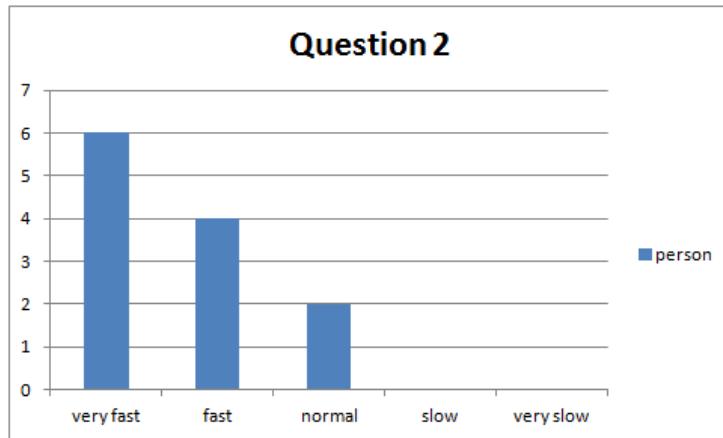
The result show that roll call system is faster 1133% than using a record sheet of attendance. Thus, it proofs that roll call system can give a good performance in taking roll call.

In the above testing, it only has a small group for testing, thus, the difference only has 60s. Yet, in real class, it contains hundred or more students. The difference should be larger than the above result. On the other hand, the roll call system would not have a big change in more person roll call in same lesson. Thus, it should be given a better performance in real lesson.

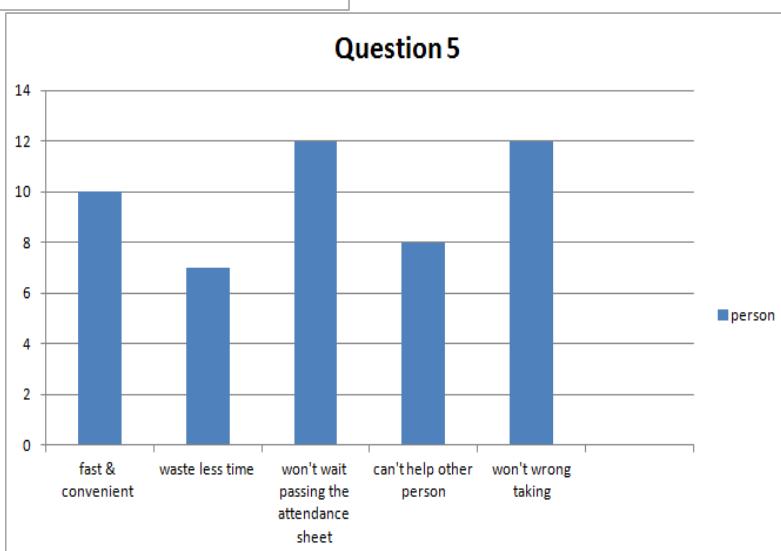
➤ Questionnaire [Appendix Questionnaire 1]

There are 12 persons' helping us for answering the questionnaire.

- In question 2, the result shows that 83.33% of persons agree the roll call function is fast.



- In question 3, all persons agree using online roll call system is faster and more convenient than using record sheet. It shows that most persons agree roll call function can achieve a faster roll call.



- In question 5, 66.67% persons agree using the roll call function is hard to helping others person taking roll call and all persons agree it can prevent write the wrong space of the other person on the attendance sheet. In the question 9, it has 4.33 out of 5 average score in the satisfaction of the roll call function.

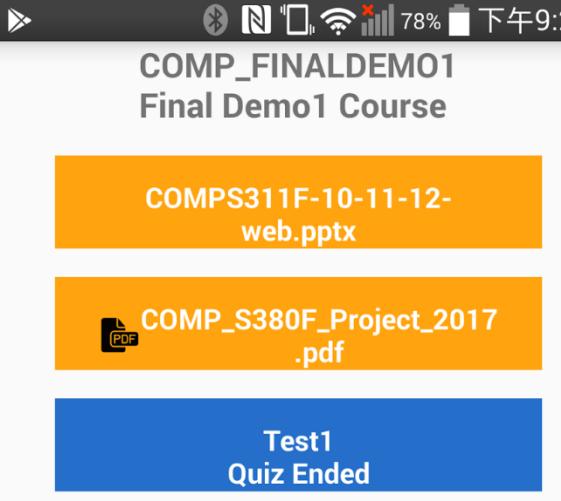
5.2 Download/ Upload Materials

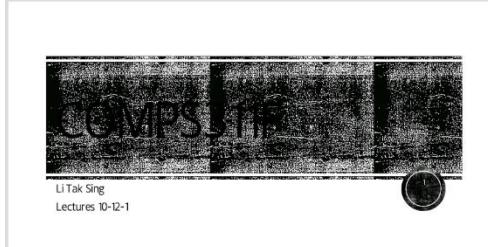
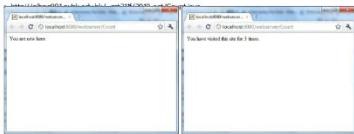
Download/ Upload Materials - System Test

Table 7 - System Test - Upload Materials (Web Application - Teacher)

Upload Materials (Web Application - Teacher)																	
Test Case / Expected output	Result																
Success case																	
Upload Materials - Success case 1: Success upload materials Expected output : Success Upload File	<p>Course's Material</p> <table border="1"> <thead> <tr> <th>File</th> <th>Upload User</th> <th>Upload Date</th> <th>Public Date</th> </tr> </thead> <tbody> <tr> <td>COMP311F-10-11-12-web.pptx</td> <td>teacher1</td> <td>2017-05-01</td> <td>2017-05-01</td> </tr> <tr> <td>COMP_S380F_Project_2017.pdf</td> <td>teacher1</td> <td>2017-05-01</td> <td>2017-05-01</td> </tr> <tr> <td>car_type2.csv</td> <td>teacher1</td> <td>2017-05-28</td> <td>2017-05-30</td> </tr> </tbody> </table>	File	Upload User	Upload Date	Public Date	COMP311F-10-11-12-web.pptx	teacher1	2017-05-01	2017-05-01	COMP_S380F_Project_2017.pdf	teacher1	2017-05-01	2017-05-01	car_type2.csv	teacher1	2017-05-28	2017-05-30
File	Upload User	Upload Date	Public Date														
COMP311F-10-11-12-web.pptx	teacher1	2017-05-01	2017-05-01														
COMP_S380F_Project_2017.pdf	teacher1	2017-05-01	2017-05-01														
car_type2.csv	teacher1	2017-05-28	2017-05-30														

Table 8 - System Test - Download Materials (Android - Student)

Download Materials (Android - Student)	
Test Case / Expected output	Result
Success case	
Download Materials - Success case 1: Show Course Materials list Expected output : Success show correct Course Materials list	

<p>Download Materials -</p> <p>Success case 2:</p> <p>Success Download Course Materials</p> <p>Expected output : Success Download Course Materials</p>	 <p>A WEB PAGE THAT COUNTS THE NUMBER OF TIMES THAT YOU HAVE VISITED THE PAGE.</p> <ul style="list-style-type: none"> You can try the page at: http://i3open001.oa.hk.edu.hk/~i3fypgo/ You can get the source at: http://i3open001.oa.hk.edu.hk/~i3fypgo/count.java  <p>COUNT</p> <p>"COMPS311F-10-11-12-web-6.pptx" 已下載</p> <pre># if getname.equals("Count") { count = c.getvisitors(); } }</pre>
<p>Fail Case</p> <p>Download Materials - Fail</p> <p>case 1:</p> <p>Can't show non-public file</p> <p>Expected output :</p> <p>don't show non-public file</p>	 <p>COMP_FINALDEMO1 Final Demo1 Course</p> <p>COMPS311F-10-11-12-web.pptx</p> <p>COMP_S380F_Project_2017.pdf</p> <p>Test1 Quiz Ended</p> <p>Don't Show the Car_type2.csv</p>

Download/ Upload Materials - Evaluation Testing

➤ Experiment Testing (Download/ Upload Materials)

Testing Group: Use the application to download a file

Assumption: Assume all students has downloaded the application and logged in.

Objective: To find the different time between using download materials function and download material from OLE

Control Group: Using computer to download the same file in OLE with the same network.

Step:

1. Start the app
2. Select Course
3. Download a file
4. Repeat step 1 to step 3 five times.

Result

	Testing Group	Control Group
Average download time	6.72s	19.12s

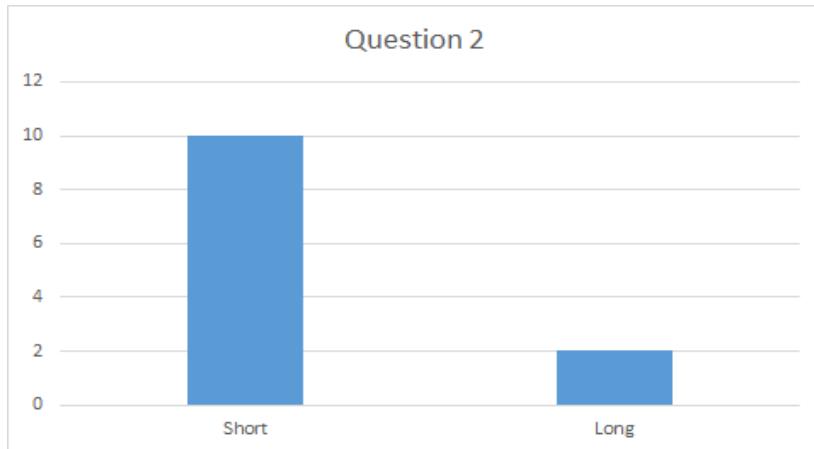
The result show that download materials function of the mobile application is faster 285% than download material from OLE.

The difference between using mobile application and website is big may because of loading a web will load a lot of data which is useless, like page background or logo. Moving the cursor is a time waste too. Thus, using mobile application can achieve a shorter download time by reducing loading useless data and moving time.

➤ Questionnaire [Appendix Questionnaire 2]

There are 12 persons' helping us for answering the questionnaire

- In the question 2, 83.3% of student agree the time of download material is short or very short. Therefore, we can know the user is agree the system is convenient.

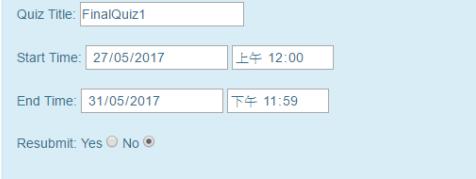


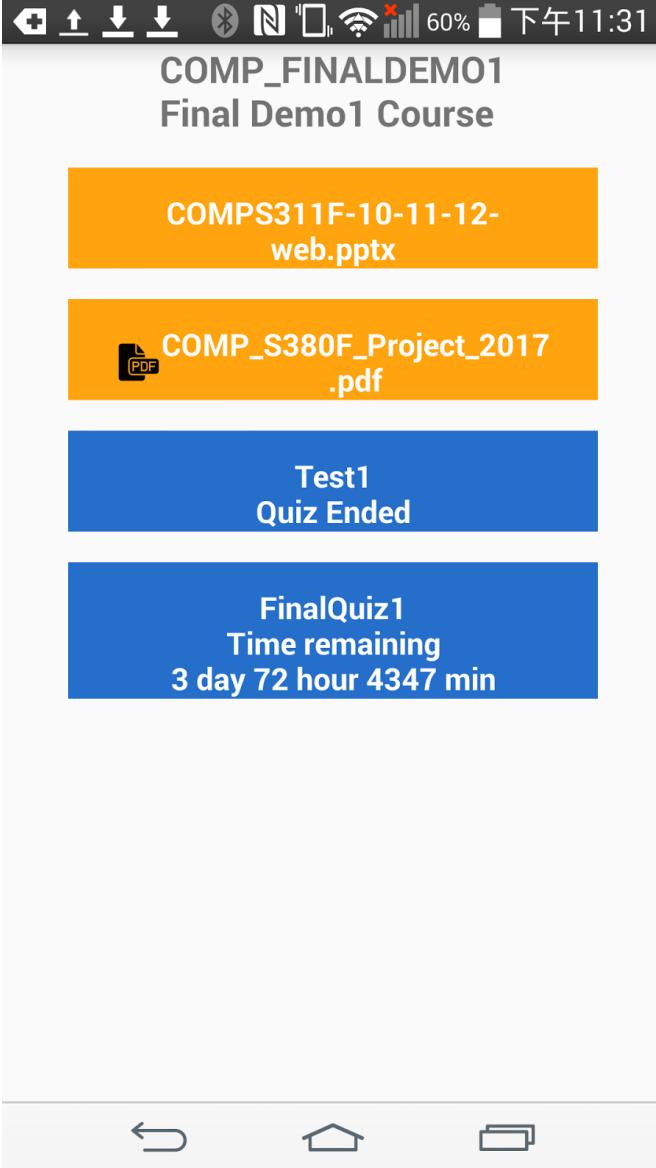
- In the question 3, the average score which student agree download using mobile application is faster than web site is 4.75 out of 5. Therefore, most of the user agree the mobile application is faster.
- In the question 5, it has 3.67 out of 5 average score in the satisfaction of the material platform.

