Team 1 min

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Slack channel name: _e05_team_1_min

Project Name: LABORATORY APPLICATION SOFTWARE

Problem Identification:

1. A practical lab class is not possible.
2. There is a lack of effectiveness in plain online classes.
3. Monotony towards theoretical classes has been increasing due to lack of practical work and also students can not hold attention all over the class.
4. Interactive learning with peers, group tasks, communicative learning,hand-on activities etc has become impossible nowadays.
5. A great percentage of students who live in mostly rural areas can not join directly to the live online classes which are causing them to fall behind.
6. Evaluating and tracking real-time progress of a student is not possible for the instructor taking an online lab class. Also, an instructor can't determine which of the students are struggling to understand the class in an online environment.
7. Creating a habit of following proper laboratory safety measurements, ethics to the students is not feasible in an online environment.

Risk Analysis:

1. Poor Productivity
2. Inaccurate Estimations
3. Specification Breakdown
4. Technical Difficulties
5. Poor Management
6. Sudden growth in requirements

Formulating Idea:

While creating the project, our goal was to make the students more engaged in the practical or lab classes they attended while also considering those who are limited by the technology available to them. To engage students more effectively in the lab classes we thought, there could be no other effective way to hold the students attention unless he was doing the experiment himself. So we resort to simulation technology to give the students more agency and incentive to actively participate in class. Thus using the simulated lab environment students will be able to have a more finer understanding about the subject they are learning, which will be a great improvement from the simple video lab class we normally see today. Also the video instruction and simulated lab environment will be completely downloadable which will help those who do not have a consistent internet connection. Overall we think that our solution can greatly improve upon the current system of distance learning in experimental education while giving an ease of access to everyone involved in it.
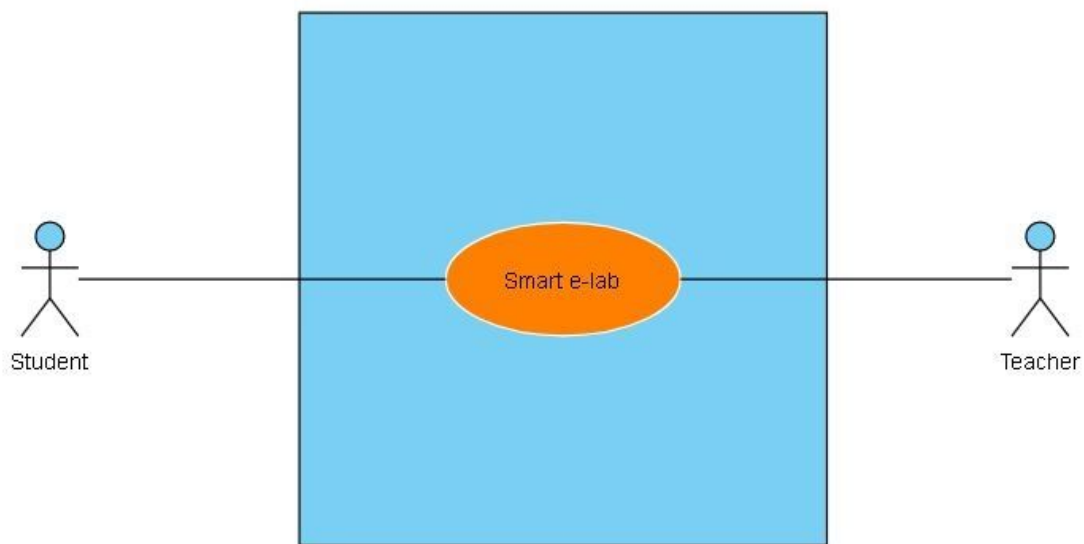
Implementation Plan:

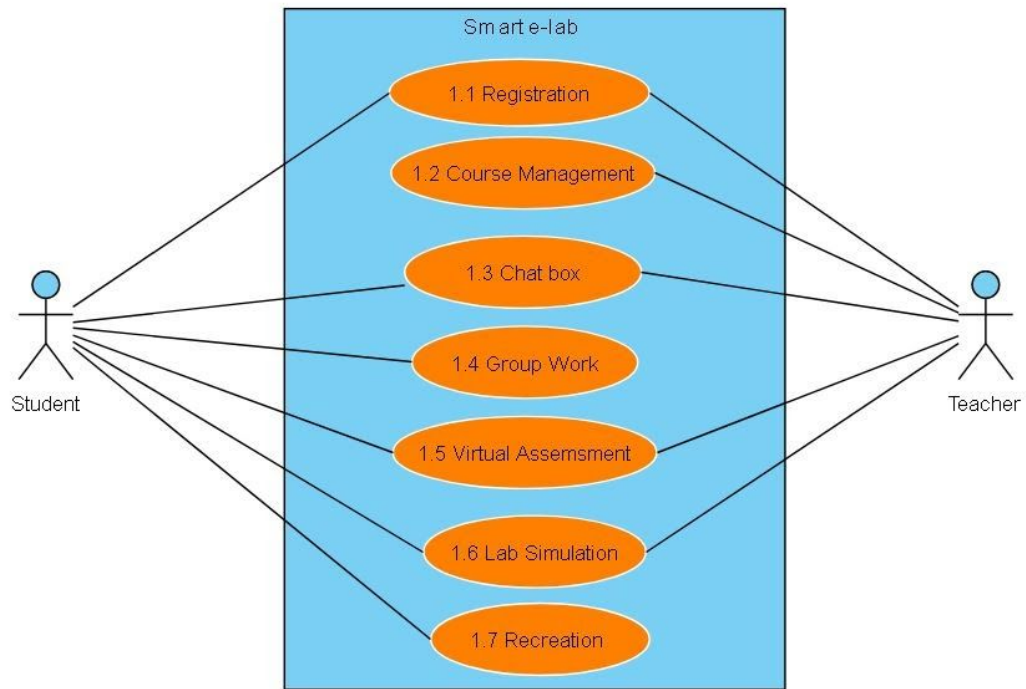**Solution regarding laboratory and interactive education :**

1. The teacher can take interactive live classes through laboratory simulation application software where he will give instructions for all the lab work. For example, the teacher will instruct what are the components to be added in the chemistry lab to get the specific result, how many beakers to use, what will be the smell and colour of the resultant product through this application. Scope of virtual reality will be added so that students can get the feel of real-life equipment.

