



Student Learning System App——Mobile Application

Module Code:CMT404

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1 Abstract

In this project, I want to create a Android application, which is the mobile terminal of the learning center of Cardiff University so that students can use the learning center more conveniently through mobile phones, I named him 'Bright Space'

The program I want to make is a mobile application of the student learning system of Cardiff University. The purpose is to help students increase the efficiency of learning and make their learning more convenient. Due to the severe global epidemic, more and more countries and Schools started to take classes remotely, which caused several problems.

1. The students come from different countries and different countries have different time differences, so the class time is different. It will appear that the school time is daytime, but the student time is night or early morning, so that the students may be doing other things during the live broadcast class. Things, or it's inconvenient to use a computer to go to class.
2. Due to remote classes, many times students do other things at the time when they should be in class, or there is no computer around to take live classes.
3. When students want to review or review previous courses, and want to check course materials and watch course replays to learn, it is very inconvenient to use the computer

The problem is that many students can only log on to the web using laptops to watch course materials and play back videos. When students go out without a computer and do not have a large space to put the computer, it is impossible for students to watch the course materials and replay the video. If I add this function, it is very convenient for students to review and study anytime and anywhere by using mobile phones and iPad. As user experience is improved, the usage rate will increase, and students' learning will be more efficient.

2 Acknowledgements

Firstly, I would like to thank my supervisor, Dr. Beryl Noe, for her comprehensive advice and guidance throughout the project. During the project, from the topic selection of the dissertation to the completion of the entire project, Dr. Beryl Noe gave detailed guidance. Her humble attitude and rich professional knowledge gave me a deep impression and benefited me a lot. Especially the useful documentation and constructive suggestions she provided played an essential role in promoting the completion of the project.

Secondly, I would like to thank all the professors and lecturers of this year. Under their teaching, I learned much useful knowledge.

Lastly, I would like to thank my friends and classmates, who gave me much technical guidance. Also, I want to thank my family for their financial support and spiritual encouragement.

3 Introduction

Ever since the pandemic outbreak, CO-VID 19 impacted the lives of every person around the globe. Having said that, universities had to adapt to remote teaching and respectively the students had to adapt to the remote learning process. Many universities already had student web platforms where it allowed for a mixed way of teaching.

For offline teaching, we can take the laptop to the school's classroom to attend class. Professors can now use the projector to cast the screen to teach. All the learning materials that students need include the need to go to the library to find some paper books. Or go to the school's official website to download some of the courseware and materials uploaded by the teacher during class.

But now because of the epidemic, most students in most schools have chosen to take classes remotely. As a result, the original way of finding paper books for students will waste time and become inefficient. At the same time, these students have free time and free learning methods. When they normally need to go to class in the classroom, the students may be sleeping, shopping, going to the bathroom, or on the subway or car. The laptops are too big.

As a result, students do not have the opportunity to study with laptops currently. Using a computer for class or study requires a flat and stable place to attend class or check information, but these scenarios are very inconvenient, so students will choose to give up learning in this scenario, Delayed the course meeting, delayed the project progress and so on.

I want to make a Mobile terminal of Learning Center here. Through the mobile phone, students can watch the school's live courses at the same time, and they can also watch the school's course replays. You can also view all the course materials and the teacher's courseware on the mobile phone. The teacher can also upload replays and replays through the app. Course materials.

Students can use the mobile terminal of the learning center to watch the video playback of the course, find the learning materials of the course and check the grades, etc.so that the students and other learning will become efficient, and they can use their mobile phones or iPad anytime, anywhere. To operate and then learn, the teacher can also easily manage the course.

4 Aim & Objectives

The main purpose of the project is to develop a functional application that can be used as a mobile learning center for students in the school organization, which greatly facilitates all students in the team and increases the learning efficiency of students.

The second goal of the project is that the final product is an attractive and user-friendly native Android application. The application should have an intuitive user interface and should have an attractive design.

In order to achieve these goals, the following goals must be achieved

First, create an MVP (Minimum Viable Product) before the project deadline, where the main functions of the application have been successfully implemented and tested. The functionality and usability of the application should have a sufficiently high standard to meet the requirements for publishing the application to the Android application store.

Second, the user interface and user experience of the application must be adequate. It must be user-friendly enough so that students and professors can use the application without difficulty to ensure that the organizational process is more efficient. The application must be intuitive and easy to use, with minimal explanation of the steps required to use all application functions.

Finally, in order to successfully achieve all goals and complete the project on time, effective project planning, organization, and time management must be adopted from the beginning. This will be achieved using agile development methods, focusing on obtaining effective products and quickly responding to any unforeseen problems. At the same time, it is often ensured that the project is carried out in accordance with the prescribed project timetable to meet the final deadline.

5 RELATED WORK

I will conduct a comprehensive functional analysis of the web-based learning center to determine which functions I want to add to the mobile learning center and explain the reasons, to analyze these specific functions. The web version of the learning center is a very complete and fully functional website for all students at Cardiff University to learn related content. The functions of this website are Institution, Personal Center, Activity Stream, Course, Organizations, Calendar, Messages, Marks.

Institution

This function is a very critical function, which is a general entrance combining other key websites of the school. Students can click Institution, and then they can find the official website of Cardiff University, Library link, student's timetable, student's email link, student's college website, etc. These are all very important websites with the highest daily usage rate of students, such as students' timetable. The learning website that every student sees most every day is the timetable, get up every day to see when the first class is today, when there is a meeting, and before going to bed to see if there is a class the next day, as well as the exam period, students will watch the specific examination time and the deadline for submitting various reports through the timetable. In addition, there will be a live link for each course in the timetable. Students can directly jump to teams or zoom to hold meetings, group discussions and classes by clicking on the link.

The Mail function is also used very frequently, but because our mailbox uses outlook, students can use outlook app to view daily mail very conveniently. Some other school links are mostly links that school very important students will use.

In view of these functions, a survey was made on whether students prefer to use mobile phones or computers. According to the survey results, most students think that checking the timetable is more convenient to check through mobile terminals, because turning on the computer and logging in is a tedious process. However, for other functions, most students use them more in classrooms and libraries when learning, which will not affect the experience. Therefore, I plan to add the timetable function to the mobile terminal of the learning center. On the mobile terminal, I want to ensure the clarity of the timetable and create a calendar format. students can clearly know the specific time and date through the timetable, and can also clearly know the time to do in the future through the timetable. At the same time, because different students have different student scenarios, the course link will also be added to the mobile terminal, using the interfaces of teams and zoom, in this way, students can flexibly choose whether to use the web version or mobile terminal according to their own needs.

Personal Center:

The main function of the personal center is to show teachers and schools some basic information, such as photos, names, student numbers, email addresses and some other basic information, such as date of birth, education level, personal website, mobile phone number, mailing address, professional information of the company, etc. These are some very comprehensive information that can let the school know your situation better. When schools or teachers need to check your information, they can check it according to the information you fill in in the personal center. However, many of these information is unnecessary information, such as mailing address, company or personal website. The most important information is your name, student number and email address, because teachers know more about this information to give grades or send emails.

According to whether the filling of personal information needs to be added to the mobile terminal for investigation, most of the students have not used this function, because they feel that they do not have a lot of information, for example, because the company is a student, so I decided to put the three most important basic information, name, student number and email address on the mobile terminal of the mobile phone and mark them.

The frequency of using personal information is not high for students. They can all be very clear and remember their basic information. In terms of non-functional analysis, we only need to ensure that this function is easy to operate and the user interface is beautiful. This is a very basic function.

Activity Stream:

Activity flow is a list of all modules including school news, learning materials, video playback and other daily Different added content, which can be clearly seen, such as video playback, you can clearly know the new Upload date, specific courses and video title in the list. After clicking in, you will go to the video playback function and directly find the exact position of the video (I will analyze the video playback function later), it can help students save a lot of time to find the video of this lesson from the list of all courses in video playback. For example, you can also see the specific course name, upload time, and material name of the learning materials. After you click it, you will be redirected to the exact position of the material on the course materials function page, helps students reduce the time to find specific data in all data lists, because they need every data directory to find. What's more, we can also see the newly announced results in the activity flow. After the students finish the test, everyone is looking forward to knowing their results, moreover, the time for publishing the results of each course is different. At present, students only need to click on the activity flow every day to clearly know when the results will

be published, and click on the link to publish the results, they will jump directly to the results function page to see the detailed grades.

The function of activity flow is very important and novel, which makes students learn and get the information they want more efficiently. So, I decided to add this function to the mobile terminal of the learning center. Every day, students only need to open the app to collect the information they want, instead of collecting the information you want by turning on the computer every time, you can arrange your own plans efficiently at the same time. This can increase efficiency and facilitate students. Non-functional analysis: This function needs to ensure that the Time list is clear on the mobile terminal, that students can clearly see the date, and choose and judge according to the date. In other places, you only need to ensure that the user interface is beautiful.

Courses:

courses are the core function of the learning center. After you click to enter the courses on the webpage, the schedule of one semester will be displayed. You can choose different courses in different semesters with the term as the option, it is very intuitive and clear for students to understand the details from semester to course to course. And there is a search function on this page, you can search for the courses you want.

In the course list, the course name and the professor's name are displayed in detail. You can choose optional courses and courses to be started. The following will explain in detail the functional details after clicking on a course. Computer-based courses are very complex, comprehensive and rich functions. It contains announcements, module overview, module description, module team, module schedule, learning and teaching, learning materials, assessment and feedback, discussion board, reading lists, library search, online learning guidance, groups and chassis, etc. Each function is very important in students' learning process.

In the function of announcements, there are some messages about the learning plan given by the professors of each course at different times. Some are to guide everyone to prepare and preview before class, and some are to leave messages after class, let me tell you the next plan. This is an instructive function. This function is more for students to make their own plans according to the professor's message in the learning process, and this function is more often used in the web learning center, it is not suitable for students to operate when using mobile phones or iPad.

Module description this function is an introductory function, which will introduce courses in detail, such as course name, course id, credits, course grade, course leader, semester, time, including the proportion of exam results and other very detailed information. Most students will

understand the basic information only at the beginning of this course and during the examination period. At the beginning of this course, students should know the basic information of this course and know the examination information of this course through this function during the examination. This function is very important, but it is not commonly used. Therefore, it is not necessary to add this function to the mobile learning center, because students know more about this information in a formal environment, for example, when studying in the classroom or library, most students will not check the basic information in the daily learning process.

This function of Module team is to introduce the function of the teaching team of the course, which mainly shows the introduction of some basic contact information of the professor, and some teachers want to give students an introductory message display for this course. This function is mainly an introductory function. Most students will learn the basic information and Professor information of this course at the beginning of this course. And when you want to find the professor's contact information, you will go through here to check, but after communicating with the professor, you can communicate through records in the future without re-searching, therefore, this function does not need to be added to the mobile terminal, and students use it less frequently.

This function of Module Schedule is to show the detailed planning of the whole course of a course. It may be a PDF file containing the overall detailed learning plan and arrangement of the course, most of the time, students need to check this function through computers, and the learning environment is formal. For example, in professors or libraries, students know the plan by checking the module schedule, then arrange your own learning plan, and this function is not frequently used by students, so this function will not be added to the mobile terminal of the learning center.

Learn materials

The course materials contain a lot of the most used functions for students, such as the ability to view the teacher's class materials, as well as the preview materials, and even include a lot of playback videos, students can fully review and preview in the learning materials function. At the same time, search and classification functions are also made, so that students can easily find the file they want to see in a lot of materials. So, this function is the most important function, and I will add it to the program I designed.

Calendar

At the same time, the timetable is also one of the most important main functions. I will also add it to the mobile app that I made. The timetable is viewed every day by all students. It is used

very frequently, and it is in a clear timetable. It also allows students to better arrange their own time to increase efficiency. The timetable also contains a live link of the course, click to jump directly, I will keep these functions and then design the mobile terminal into the software.

Marks

For students, what is more important is their grades. No matter elementary school, high school, or university, there will be examinations. The examination results are also a verification of the students' periodic learning. Most students hope that the first time after the results is obtained You can see your own results, so adding this necessary function to the mobile terminal will also increase the frequency of students' use and increase the comprehensiveness of the mobile application.

6 background Material

6.1 Competitor Analysis

blackboard app: Currently, some sections include course dynamics, course, organization, grade, asset, expiration date, and the main function of setting is to let students view the course and deadline of the course, then you can check the score disadvantage: there is no exclusive entrance to the class link, you need to download teams separately, or zoom is very inconvenient and inefficient to log in and hold meetings. The second is that there are no course materials and playback videos in the blackboard. Students must log in to learn on the computer if they want to download course materials and playback videos.

Brightspace: The main function of the student system of this software is to combine the course schedule, course module, course materials, course playback, live jump link of the course, and the most used Collection of students with scores.

Advantages: such a mobile app can meet students' various needs under various conditions. For example, if a student does not have a computer but only a mobile phone or ipad, he can go to class directly, after class, you can directly click on the course module to review the video playback and materials uploaded by the teacher. Without this software, students may delay their progress and can only study until they return to the dormitory.

Second advantage: Although this app is a minimum feasible model, all functions are the functions that students use most, which can increase the utilization rate of students, when the usage rate of this app is very high, we can perform iterative update on this app to add new functions, such as students' check in, various questionnaires of the school, students' class situation, as well as many things that are convenient for schools to collect students' information and ideas, so that there is no need to send emails in outlook. Because I asked many students and learned that mailbox is not the app with the highest utilization rate for students. I often read mailbox once every few days, which makes many messages very untimely. If you iterate and use this app later, it will increase the efficiency of the school and facilitate the school.

The third point can also help schools increase advertising revenue: there are often some community activities or activities of other organizations, and they need to send advertisements to increase students' participation, but now it is more sent by email and put together with important messages, which will become a mess. Students don't want to see it and open it to see it, and it will make some important emails invisible, but this app has the function of news delivery page, where you can put some important school news and advertisements of clubs or other organizations, even recruitment information can also increase the income of schools.

The disadvantages are as follows: firstly, the interface between the server and database of the school needs to be connected to this app, and the engineers of the school need to cooperate to complete certain work. Secondly, the development and iteration of the basic app need to be completed, one front engineer, one server engineer, one design engineer and one test engineer are required, which will cost the labor cost of the school and require long-term maintenance and update in the later period.

Teacher system: Teachers can log in to this app to complete all the corresponding work, such as uploading scores. It is very convenient to select students and directly input scores to complete it. The operation is very simple

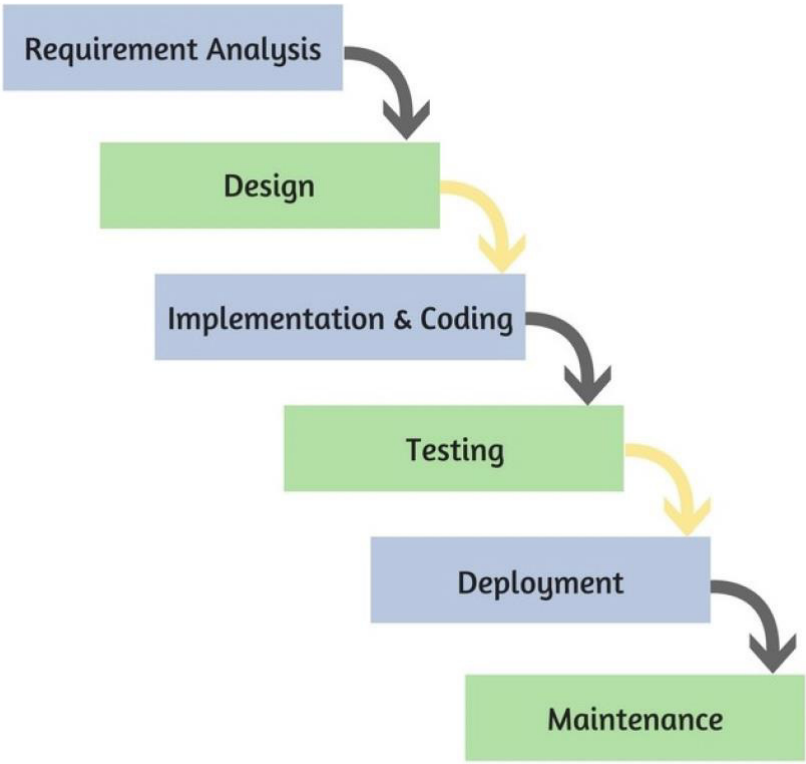
You can also upload videos and course materials very simply. If the teacher just needs to use a mobile phone or iPad at this time, for example, the teacher just finished the class, however, we need to go out for dinner or other dates and meetings, and we don't have time to finish these tasks through computers. However, with this app, teachers can upload video playback, course materials and even the results through mobile phone and app during the time on the road, because the teacher's workload is very heavy and very hard, besides, teachers also have their own life, which requires dates, shopping and rest. It is impossible to sit and do it all the time.

I will constantly update the teacher system to add some more needed requirements for teachers. It will be very convenient to log in to the app to complete the above operations, which will increase students' learning efficiency and students' learning enthusiasm at the same time. School work can also be completed more efficiently and more conveniently. Teachers can also work efficiently, reduce working hours and have more time to do what they want to do.

