UTM
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PROJECT -Part 2(Team 8)

SECP1513 Technology and Information System

Title : VR Classroom

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Section : 06

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Programme : Bachelor of Computer Science (Software Engineering)

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1.0 INTRODUCTION

In our project, we mainly focus on one of the technologies of the Fourth Industrial Revolution (IR4.0) is, virtual reality Classroom. Virtual reality is a new technology that can be used in the classroom to augment the teaching of a subject or topic by allowing students to 'experience' the information. Beyond engaging students, virtual reality allows them to explore, experience, and immerse themselves in virtual surroundings.

VR Classroom which is 'ClassVR' is a dynamic platform that uses virtual and augmented reality for education and training in settings ranging from the classroom to the boardroom. At all important phases, VR Classroom gives students a one-of-a-kind, multi-sensory, and totally immersive learning experience. Students can benefit from improved, sensory-based experiential learning by participating in a VR Classroom experience.Virtual reality can be used in the classroom in two ways: students can explore a virtual environment using a computer, keyboard, and mouse, or they can use an input device such as a controller or a virtual reality headset. The latter setup uses a head-mounted display to fully immerse students. This tool may be used for any subject and provides educators with a way to interact with a range of learning styles while also exploring alongside students. For example, children can take a trip in a rainforest and learn about different creatures and plants. The technology also allows for a lot of flexibility in terms of design and coding. VR may be used in the classroom to educate personal and social skills while breaking down geographical and communication obstacles.

2.0 DETAIL STEP AND DESCRIPTIONS

Empathy

Empathy is the stage where we should understand the problems faced by our clients. Our clients are the people that came from the education sector like teachers/lecturers and students. For the past few years, as the Covid-19 pandemic has complicated the school session for learning, it also has shown us that our education platform needs to be improved. So, first we interview some of our friends who are doing their courses online. We asked them about their personal information at the start of the interview because we thought it could help us figure out what problems they were having, and then we questioned them about their experience and problems with online classes on various platforms.

Define

Define is the stage in which we identify the issues that our clients are experiencing. We recognized their concerns after watching the interview footage by studying and analyzing their replies given during the interview process.

Ideate

Ideate is the stage for brainstorming where we can generate possible solutions for the problem statement. In this stage, we suggested different solutions for the problems based on our client interest.

Prototype

Prototype is the stage at which we choose the best concept from a source of possibilities and transform it into a product. We began prototyping when we had decided on a solution. The prototype was the ClassVR application's user interface, which was based on the design of a virtual reality classroom. Colored paper, a ruler, colored pencils, and binder rings were used to make the prototype.

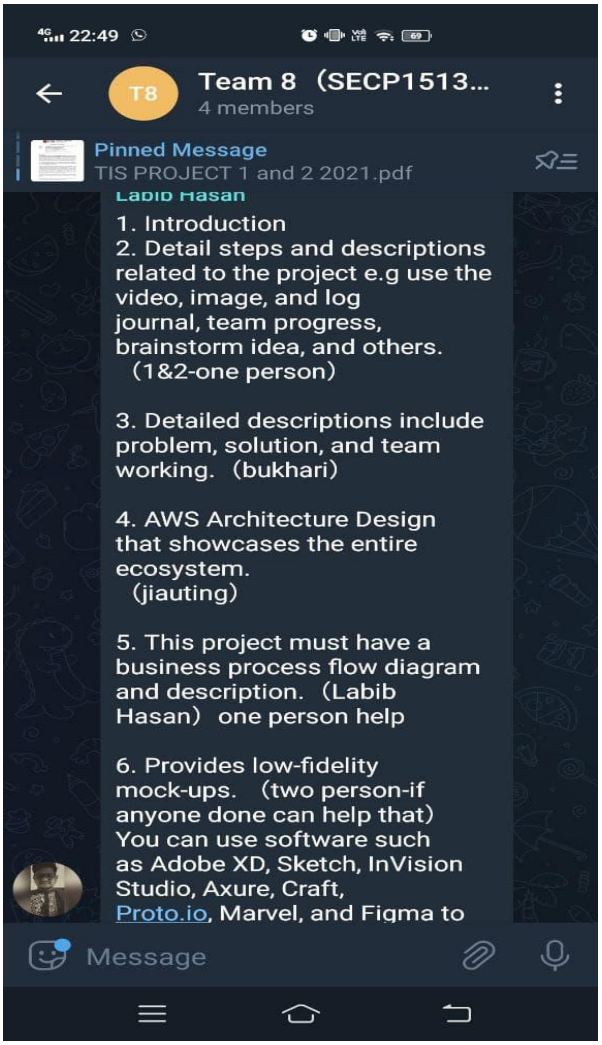
Test

Our product should be evaluated by our users, and the input we receive from them is valuable since it can help us identify the limitations of our product and enhance it further. After finishing the prototype, we showed it to the respondent and discussed the characteristics of the ClassVR application. Aside from that, we inquired for their thoughts on the product.