2. A virtual platform will be created through this laboratory application using three dimensional and virtual simulation where students can get a real feel like a real lab. For example, after adding one chemical with another the colour of the new component will be changed by the function of the action. Thus students get a clear idea about the component with the color test experiment. They can learn through the simulated experience and get a heads up for real-life problems.

3. To hold the concentration of students there will be an arranged question-answer session. For example a student has to get 50% at least to join in the next lab class. Also, there will be rewards. Like a game where more the correct answers more the coins which will help to get a certificate. Like 80 coins will lead to an 80% mark in the laboratory.

4. A chat box with this application can help students to get answers to every question related to previous class from respective teachers and peer groups also. And there will be a scope of recreation so that students can not get monotonous during lab class. For example, a game student can purchase emoji or stickers with the coin.

5. Students who have a poor network connection or who will face difficulties to enter in live classes of this application will get the opportunity of downloading the recorded class. The teacher will upload the video in this application and a student who has already missed the class can do the same tasks in the lab with the help of uploaded video. The student can also use the lab simulator to participate in the experiment.

6. The lab experiment will be divided into some specific steps or objectives. Each step will have a weight/marks which will determine the progression of the student. The steps and weights/marks will be determined by the instructor himself. During a class session, the instructor can see the total progression for all students attending that class. The instructor can use a ranged search to separate students who are progressing slower than the others. This way the instructor can ensure that all students are getting the proper care.

7. All safety measures and lab ethics will be compulsory for the students if they want to continue to the class. By doing this repeatedly the students will be accustomed to the safety measures taken inside the laboratory and it will help them to develop a habit of following them in real life.
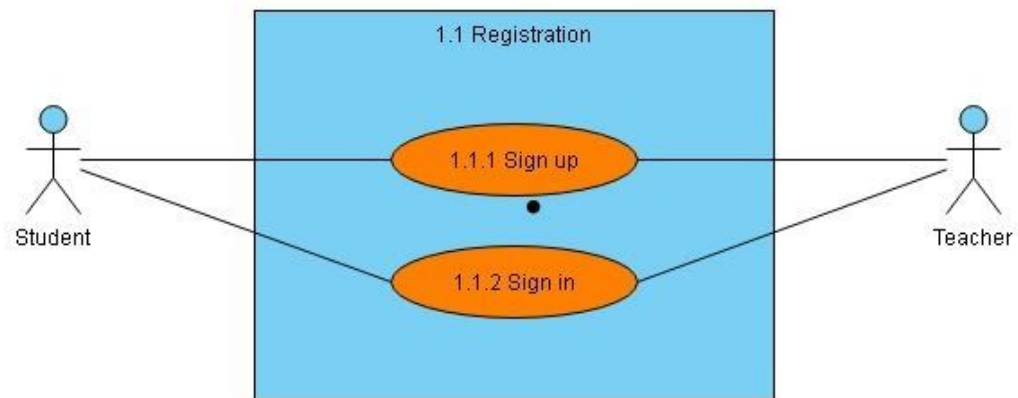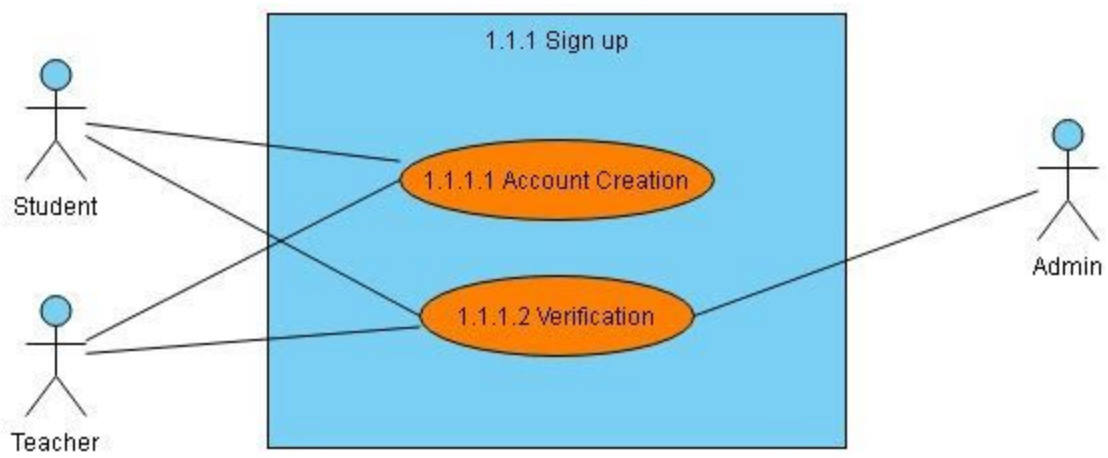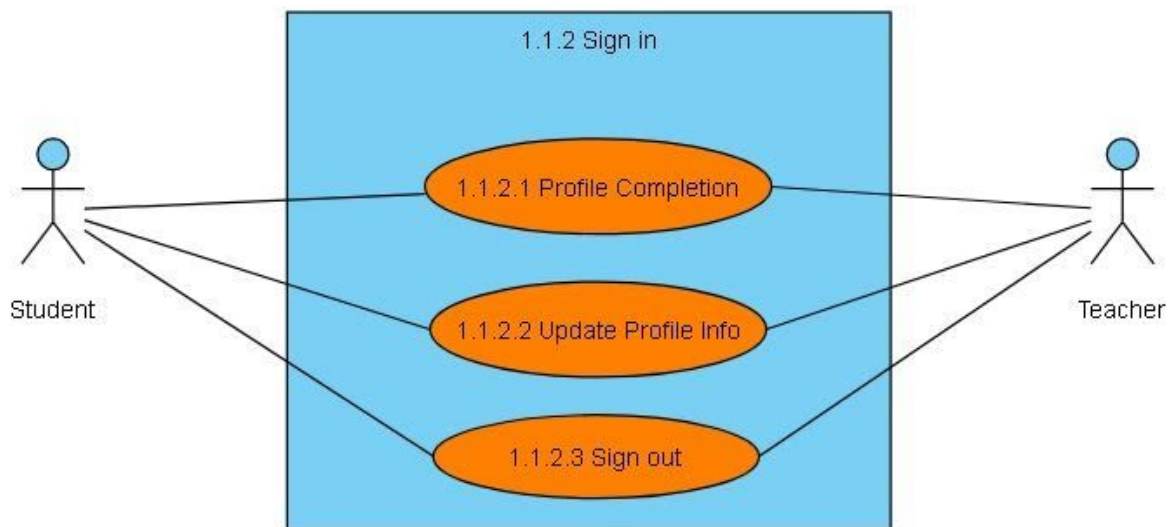
Work Progress:

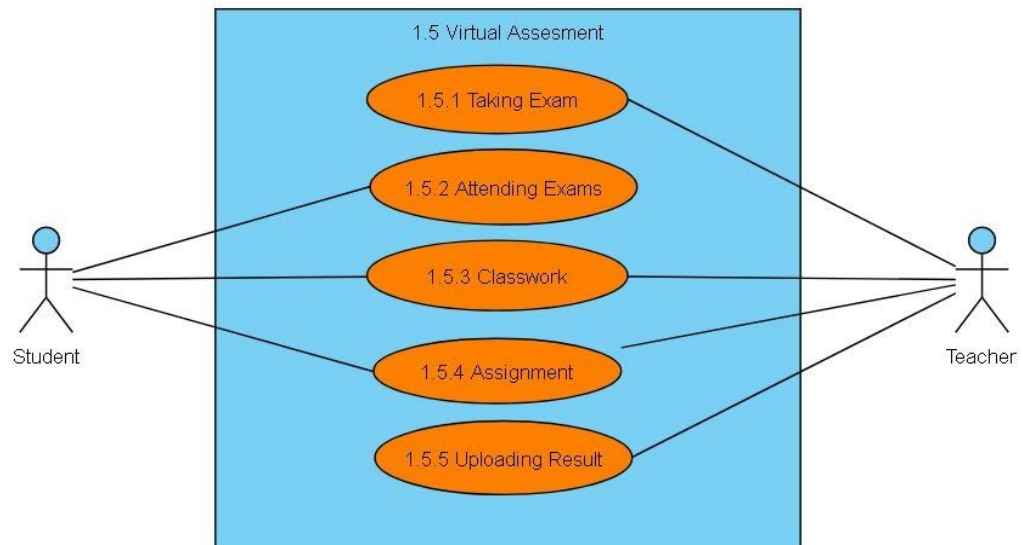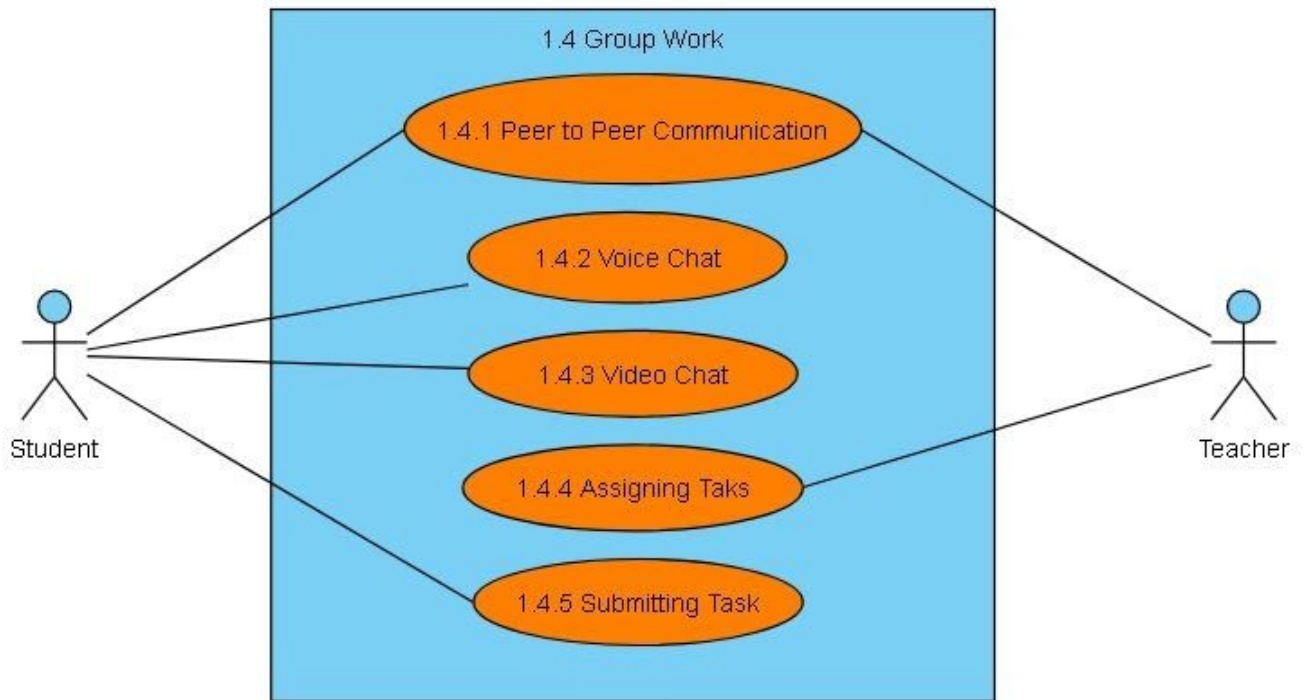So far we have finished the documentation part of the project.