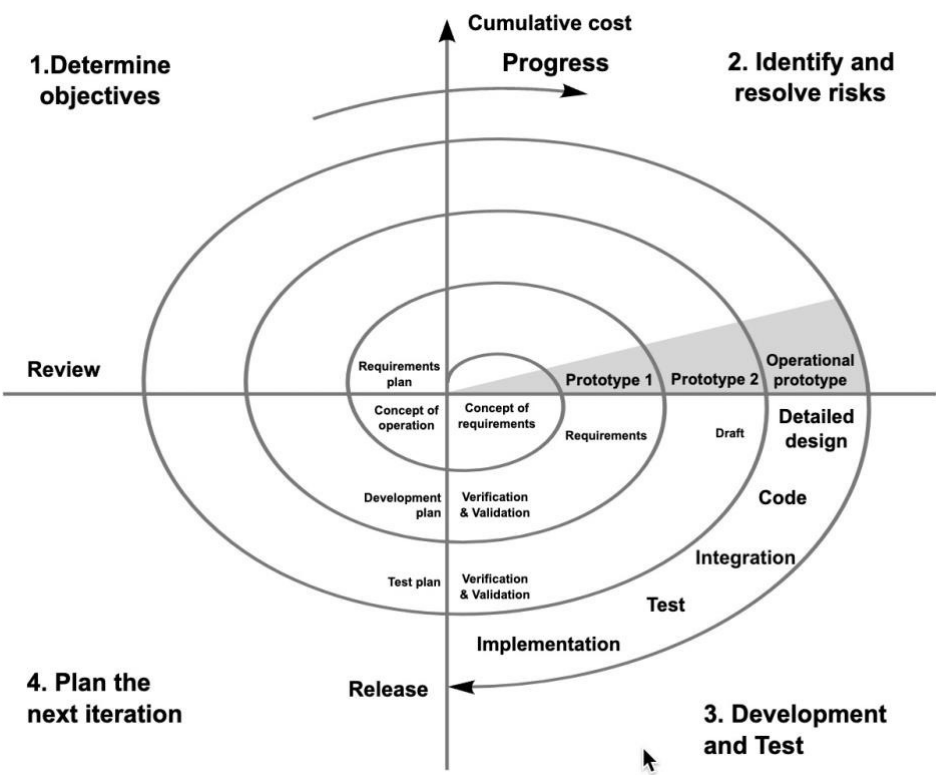
6.2 Software Development Methods

There are a vast range of different software development models to follow when developing a piece of software. Which model is most appropriate depends on several factors, such as the project requirements, the lifetime of the project scheduling constraints and levels of interaction between professors and the students?

One common traditional software development method is the waterfall model, a rigid model in which the development process is broken down into several clearly defined stages [1]. Work is undertaken in order of these stages; each stage has a deadline by which the work must be completed. The model is very inflexible and, in theory, does not allow for stages to be revisited once completed. The waterfall model suits projects where the requirements are well understood and clearly defined from the outset.



Another traditional approach to software development is the spiral model, proposed by Barry Boehm in 1986 [2]. The spiral model is an iterative, risk-oriented model that guides developers to adopt one or more development methodologies and utilize the best methods from each. The spiral model requires high levels of domain knowledge and is a costly method to follow. It does allow for a flexible approach to development and allows each feature to be iteratively improved upon. An image of the process of the spiral model can be seen below.



Finally, a more modern approach to software development that is most implemented today is the agile model, in which the projects requirements and solutions gradually evolve through the development process [3]. The agile model allows for a more flexible and adaptive approach to software development and focuses on developing working software rapidly, allowing projects to be delivered quickly and then gradually improved upon. In the agile model, many different stages that would be distinctly separate in the waterfall model overlap, for example testing and development are undertaken together within each iteration. There are several agile frameworks that are based upon the agile methodologies. Such as scrum, an iterative and incremental process for organizing complex projects [4]. And Kanban a lean method that focusses on managing workload by tasks and a clear workflow, implemented by a Kanban board. The Kanban approach allows for flexible and rapid development of software products [5]

6.3 Software Quality

In order to achieve the production of a successful application the underlying software must be well written, well organized and resilient. ISO 25010 (supersedes ISO 9126) is the international standard for the evaluation of software quality, the standard was born from the SQuaRE project (Software product Quality Requirements and Evaluation) [6]. It is comprised of a product quality model composed of eight characteristics relating to the static properties of software [6], these are: functionality, accuracy, efficiency, compatibility, usability, reliability, security, maintainability and portability. In order to meet these requirements outlined by ISO there are several software best practices were adopted in the development of this software project.

Programming style is particularly important when developing a software product, the codebase should be readable and well organized. This enables code to be more easily improved later as it is easy to understand what a piece of code is trying to achieve. Readable and understandable code also helps with developing reliable code, in order to develop something well every line of code should be understood and fit in with the code surrounding it. These best practices were adhered to in this project by following the Airbnb React/JSX style guide [7], a guide that is mostly based on standards prevalent in JavaScript.

Further to programming style, code documentation is also an important factor in developing a product that adheres to ISO 25010. It helps anyone inspect and understand the code immediately, whilst also ensuring the codebase is maintainable.

Finally, another particularly important feature of application development is security, there are many factors that impact the security of an application that are dependent on many different factors. In this project the best practices for the technologies used were followed and key aspects to security were implemented. It was most important to ensure the backend of the project was secure, as there will be personal data stored on the server. To ensure the API (application programming interface) developed was secure user authentication, TLS (transport

layer security) and password hashing were all implemented, this is discussed in detail later in the report.

6.4 Technology Stack Research

6.4.1 Frontend Technologies

The frontend of the application is a user-oriented interface that is downloaded to the user's device.

A native Android mobile application was developed in this project. There are several modern development techniques available, each with its own advantages and disadvantages. For Android device development, the most common used languages are Java, Kotlin (Kotlin is a static programming language for modern multi-platform applications, developed by JetBrains, and has officially become an official Android development language). One of the initial goals of the project is Use modern cross-platform development languages (such as Flutter or React Native) to build an application that can run locally on IOS and Android. Nonetheless, it became clear early in the development phase that this was beyond the scope of the project. Therefore, I decided to develop this application for Android devices and want to modify to run IOS devices of the future.

The modern technologies mentioned above, Flutter and React Native, provide the ability to build applications for Android and IOS devices using our modern language (JavaScript). They support the rapid development of local mobile applications without the need to learn a new language and focus on only one platform [8]. Once an application is developed for one platform, the additional work required to run the application on another type of device is relatively small. This makes them a very popular choice for organizations because only one mobile development team instead of two expert teams per platform can reduce costs.

6.4.2 Backend Technologies

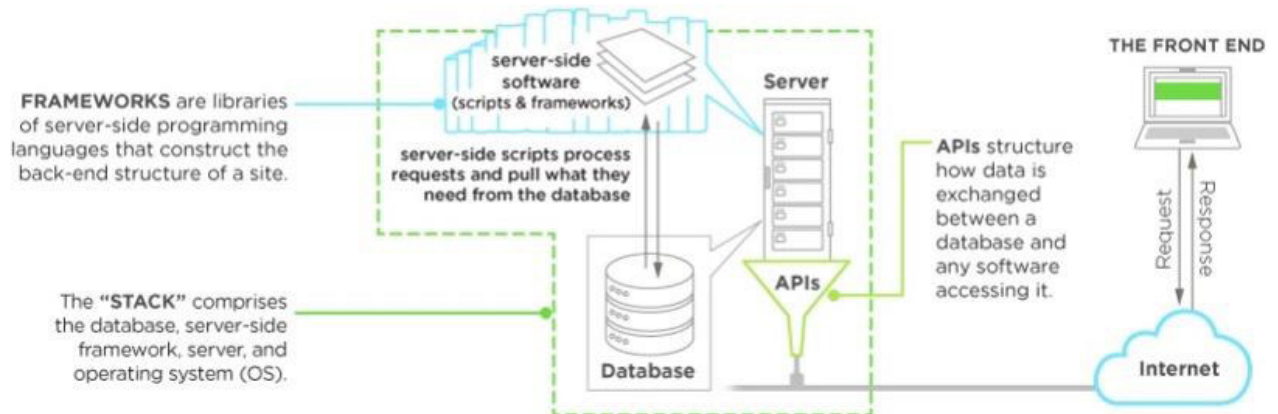
he backend of an application is the server-side software the executes all the business logic, data processing and provides the frontend with data and functionality.

The below image shows a common application backend architecture.

There are almost an infinite number of options when it comes to creating the backend of the application. Some of the most popular technologies in modern applications utilize Python, Java

or JavaScript. Django and Flask are two common Python backend frameworks, they are both popular and used heavily in industry, particularly Django. A very popular modern technology used for mobile and web development is Node.js, which is a JavaScript runtime that executes JavaScript on the server-side [19]. Node. Js, runs code asynchronously, meaning it can deal with many incoming requests at once making it a great choice for applications that will deal with large amounts of traffic and have scalability in mind.

BACK-END DEVELOPMENT & FRAMEWORKS IN SERVER SIDE SOFTWARE



6.4.2.1 REST API

REST API is the short version of Representational State Transfer Application Programming Interface [10]. REST APIs generally make use of Http (hypertext transfer Protocol) to transfer data between the APL, where the data is stored, and whatever other software is requesting the data. REST APIS are flexible and can be designed to meet whatever requirements are specified by the designer or developer hey utilize the standard CRUD (Create, Read, Update and Delete) functionality facilitated by HTTP requests.

6.4.2.2 Data Storage

The backend of the application also needs a data store of some kind to keep all of the application's and users' data. Again, there are an enormous number of options when it comes to databases. Some of the most common modern data storage technologies are explained below.

There are two main options when considering databases for use with mobile and web technologies. These are SQL (Structured Query Language) and NOSQL (Not-only SQL), traditionally SQL databases have been more popular than NOSQL databases with technologies like MYSQL, PostgreSQL and SQLite [11]. These databases are called relational databases, they are organized into distinct tables and schemas and there are clear relationships between the data in each table.

In recent years there has been a rise in NOSQL databases, with technologies like MongoDB, Cassandra and Redis becoming increasingly popular. NOSQL databases are not relational and do not have strict schemas which dictate the format in which the data must be stored in. They are flexible and often store data in lightweight formats.

For example, MongoDB is a document database and stores data in BSON (JSON-like) format documents [12] NOSQL databases are well known for being highly available and scalable due to their lightweight formats. Although, they can easily become messy and disorganized if implemented without considering data structure and format.

7 Problem & Feasibility analysis

The program I want to make is a mobile application of the student learning system of Cardiff University. The purpose is to help students increase the efficiency of learning and make their learning more convenient. Due to the severe global epidemic, more and more countries and Schools started to take classes remotely, which caused several problems.

4. The students come from different countries and different countries have different time differences, so the class time is different. It will appear that the school time is daytime, but the student time is night or early morning, so that the students may be doing other things during the live broadcast class. Things, or it's inconvenient to use a computer to go to class.
5. Due to remote classes, many times students do other things at the time when they should be in class, or there is no computer around to take live classes.
6. When students want to review or review previous courses, and want to check course materials and watch course replays to learn, it is very inconvenient to use the computer

So, in response to the above questions, I made a questionnaire about the mobile application of the student learning system, distributed to 20 students, answered anonymously, the results of the questionnaire and the questionnaire are in appendix A, and the video presentation of the app I will attach it the form is uploaded to pats separately.

The results of the questionnaire show that most students agree that the mobile application of the learning system includes watching live lessons, viewing calendars, and linking to live lessons, viewing course materials and video playback. Most students agree. At the same time, we did a usability questionnaire on the mobile application, which proved the feasibility of the application is also very good.

In summary, combining these problems and feasibility analysis, these are the problems to be solved after the completion of this project.

8 Approach

8.1 Defining Application Requirements

There are six main areas of functionality that must be implemented in order to produce an MVP that successfully meets the criteria outlined by the aim and objectives of the project:

1. Personal information

Users can know their basic information through the personal information interface, and mark it in the app, such as name, photo, email account and student ID.

2. Calendar

Users can use the calendar to clearly understand the specific time of class for easy viewing.

3. Live course link

Users can access live courses and meetings by clicking live links.

4. Course materials

Users can also review or preview courses through course materials.

5. Video playback

Users can watch the previous recording and broadcasting courses through video playback for better review.

6. Grades list

Users can easily view the results of the course at the first time through the Grades list.

8.2 Planning & Project Management

The first stage of the project after the conception of the idea was to develop a thorough outline of tasks that were to be completed and to select a project management method. This was to ensure the project was well directed and organized from the start. Initially, a rough outline of the project was created, containing the main, high-level tasks that were to be completed, these included:

- Market research
- Technology stack selection
- Learning
- Specification and requirements
- System architecture design (frontend and backend)
- Data modelling
- App design (frontend)
- Backend development
- Frontend development

These tasks were then broken down further into sub-tasks and populated into a Trello board and used as a Kanban board, which was the chosen software development method for this project. A Kanban approach is a lean, agile development methodology, it allows for flexible working and efficient delivery of products, which was ideal for this project.

This helped focus the direction of the implementation stage and ensured the development process was efficient.

This approach allowed large tasks to be broken down into smaller, manageable tasks that could be tackled one at a time. The use of the Kanban board provided a visual process management system which allowed for constant monitoring of progress and a clear outline of the most important tasks to be worked on at a certain point in time.

Alternatively, a more rigid approach like the waterfall model could have been used as the project management methodology in this project, it would have allowed for a more systematic approach to developing the product to be used and would have given strict deadlines when to finish certain parts of the application. It was decided that this was not the most appropriate approach for this project for two main reasons. The first being the circumstances of the time the project was being worked on, which was during a very busy time of the year, where work was to be fitted around other commitments, so flexibility was key. Secondly, a more rigid approach would not have been feasible, this was because it was very hard to estimate the length of time any task would take, due to the unpredictable nature of software development, particularly as it was my first-time completing work of this nature.

8.3 Technology Stack Selection

When choosing front-end technology to build an application, our first task is to build an application with a stable and smooth experience. Therefore, we chose Java (for Android development). The reason for this decision is that Java, as one of the most popular languages at present, and Android has experienced 17 years of development, has been quite stable, and has a rich ecosystem, which can better support us in our rapid development work. Why don't we use the current popular cross-platform development? For example, Flutter and React-Native. The reason is that although these cross-platform development technologies can reduce the cost of development work, they only need one end to be developed to run on multiple ends, but they are still unable to achieve the effect of native development in terms of function and experience. Because we pursue stability and experience, we chose to develop native Android here. Although this project is an application developed specifically for Android devices, if this project continues in the future, it will take the least amount of work to make the application suitable for IOS devices.

In the selection of Android development components, in order to ensure stability and standardization, we follow the best practices officially recommended by Google. This project

mainly uses the Android Jetpack component library. Jetpack is a suite of multiple libraries that can help developers follow best practices, reduce boilerplate code, and write code that can run consistently across various Android versions and devices, allowing developers to focus on what is important Coding work. And Jetpack is Google's official component library, with complete documentation, good stability, and rich functions, which helps us to develop App faster. In the project, we used the Room component to create, store, and manage the persistent data supported by the SQLite database. Using Lifecycle, life cycle-aware components can perform operations in response to the life cycle state of another component (such as Activity and Fragment) Changes, these components help us write more organized and often streamlined code, which is easier to maintain.

8.4 Learning

Once the most appropriate technology stack had been researched and selected the next step was to learn the basics of the technologies chosen. This involved following tutorials for small projects at the appropriate difficulty-level online and absorbing the basics of the technologies.

8.5 Specification and Requirements

From studying the problem of student learning system in detail, the test cases for each of the app's functionalities were drafted. Then the steps to be followed were refined until a details specification for each functional had been created.

8.6 System Architecture Design

Once the technologies that were being used in the project had been broadly understood and learnt, and the market research had informed a clear product idea the design of the system architecture took place. This was created by looking at a few other successful applications in production and finding the most scalable, reliable and applicable approach for this project. It was decided that the most appropriate architecture approach was to have a REST API as the backend of the application, exposing certain endpoints to the frontend that could be called upon to achieve the functionality of the app. This is an advantageous approach for many reasons, if well implemented a REST API is secure and flexible. If, in the future, a web application is developed and was to implement the same features of the mobile application, then the same REST API could be used and interact with the web app using the same endpoints.

8.7 Data Modelling

Data modelling is the process in which the data storage format is defined, it outlines the tables

and schemas for which the data of the application is to be stored in. Although, a NoSQL database was chosen as the data storage method in this project, so no strict data model needed to be created at the beginning of the project. This meant the data modelling was an iterative process when building an application from scratch and takes time to perfect. This is another reason why a NoSQL database was a good choice, as it allows for flexibility in the initial design and the data model can be adapted whilst in the application development stage. The final data model used in the application is defined in detail in the Application of Approach section of this report.

MongoDB was chosen as the database for the project, this is because of its fast and lightweight document stores, flexible schemas and its highly scalable nature. One of the sub-aims of the project was to develop an application that is scalable, meaning an application that would be able to cope with a very high number of requests and concurrently meet the demands of a great number of users. As explained earlier in the report, MongoDB is document database which stores data in lightweight documents but also has many other features. It is widely used in industry by some of the most popular applications in the world. As previously mentioned, MongoDB also has some functionality of a relational dataset, whilst having the lightweight and flexible features that are common to NoSQL databases which made it a good choice for this project. An ER (entity relationship diagram) was developed to model the relationships between the different data models within the database, this can be seen later in the report.

8.8 Application Design

Once the backend of the application and the system architecture had been finalized the frontend design process could begin. The focus of the frontend design process was to ensure the user interface was clear and intuitive. It must allow the user to easily make use of all the core functionality of the app, provided by the backend of the application. The design process was executed using Adobe XD, a free platform offered by Adobe and is used widely by professional designers in industry.

8.9 Development

This stage of the project was the most time consuming, this is where the product was actually created, and the code was written. Throughout this stage the agile development methodologies were carried out and the tasks defined on the project Kanban board were completed. The TDD methodology was followed throughout the development process to ensure the functional requirements and test cases outlined prior to implementation were met.

The development approach taken was to implement the main functionality of the REST API

first, then move onto the frontend of the application and implement this functionality. Once the main portion of functionality was completed and working well, the application could be fine-tuned and ensured that all test cases were met. Once this had been completed the security of the application was implemented in the backend and the frontend, by ensure users were authenticated in the login phase and that the REST API was secure. All these tasks were continually monitored using the Kanban board, it was ensured the project was running on time and that the right tasks were being prioritized.

This stage was the most unpredictable due to the nature of developing an application. Some features were implemented completely in a matter of hours, whereas some of the smaller features took many days of tweaking and debugging to implement correctly. Therefore, an agile approach was an effective way to manage the completion the project.