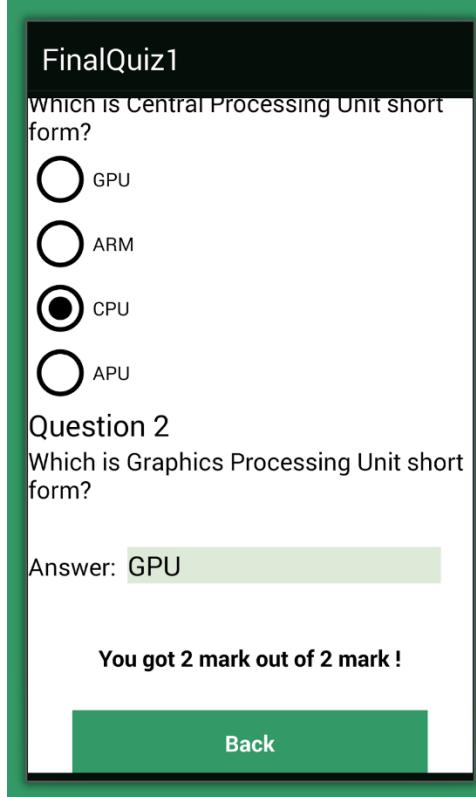
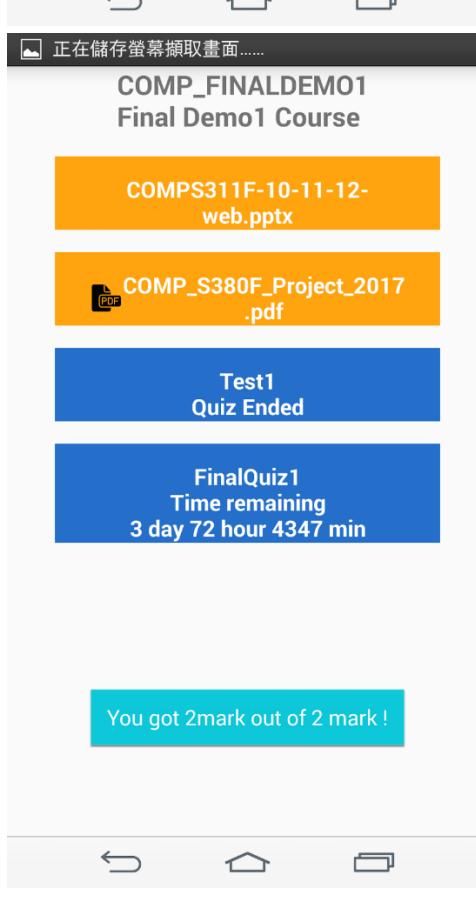
5.3 Interaction - Quiz

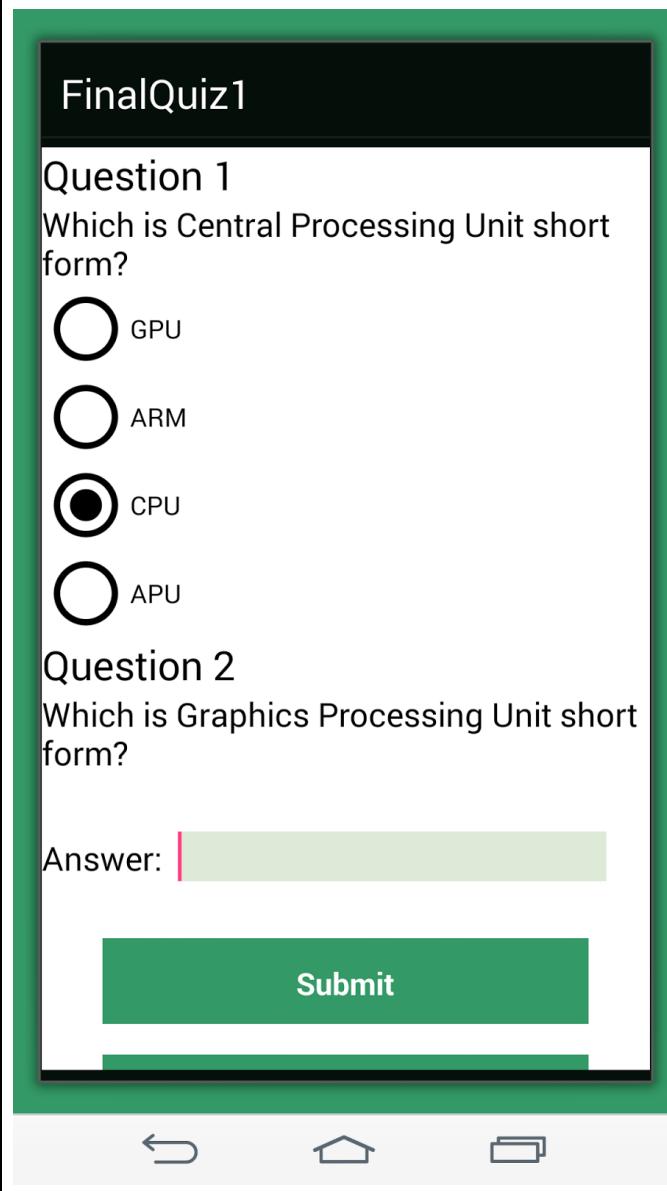
Interaction - Quiz - System Test

Table 9 - System Testing - Quiz (Web Application - Teacher)

Quiz (Web Application - Teacher)														
Test Case / Expected output	Result													
Success case														
Quiz - Success case 1: Create Quiz with multiple choice And Short Question Expected output : Success Create Quiz	Quiz - COMP_FINALDEMO1  Question 1 Question Type: <input checked="" type="radio"/> MC <input type="radio"/> Short Question Question: Which is Central Processin Answer: CPU Choice: GPU ARM CPU APU													
	Question 2 Question Type: <input type="radio"/> MC <input checked="" type="radio"/> Short Question Question: Which is Graphics Process Answer: GPU <input type="button" value="Add Question"/> <input type="button" value="提交"/>													
	<table border="1"> <thead> <tr> <th>Quiz</th> </tr> </thead> <tbody> <tr> <th>Quiz Title</th> <th>Upload Teacher</th> <th>Start Date</th> <th>End Date</th> </tr> <tr> <td>Test1</td> <td>teacher1</td> <td>2017-05-01</td> <td>2017-05-01</td> </tr> <tr> <td><u>FinalQuiz1</u></td> <td>teacher1</td> <td>2017-05-27</td> <td>2017-05-31</td> </tr> </tbody> </table>	Quiz	Quiz Title	Upload Teacher	Start Date	End Date	Test1	teacher1	2017-05-01	2017-05-01	<u>FinalQuiz1</u>	teacher1	2017-05-27	2017-05-31
Quiz														
Quiz Title	Upload Teacher	Start Date	End Date											
Test1	teacher1	2017-05-01	2017-05-01											
<u>FinalQuiz1</u>	teacher1	2017-05-27	2017-05-31											

Quiz (Android - Student)	
Test Case / Expected output	Result
Success case	
Quiz - Success case 1: Show the Quiz list Expected output : Correctly show the Quiz list	

<p>Quiz - Success case 2: Student finish the Quiz and submit</p> <p>Expected output : Student can submit the Quiz</p>	 <p>The screenshot shows a quiz interface titled "FinalQuiz1". A question asks "Which is Central Processing Unit short form?" with options GPU, ARM, CPU, and APU. The "CPU" option is selected. Below it, another question asks "Which is Graphics Processing Unit short form?", with the answer "GPU" highlighted in green. A message at the bottom says "You got 2 mark out of 2 mark !". A "Back" button is visible at the bottom of the quiz screen.</p>  <p>The screenshot shows a course page for "COMP_FINALDEMO1" titled "Final Demo1 Course". It lists files: "COMPS311F-10-11-12-web.pptx" and "COMP_S380F_Project_2017.pdf". Below these are two blue boxes: one for "Test1" which says "Quiz Ended", and another for "FinalQuiz1" which shows "Time remaining 3 day 72 hour 4347 min". At the bottom, a message says "You got 2mark out of 2 mark !". Navigation icons are at the very bottom.</p>
<p>Fail Case</p>	

<p>Quiz - Fail case 1: not Enroll course student cant do the quiz (Not Enroll that Course Student cant view that course quiz / Materials)</p> <p>Expected output : Can't show course quiz list</p>	
<p>Quiz - Fail case 2: multiple choice only accept one answer</p> <p>Expected output : Only accept one answer</p>	

5.4 Interaction - Share Screen

Interaction – Share Screen- System Test

Table 10 - System Test - ShareScreen (Web Application - Teacher)

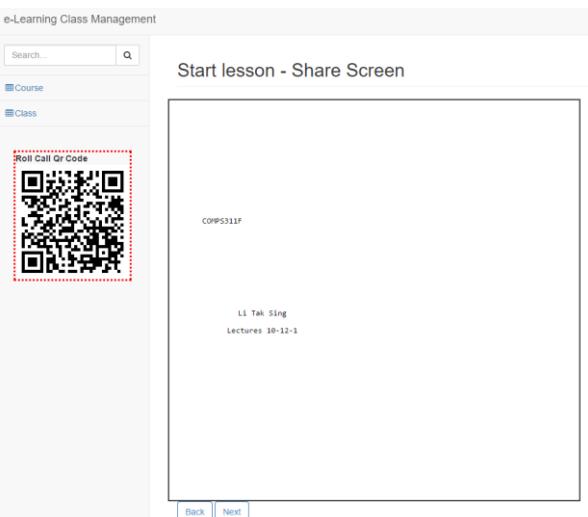
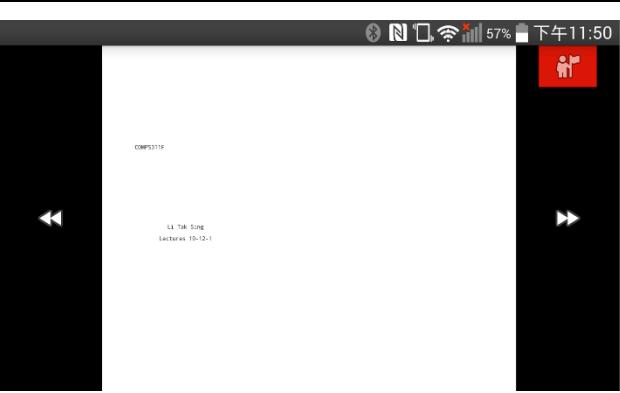
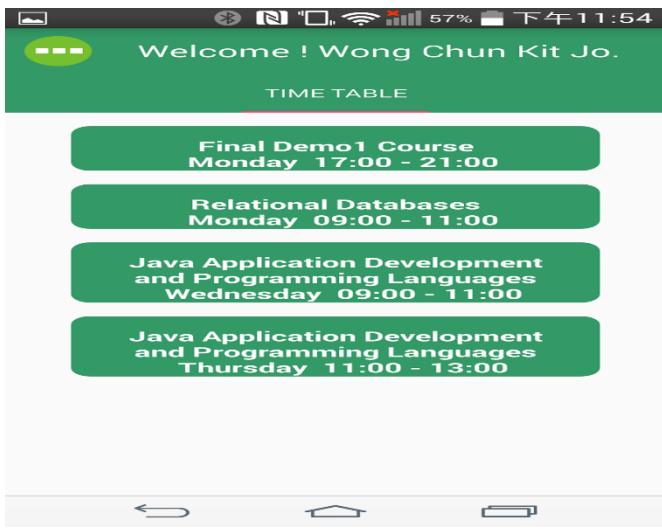
ShareScreen (Web Application - Teacher)	
Test Case / Expected output	Result
Success case	
ShareScreen - Success case 1: Teacher can start lesson and share the screen with student Expected output : Success Start lesson and ShareScreen	