Use Case Diagram:

Student
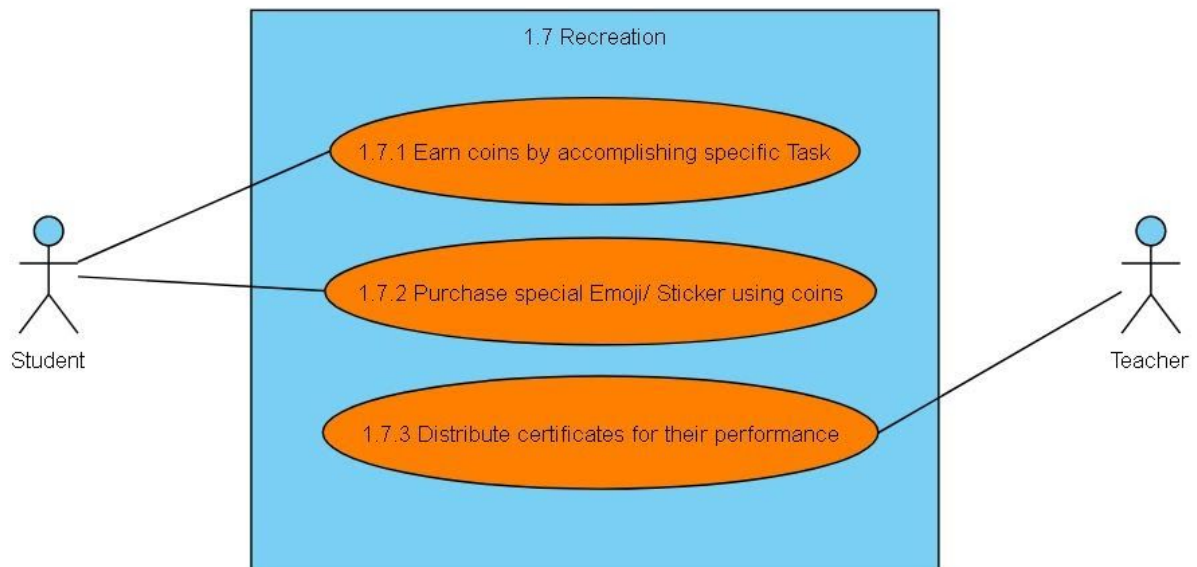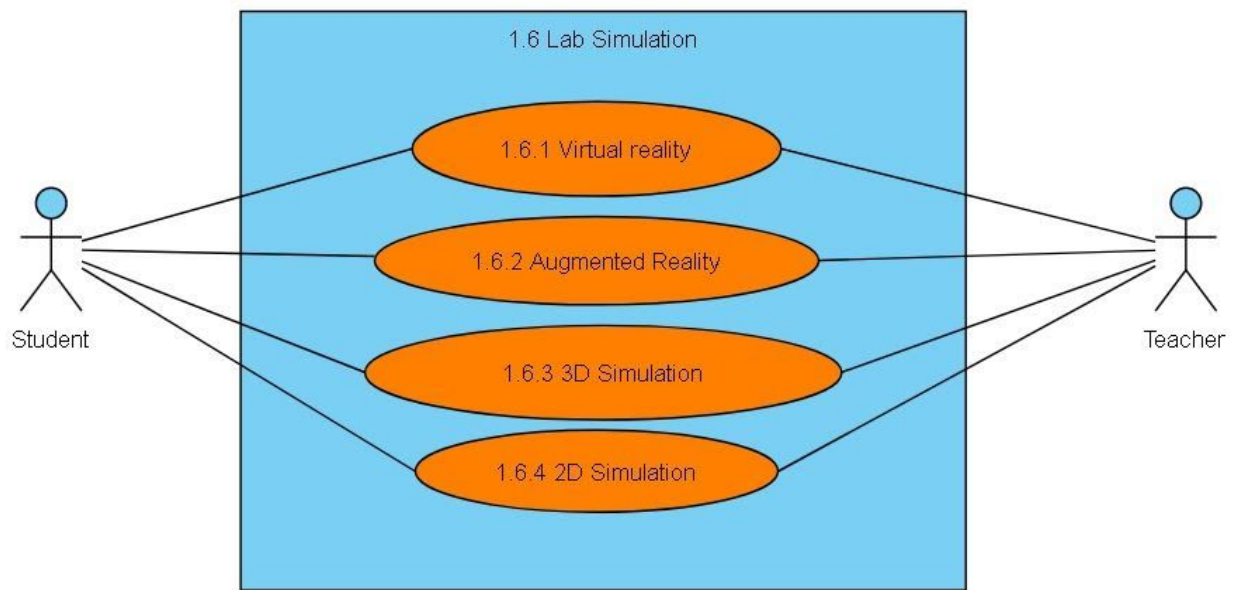
Teacher