10 Products

10.1 Functional requirements

1. FR1 – The system would provide the user its own secure space, which could only be personally accessed. (Student interface) – Type: Must have

Acceptance Criteria:

- User can log in with a username and a password to the system.
- Method of signing up would be provided to the users.

2. FR2 – The system would allow the user to read personal information(Student interface) – Type: Must have

Acceptance Criteria:

- ☐ After entering the main interface, the user should be able to see the name, email address, and student ID from the homepage

3. FR3 – The system allows users to watch the calendar (Student interface) – Type: Must have

Acceptance Criteria:

- ☐ Users can enter the calendar interface
- ☐ Users can see the preparation time and content in the calendar

4. FR4 – Users can watch live courses in the calendar (Student interface) – Type: Must have

Acceptance Criteria:

- ☐ The user can see the entry button of the live link
- ☐ After entering the live-streaming interface the user should be able to choose in between live-streamed lectures in the current moment

- ☐ Video player should allow the user to see the content

5. FR5 –The system allows students to view the list of course modules (Student interface) – Type: Must have

Acceptance Criteria:

- ☐ After entering, students can clearly see the name of each course module

6. FR6 – The system allows users to view learning materials (Student interface) – Type: Must have

Acceptance Criteria:

- ☐ Enter the learning materials interface, students can see the list of materials
- ☐ Every data file can be opened, and students can read the content

7. FR7 – The system allows students to watch the video playback(Student interface) – Type: Must have

Acceptance Criteria:

- ☐ Users can see the list of videos on the video playback interface
- ☐ Video player should allow the user to see the content

8. FR8 – The system allows users to view their own grades for each course module (Student interface) – Type: Must have

Acceptance Criteria:

- ☐ After entering the grade interface, students can see the name of the course
- ☐ Students can see the scores of subjects behind the course name

10.2 Non-functional requirements

1. NON-FR1 – The system will be intuitive and easy to use. (Student interface) – Type: Must have

Acceptance Criteria:

- ☐ The User interface should be appropriate and consistent to use.

2. NON-FR2 – The whole system has reliability. (Student interface) – Type: Must have

Acceptance Criteria:

- ☐ The APP can be used normally, and users can use it after configuring the network

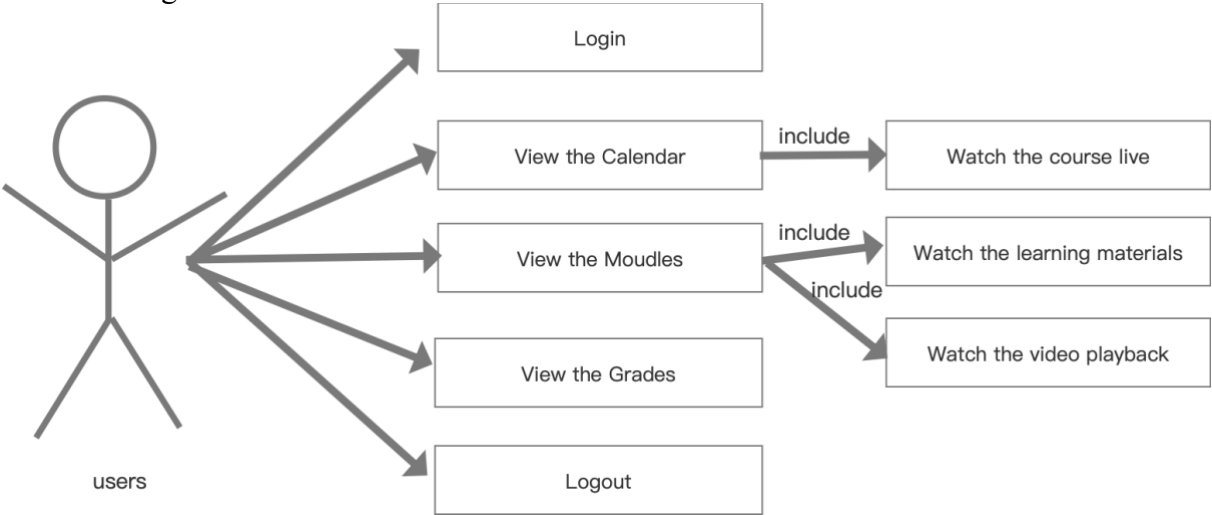
3. NON-FR3 –The whole system can still be redeveloped. (Student interface) – Type: Should have

Acceptance Criteria:

- ☐
- Whether it is software or hardware, the system can demand secondary development

10.3 Use cases

Use case diagram



Use Case No: 1	Use Case Name: Login	Rating: Must have
Purpose: Users can login to the app with their email and password		
Main Actor: Users	Secondary Actions: N/A	
Pre-conditions: The user is a student at Cardiff University		
Trigger: App opened, and user logged out		
Basic flow: Users can login with their credentials		
Related Use Cases: N/A		

Use Case No: 2	Use Case Name: View calendar	Rating: Must have
Purpose: The user can view the calendar, and the course name and time are displayed on the calendar		
Main Actor: Users	Secondary Actions: N/A	
Pre-conditions: The user is a student at Cardiff University and login system		
Trigger: User clicks on the calendar		
Basic flow:		
1. User clicks on the calendar		
2. Pop-up calendar and course list		
3. Show detailed course schedule		
Related Use Cases: No.1		

Use Case No: 3	Use Case Name: Watch the live course	Rating: Must have
Purpose: The goal is that a user can view live-stream course. The lectures that are currently live streaming would be portrayed as hyperlinks to a page with a media player that would portray the live streaming content		
Main Actor: Users	Secondary Actions: N/A	
Pre-conditions: The user needs to click on the calendar and enter the calendar interface		
Trigger: User clicks on the calendar		
Basic flow: <div>1. User clicks on the calendar</div> <div>2. Pop-up calendar and course list</div> <div>3. Choose the course you want to take</div> <div>4. Click join</div> <div>5. Pop up live video</div>		
Related Use Cases: No.2		

Use Case No: 4	Use Case Name: Watch the course catalog	Rating: Must have
Purpose: The purpose is to summarize and classify all courses for students of different majors, so that students know what their courses are		
Main Actor: Users	Secondary Actions: N/A	
Pre-conditions: The user is a student at Cardiff University and login system		
Trigger: User clicks on the modules		
Basic flow: 1. User clicks on modules 2. Pop-up course module list		
Related Use Cases: No.1		

Use Case No: 5	Use Case Name: View learning materials	Rating: Must have
Purpose: Students can view the materials they want to learn and can open files and watch		
Main Actor: Users	Secondary Actions: N/A	
Pre-conditions: The user needs to click on the modules and enter the modules interface		
Trigger: User clicks on the course		
Basic flow: <div><div>1. The user clicks on the name of the course he wants to learn</div><div>2. The user clicks on the learning material entry</div><div>3. Pop up file list</div><div>4. Click on the file you want to learn</div><div>5. open a file</div></div>		
Related Use Cases: No.4		

Use Case No: 6	Use Case Name: watch video playback	Rating: Must have
Purpose: Students can watch the video playback, and successfully open the video and display it on the screen		
Main Actor: Users	Secondary Actions: N/A	
Pre-conditions: The user needs to click on the video playback and enter the video playback interface		
Trigger: User clicks on the video playback		
Basic flow: 1. The user clicks on the name of the course he wants to learn 2. The user clicks on the video playback portal 3. Pop up video list 4. Click on the video you want to watch 5. Open video		
Related Use Cases: No.4		

Use Case No: 7	Use Case Name: View course grades	Rating: Must have
Purpose: Students can check their own subject grades		
Main Actor: Users	Secondary Actions: N/A	
Pre-conditions: The user is a student at Cardiff University and login system		
Trigger: User click grades		
Basic flow: 1. User login system 2. User clicks on the score entry 3. Pop-up course grade list		
Related Use Cases: No.1		

Use Case No: 8	Use Case Name: View app version	Rating: Must have
Purpose: Students can view the app version, and the version number of the corresponding version is displayed on the screen		
Main Actor: Users	Secondary Actions: N/A	
Pre-conditions: The user is a student at Cardiff University and login system		
Trigger: User click setting		
Basic flow: 1. User login system 2. User clicks setting 3. Pop up version number and logout		
Related Use Cases: No.1		

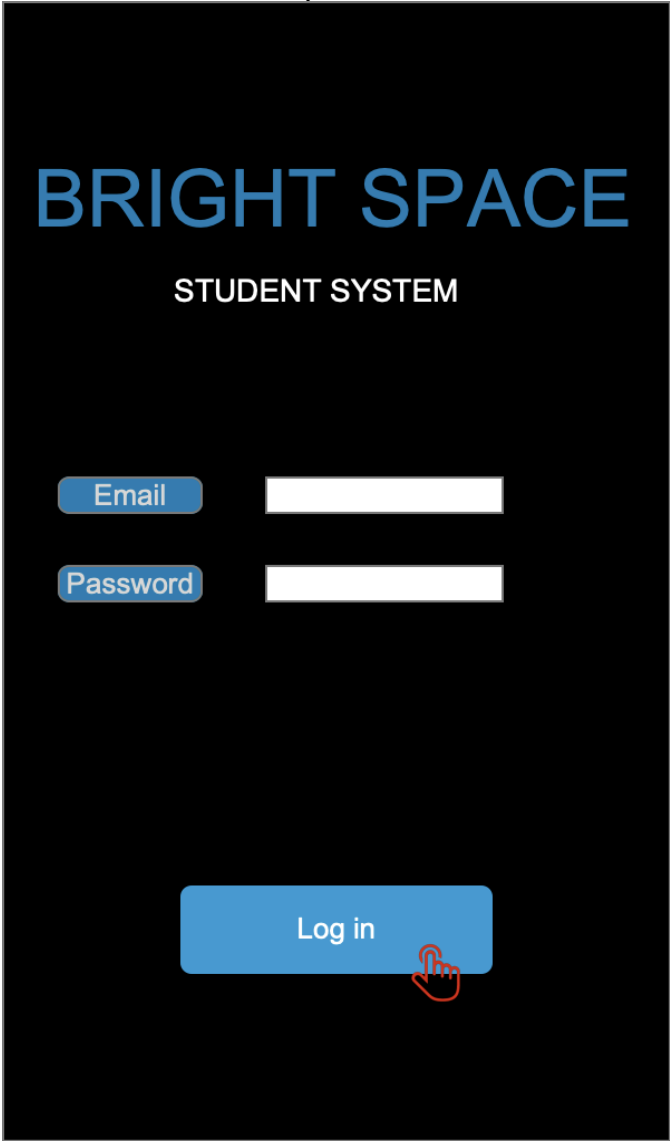
Use Case No: 9	Use Case Name: logout	Rating: Must have
Purpose: Students can log out of the system		
Main Actor: Users		Secondary Actions: N/A
Pre-conditions: The user clicks on the setting, and the version page is displayed		
Trigger: User click setting		
Basic flow: 1. User clicks setting 2. Pop up version number and logout 3. User clicks on logout		
Related Use Cases: No.8		

11 Design

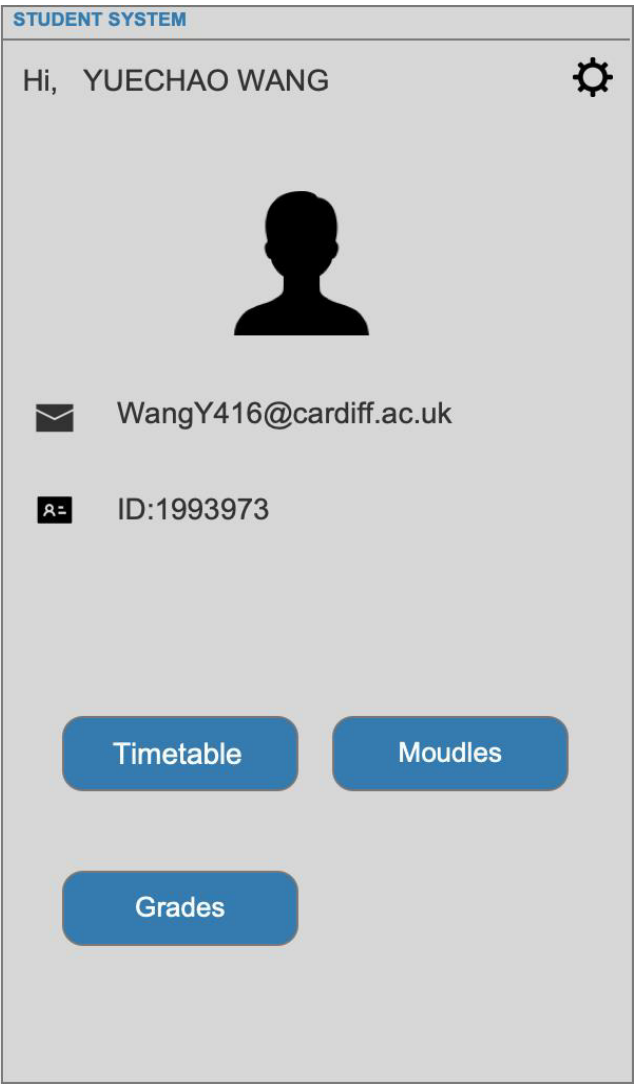
11.1 User interface prototypes

One of the main priorities of the project was the usability of the Android app. It was essential to create mock-ups and prototypes of the system before I started developing the whole Android app. For the mock-ups to be precise, I kept in mind the personas, the functional requirements of the system and the use cases.

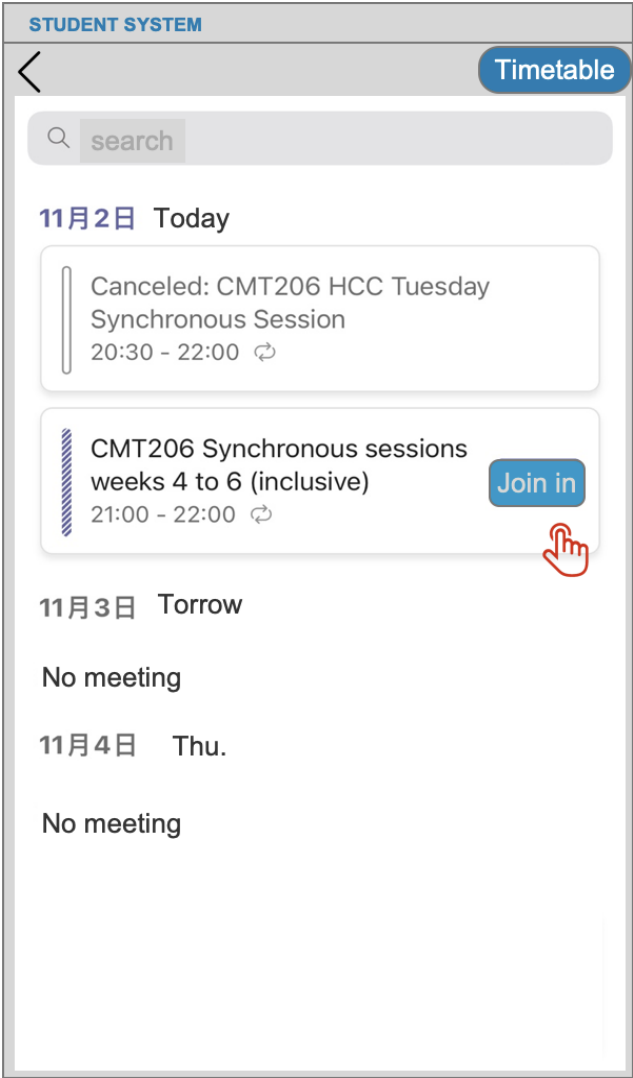
With all the requirements in mind, the initial prototype was an MVP design of the platform. The following prototypes do not follow the STNs precisely, but the final prototypes do. After evaluating the initial prototype, I derived a final prototype, which would be precisely based on the STNs and all the requirements.