Work progress Evidence

Figure 2.1 Project progress

Figure 2.2 Group Meeting to Discuss project



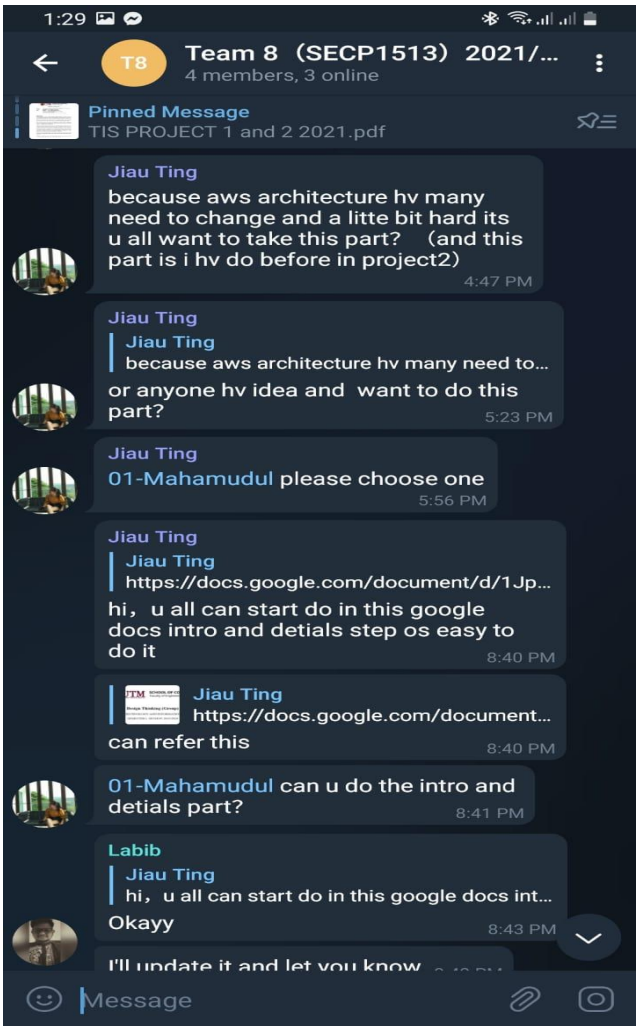


Figure 2.3 Group Discuss and Plan

3.0 DETAILED DESCRIPTION

PROBLEM

After the interview session, we found that online learning sessions that are being conducted nowadays are not effective. Students have a problem focusing during class sessions because their surroundings are not conducive enough for them, especially when they have online class at home. Students cannot feel the same pressure as they are having class in a real classroom, where the surroundings are more effective for students to focus.

SOLUTION

After the discussion, Our team decided to create an application called VR Classroom.This application will be connected to VR gear and bring students to experience a learning session in virtual reality that displays the same surroundings as a real life classroom. This will provide sufficient pressure and environment for students to focus during the learning session.

TEAM WORKING

Our group has split ourselves into different tasks. Labib will mainly focus on the production of the video. Bukhari, Jiau Ting and Mahamudul will focus on the content of the report and discuss the progress in creating the prototype of the VR classroom application.

During the design thinking process, we do not come up with the idea at an early time, which has become our very obstacle and causes our progress to become very slow. Besides, our team can hardly find a suitable time for us to have at least one productive discussion and come up with ideas for our project due to different timetables and lots of activities after the class. Fortunately, each of us is clear about the tasks that were given and finally manage to come out with a complete report and videos.

4.0 AWS Architecture Design

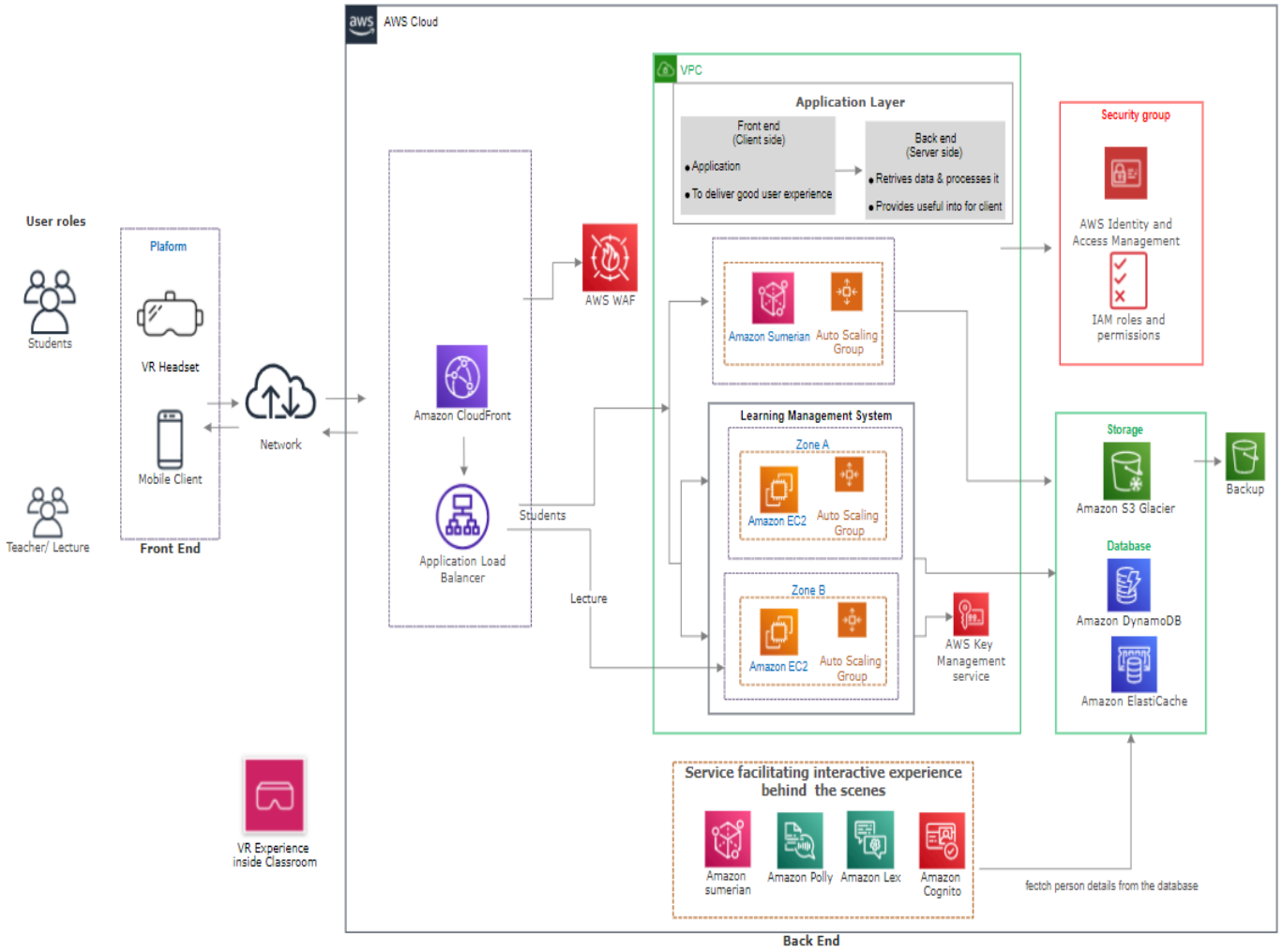


Figure 4.1 AWS Architecture Diagram

We will first explain the architecture for building the VRclassroom and then we will show how we can measure its effectiveness.

Components of Front-End Cloud Architecture

The client is the front-end of a cloud computing system. The front end is what the user sees and interacts with (user interface).

User Role

The concept suggests support for numerous roles in the learning environment that define the user's actions and learning process, and in the opposite portion of virtual reality, decide the type of interaction and information accessible, as well as the educational services connected with it.