1.1.1 Sign up

1.1.1.1 Account Creation

1.1.1.2 Verification

Admin

1.1 Registration

Student

1.1.1 Sign up

1.1.2 Sign in

Teacher

Student

Teacher

1.1.2 Sign in

1.1.2.1 Profile Completion

1.1.2.2 Update Profile Info

1.1.2.3 Sign out

1.4 Group Work

- 1.4.1 Peer to Peer Communication
- 1.4.2 Voice Chat
- 1.4.3 Video Chat
- 1.4.4 Assigning Taks
- 1.4.5 Submitting Task

Student

Teacher

1.5 Virtual Assesment

- 1.5.1 Taking Exam
- 1.5.2 Attending Exams
- 1.5.3 Classwork
- 1.5.4 Assignment
- 1.5.5 Uploading Result

Student

Teacher

1.6 Lab Simulation

Student — **Teacher**

- 1.6.1 Virtual reality
- 1.6.2 Augmented Reality
- 1.6.3 3D Simulation
- 1.6.4 2D Simulation

1.7 Recreation

Student — **Teacher**

- 1.7.1 Earn coins by accomplishing specific Task
- 1.7.2 Purchase special Emoji/ Sticker using coins
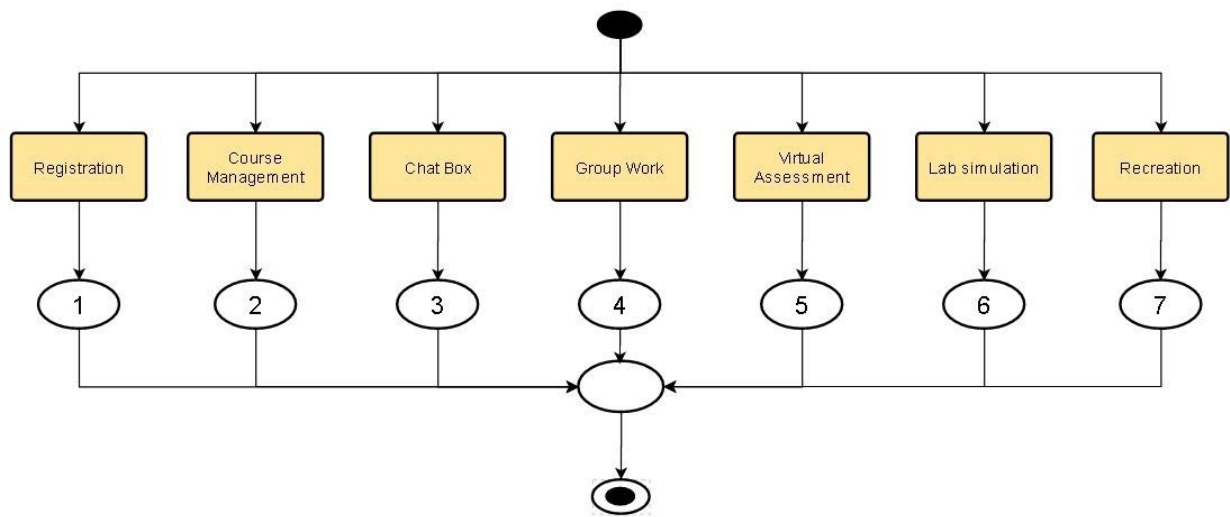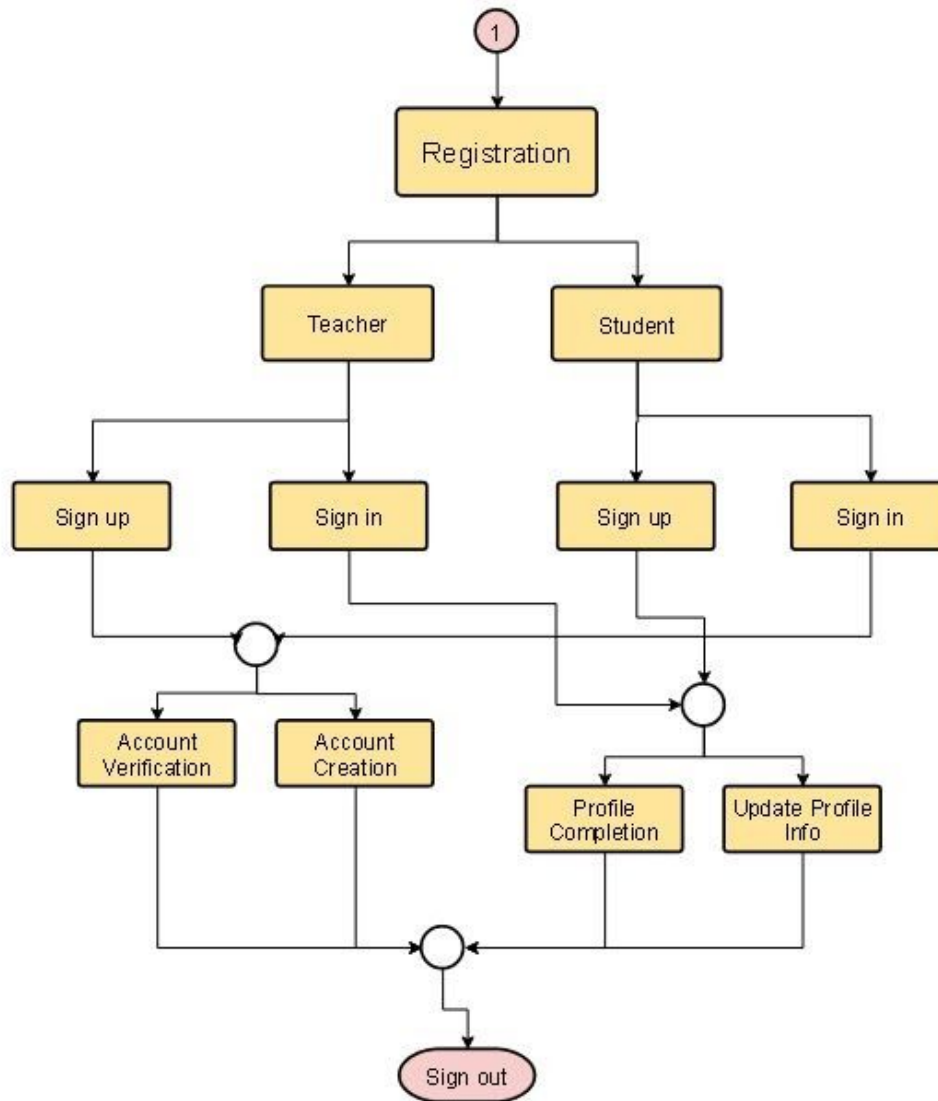- 1.7.3 Distribute certificates for their performance