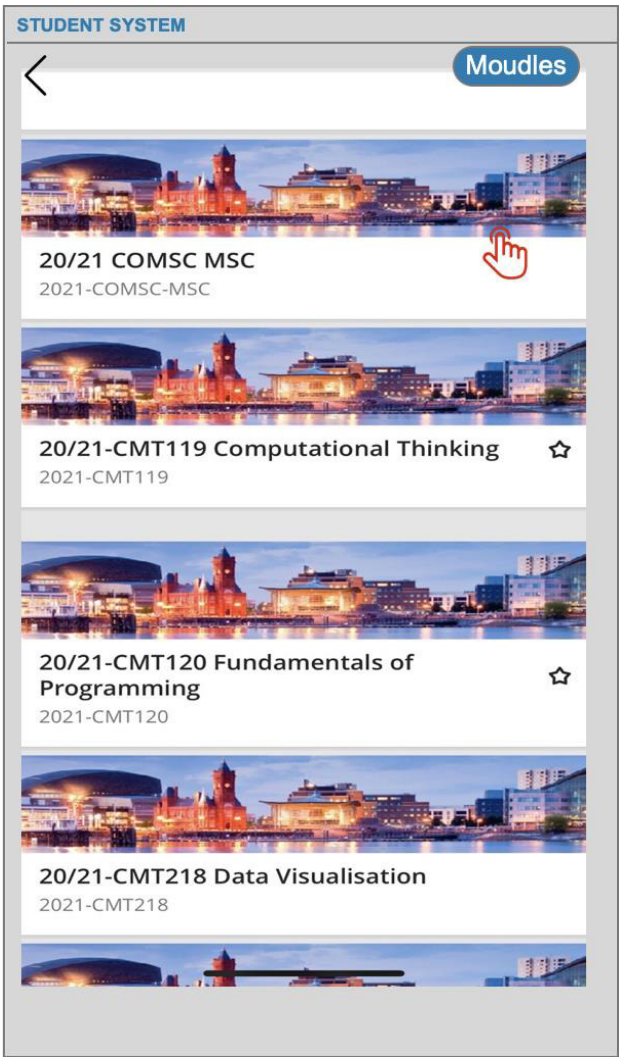
Users can login with their credentials



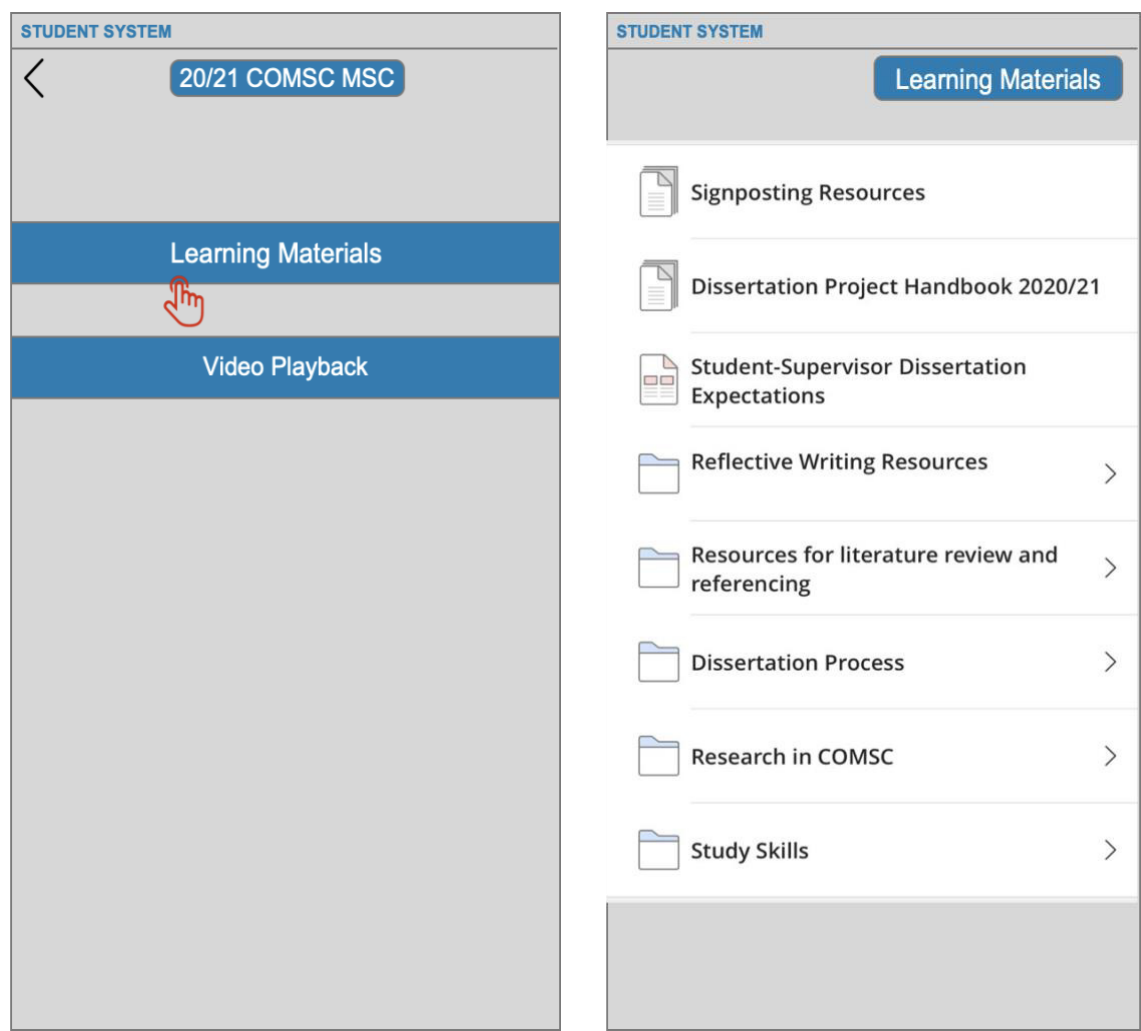
After logging in, jump to the main page, displaying personal information and the entrance to the three main functional requirements



The user can view the calendar, and the course name and time are displayed on the calendar. The goal is that a user can view live-stream course. The lectures that are currently live streaming would be portrayed as hyperlinks to a page with a media player that would portray the live streaming content.



The purpose is to summarize and classify all courses for students of different majors, so that students know what their courses are.

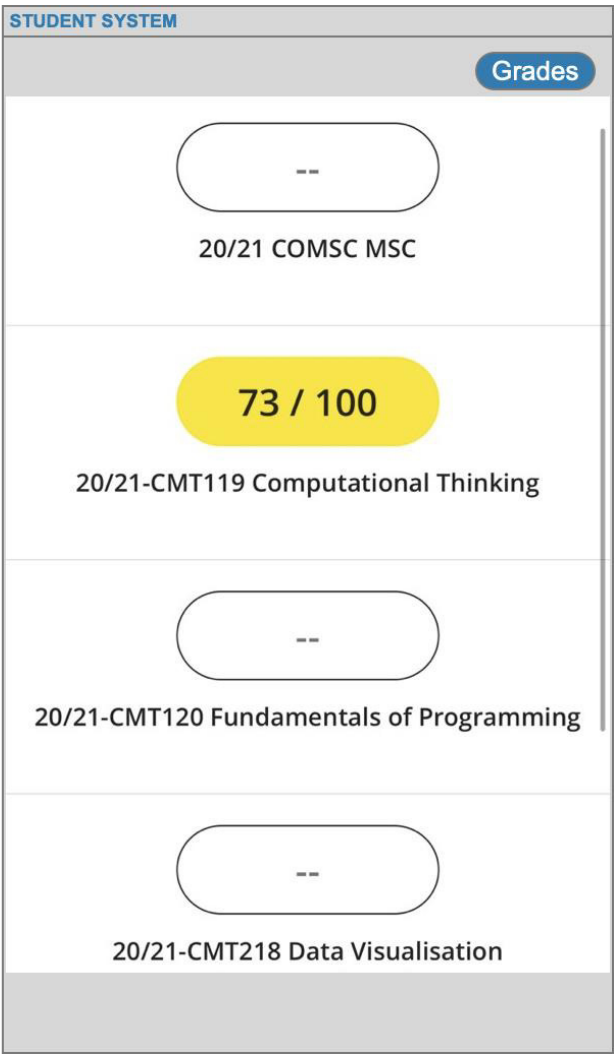


Students can view the materials they want to learn and can open files and watch.

1. The user clicks on the name of the course he wants to learn
2. The user clicks on the learning material entry
3. Pop up file list
4. Click on the file you want to learn
5. open a file

STUDENT SYSTEM	
Video Playback	
	
Title of the course	2021/11/2
	
Title of the course	2021/10/2

Students can watch the video playback, and successfully open the video and display it on the screen.



Students can check their own subject grades.

11.2 User interface/UX

As previously discussed, user interface and experience are extremely important to the users of the app and were two of the most important factors from the competitor analysis.

The designs of the application dictated the interface design and made the animations and transitions of the application relatively easy to decide upon. The modal card pop-ups must slide up smoothly from the bottom of the screen. The tiles must give responsive feedback to the user, so that they are more involved when interacting with the application.

The primary color scheme of the application was generated after the initial designs had been developed. As the main theme of the application was sport, the main color of the application was green to represent the focus of the application being on grassroots sports. From this, secondary colors were generated to be used throughout the app for a consistent and attractive color scheme.

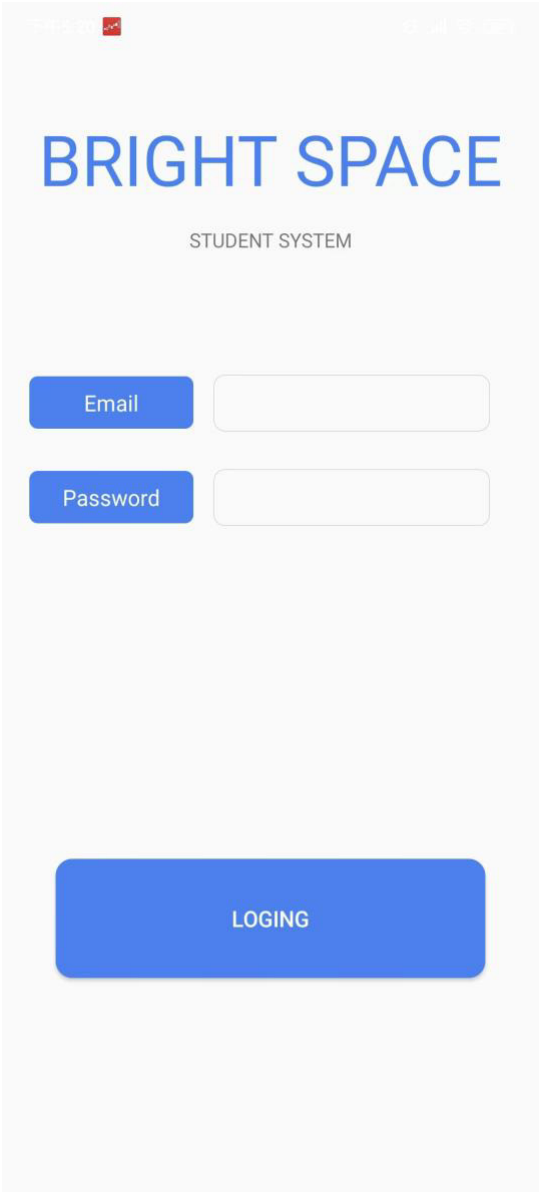
The final consideration considered in the design phase of the application was consistency. The

same components all had the same design and color throughout the app, for example, the app's buttons were all the same shape, size and color. Ensuring components and colors are consistent throughout the app is paramount to ensuring a good user interface is created. Consistency is important to the user as it gives the impression of a high-quality application, meaning users will trust the app and want to make use of the app's functionality.

12 Implementation

The following section outlines the final product that was developed and shows screenshots for all the functionalities implemented in the student learning system application.

Login

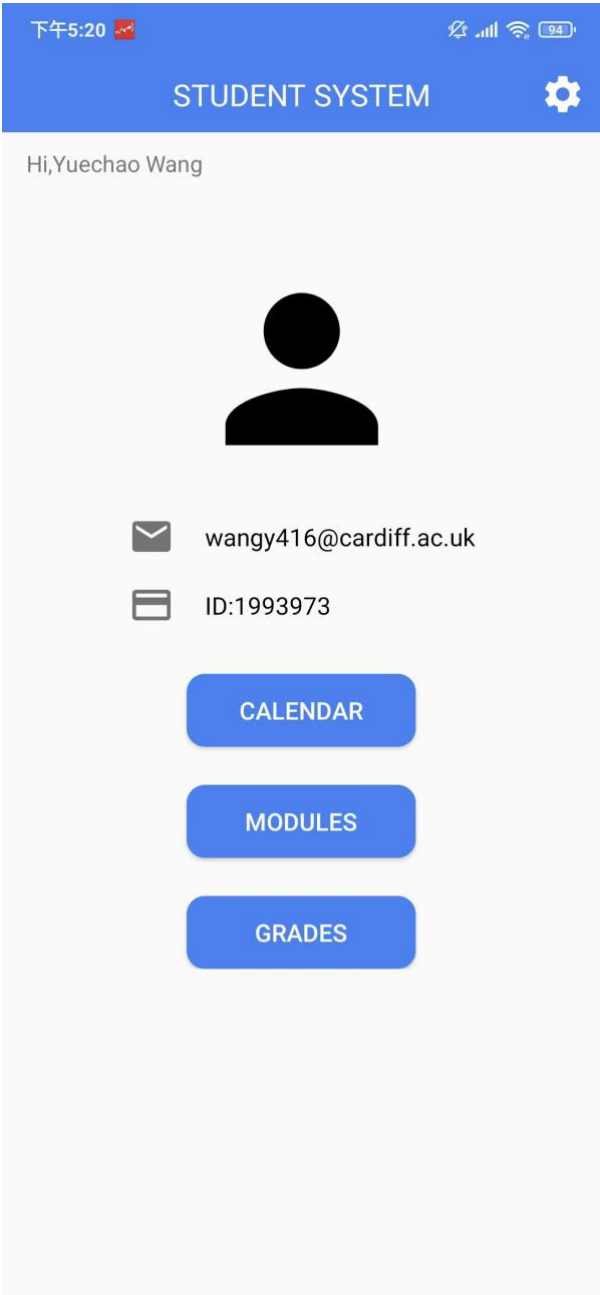


Users can login using their login credentials created in the signup process. If the user's credentials do not match what is in the database, then the user is alerted that this is the case, and access to the app is not granted.

Failed login attempt

This is the alert shown when a user inputs an incorrect email address Login because we have no permission to link to the database and server of the school, the login email account and password in the MVP model are all fixed data that I use in the local database to display.

Home Page

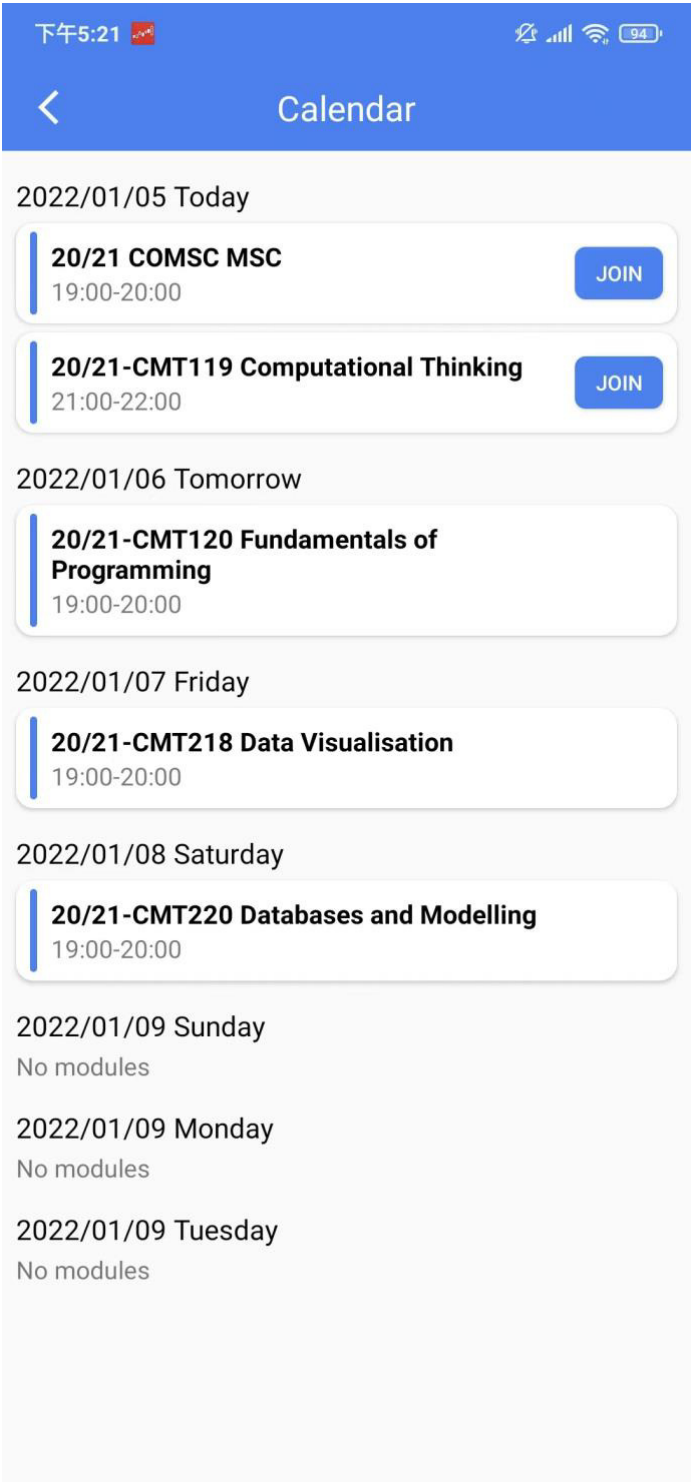


After logging in successfully, the user will go to the homepage of the personal information and functions page.

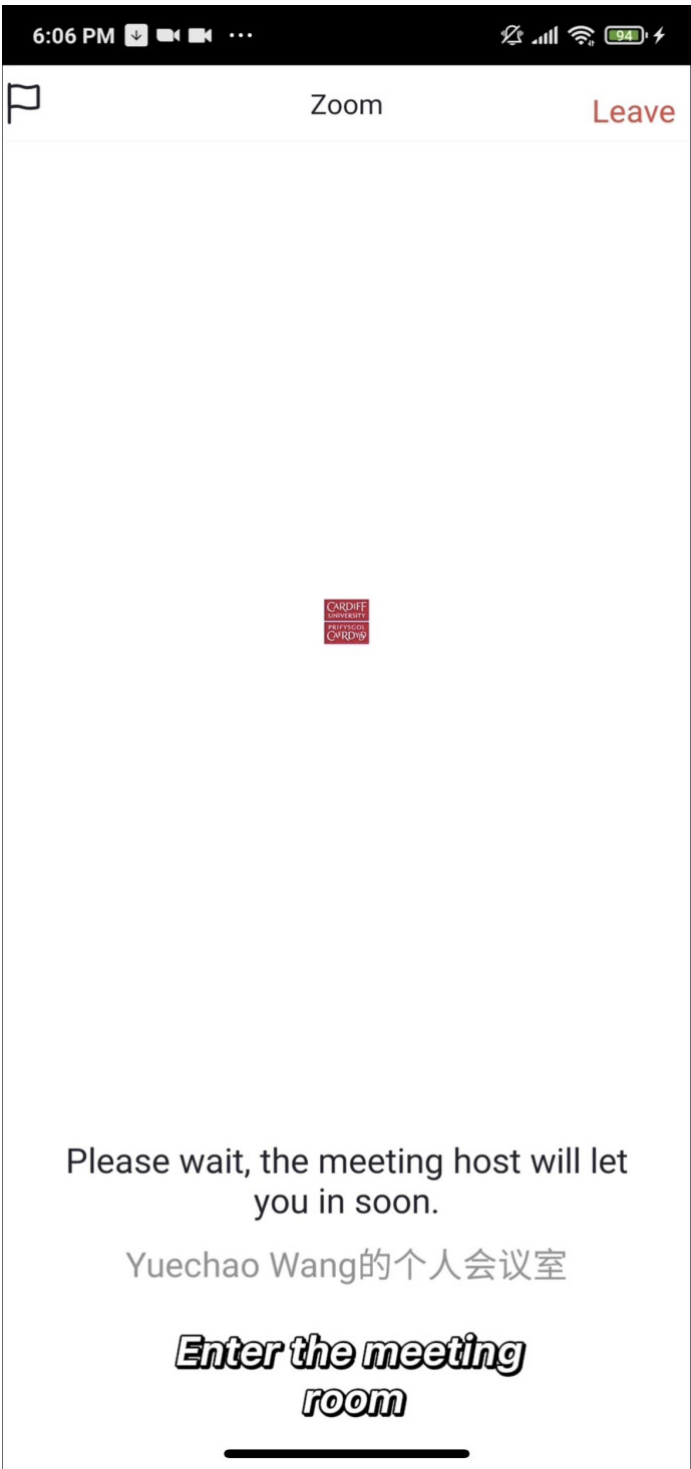
It displays personal information in detail, including students' names, students' mailboxes and students' student numbers, as well as several main function entrances of the student system, which are the entrance of calendar and live course links, the entrance to the course module materials and playback, the entrance to the transcript, and the version number of the app.