User and Description:

Teacher

- Provide student orientation services
- Provide content for pedagogical activities
- He is an expert who dominates the contents
- Share learning experiences with students
- Encourage student participation
- Facilitate the understanding of the basic contents and encourage self-learning

Student
- It generates its own knowledge
- It is characterized by being interactive
- It is related to the learning process
- Guided by the teacher while building their own knowledge
- Plans the learning activities

Platform
VR Headset
VR headsets are considered "clients" of servers. A virtual reality headset is a head-mounted display (HUD) that allows the user to interact with a simulated environment and experience a first-person perspective (FPV). VR headsets can connect to each other as well as to the cloud. The instructor/student can move the user's perspective in a natural way through the eye-tracking module, position and motion controllers.

Mobile
Our system is run in a mobile application. VR learning environments can be built on mobile devices.Therefore, lecturers or students use mobile to open the VR Classroom app that can connect required VR headsets such as Oculus RifT3 or HTC Vive4. This can let students and lecturers go into the learning system to view the menu and case submission.

Network
Lecturers and students receive the visual experience via a 5G network connection with minimal latency, high capacity, and assured throughput. The sensor input signals from the terminal are sent to the app for processing over the same 5G network connection.

Components of Back-End Cloud Architecture

Compute and Networking
Application Load Balancer: The load balancer serves as the client's single point of contact. Incoming application traffic is distributed by the load balancer to numerous destinations, such as EC2 instances in different availability zones. This improves the application's availability. To the load balancer, add one or more listeners.

Auto Scaling Group
Amazon EC2 Auto Scaling assists us in ensuring that we have the appropriate number of Amazon EC2 instances available to manage the load on your application. We will establish a collection of EC2 instances known as automatic scaling groups.

Amazon EC2 instances :A virtual server in the Amazon Elastic Computing Cloud (EC2) for executing applications on Amazon Web Services (AWS) architecture is known as an Amazon EC2 instance. AWS is a large and developing cloud computing platform; EC2 is a service that allows corporate students and lecturers to execute applications in a computing environment. It may be used to create an almost limitless number of virtual machines (VMS). To satisfy customer demands, Amazon offers a variety of instances with varying Configuration of CPU, memory, storage, and network resources. Each kind has a varying size to accommodate different workload needs.

Amazon Sumerian: Amazon Sumerian is introducing 2D web apps into the realm of 3D. By incorporating 3D material into our web sites, students and lecturers may interact in novel ways with a simple click, touch, or swipe. Students can learn online through virtual education as a result of this. This will promote student participation and knowledge retention.

Database

Amazon DynamoDB : Amazon DynamoDB is a fully managed, serverless key-value NoSQL database built to run large, high-performance applications. DynamoDB has features such as built-in security, continuous backup, automated multi-zone replication, memory caching, and data export tools.Therefore, it is suitable for students and lecturers to store the information of class and personal detail.

Amazon ElastiCache: ElastiCache from Amazon is a fully managed memory caching solution that provides customizable, real-time use cases. ElastiCache may be used for caching, which improves application and database performance, or as the primary data store for non-persistent use cases such as session storage, grade leaderboards, streaming, and analytics. ElastiCache works with Redis and Memcached. It is very useful in the VR classroom system because it can help lecturers save a lot of time managing data.

Storage

Amazon CloudFront : Amazon CloudFront is a web service that speeds the distribution of static and dynamic Web material to students and teachers, such as.html,.css,.js, and picture files. CloudFront distributes your content over a worldwide network of data centers known as Edge Locations. When a student or teacher requests CloudFront material, the request is routed to an edge location with the lowest latency (time delay) to provide the content with the greatest performance.

Amazon S3 Glacier: Amazon S3 Glacier is a safe, long-lasting, and low-cost Amazon S3 storage class used for data preservation and long-term backup. Students and professors may successfully preserve data for months, years, or even decades with S3 Glacier. S3 Glacier allows students and lecturers to offload the administrative burden of operating and scaling storage to AWS, eliminating the need for them to worry about capacity planning, hardware provisioning, data replication, hardware failure detection and recovery, or time-consuming hardware migration. This is useful for students and lecturers to upload the data to the app and it will save a lot of cost.

Security

Amazon DynamoDB stores all text information as key-value pairs. These encryption keys are stored in AWS Key Management Service (KMS), which provides an additional level of data protection by securing data from unauthorized access to the underlying storage. Fine-grained identity and access management (IAM) roles and permissions, as well as virtual private cloud (VPC) endpoints, can further restrict back-end access if necessary.

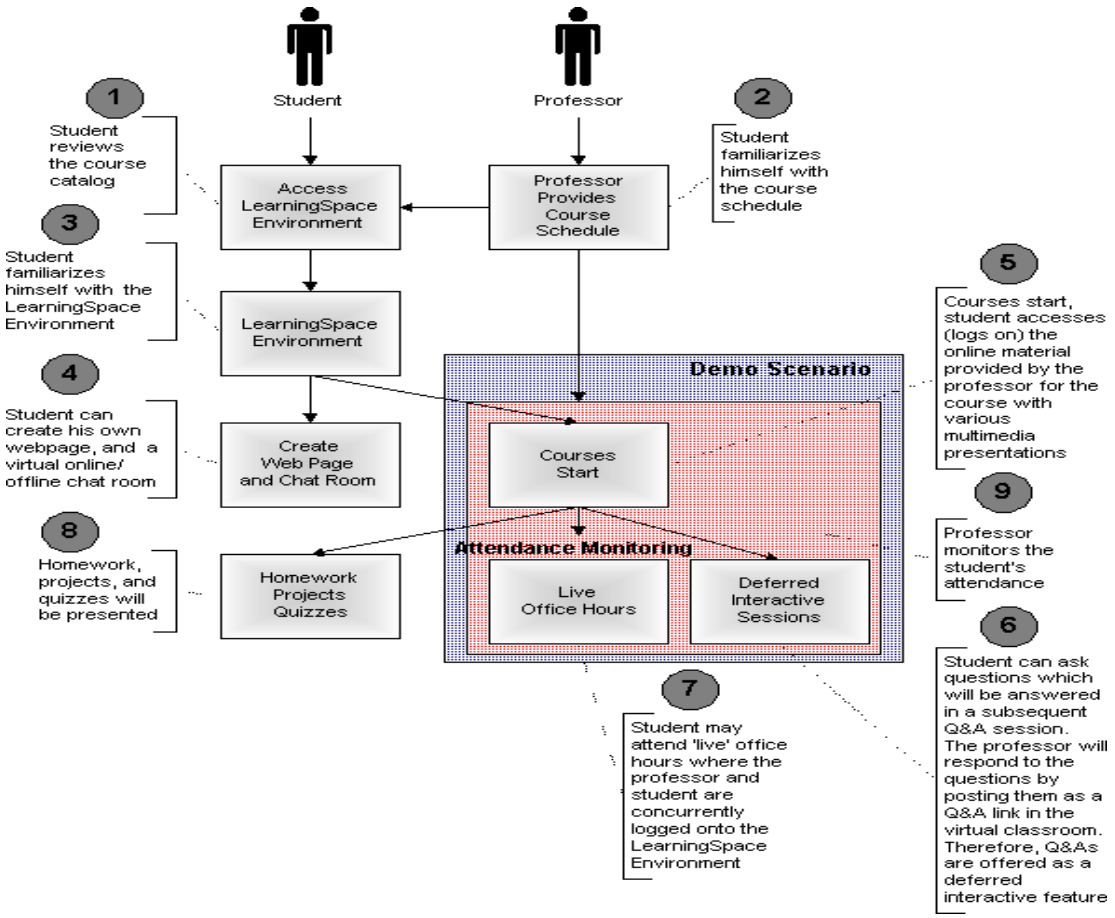
AWS WAF: AWS WAF (web application firewall) rules that filter common web-based attacks. Students and professors may utilize AWS WAF to develop unique, application-specific rules that block attack patterns in order to maintain application availability, resource security, and resource usage