Table 11 - System test - ShareScreen (Android - Student)

ShareScreen (Android - Student)	
Test Case / Expected output	Result
Success case	
ShareScreen - Success case 1: Student can join the lesson Share Screen Expected output : Correctly join the lesson Share Screen	

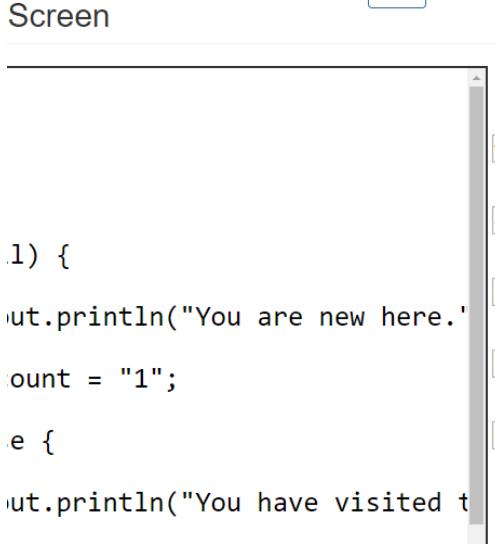
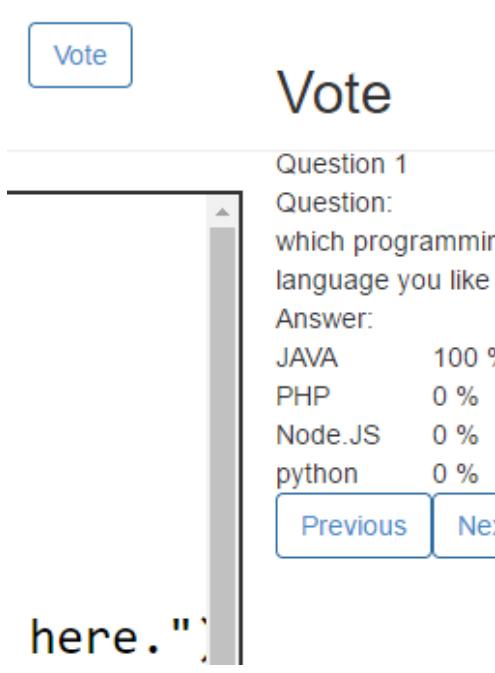
	 <p>Welcome ! Wong Chun Kit Jo.</p> <p>TIME TABLE</p> <ul style="list-style-type: none"> Final Demo1 Course Monday 17:00 - 21:00 Relational Databases Monday 09:00 - 11:00 Java Application Development and Programming Languages Wednesday 09:00 - 11:00 Java Application Development and Programming Languages Thursday 11:00 - 13:00
ShareScreen - Success case 2: Student device can synchronize teacher Share Screen Expected output : Student device synchronize teacher Share Screen and show correctly page	<p>Student Android Screen:</p>  <pre>public class Count extends HttpServlet { protected void doGet(HttpServletRequest request, HttpServletResponse response) throws ServletException, IOException { response.setContentType("text/html;charset=UTF-8"); PrintWriter out = response.getWriter(); try { String count = null; Cookie cookie[] = request.getCookies(); if (cookie != null) { for (Cookie c : cookie) { if (c.getName().equals("count")) {</pre> <p>Teacher Web Browse Screen:</p>  <p>e-Learning Class Management</p> <p>Start lesson - Share Screen</p> <pre>public class Count extends HttpServlet { protected void doGet(HttpServletRequest request, HttpServletResponse response) throws ServletException, IOException { response.setContentType("text/html;charset=UTF-8"); PrintWriter out = response.getWriter(); try { String count = null; Cookie cookie[] = request.getCookies(); if (cookie != null) {</pre>
Fail Case	

<p>Share Screen - Fail case 1: not Enroll course student cannot join the Share Screen</p> <p>Expected output : Cannot show Lesson in the home page [Final Demo1 Course] Don't show</p>	<p>The screenshot shows a smartphone interface. At the top, there is a green header bar with the text "Welcome ! Chan Ho Tai" and a "TIME TABLE" button. Below the header, there are three green rounded rectangular boxes, each representing a lesson in the timetable. The first box contains "Relational Databases Monday 09:00 - 11:00". The second box contains "Java Application Development and Programming Languages Wednesday 09:00 - 11:00". The third box contains "Java Application Development and Programming Languages Thursday 00:00 - 12:00". The bottom of the screen features standard Android navigation icons: a back arrow, a home icon, and a recent apps icon.</p>
--	--

5.5 Interaction - Vote

Interaction –Vote- System Test

Table 12 - System Test - Vote (Web Application - Teacher)

Vote (Web Application - Teacher)									
Test Case / Expected output	Result								
Success case									
Vote - Success case 1: Teacher can create the vote when using ShareScreen Expected output : Success Create Vote	<p>Screen</p>  <p>Question: Question: which programming langua</p> <p>Answer A: JAVA</p> <p>Answer B: PHP</p> <p>Answer C: Node.JS</p> <p>Answer D: python</p> <p>Submit</p> <pre> 1) { out.println("You are new here."); count = "1"; } else { out.println("You have visited t </pre>								
Vote - Success case 2: Teacher can View the vote statistic (only one student vote Java) Expected output : Show Vote Result	 <p>Vote</p> <p>Question 1</p> <p>Question: which programming language you like</p> <p>Answer:</p> <table> <tbody> <tr> <td>JAVA</td> <td>100 %</td> </tr> <tr> <td>PHP</td> <td>0 %</td> </tr> <tr> <td>Node.JS</td> <td>0 %</td> </tr> <tr> <td>python</td> <td>0 %</td> </tr> </tbody> </table> <p>Previous Next</p> <p>here."</p>	JAVA	100 %	PHP	0 %	Node.JS	0 %	python	0 %
JAVA	100 %								
PHP	0 %								
Node.JS	0 %								
python	0 %								

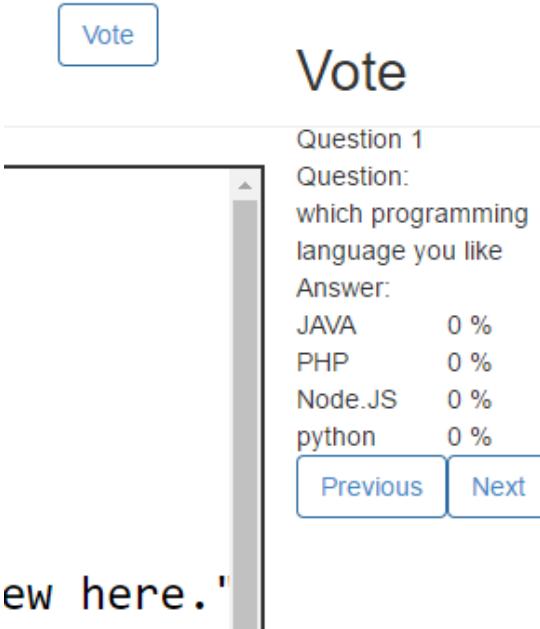
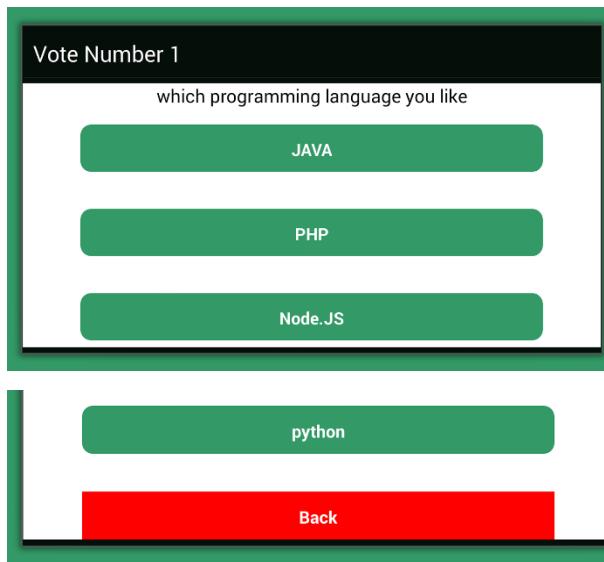
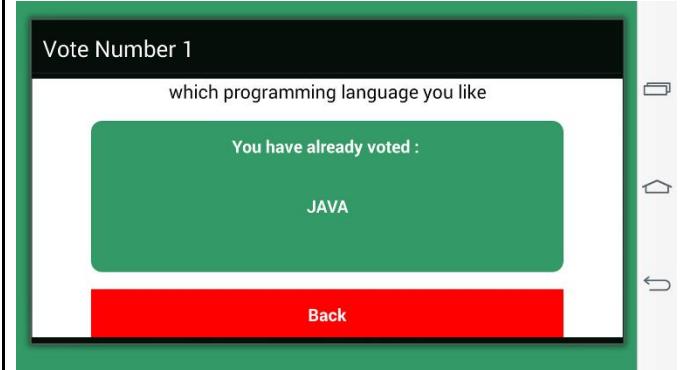
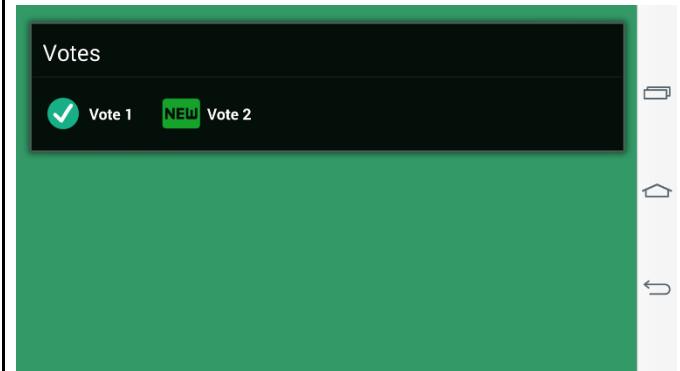
Fail Case	
<p>Vote - Fail case 1: No one vote</p> <p>Expected output : The vote statistic will be zero</p>	 <p>The screenshot shows a mobile application interface titled 'Vote'. At the top right is a '+' icon. Below it is the word 'Vote'. A horizontal line follows. The text 'Question 1' is followed by 'Question:' and 'which programming language you like'. Below this, under 'Answer:', are four items: 'JAVA 0 %', 'PHP 0 %', 'Node.JS 0 %', and 'python 0 %'. At the bottom are 'Previous' and 'Next' buttons.</p> <p>ew here.'</p>

Table 13 - System Test - Vote (Android - Student)

Vote (Android - Student)	
Test Case / Expected output	Result
Success case	
<p>Vote - Success case 1: Student can have the vote pop up screen</p> <p>Expected output : Correctly show the vote.</p>	 <p>The screenshot shows a mobile application interface titled 'Vote Number 1'. It asks 'which programming language you like'. Below are four green progress bars: 'JAVA', 'PHP', 'Node.JS', and 'python'. At the bottom is a red 'Back' button.</p>