Users can see their own information and the functions they want to choose on the homepage. For database and server reasons, user personal information is displayed in fixed data input in the local database, including personal avatar, name, account, and ID.

Calendar

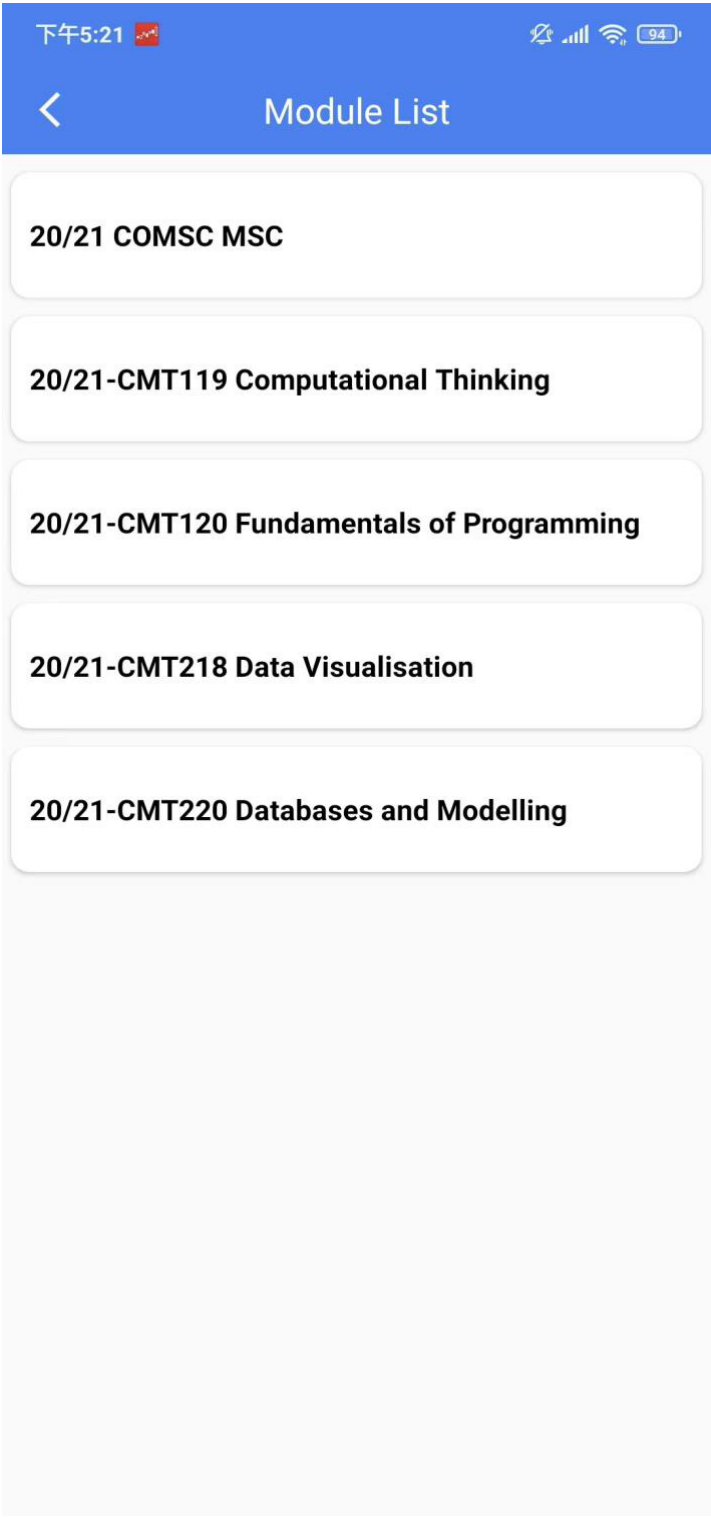


This is a very convenient function, including the timetable, course name, class time, and live links to the courses to be taught. This is the function that users use most. Most students hope to watch the school timetable and timetable through mobile phone programs and watch the live broadcast of courses through mobile phones when it is not convenient to use laptops. There are still many improvements to this function, and I will write it in detail in the reflection module. Click join to jump to common Conference websites such as zoom or teams. All the course names are taken as examples of my own courses during my postgraduate study in Cardiff. Time is also used to demonstrate randomly, which does not represent the real course time.

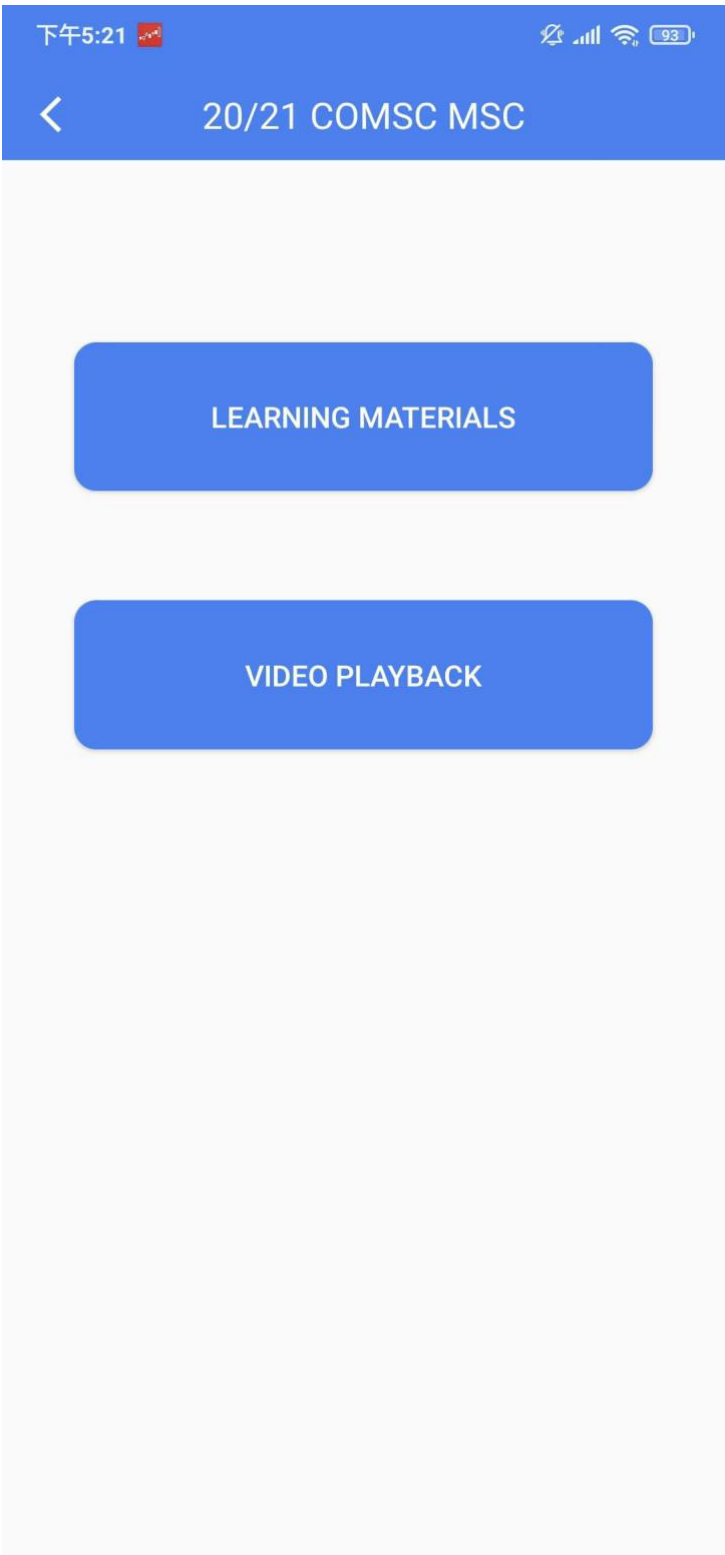


Since we do not have the permission to link to the school server to obtain the course link, the course link is a meeting created by myself on zoom, which is put into the link through the local database, in this way, users can directly jump to the meeting by clicking the Join button.

Modules



The module function is a classification and packaging of all courses that users need to take in this semester. The course number is used as the classification and packaging, and each course module contains text materials and video playback. Students can choose by choosing the courses they want to learn. The module list clearly shows all the courses. The user clicks on any course module to jump to the data and video playback.



The course module is classified to show the course materials and video playback, and users can choose according to the materials or videos they want to obtain. Click learning materials to go to the learning materials list.



6:07 PM

MScProj...k2020-21

		activity should include initial approaches to potential academic and/or industrial supervisors, to assess the viability of potential topics.
Start of dissertation phase	12 weeks before the submission deadline	A student who pass all autumn semester modules can start 12 weeks before the September deadline. If they fail a spring semester module later, they should stop the project and resume it 12 weeks before the November deadline. If they fail the resit again, then they will not be able to progress to dissertation.
Academic progress meetings	As frequently as appropriate with academic supervisor. Normally fortnightly or thereabouts.	Meetings may be more frequent in the early stages of the project, and again as it is nearing completion.
Draft dissertation to academic supervisor	As agreed.	Students will find it advantageous to present written material in stages throughout the study.
Submission of dissertation	Completed taught phase in July Exam Board: 8 October 2021 Completed taught phase in September Exam Board: 3 December 2021	

4

Activity	Time	Notes
Project demonstration	Ideally within two weeks of submission	Students are required to demonstrate their project to their supervisor. See Section 6.
Notification of result	December 2021 (October Submission)	Notification will be on the basis of Examining Board recommendations only, and will be subject to confirmation by the University.
Graduation Celebration Event	Normally the July following the notification of the result.	

2.3 Full-time Students on Masters Programmes with Placement

Full-time students on Masters programmes with a placement will normally progress to the project phase (subject to satisfactory progress in the taught phase) after the placement phase, in the June following their placement. The dissertation will be submitted in September. If students have a late start to their placement then they can start the dissertation in September and submit their dissertation in November.

By default, a student should participate in the project selection process in the Spring semester of the first academic year. If the student has not found placement by the time the dissertation phase starts, then they can start the dissertation while continuing to look for placement. If they find placement before the dissertation submission deadline, they can halt the dissertation project and resume next year after completing the placement.

If a student has found placement, they can opt out of the project selection process in the Spring semester of the first academic year. In this case, they must inform the dissertation coordinator. In addition, they must participate in the project selection process during the next academic year.

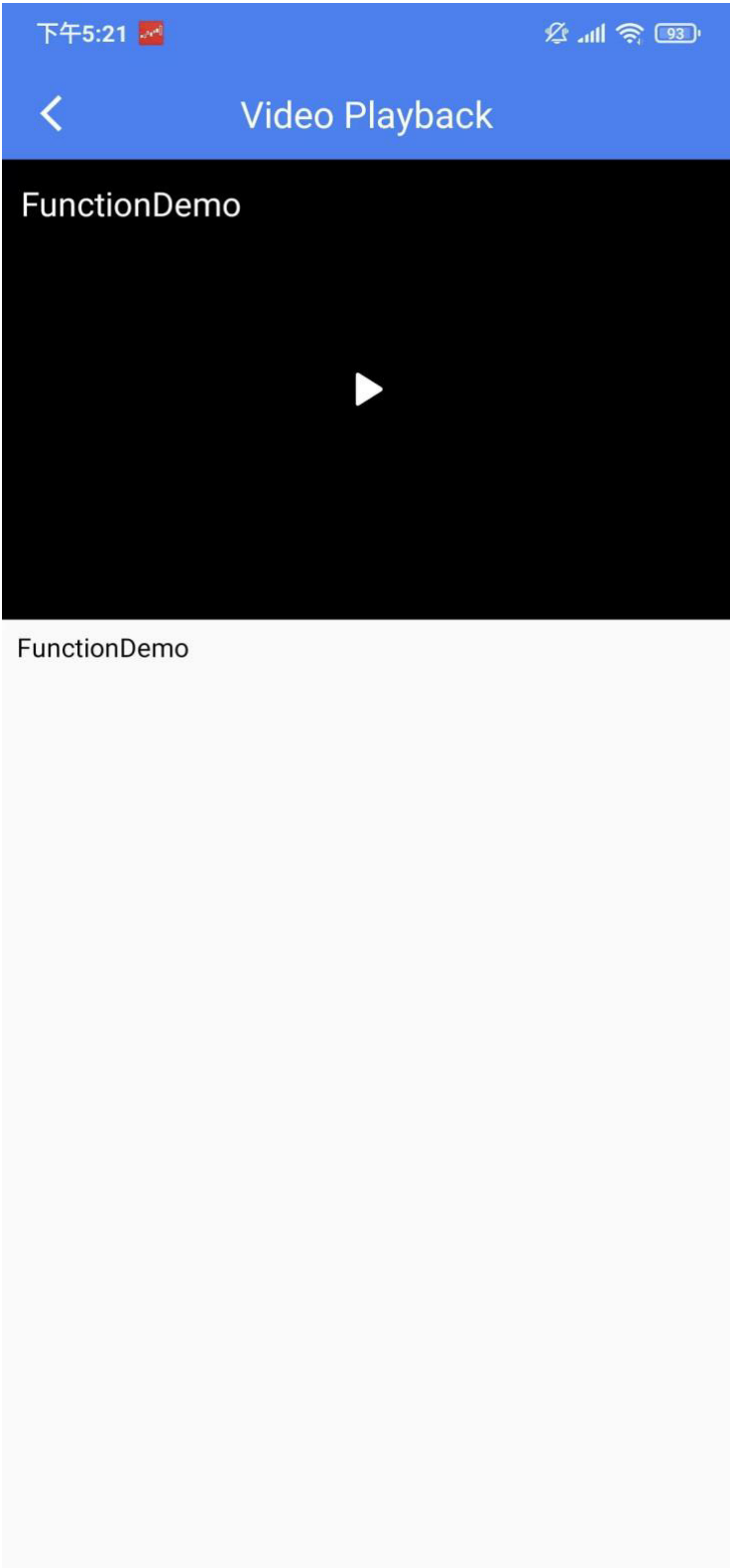
Students should ensure they have an initial project selected and approved BEFORE starting their placement. You may later propose an alternative project to build on knowledge and skills learnt during the placement, but this project should not be based on work done during the placement. You need to inform the module leader for CMT400 Dissertation if you want to propose an alternative project.

The key events in the project phase are shown below:

Activity	Time	Notes
Selection of project and academic/industrial (as appropriate) approval	Placement starts in 2021: Initial project selection - weeks 4 to 11 of the Spring semester 2021. An alternative project would need to be approved no later than week 11 of the Spring semester 2022.	Students should be considering suitable areas of research for some time prior to embarking on the project. This activity should include initial approaches to potential academic and/or industrial supervisors, to assess the viability of potential topics.
Start of the project	12 weeks before the	

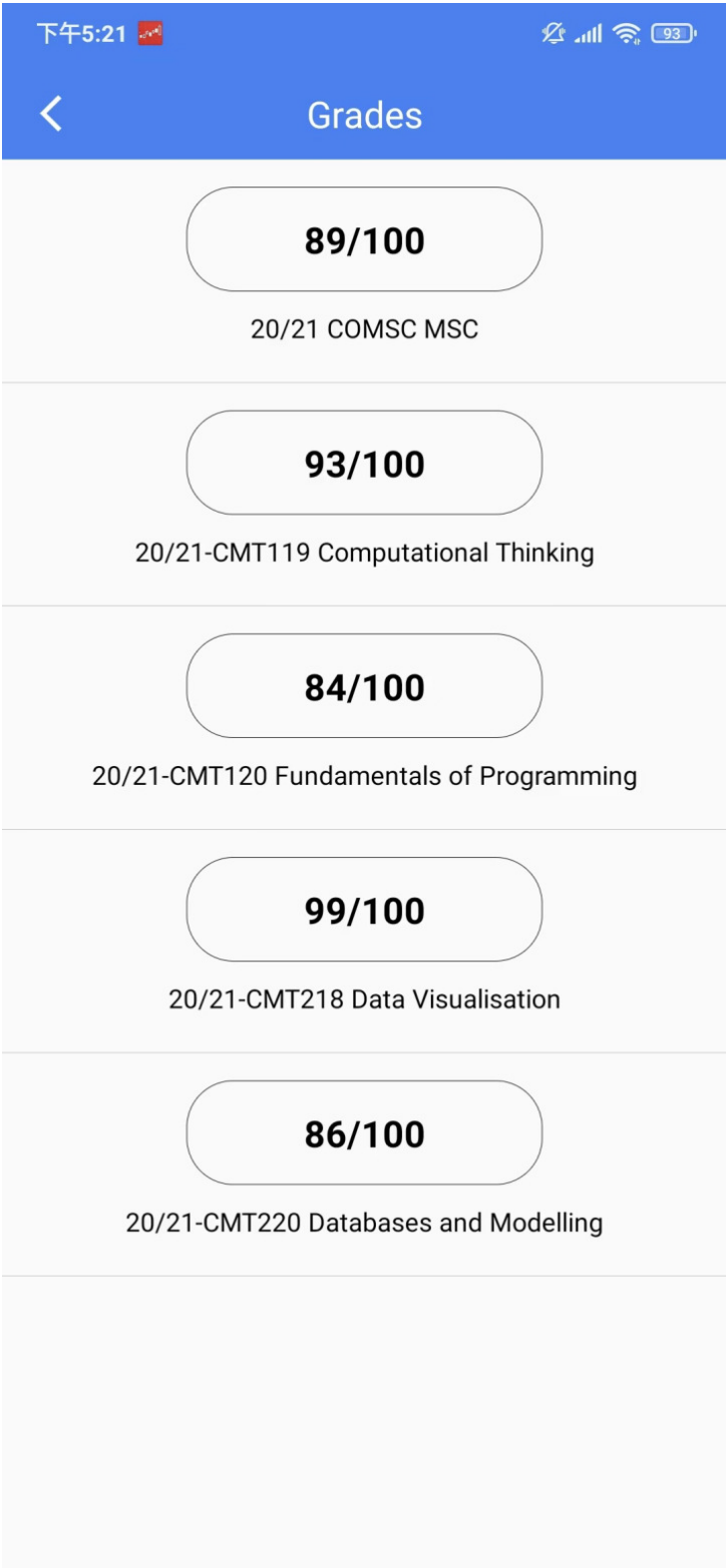
Go to the materials list, and all the course materials of this course will be displayed. Click the course materials to open it directly, and you can read and learn directly. Most of the learning materials exist in the database in the form of text. Since they cannot be linked to the server of the school, the text content is what I learned during my postgraduate study in Cardiff. I download the text, then input it into the local database for easy demonstration.

Video playback



Enter the video playback function, you can watch the video playback related to this course, and you can better review the learning content through playback. Because the server does not have the permission to link to the school server, to better display this function, I created a video demo to save it to the local database for easy display.

Grades



The third main function is the report card list. By clicking Grades, you can enter the report card of related courses of this semester. The logic of this report card is mainly to show, the subjects with scores will be reflected in the Grades, and students can easily check the scores on their mobile phones. Since this APP is an MVP model, it is not online and linked to the server, so I use my own subjects during the postgraduate period at Cardiff University as an example and input the scores of some courses in the background of the local database for easy display.

Setting



This is a setup Portal. Currently, only the version number and exit function are available for subsequent updates and iterations to display the published version number.

13 Project Management

The agile methodologies followed in the project meant the development process was a fast and efficient way to produce a fully functional minimum viable product. The Kanban board used was a great tool that meant the work was always focused on a particular task at any point in time.

It also allowed for great flexibility, especially when bugs were found. These bugs were added to the top of the work-in-progress board and immediately focused on, which meant they were rapidly eradicated from the app.

Another advantage to the use of the Kanban approach was the lack of time wasted, there were always tasks in the backlog to move onto as soon as a feature had been finished and met the requirements outlined in the test cases.

The test cases were also of great help throughout the project. They were able to guide the direction of project and were particularly useful when developing the specific functions of the application in the frontend development stage.

Although much of the project management strategy was a success, there were times in the project where the amount of work left to do seemed overwhelming. Due to the lack of deadlines in the agile Kanban model it sometimes felt like the amount of work to be completed would never be completed by the overall project deadline. This overwhelming feeling was strongest in the early stages of the project and gradually faded as more work was completed, and the efficiency of the Kanban model and test-driven development proved successful.

14 Test case

Function requirements test cases

Test case No: 1	Functional requirement No. 1: The system would provide the user its own secure space, which could only be personally accessed. Type: Must have
Test description	Acceptance Criteria: <input type="checkbox"/> User can log in with a username and a password to the system. <input type="checkbox"/> Method of signing up would be provided to the users. Test results: Pass

Test case No: 2	Functional requirement No. 2: The system would allow the user to read personal information Type: Must have
Test description	Acceptance Criteria: <input type="checkbox"/> After entering the main interface, the user should be able to see the name, email address, and student ID from the homepage Test results: Pass

Test case No: 3	Functional requirement No. 3: The system allows users to watch the calendar Type: Must have
Test description	Acceptance Criteria: <input type="checkbox"/> Users can enter the calendar interface <input type="checkbox"/> Users can see the preparation time and content in the calendar Test results: Pass

Test case No: 4	Functional requirement No. 4: Users can watch live courses in the calendar Type: Must have
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Test description	Acceptance Criteria: <ul style="list-style-type: none"><input type="checkbox"/> The user can see the entry button of the live link<input type="checkbox"/> After entering the live-streaming interface the user should be able to choose in between live-streamed lectures in the current moment<input type="checkbox"/> Video player should allow the user to see the content Test results: Pass
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Test case No: 5	Functional requirement No. 5: The system allows students to view the list of course modules Type: Must have
Test description	Acceptance Criteria: <ul style="list-style-type: none"><input type="checkbox"/> After entering, students can clearly see the name of each course module Test results: Pass

Test case No: 6	Functional requirement No. 6: The system allows users to view learning materials Type: Must have
Test description	Acceptance Criteria: <ul style="list-style-type: none"><input type="checkbox"/> Enter the learning materials interface, students can see the list of materials<input type="checkbox"/> Every data file can be opened, and students can read the content Test results: Pass

Test case No: 7	Functional requirement No. 7: The system allows students to watch the video playback Type: Must have
Test description	Acceptance Criteria: <ul style="list-style-type: none"><input type="checkbox"/> Users can see the list of videos on the video playback interface<input type="checkbox"/> Video player should allow the user to see the content Test results: Pass

Test case No: 8	Functional requirement No. 8: The system allows users to view their own grades for each course module Type: Must have
Test description	Acceptance Criteria: <div><input type="checkbox"/> After entering the grade interface, students can see the name of the course</div> <div><input type="checkbox"/> Students can see the scores of subjects behind the course name</div> Test results: Pass

Non-functional requirements test cases

Test case No: 9	Non - functional requirement No. 1: The system will be intuitive and easy to use Type: Must have
Test description	Acceptance Criteria: <div><input type="checkbox"/> The User interface should be appropriate and consistent to use.</div> Test results: Pass

Test case No: 10	Non - functional requirement No. 2: T The whole system has reliability. Type: Must have
Test description	Acceptance Criteria: <div><input type="checkbox"/> The APP can be used normally, and users can use it after configuring the network</div> Test results: Pass

Test case No: 11	Non - functional requirement No. 3: The whole system can still be redeveloped. Type: Should have
Test description	Acceptance Criteria: <input type="checkbox"/> Whether it is software or hardware, the system can demand secondary development Test results: Pass

15 Results

The results of the project can be determined by the total number of test cases that were successfully met and the number of functionalities implemented.

As the test cases show of the 11 test cases written in the beginning of the project, a total of 11 test cases passed successfully. This means that 100% of the test cases passed, and the underlying functionalities being tested in these test cases were successfully implemented.

Overall, the project was a success, the results of the test cases show that the app performed well in virtually all test cases, only failing one. A fully functional student learning system app has been produced.

16 Analysis

A comprehensive list of the successfully implemented functionalities is shown below.

Students can:

- ☐ Successfully log in to your account
- ☐ View personal information
- ☐ View calendar
- ☐ Watch the course live
- ☐ View course modules
- ☐ View course materials
- ☐ Watch the video replay
- ☐ View the grades of the course modules

UI/UX features implemented:

- ☐ Pull to refresh (feeds)
- ☐ Useful alerts and warnings
- ☐ Modern modular card design
- ☐ Smooth application navigation and transitions
- ☐ Consistent color scheme, typography and design

As the above lists outline, many functions are implemented in the two main areas outlined in the method. And all these features are working in the application. All learning features are also fully functional and meet, if not exceed, the requirements. The user interface and user experience of the application exceeded the minimum requirements outlined in the approach section of the project.

There are two unsatisfactory points. The first is that due to permissions and other issues, we do not have permission to connect to the school's server and cannot display all content with Cardiff's existing content.

The second point is that due to development costs and time, there is no way to develop and improve some of the functional requirements of the teacher system. If there is time in the future, the teacher system will be developed.

17 Conclusion

The main goal of the project is to create a fully functional mobile application that can be used as a hub system for students in their daily learning to help students learn more conveniently and increase learning efficiency. The secondary goal of the project is to create a mobile Android application that is easy to operate, intuitive, and convenient for students to learn. I believe these two main goals have been achieved.

A minimum viable product has been created with almost all of the functionality implemented successfully, the user interface and user experience of using the application is friendly and intuitive.

The main drawback of this project is that there is no classroom system, only the student system considers the extra time and resources required to realize this function, the application is fully in line with the application's specifications.

Another flaw of the project is that a lot of data is stored in the database of the Android client, because there is no permission to link Cardiff University's server to obtain the data.

Overall, the project has been a great success, the final product that has been developed implements features It can help many students to be more convenient in their daily study life and increase their learning efficiency. Therefore, meeting the main overall goal of the project.

This application still has a long way to go. In the future, some functional needs of teachers can be increased. For example, teachers can upload course materials, upload replay videos, set live links, and give scores to students to help teachers increase their work. Efficiency, convenient for teachers' work.

18 Reflection

There have been a considerable number of things I have learnt throughout the completion of this project.

The main area of improvement I have noticed since the start of the project is my ability to read and interpret documentation of technologies that help me craft my own solutions to problems, rather than using example code online. This has been of great help as it makes the development process far more efficient, but also more interesting.

I have also gained a lot of specific technical skills; at the start of the project, I had never made a mobile application and had only ever developed a small number of web based projects. I have gained knowledge and far greater understanding of SQLite databases, specifically MySQL and its unique advantages, and its shortcomings.

Furthermore, I have gained a far greater understanding and appreciation for the design and development process for a full piece of software. Having had hands on experience with all aspects of this project, including project management, requirements and specifications, application design, backend development, frontend development, command-line interfaces, debugging, testing and many more.

In addition to the research and technical skills I have developed, I have also gained experience in frontend user interface and user experience design. I now have a much better understanding of what makes a good software product, from the point of view of a developer and the point of view of a customer. I have much more respect for the design process of systems, something I used to ignore as I believed it was insignificant in comparison to dealing with the gritty technical issues.

My project management skills have improved, having had experience with an agile approach, using a Kanban board and utilizing test-driven development in a project over a period of more than three months. It has given me an understanding of how to deal with the stresses of a large project, and the power and efficiency that can be extracted from a project when utilizing an agile approach.

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20 Appendix A- Questionnaire

A survey of student use of learning system in Cardiff University



PARTICIPANT INFORMATION SHEET

Student Learning System App-Mobile Application

You are being invited to take part in a research project. Before you decide whether to take part, it is important for you to understand why the research is being undertaken and what it will involve. Please take time to read the following information carefully and discuss it with others, if you wish.

Thank you for reading this.

1. What is the purpose of this research project?

The research project aims to understand how students consult learning materials while studying remotely and evaluate the user-friendliness of a mobile learning system.

2. Why have I been invited to take part?

You have been invited because you are a student at Cardiff University.

3. Do I have to take part?

No, your participation in this research project is entirely voluntary and it is up to you to decide whether to take part. If you decide to take part, we will discuss the research project with you [and ask you to sign a consent form]. If you decide not to take part, you do not have to explain your reasons and it will not affect your legal rights. Your involvement in this research project will have no effect on their education or progression through a degree course. You are free to withdraw your consent to participate in the research project at any time, without giving a reason, even after signing the consent form.

4. What will taking part involve?

You will be asked to complete 27 questions, which will take about 20 minutes to complete.

5. Will I be paid for taking part?

No.

6. What are the possible benefits of taking part?

There will be no direct advantages or benefits to you from taking part, but your contribution will help us understand the user experience of the learning system on smart phones.

7. What are the possible risks of taking part?

There are no risks.

8. Will my taking part in this research project be kept confidential?

All information collected from (or about) you during the research project will be kept confidential and no personal information will be collected from you. Your participation is completely voluntary, and no questions are compulsory.

9. What happens to the data at the end of the research project?

All information collected from (or about) you during the research project will not be publicly shared within or outside of Cardiff University. This data will only be used for the current research project and will not be used in any further research.

10. What will happen to the results of the research project?

Results of all participants will be summarized and no participants will be identifiable in any report, publication or presentation.

11. What if there is a problem?

If you wish to complain or have grounds for concerns about any aspect of the manner in which you have been approached or treated during the course of this research, please contact Dr Beryl Noë (noeb@cardiff.ac.uk). If your complaint is not managed to your satisfaction, please contact the Cardiff University School of Computer Science Research Ethics Committee (comsc-ethics@cardiff.ac.uk).

12. Who is organizing and funding this research project?

The research is organised by Yuechao Wang in Cardiff University and supervised by Dr Beryl Noë.

13. Who has reviewed this research project?

This research project has been reviewed and given a favorable opinion by the Cardiff University Research Ethics

Committee.

14. Further information and contact details

Should you have any questions relating to this research project, you may contact us during normal working hours:

Yuechao Wang,

RM.603,NANTONG Road,Harbin,HeiLongJiang,CHINA,

+8615114676880,

WangY416@cardiff.au.uk

Thank you for considering to take part in this research project. If you decide to participate, you will be given a copy of the Participant Information Sheet and a signed consent form to keep for your records.

CONSENT FORM

Title of research project: Student Learning System App-Mobile Application

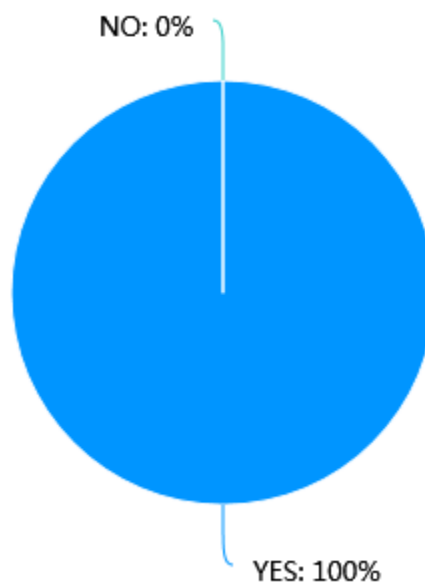
SREC reference and committee: [Insert SREC reference and committee or other relevant reference numbers]

Name of Chief/Principal Investigator: Yuechao Wang

THANK YOU FOR PARTICIPATING IN OUR RESEARCH

Section 1: Questionnaire

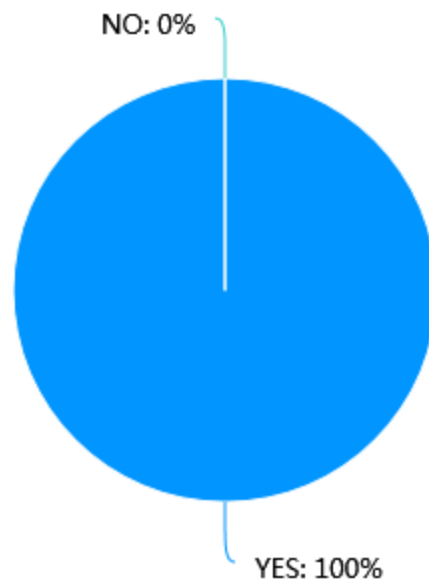
1. Have you ever experience dremote learning?



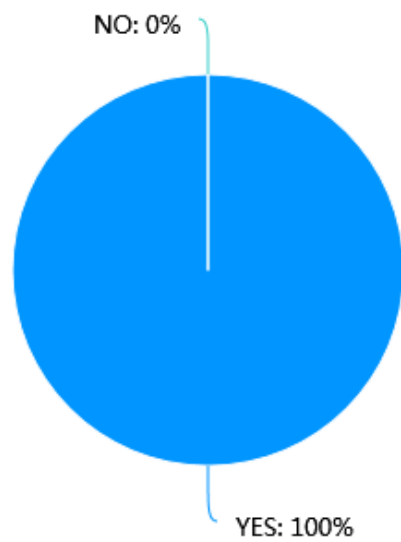
2. Do you own a smartphone?



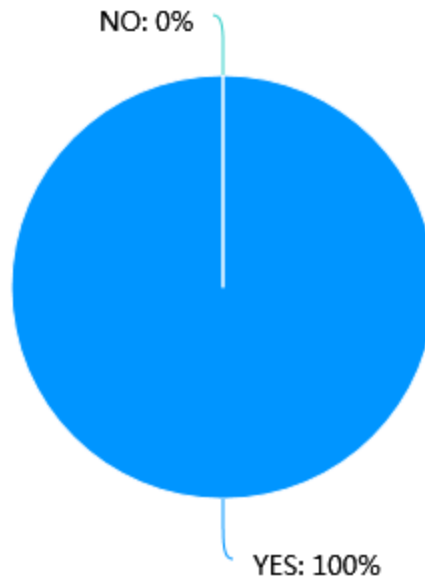
3. Do you own a desktop machine(eg.laptop,PC)?