Service facilitating interactive experience behind the scenes

The Amazonian Sumerians occupy the center of the structure. Sumerian is a hosted service for creating and running 3D, augmented reality (AR), and virtual reality (VR) apps. By importing items from an asset library into Sumerian, you may construct real-life scenarios in a classroom setting. In class, lecturers will electronically communicate with pupils. The voice component allocates material to students and instructors and uses Amazon Polly to play it back. Polly assists students in translating exercises and module information from Sumerian into natural language in real time, ensuring that students have access to the most up-to-date content for the device they are using.

Students and teachers may use an iOS or Android mobile device to access modules, quizzes, and practise questions and get certified using Amazon Cognito. Cognito is a solution that makes it simple to integrate student and course enrollment, as well as certification, to your mobile and online apps. Sumerians then construct temporary credentials for AWS services using the Cognito identity pool.

A visual state machine in the Sumerian editor controls the flow of interaction inside Sumerian. The conversation component in the editor is used to attach an Amazon Lex chatbot to an entity, in this instance a virtual class or host. Lex is a service that allows you to create voice and text-based chat interfaces.It allows you to engage in an interactive discourse with the instructor, communicate with students about their areas of interest, and give relevant classroom resources.



5.0 Business process flow diagram and description.

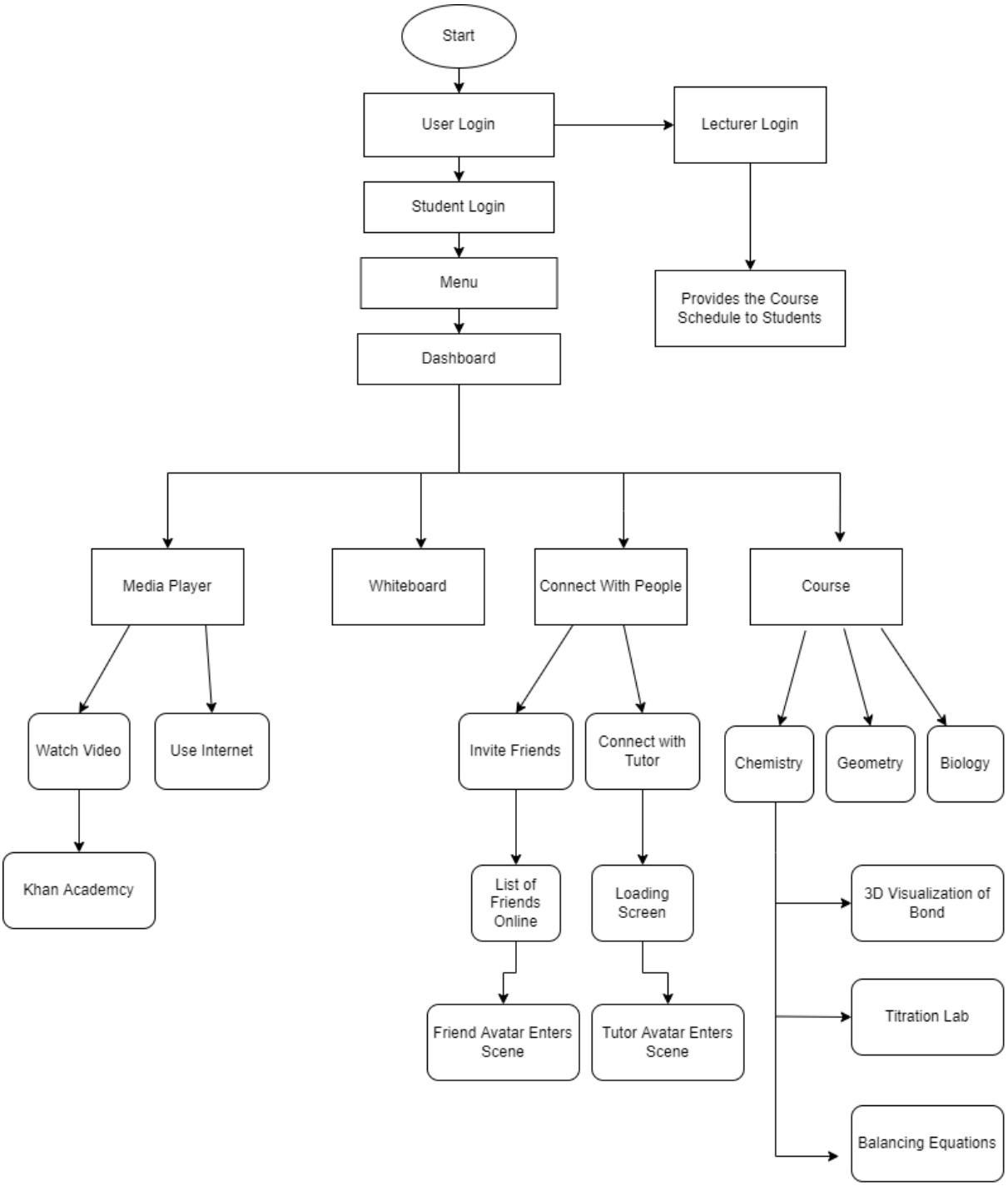


Figure 5.1 Business process flow diagram

In the business process we can figure out how the app will work from the login part to the end of each platform. Firstly there will be two ways to login to the app . Firstly by students and secondly a teacher. Both login will lead to two different ways.

When a lecturer logins then it will directly take to their respective courses and everything about that course can be edited by the lecturer. The lecturer can also provide the schedule to the students.

When a student is logged in the student can go to the main menu and go to their dashboard and can select any platform they want.
Students can click on the media player and watch videos and use the internet service for education. If the student clicks the whiteboard , it will directly put in a place to write and practice. If the student chooses to connect with people then the student can invite friends or tutor and it leads to a respective avatar entering the scene. If the student selects a course in the dashboard when the student can select any subjects they want at that moment. If the student chooses chemistry then it will lead to chemistry based classes , where the student can watch the required videos they want.

There are many online based platforms from where Students all over the world are using these applications. Top 3 online learning platforms are-

1. Cuemath

Cuemath is an after-school program for K-12 children that teaches math and coding to over 200000 students in over 20 countries.

2. WhiteHat Jr.

WhiteHat Jr. is one of the most well-known EdTech companies in the world, focusing on technology-driven learning in fields such as coding, mathematics, and music.

3. SP Robotic Works

SP Robotic Works has established an AI-based edutainment platform that promises to alter the way engineering and STEM education is accessed and consumed internationally, with courses in Robotics, Internet of Things (IOT), Image Processing, Virtual Reality (VR), and more.

6.0 Low-Fidelity Mock-Ups

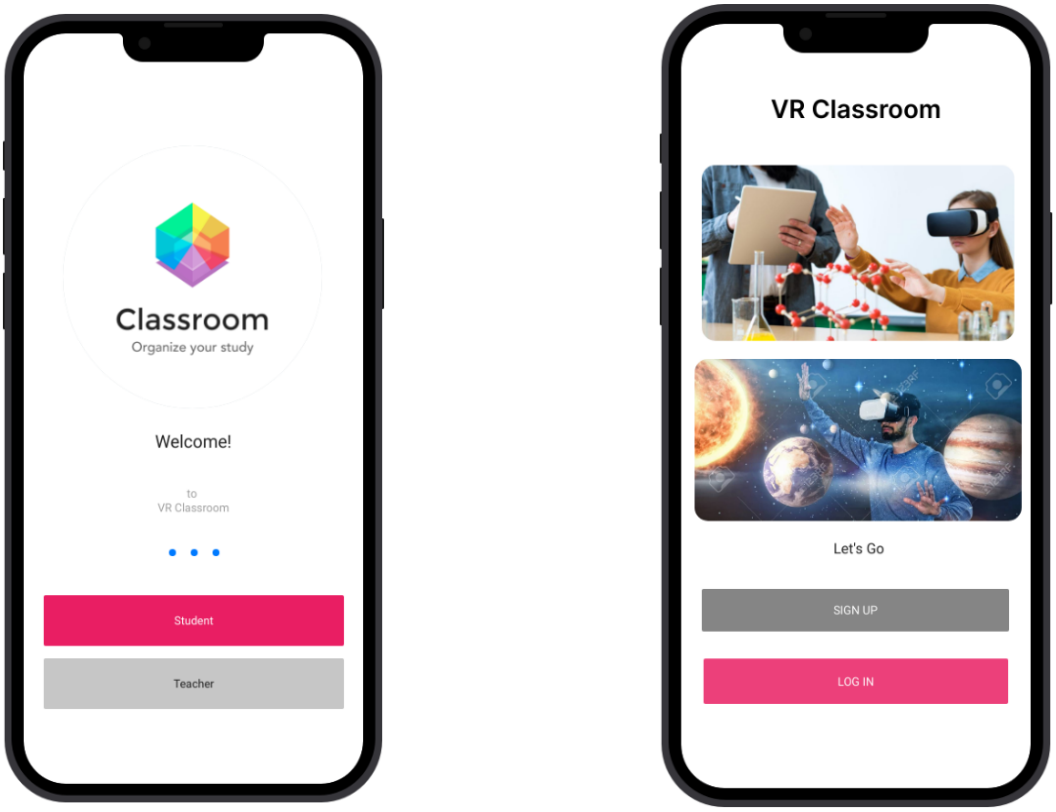


Figure 6.1 Logo & user interface of modified VR Classroom

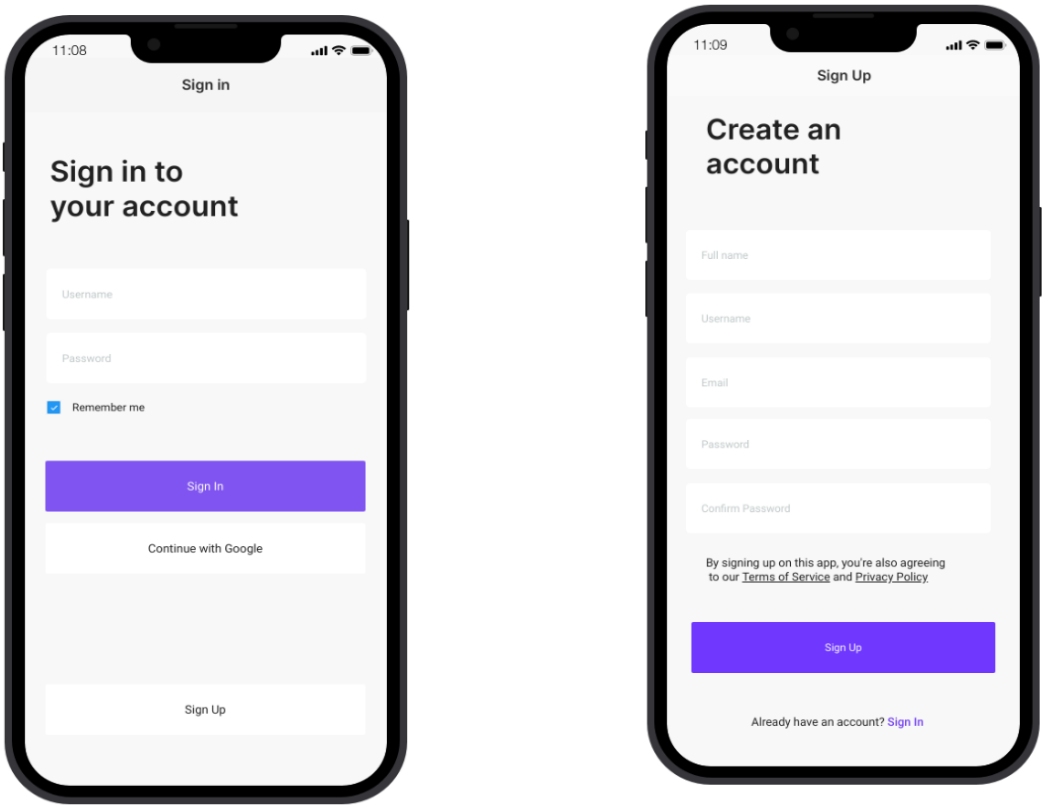


Figure 6.2 User interface for Sign in & Sign up

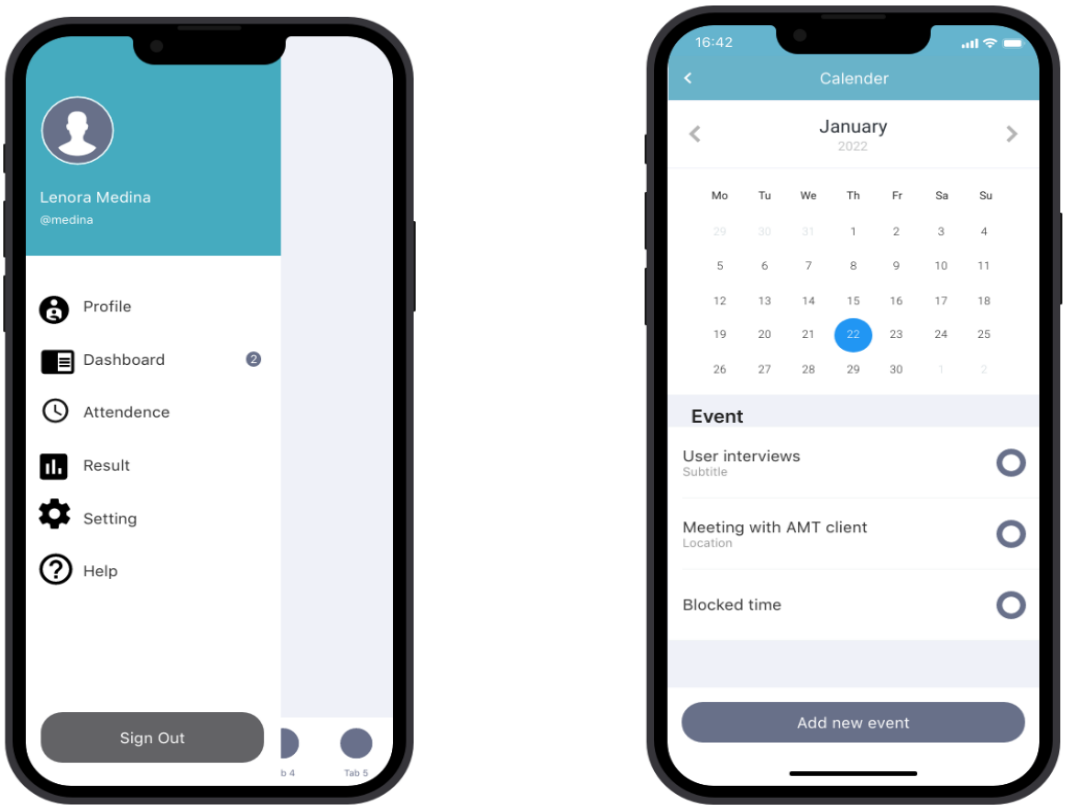


Figure 6.3 User interface of Menu and Calendar to plan the course time

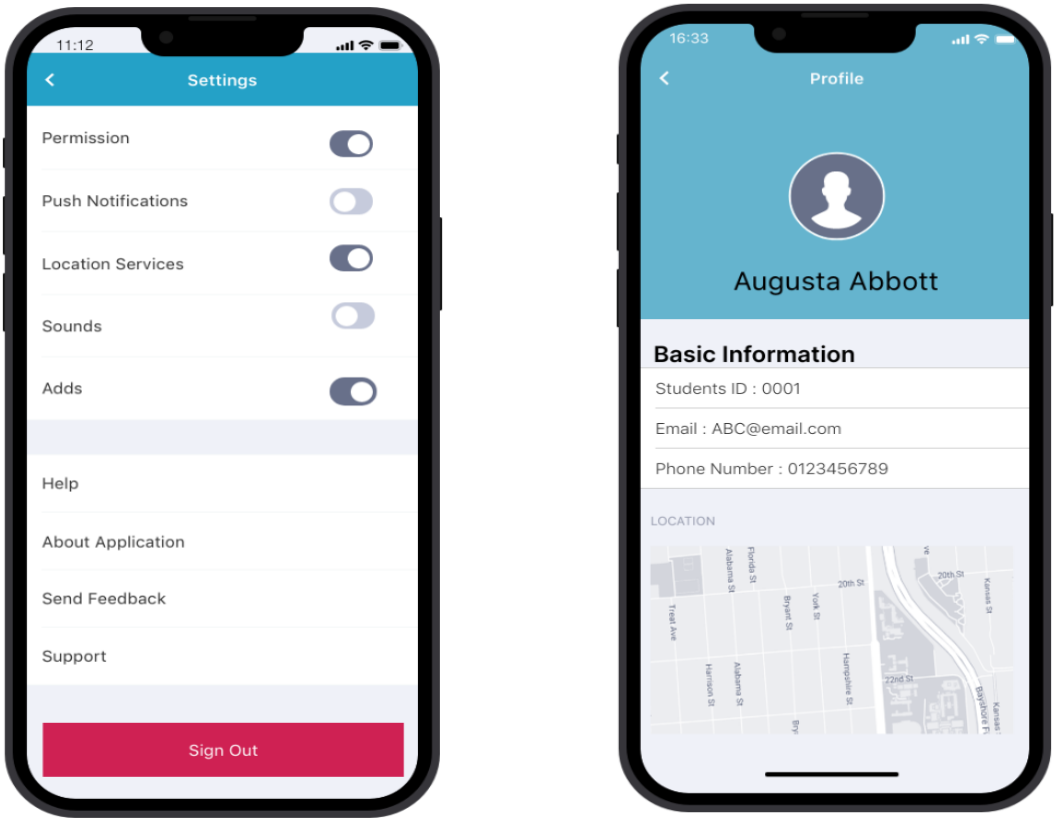


Figure 6.4 User interface of Setting and Profile

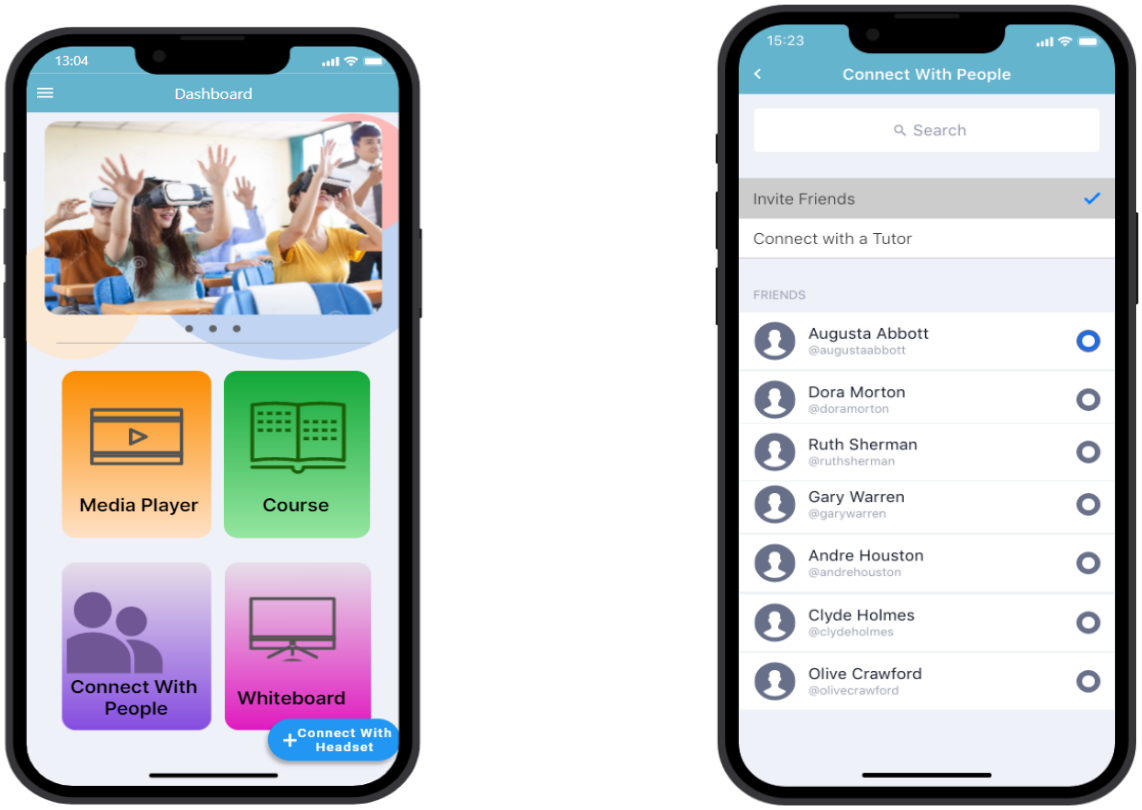


Figure 6.5 User interface of dashboard and Connect with people

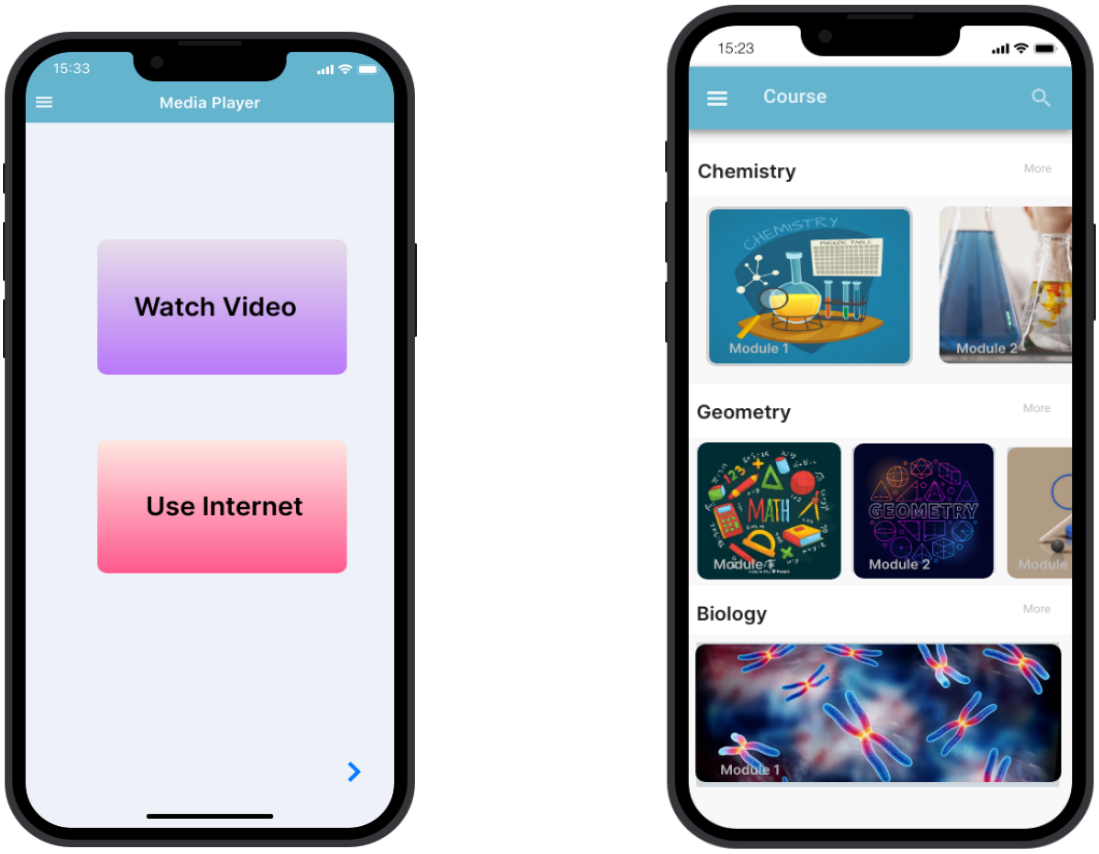


Figure 6.6 User interface of Media Player and Course

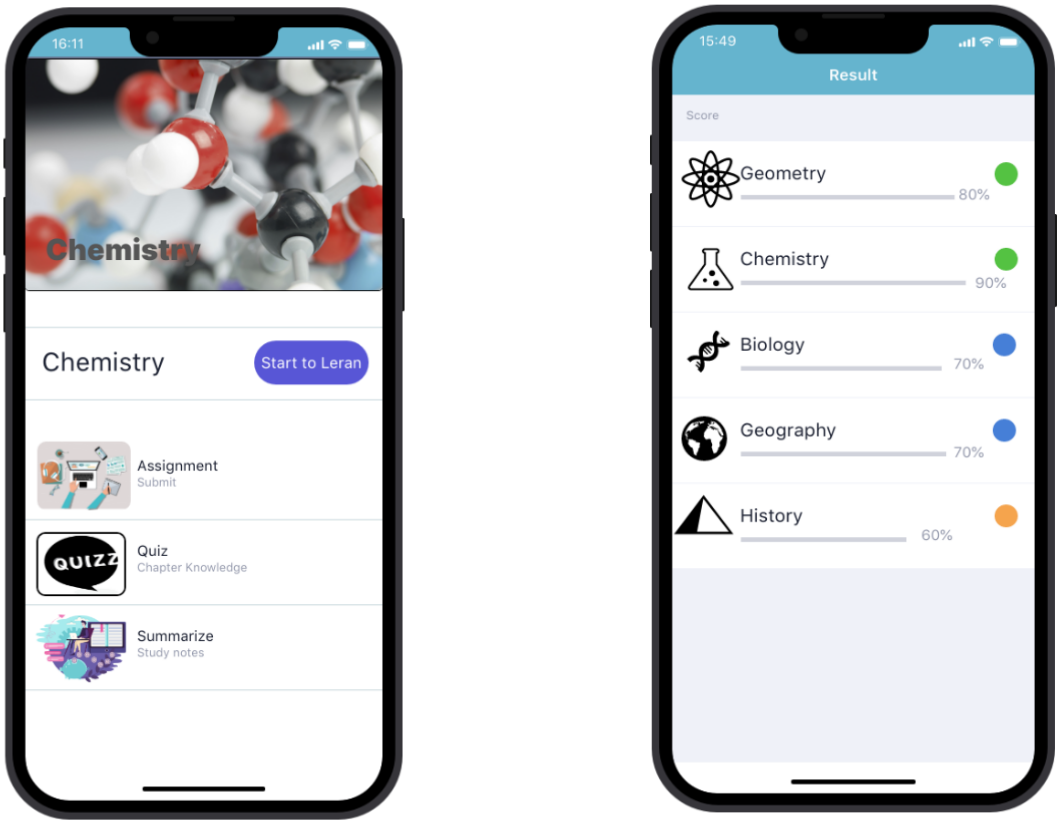


Figure 6.7 User interface of Course and Result

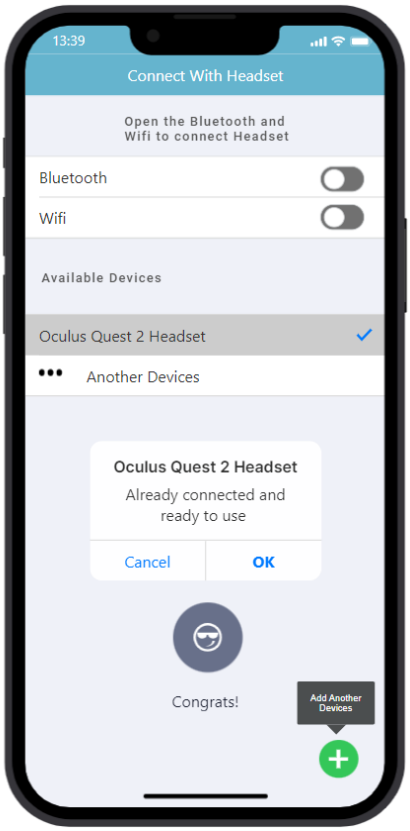


Figure 6.8 User interface for Connect With Headset and this will let students go into the 3D environment.

Figure 6.9 the expected VR Classroom in 3D connect with Headset

Reflection

Tan Jiau Ting

I learned more about how to create a software mock-up and AWS service use in cloud architecture to create a project. My motivation to complete this project is that my friend always gives me motivation,boost and teaches me so I forced myself to complete this project. I discovered from the prototype that it is difficult to develop new software since there is a large amount of existing software in the world that is operating properly. So,I find that instead of attempting to build new software, we must assist in modifying current software in order to minimize resource consumption and assist the community in swiftly resolving their problems. Therefore, I will use this knowledge to try to create a project in future.In my opinion, i think i need to improve my AWS knowledge and more technical skills to improve my potential in the industry because these two are very helpful to use in industry.

Muhammad Bukhari Imran

I learned that it takes a lot of time, effort and inspiration to create a sensible and logical project that actually can work. I frequently encourage myself to finish this project because of the limited time and discussion have always made me worry whether our project will finish in time or not. I discovered the need to study AWS service as it will help in creating a new project or software that could work properly. The inclusion of AWS services in making this project has helped us to make our application become more sensible and possible to work properly. Therefore, I will explore more about AWS and other services that could help to improve my technical skills since it will be helpful when I become part of an advanced industry.

Hasan Labib

While doing this project I learnt how to use our time perfectly. Because we had to do a lot of research for our individual part of what we have discussed. I learnt a lot of new things about VR while researching. I learnt VR had a very wide field that a very little we have explored. Today's technology is trying to keep up to discover more and more how we can use VR to our advantage. VR classrooms are the perfect example for the modern way of education. Not only that, many software and applications are being created to use VR easily and remotely. The information and the knowledge I got from this project would be very helpful for me to build my career. It was a great experience to work on this interesting topic.

Mahamudul Islam

From this project I got to learn decision making, identifying problems, problem solving and team working. My team members working sprite encourage me to finish my work timely cause we have limited time to finish the project so we have done our part timely. Our project is based on cloud architecture. This project helped me to learn about AWS service use in cloud architecture.I think i should explore more about AWS service.It will help me in future to improve my career.

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