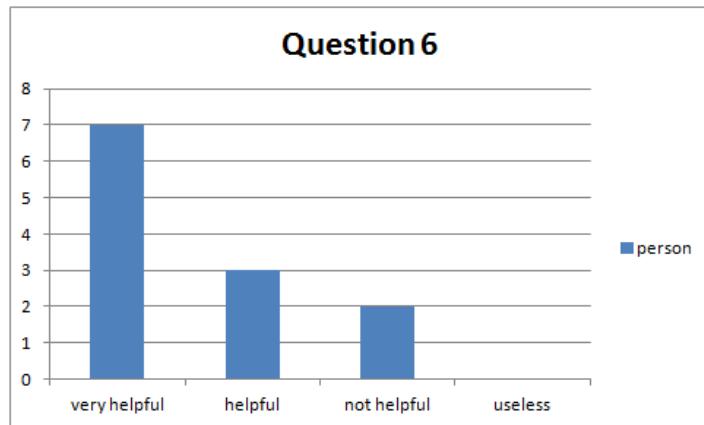
<p>Vote - Success case 2: Student can answer the vote</p> <p>Expected output : Student success to submit the vote</p>	 <p>A screenshot of a mobile application interface titled "Vote Number 1". The question is "which programming language you like". A green box displays the message "You have already voted : JAVA". A red "Back" button is at the bottom.</p>
Fail Case	
<p>Vote - Fail case 1: Can't vote the same question again (Vote1 is submitted, vote 2 is new vote)</p> <p>Expected output : cannot resubmit the vote question again</p>	 <p>A screenshot of a mobile application interface titled "Votes". It shows two options: "Vote 1" with a checked checkbox and "Vote 2" with a "NEW" tag. The background is green.</p>

Interaction - Evaluation Testing

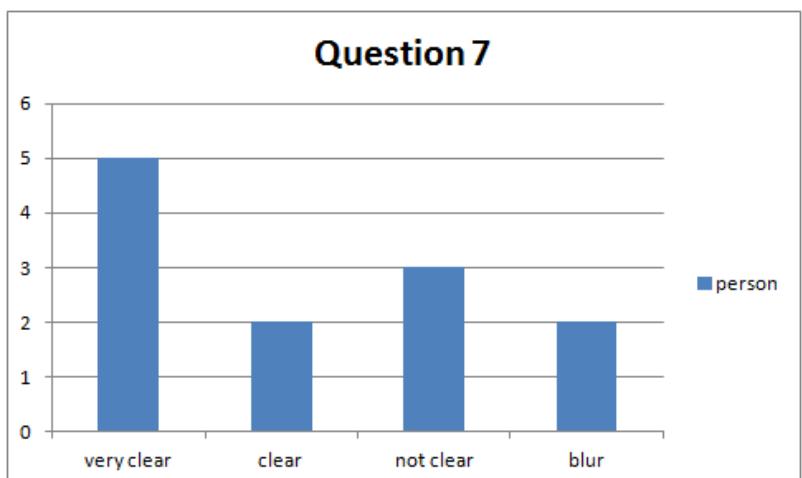
➤ Questionnaire [Appendix Questionnaire 3]

There are 12 persons' helping us for answering the questionnaire.

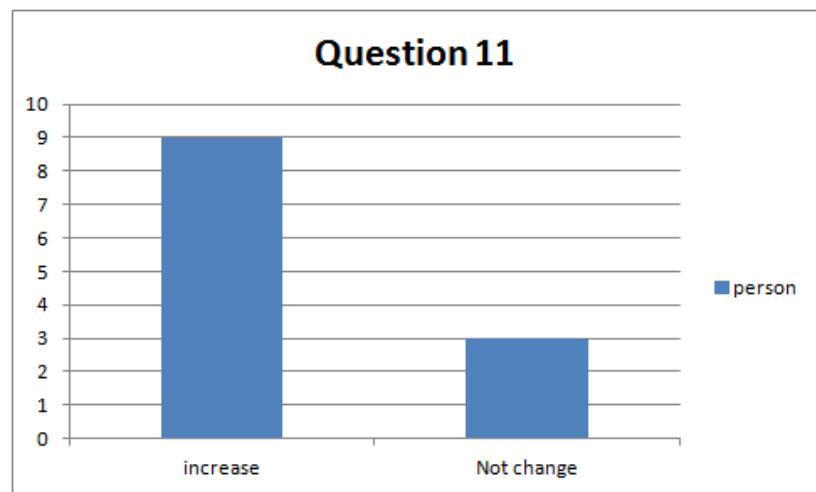
- In the questionnaire, first 5 questions are about the comment on sharing screen, question sixth to ninth are about voting and the last 4 questions are about the online quiz.
- In the share screen part, question 2 has 96.67% rate in agreeing sharing screen can provide a clearly view for learning. In question 5, it has 4.58 out of 5 average score in the satisfaction of the share screen function. It shows that they agree share screen function can give a clear view to student whatever how far to the projecting screen.
- In the voting part, there are 83.33% of persons agree online voting can help them give response to teacher in question 6.



- In question 7, there are 41.67% persons disagree in showing the voting statistic clearly. It may because of showing the statistic in text is not suitable. To improve the displaying clearly, it can show it using bar chart with different color instead of only using text. Thus, in question 9, the average score of satisfaction in the voting is 3.75 out of 5 and half of persons answered only 3 score.



- In the online quiz part, it has 75% persons agree with using the online quiz has a larger flexibility in doing quiz. The leaving persons said that they want to using computer to doing quiz at home. Yet, this system only has a mobile application for student. In question 13, it has 3.58 out of 5 in satisfaction of online quiz.



6. Conclusion

The aim has been satisfied by implement the MVC system design.

The aim of this project is to develop a mobile learning management system for tertiary Institutions through mobile communication technology.

The system increase interactivity between teacher and student by implement share screen function. The system improve student learning efficiency by implement lot of convenient function such as download material.

The objectives have been satisfied.

Develop online platform to share learning materials .

Develop roll call system implement by QR code and MAC Address.

Develop real time mobile learning system

(e.g.. Share screen function which is using the socket programming to communicate)

➤ Build a communication platform implement online quiz.

6.1 Summary of achievements

6.1.1 Functional achievements

- Mobile learning management system was developed
- Developed mobile application to fulfill student need in the class and study
- Developed website to allow teacher managing the class and course
- Developed PHP server in the backend support the operation
- Developed new roll call system (QR code) for school
- Developed Share Screen system
- Developed Online Quiz system

6.1.2 Non-Functional achievements

- Improve the interaction between student and teacher in class
- Enhance the roll call performance and accuracy
- To provide convenience to student (e.g. spend less time to login in)

6.2 Limitation of the solution and methods

6.2.1 Roll Call

The first problem of the implementation lack of attendance statistic. In the website, there are only a table for showing the attendance record for specific class. This is not good enough for teacher to manage the class. For example, the system does not calculate the attendance rate each lesson. Teacher cannot know the situation of class. It should have some statistic tools to assist the teacher for making any decision of managing the class.

Show Student Attendance

Class COMP_S311F_L01_1617				
Show	10	entries	Search:	
Student	Week1	Week2	Percentage	
s001	Y	N	50%	
s002	Y	N	50%	

Showing 1 to 1 of 1 entries

Previous 1 Next

Figure 103 - View Roll Call Attendance

For student, another problem is that the attendance record is not reviewable. In the current system design. The system shows the success / failed message when they roll call. Afterwards, student cannot review their own attendance record. Student may doubt whether he/she finished the roll call or not.

6.2.2 Download/upload material

The system design is not flexible. Once student download the material to the mobile. The program design downloads the file every time instead of retrieving the file from the local storage. Another problem is the system design does not allow teacher delete material from the website. Once teacher improperly upload the file, and teacher cannot delete afterward.

6.2.3 Share screen

The function is imperfect. The function of share screen is only support simple text and photo. When the PowerPoint contains some special character, the share screen content will fail to generate. Also, it is not support table, media, image rotation etc.

6.2.4 Quiz

The system design is not flexible. Teacher cannot reuse the question for next quiz. The current design is to save the one quiz' s questions to JSON Format, then save it to quiz table inside the question field in one row, as follow example :

quizTitle	courseID	questions
Demo	COMP_S311F	[{"questionNumber": "1", "type": "mc", "question": "1+1=?", "choice": ["1", "2", "3", "4"], "answer": "2"}]
Demo2	COMP_S311F	[{"questionNumber": "1", "type": "mc", "question": "Which is Central Processing Unit short form?", "choice": ["APU", "GPU", "CPU", "RAM"], "answer": "CPU"}]
Quiz 10	COMP_S311F	[{"questionNumber": "1", "type": "mc", "question": "Which is Graphics Processing Unit short form?", "choice": ["GPU", "gpu"], "answer": "GPU"}]
Quiz 11	COMP_S311F	[{"questionNumber": "1", "type": "mc", "question": "1+1=?", "choice": ["1", "2", "3", "4"], "answer": "2"}]

Figure 104 - Quiz Question data in database

Example of quiz table - Questions Field

```
[{
    "questionNumber": 1,
    "type": "mc",
    "question": "1+1=?",
    "choice": ["1", "2", "3", "4"],
    "answer": "2"
}, {
    "questionNumber": 2,
    "type": "mc",
    "question": "Which is Central Processing Unit short form?",
    "choice": ["APU", "GPU", "CPU", "RAM"],
    "answer": "CPU"
}, {
    "questionNumber": 3,
    "type": "sq",
    "question": "Which is Graphics Processing Unit short form?",
    "choice": ["GPU", "gpu"],
    "answer": "GPU"
}]
```

Figure 105 - Quiz Table -Questions Field Data Format

The design cannot support the reusable question expect apply the modification of database structure.

Another limitation of quiz function is the score marking shouldn't proceed before the quiz is ended. The original program design allows the student to know their score instantly.

The limitation is the student can estimate the answer by the score. Some of the student might share the information to others and the fairness of the quiz will be affected.

6.3 Suggestion of future work

6.3.1 Mobile application

The system should support IOS platform.

iPhone had a certain rate of market share, the system should also cover these markets. The system design is using the MVC model. Android mobile application called the PHP webservice from the server to communicate. The extensibility of the system is good. In the future, it is possible to develop IOS application and without modify any server side code.

6.3.2 Roll Call

The system should Implement the attendance statistic.

From the statistic, the teacher can possible define the problem in the class and decide teaching strategies Statistic is helpful for teacher to the make decision of teaching.

For example, Pie chart of student attendance can let the teacher easier to distinguish the percentage.

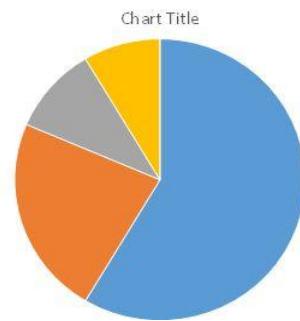


Figure 106 - Roll Call Result show in pie chart

Column chart can allow teacher to compare the attendance in different lesson. (e.g. Most of the student attend last lesson to get exam hint, Teacher can choose the lesson important announcement to make sure all the student knows)

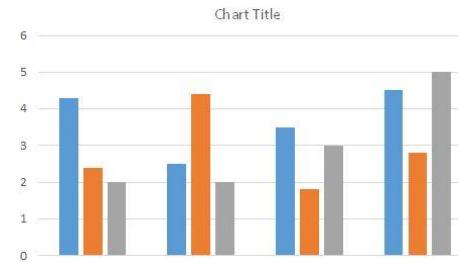


Figure 107 - Roll Call Result show in bar chart

6.3.3 Vote

The mobile system should implement the vote statistic. In the current system, student can know the vote results through teacher screen only. Student may be interested in the vote result.

6.3.4 Share Screen

The limitation of share screen function is only support simple text and photo. The library converts PowerPoint to HTML content. It is not fully complete. In the future development. It is possible to improve the library. For example, read the table content and rebuild as HTML <table> <tr><td>.

According to the user response, some of the user suggest adding the annotation function.

It means by adding a new function to allow teacher writing annotation on share screen.

Some user gives another possible suggestion that should allow student to drop their own note beside the share screen and save it to local storage. It should able to review for study.

For implement this function, it can use Canvas to draw the text and save the paint as the transparent layer.

6.3.5 Quiz

To let the question reusable, database design should be revised. The Question should be save at Question Table and add foreign key constraint.