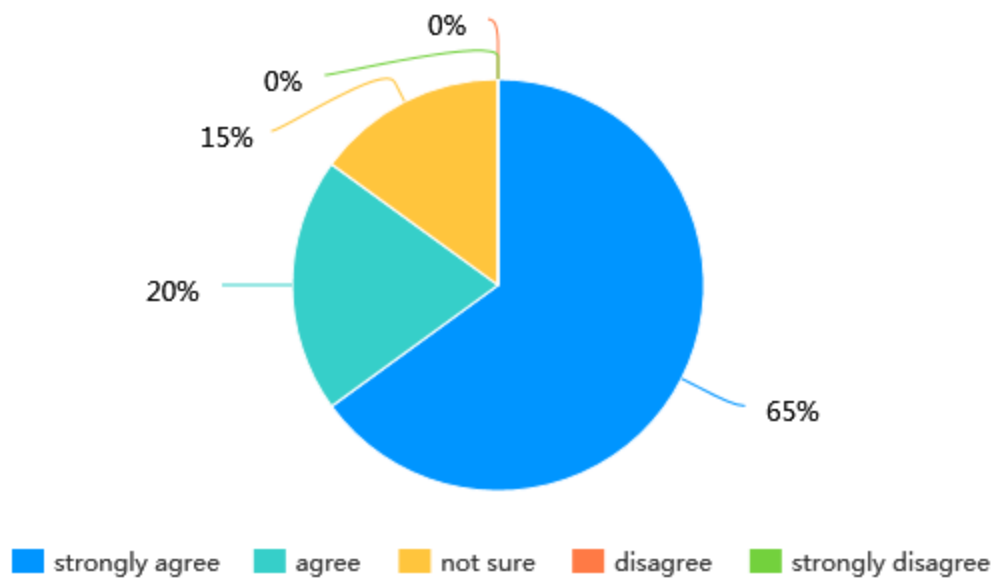
4. Do you watch recorded lecture videos on your smartphone?



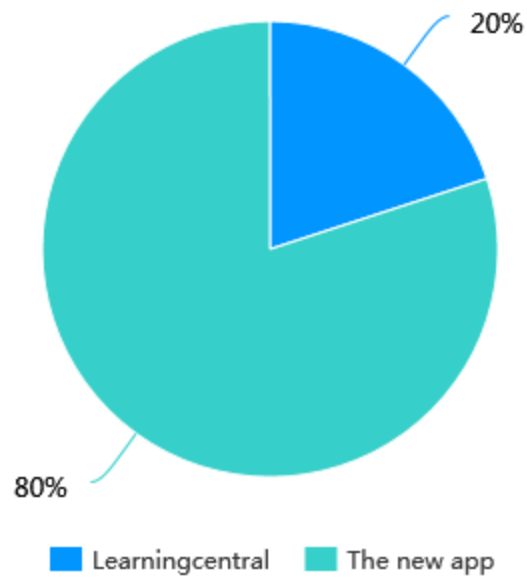
5. Do you use your smart phone to access learning materials?



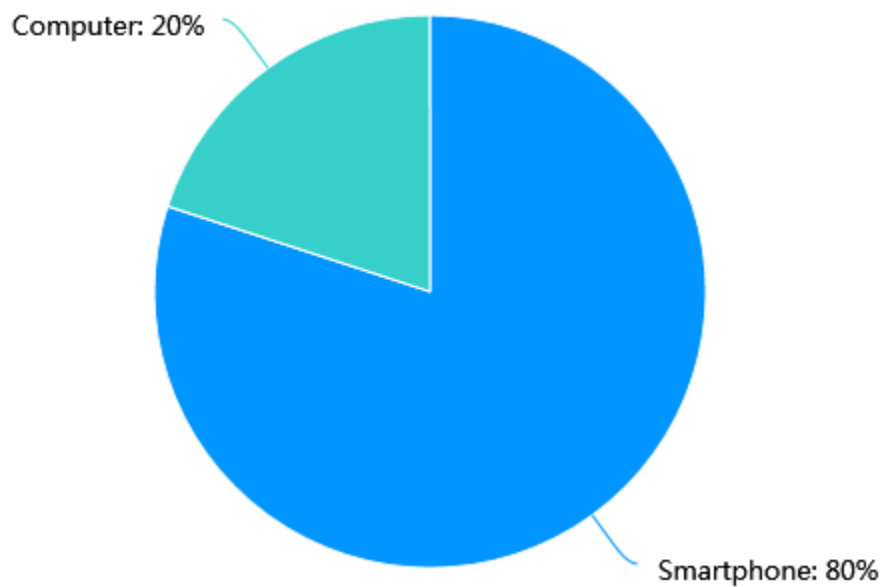
6. Do you think it is very convenient to use smartphones to access learning materials during the epidemic?



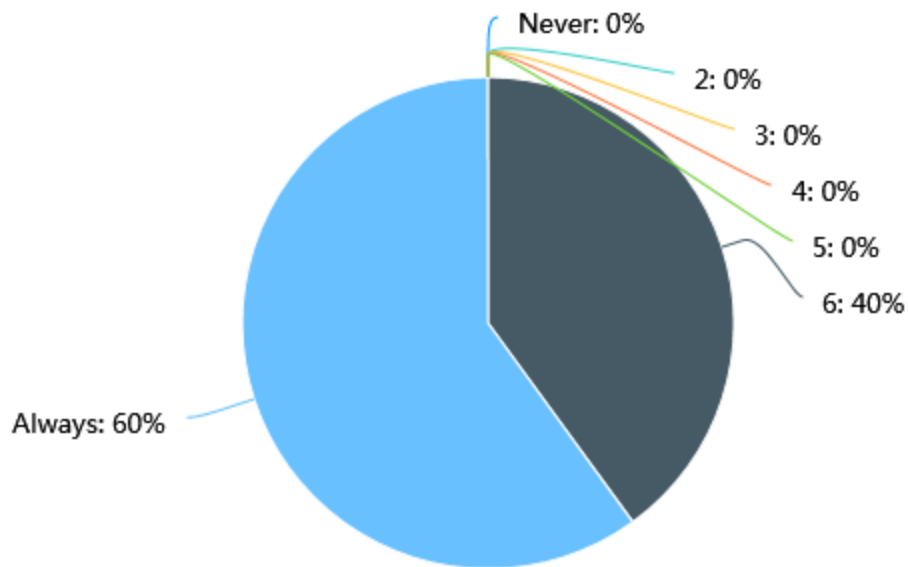
7. If there is an app that can watch lectures video, would you prefer to use learning central or the new app to view these videos?



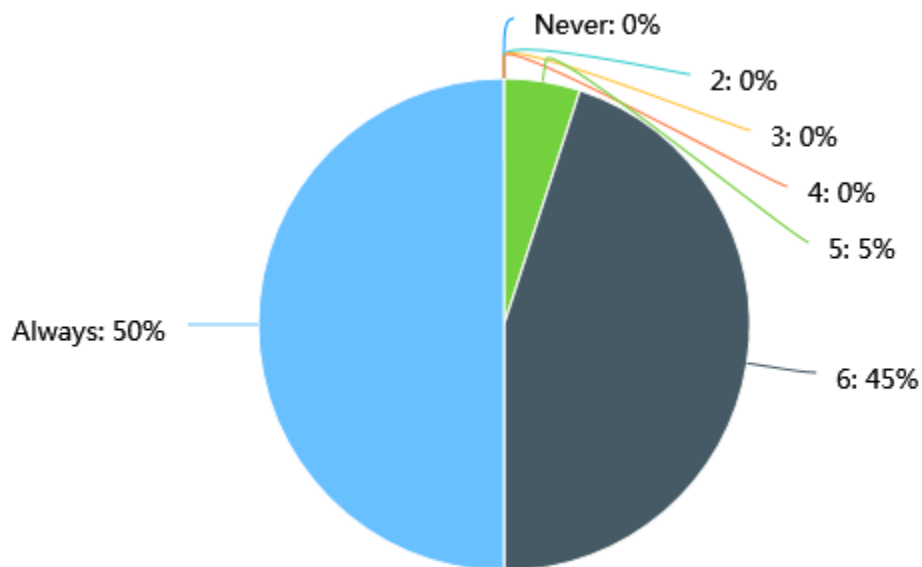
8. Do you prefer to use a smartphone or a computer to watch live lessons during remote learning?



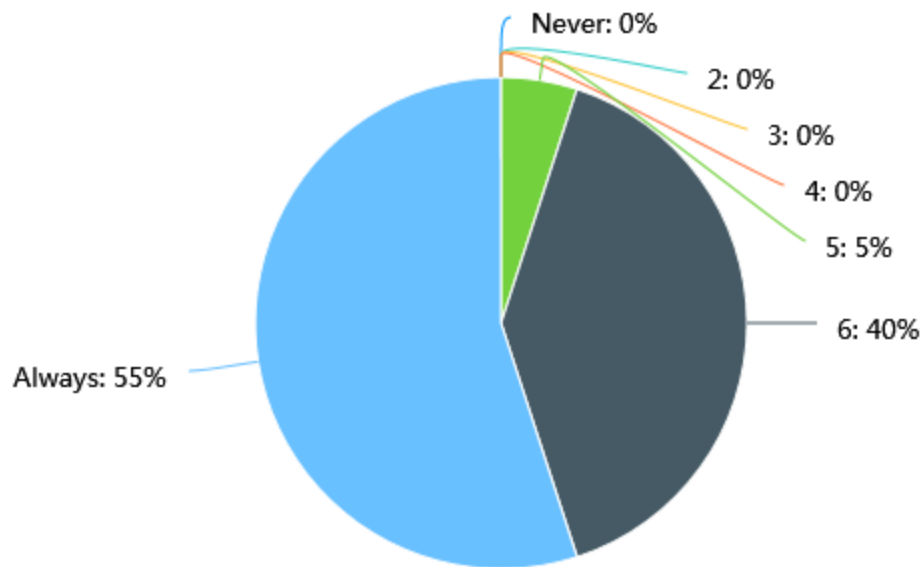
9. How frequently do you use your desktop machine to access learning materials for university? Please select from 1 (never) to 7 (always)



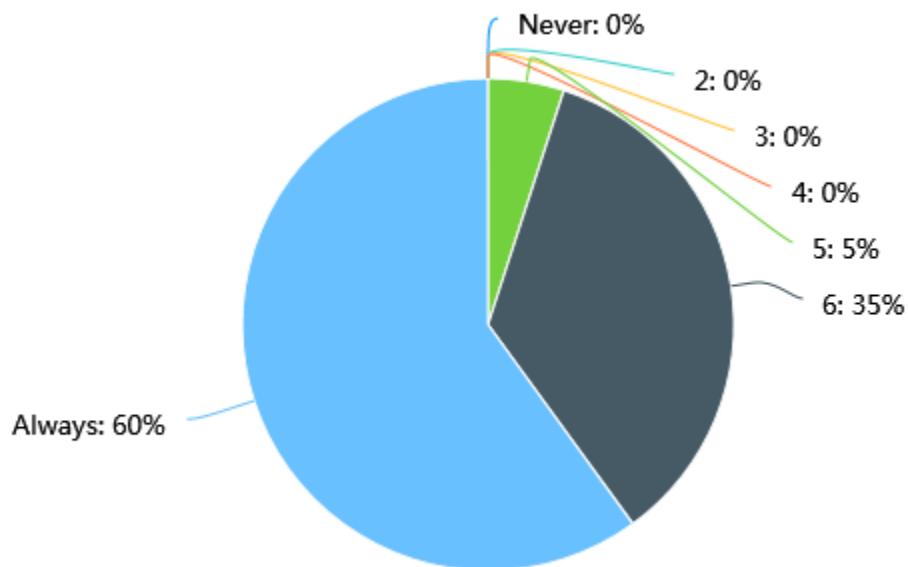
10. How frequently do you use your phone to watch live video lessons? Please select from 1 (never) to 7 (always)



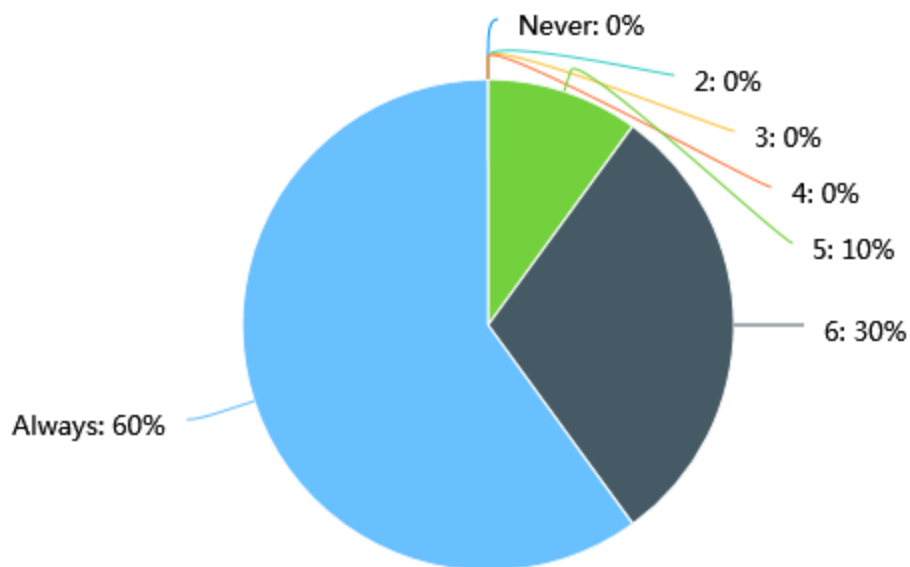
11. How frequently do you use your computer to watch live lessons? Please select from 1 (never) to 7 (always)



12. How frequently do you use your smartphone to access learning materials for university? Please select from 1 (never) to 7 (always)



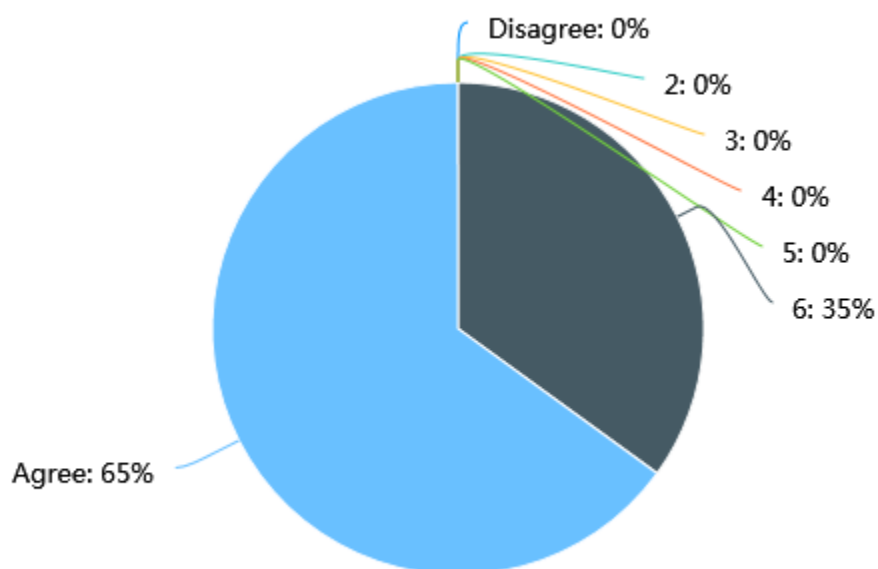
13. How frequently do you want to watch the lecture video on your mobile phone? Please select from 1 (never) to 7 (always)



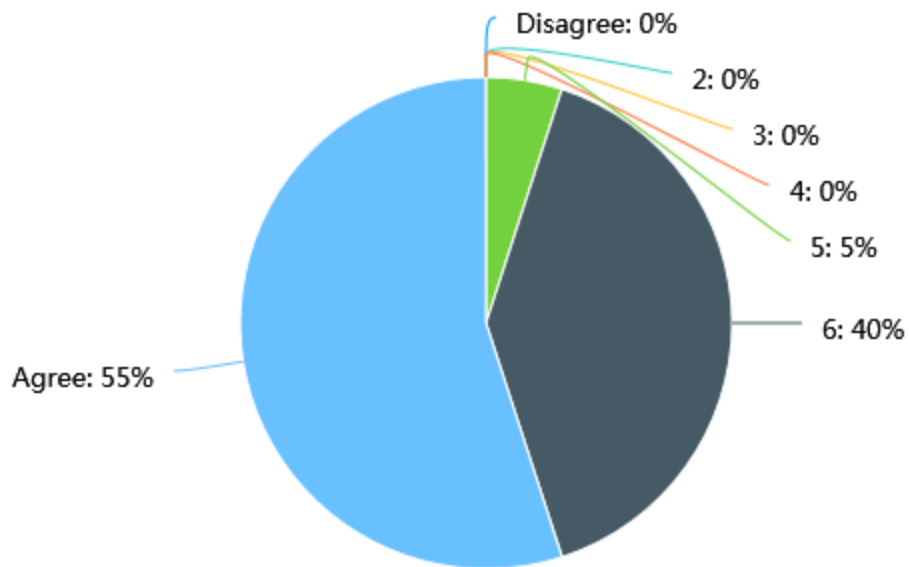
Section 2: Usability questionnaire

Please visit the attachment video and answer the following questions about the app. Please select from 1(Disagree) to 7 (Agree)

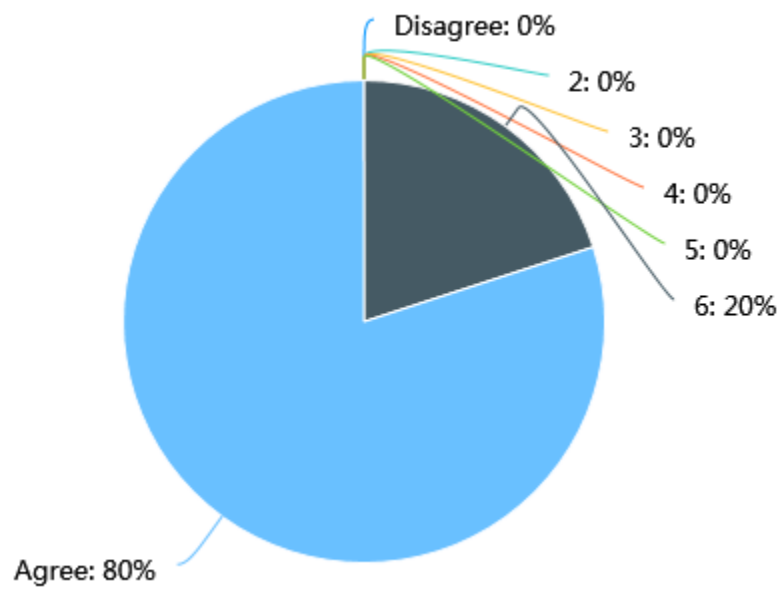
1. Overall, I am satisfied with how easy it is to use this APP