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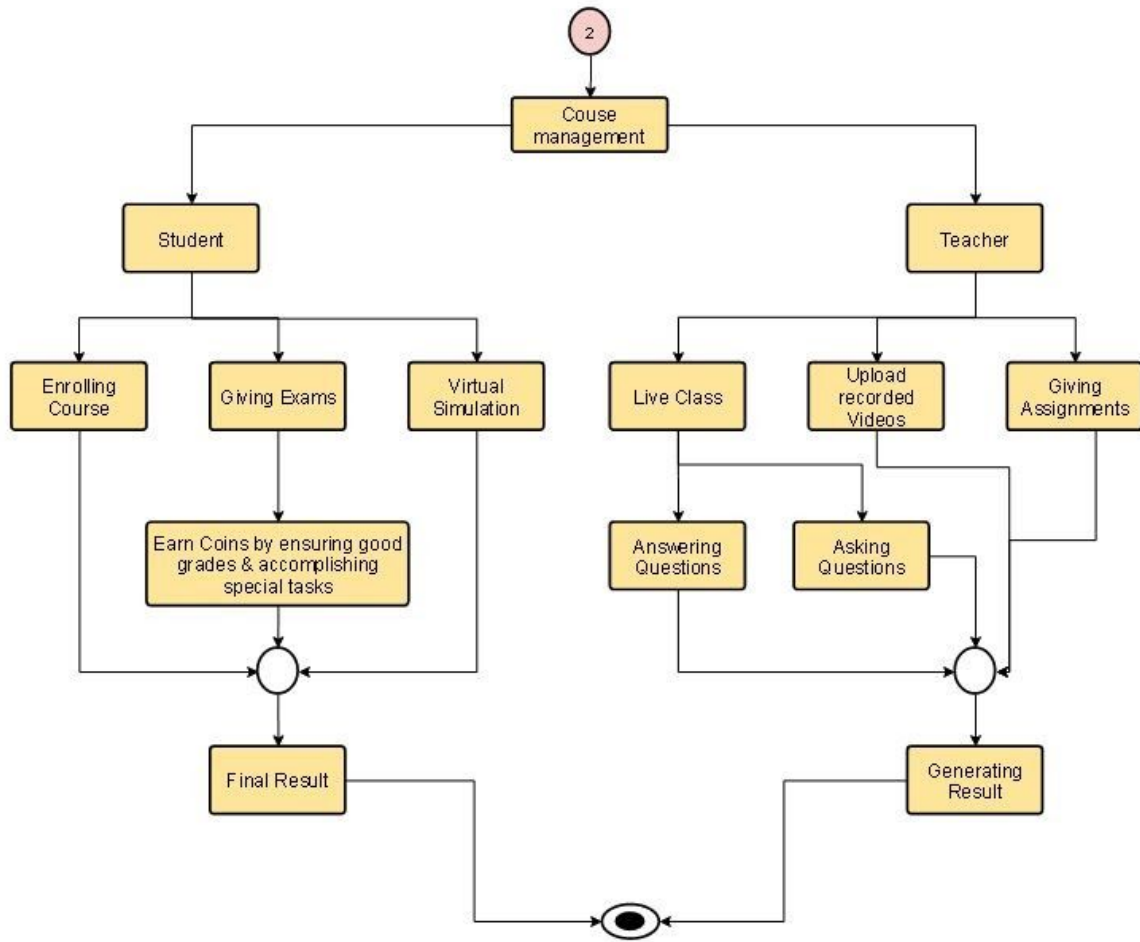