One quiz can have one to many question. Question can be owned by zero to many quiz.

There is possible to implement more question type. For example, multi-answer multiple choice.

6.3.6 Program Code Design

Some of the limitation has been found. Some of the function should be revised to fulfill user requirement.

➤ **Student review attendance**

It should use shared-preferences to save the record locally.

For advance programming, server side can create a web service to allow student to get his/her own record.

➤ **File download multiple time**

There should be the checking before download, if there is existing file, the program should open it.

➤ **Score marking before the quiz timeout**

There should be the network time checking and publishing when time is over.

➤ **Teacher cannot delete material**

Add the function in the website

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8. Appendix

Appendix A.

Members' Roles, Responsibilities And Process Report

Roles

Roles	Member(s)	Remarks
Team Coordinator:	John	
Secretary:	Tai	Meeting agenda and minutes
System Analyst & Designer:	John, Tai, Pizza	
Programmer:	John, Tai, Pizza	
Tester and Evaluator:	John, Tai, Pizza	
Database Expert:	Tai	MySQL
Cloud Server Expert:	John	Amazon EC2, Apache, MySQL
Android Expert:	Pizza	
UML Diagram Expert:	John, Tai	

Responsibilities and Process Report

The progress of this project is not good. Two of the three major objectives is ongoing and one is not started and the basic function is ongoing too.

Tasks	Responsible Member(s)	Target Date	Completion	Remarks
Technology Test: QR Code (Android)	John	Sep 2016	100%	
Technology Test: Android Get connected Wi-Fi (Mac address)	Tai	Sep 2016	100%	
Database Design	John	Nov 2016	100%	
Cloud Server Setup and Maintenance	John	Nov 2016	100%	
Mobile Application				
User Login	Pizza, John	Nov 2016	100%	
View course	Pizza, John	Nov 2016	100%	
View course material	Pizza, John	Nov 2016	100%	
Roll Call (QR Code)	John	Nov 2016	100%	
Roll Call(Mac Address)	Tai	Nov 2016	100%	
Display the shared screen	Pizza, John, Tai	Mar 2017	100%	
Answer quiz / Vote	Pizza, Tai	Mar 2016	100%	

Responsibilities And Progress Report (Cont'd)

Tasks	Responsible Member(s)	Target Date	Completion	Remarks
Web Application				
webservice for backend (android device use)	John	Mar 2017	100%	
User login	John	Nov 2016	100%	
Upload course materials	Pizza	Feb 2017	100%	
Share screen	Pizza, John, Tai	Mar 2017	100%	
Set quiz / vote	Pizza, Tai	Feb 2017	100%	
View quiz / vote result	Pizza, Tai	Feb 2017	100%	
Enroll student class	Tai	Feb 2017	100%	
Enroll teacher course	Tai	Jan 2017	100%	
Create Course	Tai	Jan 2017	100%	
Manage Course	Tai	Jan 2017	100%	
Create Class	Tai	Jan 2017	100%	
Manage Class	Tai	Jan 2017	100%	
View Roll Call Data	John	Feb 2017	100%	
Generate Roll Call Report	John	Feb 2017	100%	
Experiment Setup and Coordination	John, Tai, Pizza	Apr 2017	100%	

Appendix B1. Wong Chun Kit John Final Report

Project Title	An Online Learning System for Class Management and Class Interaction
Team Name	i3-FYPGO
Student Name & ID	Wong Chun Kit John s11503002
Supervisor's Name	Dr. Li Tak Sing

B. Declaration Statement:

I, Wong Chun Kit John s11503002, certify that the work is original and I have utilized guidance of our supervisor in completing this project, and that the content which is not our own has been attributed and referenced properly. There should be no copyrighted content without permission to use. There should be no confidential data.

Signature _____

Date ()

Appendix B1. Wong Chun Kit John Final Report

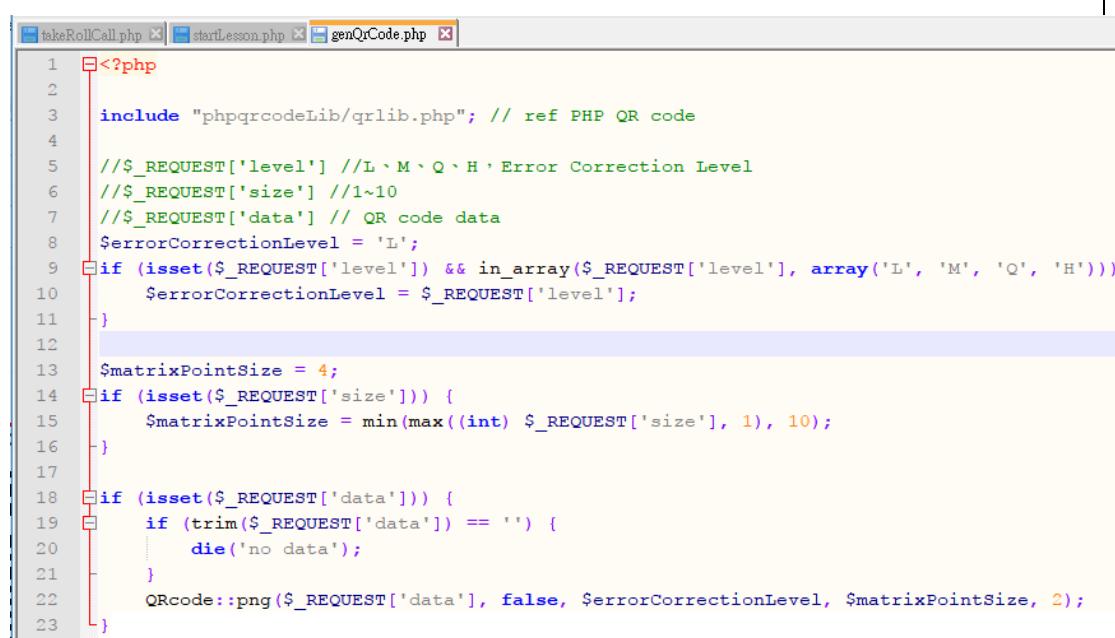
C. Tasks Assigned to the Author and their Status

Tasks	Responsible Member(s)	Target Date	Completion	Remarks
Technology Test: QR Code (Android)	John	Sep 2016	100%	successful to get data from qrcode
Database Design	John	Nov 2016	100%	
Cloud Server Setup and Maintenance	John	Nov 2016	100%	
Mobile Application				
webservice for backend (android device use)	John	Mar 2017	100%	
User Login	Pizza, John	Nov 2016	100%	
View course	Pizza, John	Nov 2016	100%	
View course material	Pizza, John	Nov 2016	100%	
Roll Call (QR Code)	John	Nov 2016	100%	
Display the shared screen	Pizza, John, Tai	Mar 2017	100%	
Web Application				
User login	John	Nov 2016	100%	
Share screen	Pizza, John, Tai	Mar 2017	100%	
View Roll Call Data	John	Feb 2017	100%	
Generate Roll Call Report	John	Feb 2017	100%	
Experiment Setup and Coordination	John, Tai, Pizza	Apr 2017	100%	
Experimental Data Analysis	John	Apr 2017	100%	

Appendix B1. Wong Chun Kit John Final Report

D. Review and Appraisal of Code Section

Generate QR-Code Library



```

1 <?php
2
3     include "phpqrcodeLib/qrlib.php"; // ref PHP QR code
4
5     //$_REQUEST['level'] //L、M、Q、H , Error Correction Level
6     //$_REQUEST['size'] //1~10
7     //$_REQUEST['data'] // QR code data
8     $errorCorrectionLevel = 'L';
9     if (isset($_REQUEST['level']) && in_array($_REQUEST['level'], array('L', 'M', 'Q', 'H'))){
10         $errorCorrectionLevel = $_REQUEST['level'];
11     }
12
13     $matrixPointSize = 4;
14     if (isset($_REQUEST['size'])) {
15         $matrixPointSize = min(max((int) $_REQUEST['size'], 1), 10);
16     }
17
18     if (isset($_REQUEST['data'])) {
19         if (trim($_REQUEST['data']) == '') {
20             die('no data');
21         }
22         QRcode::png($_REQUEST['data'], false, $errorCorrectionLevel, $matrixPointSize, 2);
23     }

```

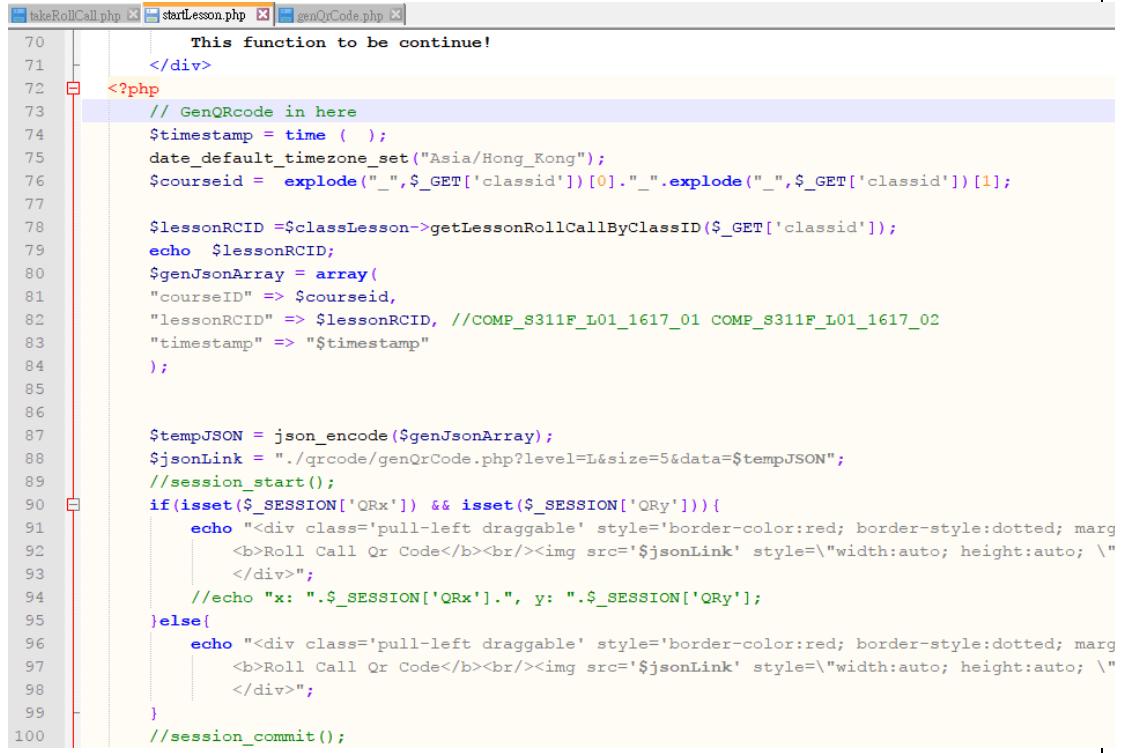
This is a controller of QRcode , it's responsible for generating QR-Code in standard request format : as follows example

Link of Generate QR-Code

[./qrcode/genQrCode.php?level=L&size=5&data={"courseID":"COMP_FINALDEMO1","lessonRCID":"","timestamp":"1495991350"}](#)

Appendix B1. Wong Chun Kit John Final Report

When start Share Screen (start lesson) Generate QR-Code



```

70     This function to be continue!
71         </div>
72     <?php
73         // GenQRcode in here
74         $timestamp = time( );
75         date_default_timezone_set("Asia/Hong_Kong");
76         $courseid = explode("_", $_GET['classid'])[0]."_".explode("_", $_GET['classid'])[1];
77
78         $lessonRCID = $classLesson->getLessonRollCallByClassID($_GET['classid']);
79         echo $lessonRCID;
80         $genJsonArray = array(
81             "courseID" => $courseid,
82             "lessonRCID" => $lessonRCID, //COMP_S311F_L01_1617_01 COMP_S311F_L01_1617_02
83             "timestamp" => "$timestamp"
84         );
85
86
87         $tempJSON = json_encode($genJsonArray);
88         $jsonLink = "./qrcode/genQrCode.php?level=L&size=5&data=$tempJSON";
89         //session_start();
90         if(isset($_SESSION['QRx']) && isset($_SESSION['QRy'])){
91             echo "<div class='pull-left draggable' style='border-color:red; border-style:dotted; margin-bottom:10px;'><b>Roll Call Qr Code</b><br/><img src='".$jsonLink"' style='width:auto; height:auto; border-radius:50%;' /></div>";
92             //echo "x: ".$_SESSION['QRx'].", y: ".$_SESSION['QRy'];
93         }else{
94             echo "<div class='pull-left draggable' style='border-color:red; border-style:dotted; margin-bottom:10px;'><b>Roll Call Qr Code</b><br/><img src='".$jsonLink"' style='width:auto; height:auto; border-radius:50%;' /></div>";
95         }
96         //session_commit();
97     
```

This is Share Screen (start Lesson) coding it responsible for when the teacher start the lesson, the QR-Code will be auto generating, it contains courseID, LessonRCID, Timestamp.

Timestamp is for android count the QR-Code expire or not.

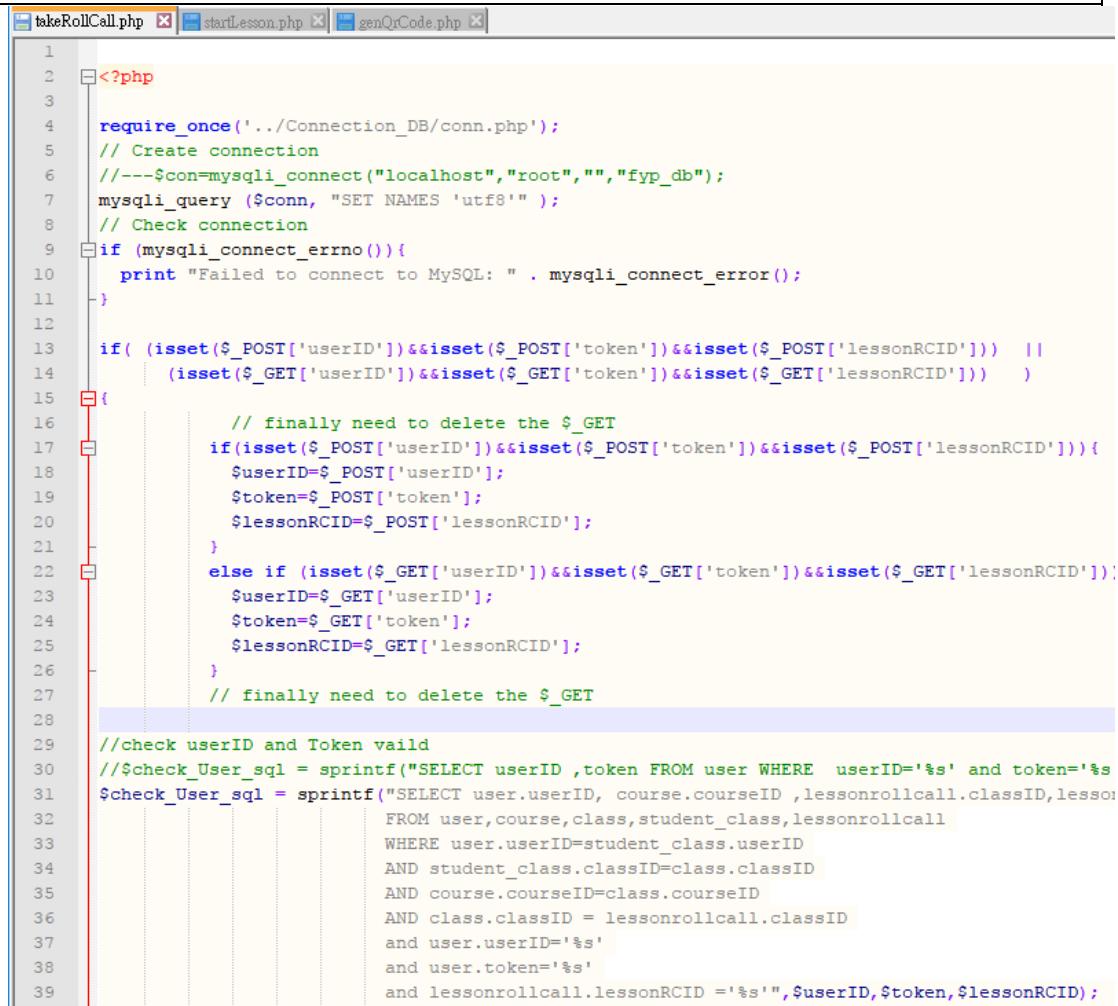
LessonRCID is means Lesson Roll Call ID for Roll Call use.

CourseID is means Course ID for check student is enroll course or not.

Appendix B1. Wong Chun Kit John Final Report

Backend Take Roll Call

This Backend for handle android taking Roll Call.



```

1  <?php
2
3  require_once('../Connection_DB/conn.php');
4  // Create connection
5  $con=mysqli_connect("localhost","root","","fyp_db");
6  mysqli_query ($con, "SET NAMES 'utf8' ");
7  // Check connection
8  if (mysqli_connect_errno()){
9      print "Failed to connect to MySQL: " . mysqli_connect_error();
10 }
11
12 if( (isset($_POST['userID'])&&isset($_POST['token'])&&isset($_POST['lessonRCID'])) || 
13     (isset($_GET['userID'])&&isset($_GET['token'])&&isset($_GET['lessonRCID'])) )
14 {
15
16     // finally need to delete the $_GET
17     if(isset($_POST['userID'])&&isset($_POST['token'])&&isset($_POST['lessonRCID'])){
18         $userID=$_POST['userID'];
19         $token=$_POST['token'];
20         $lessonRCID=$_POST['lessonRCID'];
21     }
22     else if (isset($_GET['userID'])&&isset($_GET['token'])&&isset($_GET['lessonRCID'])){
23         $userID=$_GET['userID'];
24         $token=$_GET['token'];
25         $lessonRCID=$_GET['lessonRCID'];
26     }
27     // finally need to delete the $_GET
28
29 //check userID and Token valid
30 //$check_User_sql = sprintf("SELECT userID ,token FROM user WHERE userID='%s' and token='%s'
31 $check_User_sql = sprintf("SELECT user.userID, course.courseID ,lessonrollcall.classID,lesson
32                                     FROM user,course,class,student_class,lessonrollcall
33                                     WHERE user.userID=student_class.userID
34                                     AND student_class.classID=class.classID
35                                     AND course.courseID=class.courseID
36                                     AND class.classID = lessonrollcall.classID
37                                     and user.userID='%s'
38                                     and user.token='%s'
39                                     and lessonrollcall.lessonRCID ='%s'", $userID,$token,$lessonRCID);

```

Android is used POST to sending a request to the server.

First , the backend controllers receive the POST data,

Then connect the database to check the student is enroll the course or not

The problem is will have the SQL injection, it should be use to escape special string function to prevent the SQL injection. Eg. mysql_real_escape_string(\$userID)

```

40
41     if ($result = mysqli_query($conn, $check_User_sql)) // 1 if $check_User_sql
42     {
43         $resultCount= mysqli_num_rows($result); //return result count
44
45         if($resultCount>0){
46             //2.insert Data
47             date_default_timezone_set("Asia/Hong_Kong"); // set Timezone Hong_Kong utc +8
48             $currentdate= date("Y-m-d");
49             $currenttime= date("H:i:s");
50             // This SQL statement selects ALL from the table 'Locations'
51             $insert_sql = sprintf("INSERT INTO `studentrollcall` ('userID', 'lessonRCID', 'rcDate', 'rcTime') VALUES (%s, %s, '%s', '%s')");
52             // SELECT userID , userName ,userType , phone FROM user WHERE userID='%s' and token='%s'
53             // Check if there are results
54             if ($result = mysqli_query($conn, $insert_sql))
55             {
56                 header('Content-Type: application/json');
57                 // If so, then create a results array and a temporary one
58                 // to hold the data
59
60                 $resultCount= mysqli_affected_rows($conn); //return result count
61                 if($resultCount>0){
62                     // Finally, encode the array to JSON and output the results
63                     $json = new stdClass();
64                     $json->success=1;
65                     $json->affected_rows = $resultCount;
66                     $json->userID=$userID;
67                     $json->lessonRCID=$lessonRCID;
68                     $json->date=$currentdate;
69                     $json->time=$currenttime;
70                     print json_encode($json,JSON_UNESCAPED_UNICODE);
71                 }
72             }else{
73                 header('Content-Type: application/json');
74                 $faileLoginMsg = '{"success":-2,"msg":"Error! Cant INSERT already INSERT"}';
75                 $faileLoginJson=json_decode($faileLoginMsg);
76                 print json_encode($faileLoginJson,JSON_UNESCAPED_UNICODE);
77             }
78             //end 2.insert Data part
79         }else{ //1.check $check_User_sql->resultCount else part//check userid,token if wrong show error
80             header('Content-Type: application/json');
81             $faileLoginMsg = '{"success":0,"msg":"Wrong user id or token or lessonRCID "}';
82             $faileLoginJson=json_decode($faileLoginMsg);
83             print json_encode($faileLoginJson,JSON_UNESCAPED_UNICODE);
84         }
85
86     }//end 1. $check_User_sql
87
88 }else{
89     header('Content-Type: application/json');
90     $faileLoginMsg = '{"success":-1,"msg":"missing post data"}';
91     $faileLoginJson=json_decode($faileLoginMsg);
92     print json_encode($faileLoginJson,JSON_UNESCAPED_UNICODE);
93 }
94 // Close connections
95 mysqli_close($conn);
96 ?>

```

If the student is enrolled the course , the system will insert a roll call record to the database, after that backend controller will return a JSON formatted data to the android. If the Student is no enrolled the course ,it cannot roll call.

Appendix B1. Wong Chun Kit John Final Report

Android get QR-Code data

```

public void onActivityResult(int requestCode, int resultCode, Intent intent){
    IntentResult result = IntentIntegrator.parseActivityResult(requestCode, resultCode, intent);
    if (result == null || resultCode!=RESULT_OK) {finish();}
    if(result!=null){
        String scanContent = result.getContents();
        String scanFormat = result.getFormatName();
        try{
            JSONObject jo = new JSONObject(scanContent);
            Log.d("error_scanning",jo.toString());
            String course= jo.getString("courseID");
            String lessonRCID = jo.getString("lessonRCID");
            String timestamp = jo.getString("timestamp");

            UserBean ub= new UserBean(this);
            SharedPreferences prefs = getSharedPreferences("domain", Context.MODE_PRIVATE);
            String domain="";
            if (prefs.contains("domain")){
                domain=prefs.getString("domain", "");
            }
            new RollCallTask().execute(QRcode.this,domain,ub.getUserID(),ub.getToken(),lessonRCID,timestamp+"");
        }
    }
}

```

We use QR-Code library . Then we call the library put QR-Code data to a string, Then check the QR-Code is no expire (use network time). After that, the send the post request to the backend server have a roll call

E. Short Essay on Solving a Problem related to a Task Assigned to the Author

When I study existing roll call solution. I realized that nowadays online take attendance is used NFC technology, but the cost is very expensive, the reason is the NFC reader need install to every classroom. The Second existing roll call is using traditional methods: paper attendance sheet, it is low cost, but the process is time consuming.

The problem is if use NFC technology to take attendance is quick and simple, but school need spend a lot of money to develop. Most schools will not choose this method because it is expensive. The Second problem is if use the paper attendance sheet to take attendance, it will waste the lesson time and the paper is easy lost by human mistake.

So that, I research nowadays technology.

QR-Code technology to take roll call is the best way, the reason is QR-Code is the balance of the between faster and costly, because it is cheaper than NFC technology and faster than paper attendance sheet to take roll call.

Then, I choose the QR-Code technology as our roll call function, I spend a few days to study how to the generate QR-Code in the PHP. After that I find some library of generate QR-Code and do some sample testing to confirm, it can create QR-Code. At the last, I created a QR-Code generator controller, it can be easily called by other PHP page, After the call it will return the QR-Code as an image.

After I succeed to create the generate QR-Code function, I started to think about how to embed data into QR-Code. I firstly try to use XML format for storage the parameter, but the QR-code has limited space xml is used a lot tag, it wastes a lot the space.so that I use the JSON format for strong needed parameter in the QR-Code.

Example:

```
{"courseID":"COMP_FINALDEMO1","lessonRCID":","timestamp":"1495991350"}
```



In the android, Firstly I am not idea how to get the QR-code data. I also find some tutorial on the internet to teach me how to get data in QR-Code. After I succeed to get data in QR-Code, because I store the data as JSON format, it is an easy use Java function to decode the JSON object get back all parameters.



Appendix B1. Wong Chun Kit John Final Report

F. Self-Appraisal of Contributions

1 is low grades, 10 is higher grades

Types	Grades	Contributions
Project management.	9	I always response communication with teammate and supervisor
Development of integration plan.	9	I design server side and android communication method
Server Setting	9	Set up the server, let member can use that platform to create our system convenient
System design	8	I design the data format to let android and server communication.
System implementation and testing.	8	I am implement all backend service and provide some testing plan to our teammate for testing the system
Literature research and content analysis	8	I researched some roll call existing solution
Problem analysis and formulation.	8	I analysis roll call existing problem.
Project administrative work.	8	I manage database.
Development of evaluation plan.	6	I help our teammate to evaluation our system
Presentation preparation and delivery.	6	So, I make a PowerPoint for preparation of presentation.

Appendix B2. Chan Ho Tai Final Report

Project Title	An Online Learning System for Class Management and Class Interaction
Team Name	i3-FYPGO
Student Name & ID	Chan Ho Tai s1152236
Supervisor's Name	Dr. Li Tak Sing

I, Chan Ho Tai, s1152236, certify that the work is original and I have utilized guidance of our supervisor in completing this project, and that the content which is not our own has been attributed and referenced properly. There should be no copyrighted content without permission to use. There should be no confidential data.

Signature _____
Date ()

Appendix B2. Chan Ho Tai Final Report

C. Tasks Assigned to the Author and their Status

Responsibilities And Progress Report

Tasks	Responsible Member(s)	Target Date	Completion	Remarks
Technology Test: Android Get connected Wi-Fi (Mac address)	Tai	Sep 2016	100%	
Mobile Application				
Roll Call(Mac Address)	Tai	Nov 2016	100%	
Display the shared screen	Pizza, John, Tai	Mar 2017	100%	
Answer quiz / Vote	Pizza, Tai	Mar 2016	100%	

Web Application				
Share screen	Pizza, John, Tai	Mar 2017	100%	
Set quiz / vote	Pizza, Tai	Feb 2017	100%	
View quiz / vote result	Pizza, Tai	Feb 2017	100%	
Enroll student class	Tai	Feb 2017	100%	
Enroll teacher course	Tai	Jan 2017	100%	
Create Course	Tai	Jan 2017	100%	
Manage Course	Tai	Jan 2017	100%	
Create Class	Tai	Jan 2017	100%	
Manage Class	Tai	Jan 2017	100%	
Experiment Setup and Coordination	John, Tai, Pizza	Apr 2017	100%	

Appendix B2. Chan Ho Tai Final Report

D. Review and Appraisal of Code Section

```
WifiManager wm = (WifiManager) this.getSystemService(Context.WIFI_SERVICE);
WifiInfo wifiInf = wm.getConnectionInfo();
String macAddr = wifiInf.getBSSID();
```

It is the code from android in the roll call function. The first statement is to create a WifiManager Object to get the android wifi system service. The second statement is to create a WifiInfo object. The third statement is to assign the mac address to the macAddr variable for sending the mac address to server to match the mac address list.

```
public function getVoteQuestion($shareScreenId, $questionNumber){
    require("../connect.php");
    $sql = "select * from votequestion vq, vote v where v.voteID=vq.voteID and vq.questionNumber='".$questionNumber."'";
    $rs = mysqli_query($conn, $sql);
    if($row_rs = mysqli_fetch_assoc($rs)){
        //SQL = "select count(answer) as countA from votestudentans vsa, vote v where v.voteID=vsa.voteID and answerID=1";
        $sql = "select count(answer) as countA from votestudentans vsa,votequestion vq, vote v where v.voteID=vq.voteID and answerID=1";
        $rs2 = mysqli_query($conn, $sql);
        if($row_rs2 = mysqli_fetch_assoc($rs2)){
            $countA=$row_rs2['countA'];
        }
        //SQL = "select count(answer) as countB from votestudentans vsa, vote v where v.voteID=vsa.voteID and answerID=2";
        $sql = "select count(answer) as countB from votestudentans vsa,votequestion vq, vote v where v.voteID=vq.voteID and answerID=2";
        $rs2 = mysqli_query($conn, $sql);
        if($row_rs2 = mysqli_fetch_assoc($rs2)){
            $countB=$row_rs2['countB'];
        }
        //SQL = "select count(answer) as countC from votestudentans vsa, vote v where v.voteID=vsa.voteID and answerID=3";
        $sql = "select count(answer) as countC from votestudentans vsa,votequestion vq, vote v where v.voteID=vq.voteID and answerID=3";
        $rs2 = mysqli_query($conn, $sql);
        if($row_rs2 = mysqli_fetch_assoc($rs2)){
            $countC=$row_rs2['countC'];
        }
        //SQL = "select count(answer) as countD from votestudentans vsa, vote v where v.voteID=vsa.voteID and answerID=4";
        $sql = "select count(answer) as countD from votestudentans vsa,votequestion vq, vote v where v.voteID=vq.voteID and answerID=4";
        $rs2 = mysqli_query($conn, $sql);
        if($row_rs2 = mysqli_fetch_assoc($rs2)){
            $countD=$row_rs2['countD'];
        }
        $total = $countA+$countB+$countC+$countD;
        if($total==0)
            $total=1;
        echo '
<h2>Vote</h2>
<table>
<tr><td colspan=\'2\'>
<div>Question '.$questionNumber.'</div>
</td></tr>
<tr><td colspan=\'2\'>
<div>Question:</div>
</td></tr>
<tr><td colspan=\'2\'>
<div class=\'question\'>'.$row_rs['question'].'</div>
</td></tr>
<tr><td colspan=\'2\'>
<div>Answer:</div>
</td></tr>
<tr>
<td><div class=\'answer\'>'.$row_rs['answerA'].'</div></td>
<td>'.($countA*100/$total).'%</div></td>
</tr>
```

It is the code from vote class in the voting function on the website. The first SQL statement is to select one vote question from the database which matches the vote id and question number. If matched, it will select the answer count of each answer in this question. Finally, it will add up all counting's to a total variable and print the table to the sharing screen web page. “\$countA*100/\$total”, it is calculated the percentage of students answered choice. When calculating the

total, if total is 0, it will set total be 1 to prevent 0 divided by 0. Thus, the table can display normally when no one answered.

For improvement in the implementation, sql statement should be replaced by prepared statement for security. The printing code of the vote table should place into share screen instead of placing in the class. Thus, the forward change on UI can only change the View of the website without changing the classes.

```

public function importStudent(){
    if( iset($_FILES['CSVuploads'])) {
        $tempname = $_FILES['CSVuploads']['tmp_name'];
        $file = fopen($tempname, "r");
        require("connect.php");
        while(! feof($file)){
            //print_r(fgetcsv($file));
            $array = fgetcsv($file);
            $studentid = $array[0];
            $classid = $array[1];
            if($studentid != ""){
                $sql = "select userlD from user where userlD='".$studentid."'";
                $rs = mysqli_query($conn, $sql);
                if($row_rs = mysqli_fetch_assoc($rs)){
                    $sql = "select classID from class where classID='".$classid."'";
                    $rs2 = mysqli_query($conn, $sql);
                    if($row_rs2 = mysqli_fetch_assoc($rs2)){
                        $sql = "select count(userID) as count from student_class where userID='".$studentid."' and classID='".$classid."'";
                        $rs3 = mysqli_query($conn, $sql);
                        if($row_rs3 = mysqli_fetch_assoc($rs3)){
                            if($row_rs3['count'] == 0){
                                $sql = "insert into student_class (userID,classID) values ('".$studentid."', '".$classid . "')";
                                $rs4 = mysqli_query($conn, $sql);
                            }
                        }
                    }
                }
            }
        }
        fclose($file);
        mysqli_close($conn);
        echo "<script>location.href='importStudent.php?courseid=".$_GET['courseid']."'&errmsg=No_Student_Id_Imported';</script>";
        break;
    } else{
        fclose($file);
        mysqli_close($conn);
        echo "<script>location.href='importStudent.php?courseid=".$_GET['courseid']."'&errmsg=No_File_Received';</script>";
        break;
    }
}
fclose($file);
mysqli_close($conn);
else{
    echo "<script>location.href='importStudent.php?courseid=".$_GET['courseid']."'&errmsg=No_File_Received';</script>";
}
echo "<script>location.href='..../viewCourse.php?courseid=".$_GET['courseid']."'&msg=Student_Imported';</script>";

```

It is the code from ClassLesson class in the enroll student function on the website. The first if condition will check is it a file posted. If yes, “while(! feof(\$file))“ is for read though the file from line 0 to end. “\$array = fgetcsv(\$file);” will get a row of the file and convert to array format. Then, it will check is it the first row of file. If class id is equal “class id”, it is showing it is the header of the table in csv, so it will skip it. If it is not the header of the csv, it will check the class exists and check the student exist, if not, it will break the loop and send an error message to user. If both are existing, it will check is the student already enrolled to the class. If student is not belonging the class, it will insert a new record to database. If student is belonging the class, it will skip to insert the record to database. Finally, it will go to next row and do checking and inserting again.

For improvement in the implementation, SQL statement should be replaced by prepared statement for security. For checking class existing or student existing may be using one SQL to check it.

Appendix B2. Chan Ho Tai Final Report

E. Short Essay on Solving a Problem related to a Task Assigned to the Author

As writing the web pages, it needed a lots of jQuery code to handle the UI response for appending new layout or remove it, like create/ update quiz, create vote.

I found that the appended html code cannot use the jQuery function which matched by element id since the jQuery function cannot sense new code in the document. Thus, the jQuery function was not work in the appended code.

When I faced this problem in developing quiz function, I decided to appended a new jQuery function after appended the html code to prevent the jQuery could not find the html element. While I was developing vote function, I went to Internet to found is it other solutions. I found that jQuery can use

`$(<element>).on('change','<class>' ,function())` format for matching the append code. The append code only needed add the class for matching the condition.

In the quiz function, I tried to put the appended code to a PHP file and using ajax function to get the appended code back. As PHP file can print JavaScript code out during printing the html code to front page. Since, the html code was loaded before the JavaScript code loading, the appended jQuery function could be worked. In the vote function, I tried to follow the solutions I found. Thus, the code on the html document can be shorted.

In the result, using the `$(<element>).on('change','<class>',function())` format is more suitable than using PHP to append a new jQuery function to do the same process. As can reduce the duplicated code in the append code. It is easier to read, as it only need add a class to the html element. Thus, finding bug in the code is easier since it only need to check the class. On the other hand, append jQuery function by PHP file will print the same function every time. It has a lower performance than using class for matching. It has a low readability than using class for matching too. Using PHP appending will involve two files, user need read two files. Yet, using class for matching can write in the same file. Thus, it can separate the view and controller.

In conclusion, using class for matching the appended html code is better than using PHP code to print a new JavaScript function for handling the appended code. As, using class for matching has a high readability.

Appendix B2. Chan Ho Tai Final Report

F. Self-Appraisal of Contributions

	Contribution	Grade (bad/ good/ excellent)
System implementation and testing	I implemented most teacher websites and I designed the system testing plan.	Good
Literature research and content analysis	I wrote the part of literature review and found the related articles.	Excellent
System design	I participated in discussing the database design.	Good
Problem analysis and formulation	I helped to find out the main problem in this project.	Good
Development of evaluation plan	I designed the evaluation plan and helped writing the questionnaire.	Good
Development of integration plan	I designed to write the socket server should developed in class. Yet, pizza developed it in not a class.	Bad
Presentation preparation and delivery	I helped writing the PowerPoint for presentation	Good
Project management	I have not manage my team member to do their works.	Bad
Project administrative work	-	-
Liaison with external partners	-	-

Appendix B3. Chan Po Chi Final Report

Project Title	An Online Learning System for Class Management and Class Interaction
Team Name	i3-FYPGO
Student Name & ID	Chan Po Chi s1152602
Supervisor's Name	Dr. Li Tak Sing

I, Chan Po Chi s1152602, certify that the work is original and I have utilized guidance of our supervisor in completing this project, and that the content which is not our own has been attributed and referenced properly. There should be no copyrighted content without permission to use. There should be no confidential data.

Signature _____

Date ()

Appendix B3. Chan Po Chi Final Report

C. Tasks Assigned to the Author and their Status

Tasks	Responsible Member(s)	Target Date	Completion	Remarks
Mobile Application				
User Login	Pizza, John	Nov 2016	100%	
View course	Pizza, John	Nov 2016	100%	
View course material	Pizza, John	Nov 2016	100%	
Display the shared screen	Pizza, John, Tai	Mar 2017	100%	
Answer quiz / Vote	Pizza, Tai	Mar 2016	100%	

Web Application				
Upload course materials	Pizza	Feb 2017	100%	
Share screen	Pizza, John, Tai	Mar 2017	100%	
Set quiz / vote	Pizza, Tai	Feb 2017	100%	
View quiz / vote result	Pizza, Tai	Feb 2017	100%	
Experiment Setup and Coordination	John, Tai, Pizza	Apr 2017	100%	

Appendix B3. Chan Po Chi Final Report

D. Review and Appraisal of a Code Section

Selection 1

```

tv.setOnClickListener(v) -> {
    if (new NetworkConnected(activity).hasNetwork()) {
        tv.setEnabled(false);
        new Handler().postDelayed(new Runnable() {
            @Override
            public void run() {
                tv.setEnabled(true);
            }
        }, 5000);
        String httppath = "";
        if (filePath.startsWith("7")) {
            httppath = filePath.substring(1);
        }
        String url = (String) args[1] + httppath;
        Log.d("urluri", url);
        DownloadManager.Request request = new DownloadManager.Request(Uri.parse(url));
        Toast.makeText(activity, filename + " Start to download " + filename, Toast.LENGTH_SHORT).show();
        request.setDescription("Downloading :" + filename);
        request.setTitle(filename);
        if (Build.VERSION.SDK_INT >= Build.VERSION_CODES.HONEYCOMB) {
            request.allowScanningByMediaScanner();
            request.setNotificationVisibility(DownloadManager.Request.VISIBILITY_VISIBLE_NOTIFY_COMPLETED);
        }
        request.setDestinationInExternalPublicDir(Environment.DIRECTORY_DOWNLOADS, filename);
        DownloadManager manager = (DownloadManager) activity.getSystemService(Context.DOWNLOAD_SERVICE);

        BroadcastReceiver onComplete = new BroadcastReceiver() {
            public void onReceive(Context ctxt, Intent intent) {
                Toast.makeText(ctxt, filename + " Download completed", Toast.LENGTH_SHORT).show();

                Intent install = new Intent(Intent.ACTION_VIEW);
                install.setDataAndType(Uri.fromFile(new File(Environment.getExternalStoragePublicDirectory(Environment.DIRECTORY_DOWNLOADS)
                    .getAbsolutePath())));
                ctxt.startActivity(install);
                ctxt.unregisterReceiver(this);
                // ctxt.startActivity(install);
                // ...
            }
        };
        activity.registerReceiver(onComplete, new IntentFilter(DownloadManager.ACTION_DOWNLOAD_COMPLETE));

        manager.enqueue(request);
    }
} else{
    Toast.makeText(v.getContext(), "No Network Connected", Toast.LENGTH_LONG).show();
});

```

Appendix B3. Chan Po Chi Final Report**Selection 2**

The code the onclicklistener waiting for the user to active it. Once the student click the download button(tv), the program code will check the connection status. If it is online, the Download Manager will start Intent to download the file from the server. The new intent has a callback function to notice the Download Manager that the download is finish. When it is complete, the program will open the file.

Selection 3

The problem is that the program design is incorrect. It should be some the error checking before download, if there is existing file, the program should search the file from the local storage. And the program opens the file.

Appendix B3. Chan Po Chi Final Report**E. Short Essay on Problem Solving**

The implement of share screen function that socket programming is the most significant task assigned to me.

It is hard to determinate which language should be used to develop the client side and the server side socket.

When I am going to select the language socket server, I knew PHP is not support thread. There are many limitations to use the PHP socket in programming. For example, it cannot update UI when the socket is running.

I spent a lot of time to try other possible solution like HTML Web-Sockets, node.js. Also, there are tons of limitation. Some of the language need Port forwarding or need extra server to support. (e.g. Cannot request port forwarding from school)

Finally, I chose PHP for my server side socket .I used the open library to (read, write ,modify the txt file). In every loop, the program read the txt file to get the current status (e.g. pagenum=1, server=open). The program will send the status to client side when any change.

Afterwards, I write a controller to access the file. Teacher can use jQuery to call the controller for changing the page

(e.g. changePage.php?pagenum=2&portId=9001)

(e.g. closeServer.php?portId=9001)

When I am going to select the language client server, I knew Java has a socket library. However, I found the socket server library that I written is not support Java socket.

The design of the share screen content is HTML, I found it is possible to use webview(WebAppInterface) to implement the socket I create a HTML contain the jQuery and Web-Socket library. The benefit is that every time the server socket sends the message(pageid) to Web-Socket. The share screen can be update through HTML code, without include any Java coding.

The program code was finished by a lot of trying. However, the socket server and client works fine in same network. However, both of them placed in different network the socket will be failed. The problem is that the port must be forwarded.

And there are no default port forwarding in our outsource server. We need send email to apply it.

To conclusion, share screen function successfully implemented. I think socket programing is very changeling. And I found when the system need to socket programing, the selection of server side language must be careful and it should be able to use threading.

Appendix B3. Chan Po Chi Final Report

F. Self-Appraisal of Contributions and Grade

	Contribution	Grade
System implementation and testing	I developed most of the android application. And I develop the socket programming which communicate with android application.	A++
System design	I participated in system design. For example, the design of system architecture, database, software etc.	A
Problem analysis and formulation	I participated in find out the main problem in this project.	B
Presentation preparation and delivery	I wrote the speech and present in every presentation. And I gave the idea whether what information should not include in the presentation.	B
Development of integration plan	I rarely make integration plan. I have only design how to integrate the server socket.	B
Project management	-	C
Project administrative work	-	C
Liaison with external partners	-	C
Development of evaluation plan	-	C

Appendix C - Questionnaire

OUHK -FYP- I3FYPGO

The purpose of the survey is to collect essential information about OUHK - Bachelor of Computing with Honours in Internet Technology 2016-2017 "i3FYPGO" team Fyp System

*必填

Part 1 點名

1. 1.你覺得用傳統紙張點名效率如何？*

您只能標示一個橢圓形。

- a.好慢
- b.慢
- c.一般
- d.快
- e.好快

2. 2.你覺得用了 i3fypGo-Online Learning Class Management 既網上點名效率如何？*

您只能標示一個橢圓形。

- a.好慢
- b.慢
- c.一般
- d.快
- e.好快

3. 3.你覺得用 網上點名/傳統紙張點名，哪一種較方便快捷。*

您只能標示一個橢圓形。

- a.網上點名，較方便快捷
- b.傳統紙張點名，較方便快捷

4. 4.我覺得 網上點名 在課堂上使用會減少浪費上堂時間？*

您只能標示一個橢圓形。

1 2 3 4 5

極不同意 極同意

5. 5.你覺得 網上點名 好處是什麼 *

請選擇所有適用項目。

- a.方便快捷
- b.減少點名時,浪費上堂時間
- c.不會過了一整堂,仍未點名
- d.學生不能替其他人點名
- e.不會點錯其他學生名
- 其他 : _____

6. 6.你覺得 網上點名 壞處是什麼 *

請選擇所有適用項目。

- a.麻煩,需要攜帶手機回校
- b.需要使學校wifi網絡
- c.點名慢
- d.應用程式反應慢
- 其他 : _____

7. 7.你覺得 傳統紙張點名 好處是什麼 *

請選擇所有適用項目。

- a.清晰
- b.方便快捷
- c.減少點名時,浪費上堂時間
- d.不需要攜帶手機回校
- 其他 : _____

8. 8.你覺得 傳統紙張點名 壞處是什麼 *

請選擇所有適用項目。

- 浪費上堂時間
- 點名時很容易,剔錯了其他日期
- 找不到自己的名字
- 點名表格很亂
- 過了一整堂,仍未點名

9. 9.總括而言,你對網上點名系統滿意嗎? *

您只能標示一個圓形。

1 2 3 4 5

非常不滿意 非常滿意

Appendix C - Questionnaire part 2

2.Download Material

10. 1.你覺得下載流程長嗎？

您只能標示一個橢圓形。

- 非常短
- 短
- 長
- 非常長

11. 2.你覺得需時多嗎？

您只能標示一個橢圓形。

- 非常短
- 短
- 長
- 非常長

12. 3.你覺得用手機app比網頁快嗎？

您只能標示一個橢圓形。

1 2 3 4 5

非常不讚成 非常讚成

13. 4.你覺得整體方便嗎？

您只能標示一個橢圓形。

1 2 3 4 5

非常不方便 非常方便

14. 5.你對這個下載方法滿意嗎？

您只能標示一個橢圓形。

1 2 3 4 5

非常不滿意 非常滿意

Appendix C – Questionnaire part 3

Interaction - Share Screen & Vote & Quiz

15. 1.你覺得畫面同步反應快嗎？

您只能標示一個橢圓形。

- 非常快
- 快
- 慢
- 非常慢

16. 2.你覺得畫面同步有令你看到更清晰的投影內容嗎？

您只能標示一個橢圓形。

1	2	3	4	5	
非常不讚成	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	非常讚成

17. 3.你覺得畫面同步有助你集中課堂嗎？

您只能標示一個橢圓形。

1	2	3	4	5	
非常不讚成	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	非常讚成

18. 4.你覺得畫面同步方便嗎？

您只能標示一個橢圓形。

1	2	3	4	5	
非常不方便	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	非常方便

19. 5.你對這個畫面同步滿意嗎？

您只能標示一個橢圓形。

1	2	3	4	5	
非常不滿意	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	非常滿意

20. 6.你覺得投票功能有助你參與課堂嗎？

您只能標示一個橢圓形。

- 非常有幫助
- 有幫助
- 沒有幫助
- 完全沒有幫助

21. 7.你覺得投票的結果表示清楚嗎？

您只能標示一個橢圓形。

- 非常清楚
- 清楚
- 不清楚
- 非常不清楚

22. 8.你覺得投票功能方便嗎？

您只能標示一個橢圓形。

- 非常方便
- 方便
- 不方便
- 非常不方便

23. 9.你對這個投票功能滿意嗎？

您只能標示一個橢圓形。

1 2 3 4 5

非常不滿意 非常滿意

24. 10.你覺得測驗功能的核對答案速度快嗎？

您只能標示一個橢圓形。

非常快

快

慢

非常慢

25. 11.你覺得手機做測驗有沒有提升做測驗的彈性

您只能標示一個橢圓形。

有

沒有

26. 12.你覺得測驗功能方便嗎？

您只能標示一個橢圓形。

非常方便

方便

不方便

非常不方便

27. 13.你對這個測驗功能滿意嗎？

您只能標示一個橢圓形。

1 2 3 4 5

非常不滿意 非常滿意