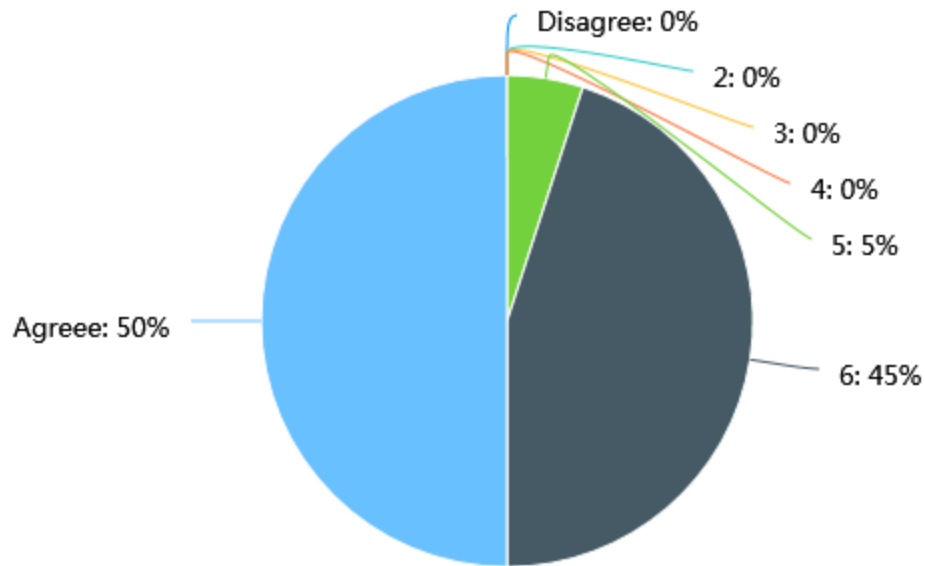
2. It was simple to use this APP



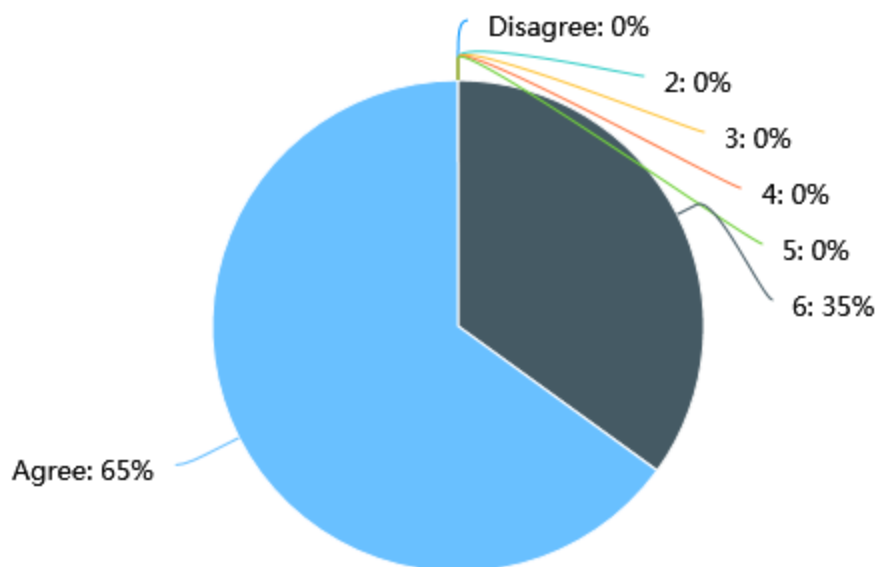
3. I could effectively complete the study and review and scenarios using this APP



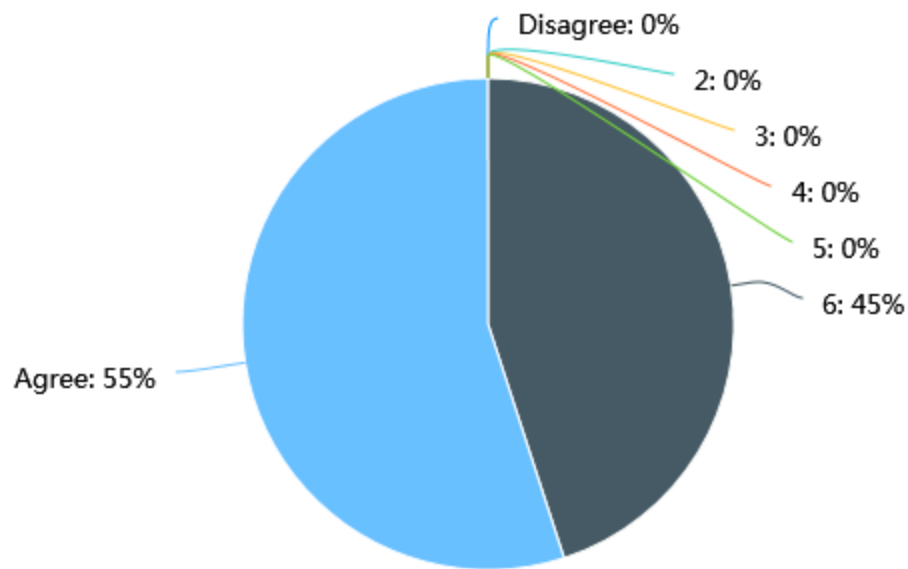
4. I was able to complete the study and review and scenarios quickly using this APP



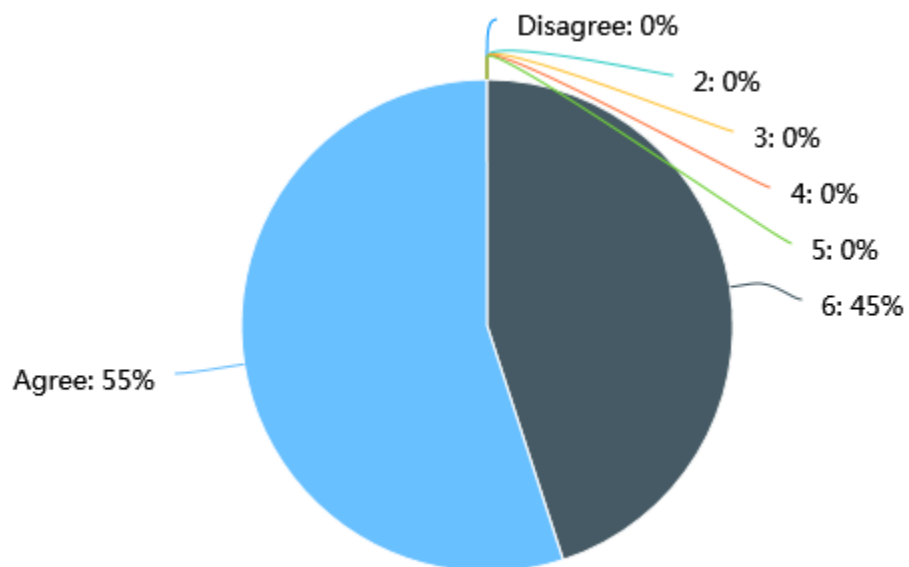
5. I was able to efficiently complete the study and review and scenarios using this APP



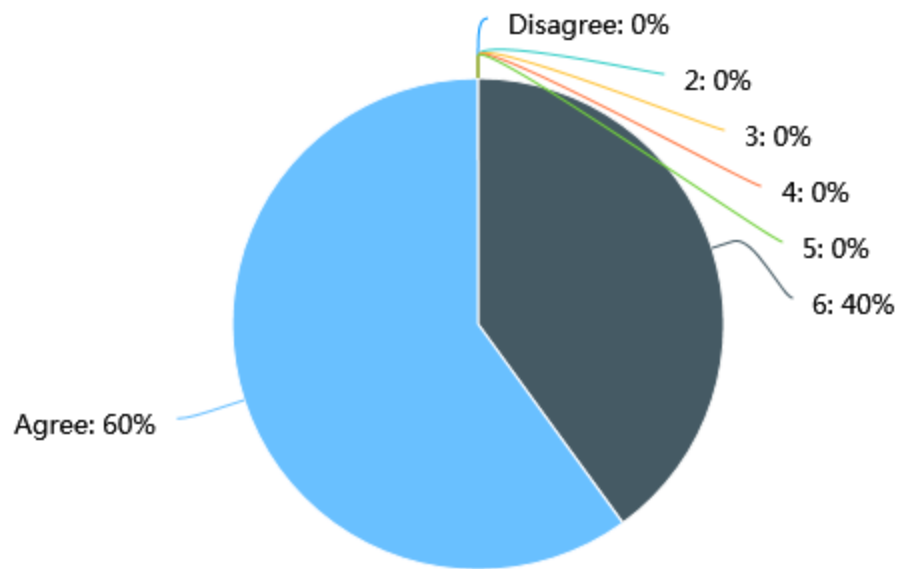
6. I felt comfortable using this APP



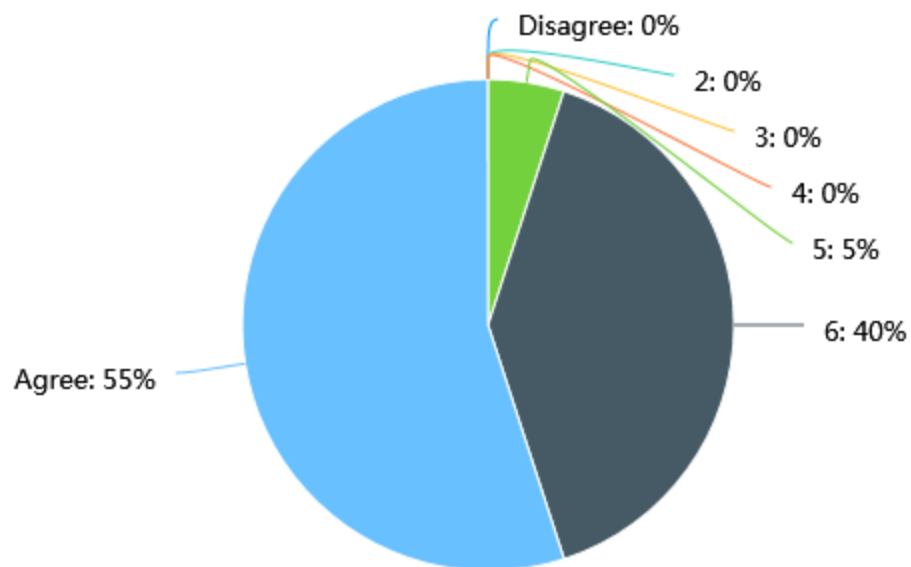
7. It was easy to learn to use this APP



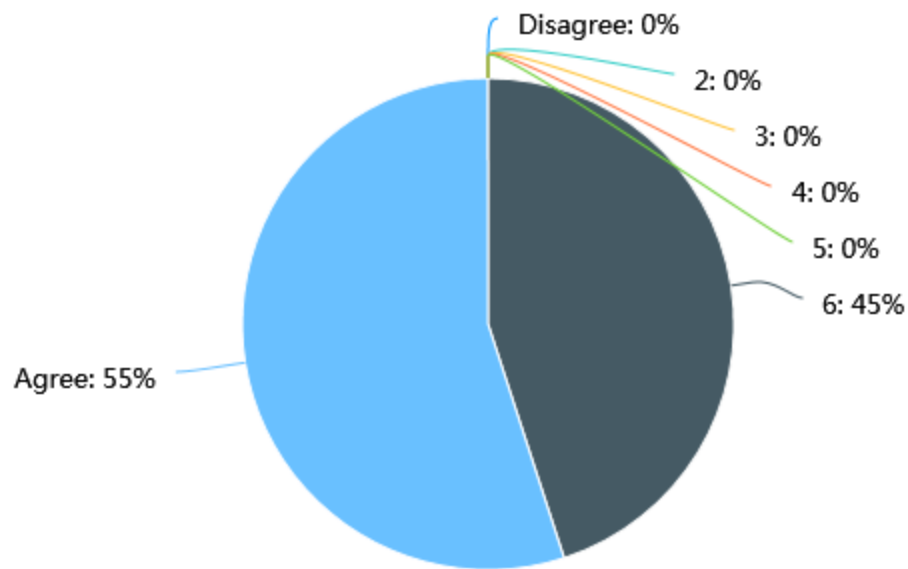
8. It was easy to find the video playback and materials I needed



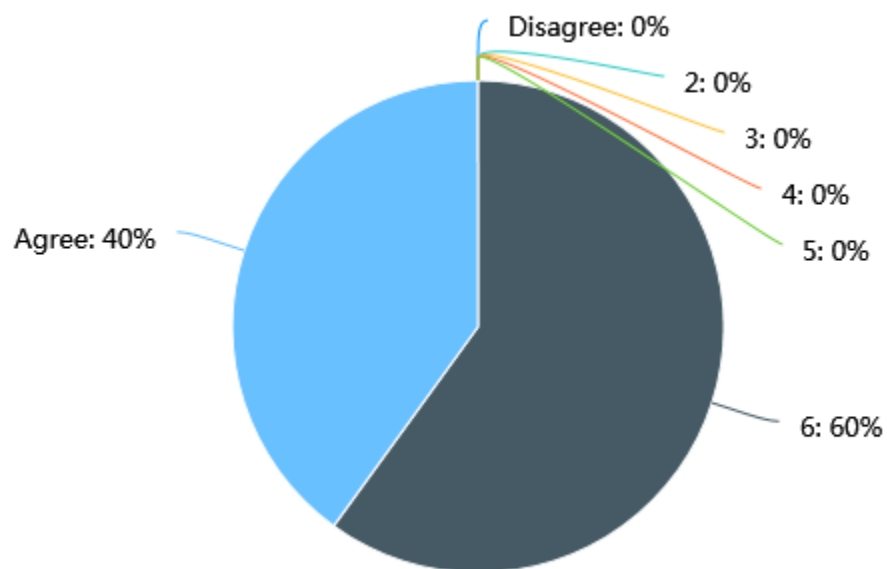
9. The APP was effective in helping me complete the study and review



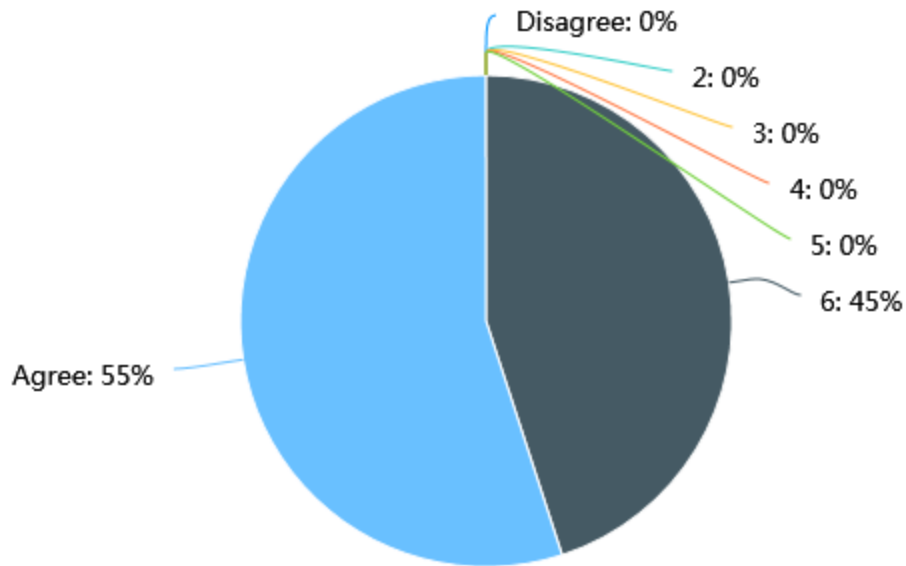
10. The organization of information on the APP screens was clear



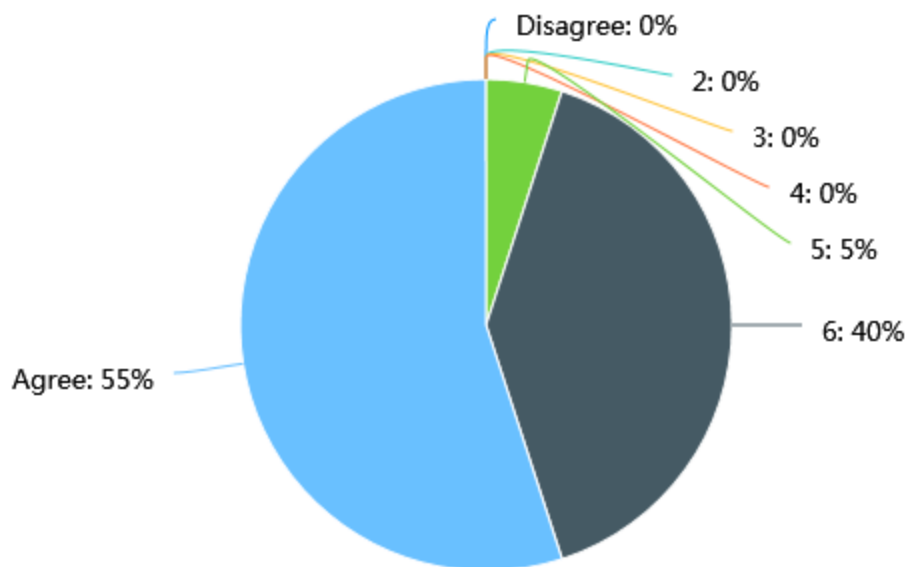
11. The interface of this APP was pleasant



12. I liked using the interface of this APP



13. This APP has all the functions and capabilities I expect it to have



14. Overall, I am satisfied with this APP