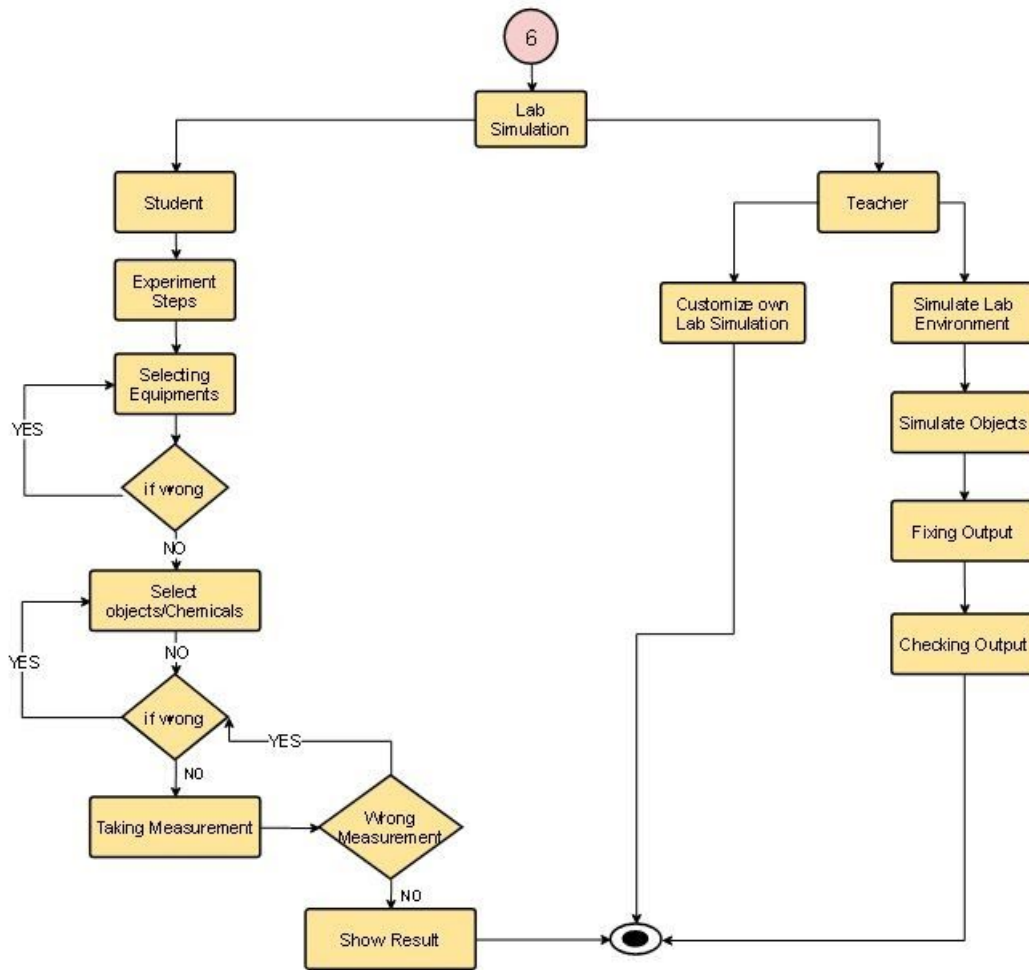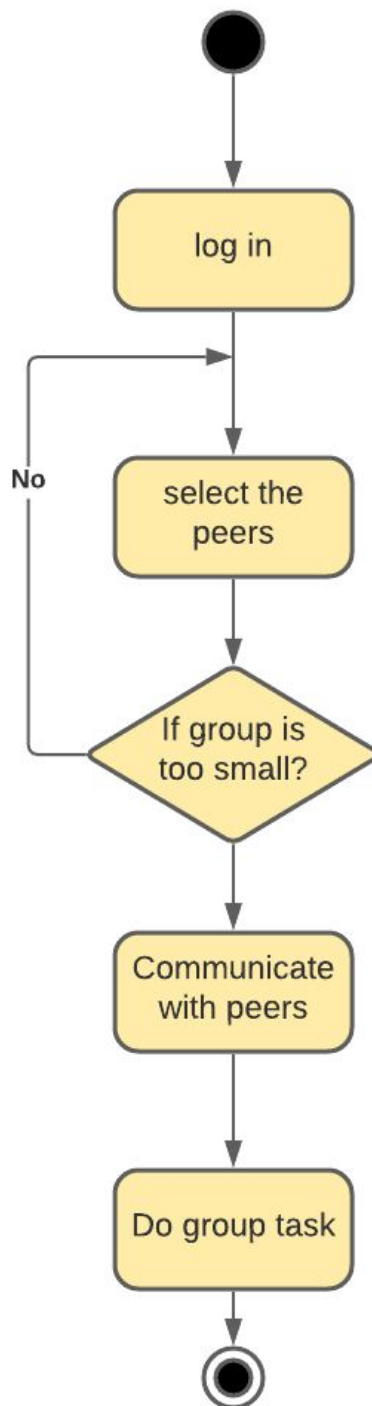# Activity Diagram:

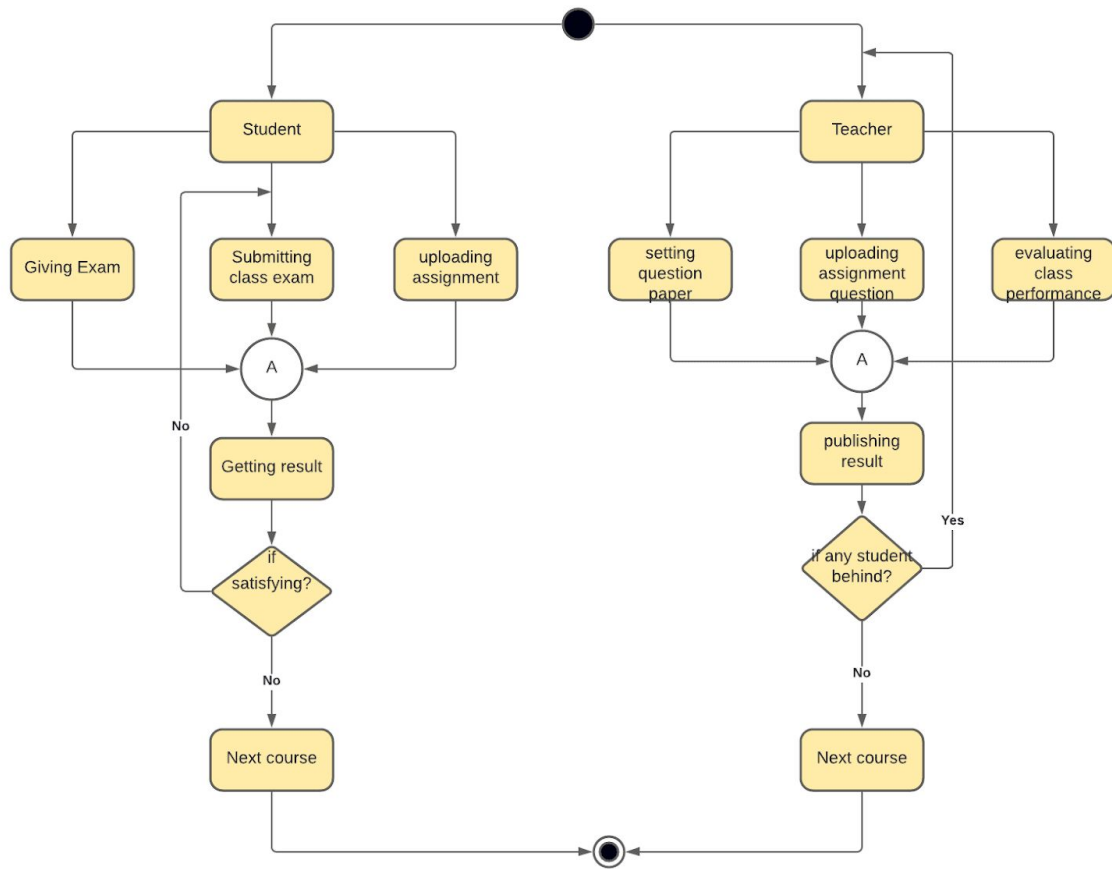**Figure 1 : Activity Diagram 01**

Figure 10 : Activity Diagram 02

Figure 11 : Activity Diagram 03

Figure 12 : Activity Diagram 04

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        ●
        │
        ▼
   ┌─────────┐
   │  log in │
   └─────────┘
        │
        ▼
   ┌─────────────┐
   │ select the  │◄──────┐
   │   peers     │       │ No
   └─────────────┘       │
        │                │
        ▼                │
      ╱─────────╲        │
     ╱ If group  ╲───────┘
     ╲ too small? ╱
      ╲─────────╱
        │
        ▼
   ┌─────────────┐
   │ Communicate │
   │ with peers  │
   └─────────────┘
        │
        ▼
   ┌─────────────┐
   │ Do group task│
   └─────────────┘
        │
        ▼
       ◉
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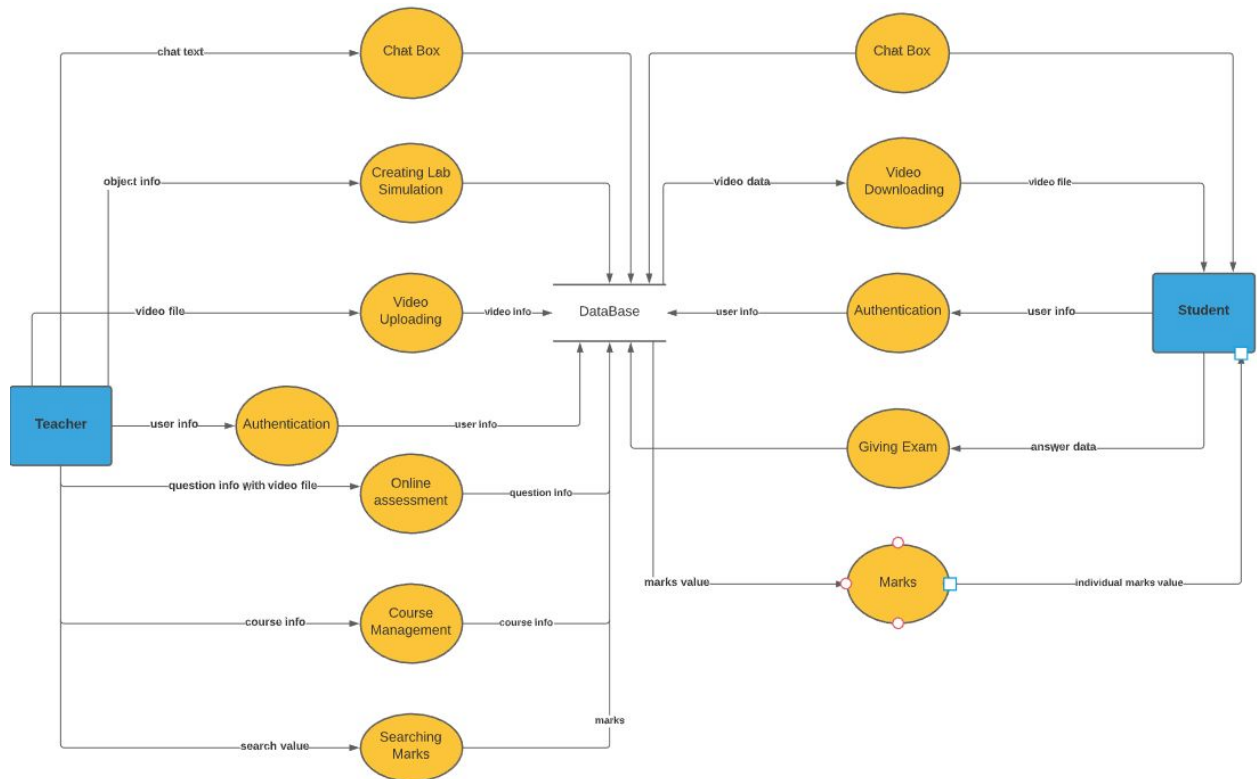
Figure 14 : Activity Diagram 06

Data Flow Diagram:

Architecture Diagram: