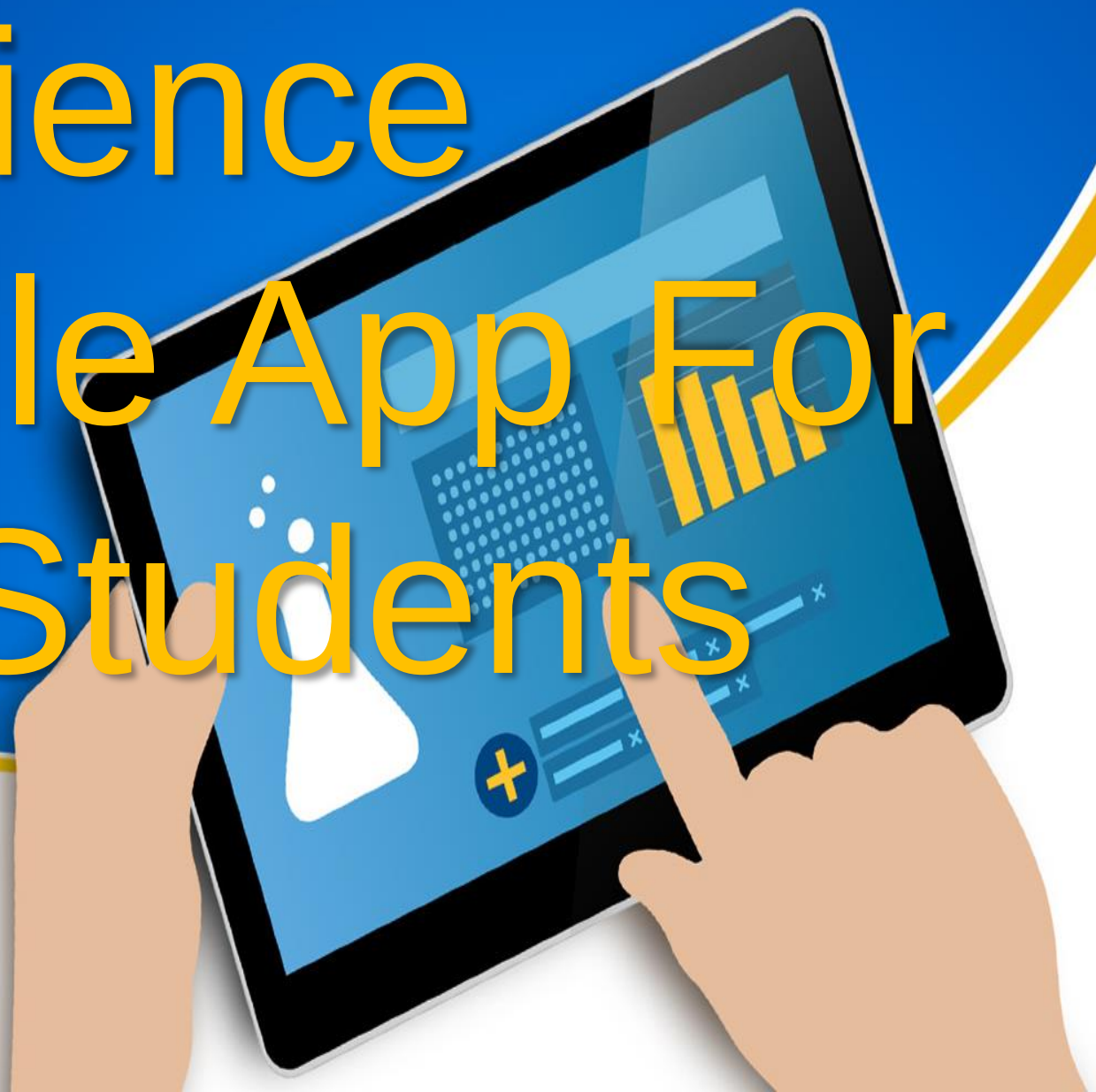
A Science Mobile App For O/L Students



Our Team

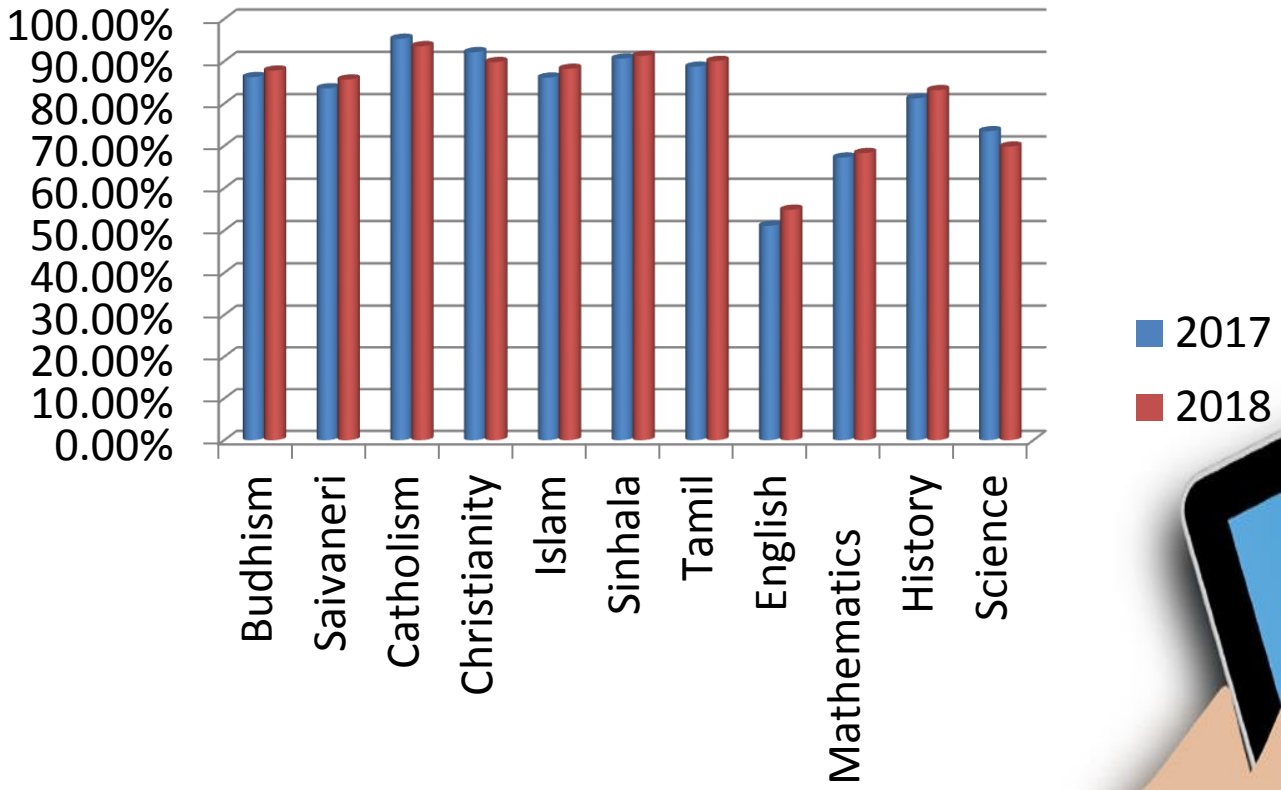
- Wendy De Silva
- Upeka Hettihewa
- Pramudi Liyanage
- Piumi Naranpanawa

Agenda

- Research Problem
- Proposed Solution
- AR support to learn about plants
- Human Biology with AR
- AR support for chemistry

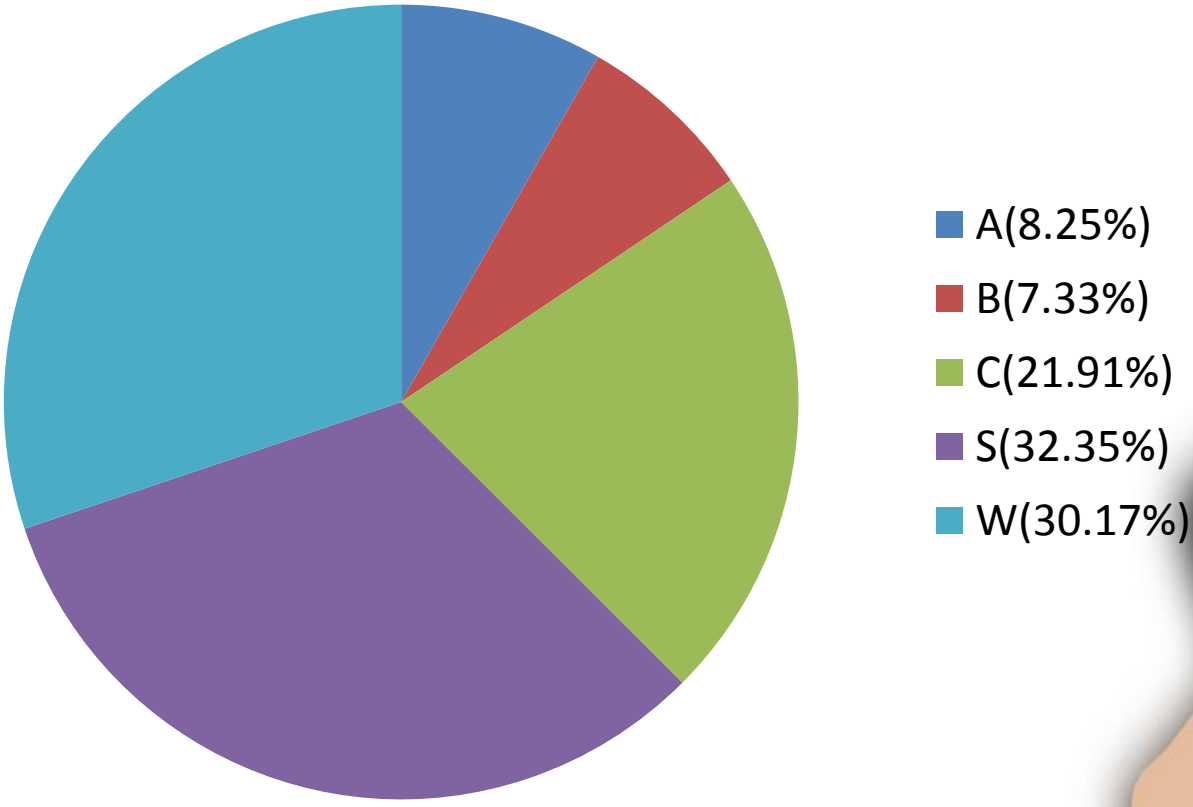
Research Problem

Passed percentage of compulsory subjects during previous two years [1].



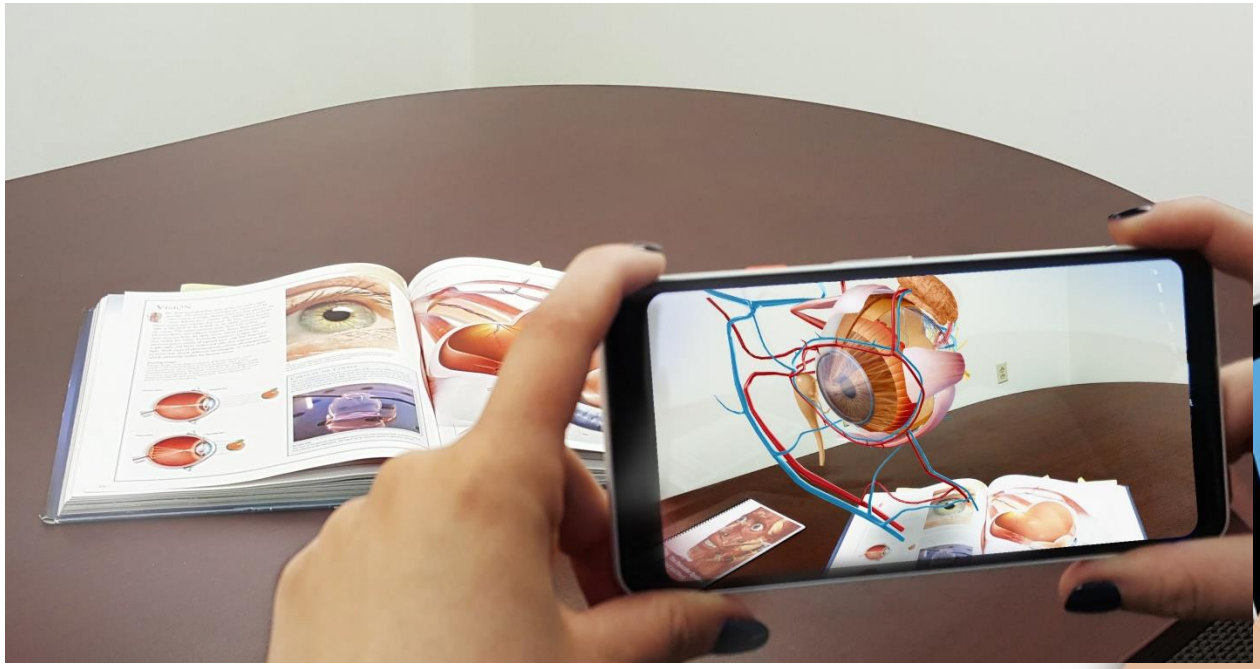
Research Problem

Science results of 2018 by grades [1].



Our Product

- A mobile app using augmented reality to support O/L students to learn science in a more effective manner.



AR Support to learn about plants

OBJECTIVE

- Understanding the interior structure of plant Cells and tissues
- 3D experience on organization of cell organelles.
- Demonstrate the processes related to plants

  Photosynthesis

  Plant Reproduction

Comparison of existing systems and related work

	3D Animations on Plant Cell structure	3D Animation on Plant tissue structure	Videos on Plant Processes	Experiments on Plant respiration	Specific to Local O/L Syllabus
Plant cell structure[1]	No animations	X	X	X	X
Plant tissue structure[2]	X	No animations	X	X	X
Plant processes[3]	X	X	X	X	X
Plant respiration	X			X	
Proposed App					

Methodology

AR Demonstration on plant structure

- **Displaying 3D diagrams of Interior structure of plant Cells and tissues.**

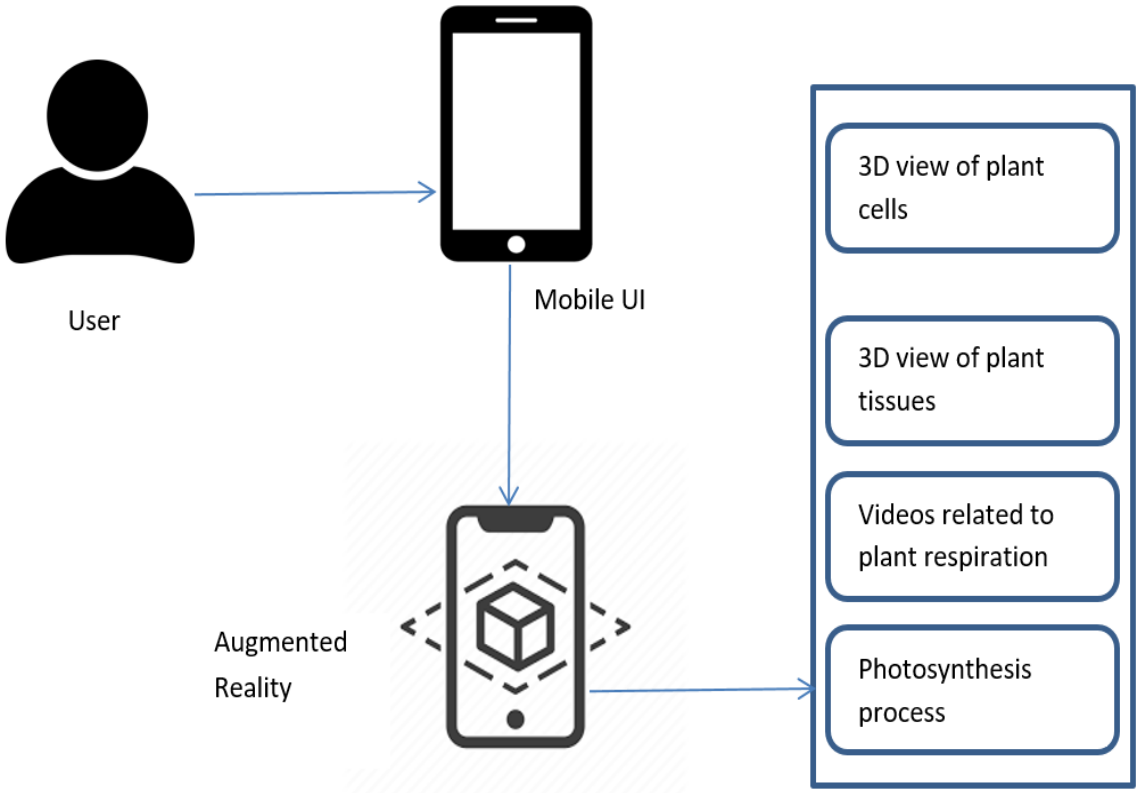
Experiments related to plant respiration

- **providing videos which demonstrate the experiments given in the captured activity.**

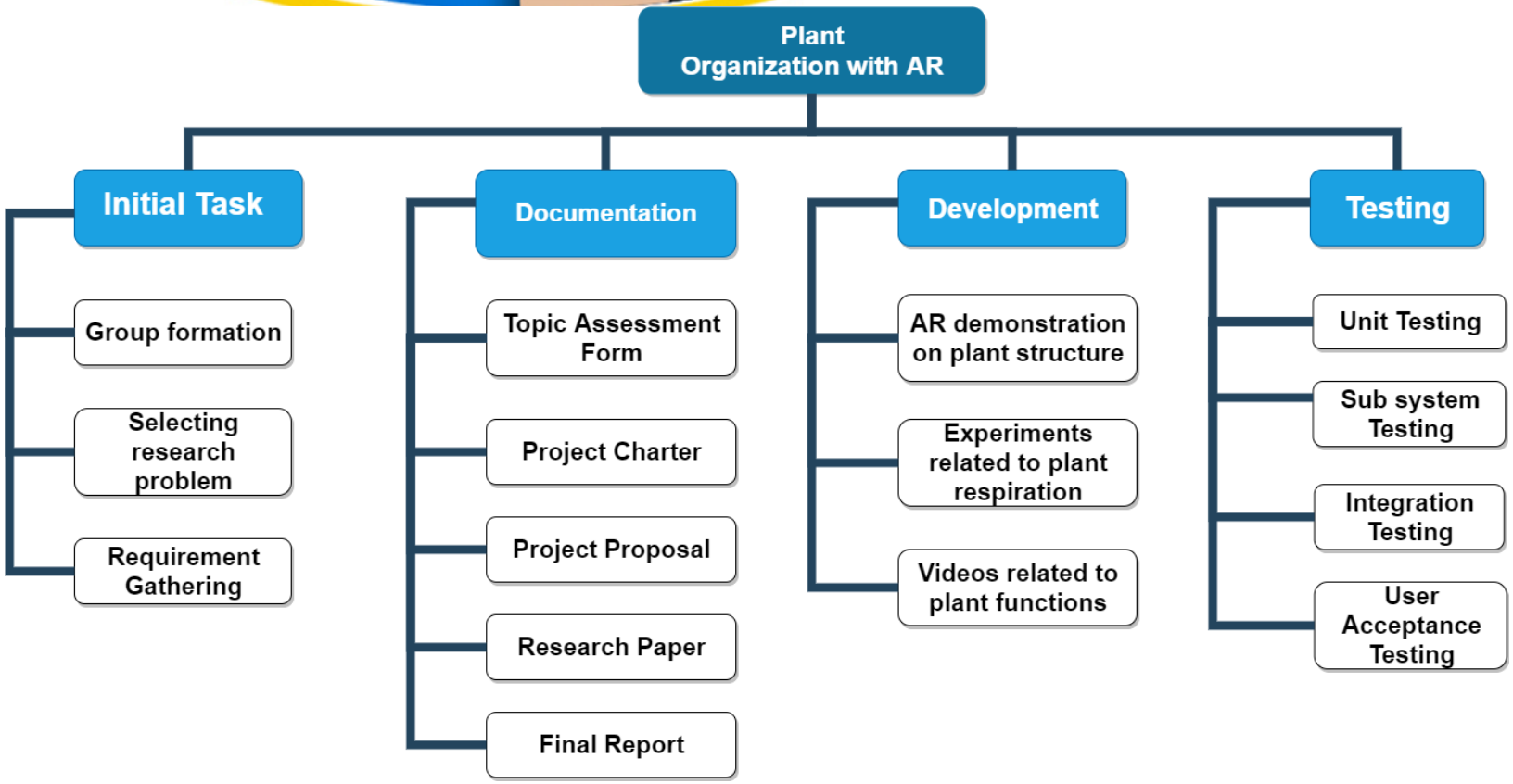
Videos related to plant functions

- **providing videos on plant processes and details of each processes.**

Methodology - System Architecture

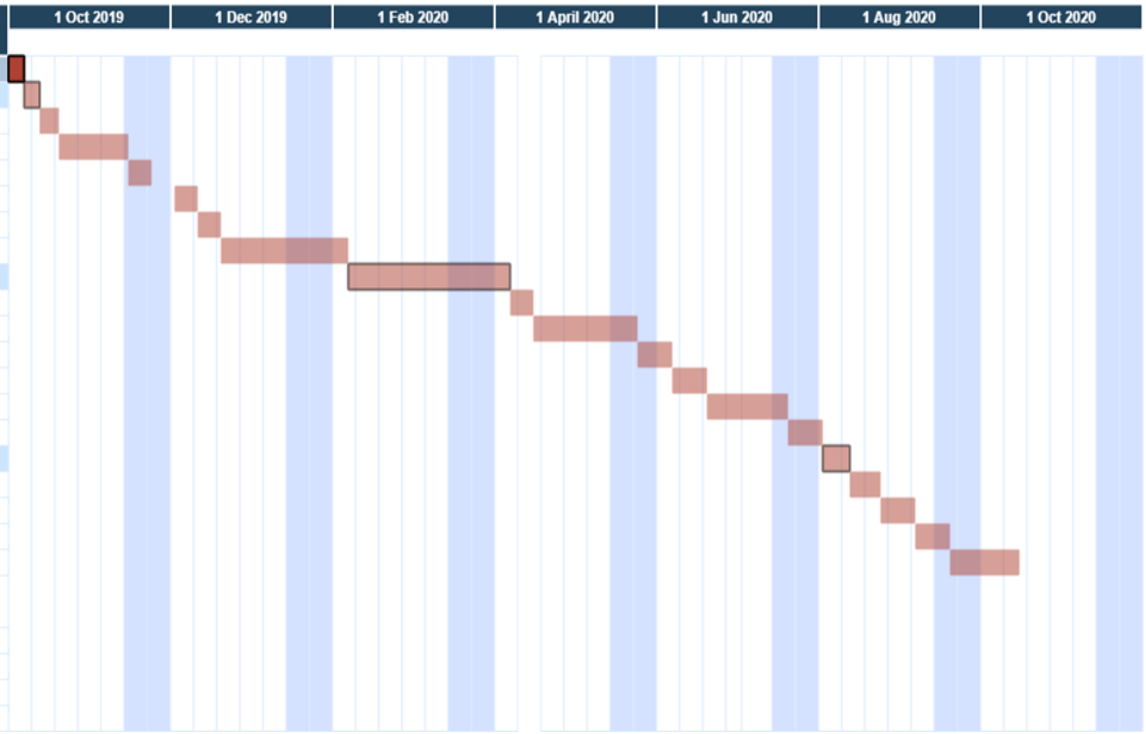


Methodology - Work Breakdown Structure



Methodology - Gantt Chart

	Task Name	Duration	Start	End
1	Forming a group	1 day	04.10.19	5.10.2019
2	Selecting a research area	6 days	06.10.2019	12.10.2019
3	Identifying an existing problem	5 days	13.10.2019	18.10.2019
4	Requirement Gathering	1 month	18.10.2019	30.11.2019
5	Topic Registration	3 days	30.11.2019	3.12.2019
6	Charter preparation	4 days	18.01.2020	22.01.2020
7	Preparation for the proposal presentation	6 days	22.01.2020	28.01.2020
8	Preparation for proposal document	3 weeks	28.01.2020	14.02.2020
9	AR support on plant structure	2 months	15.02.2020	10.04.2020
10	Unit Testing	5 days	10.04.2020	15.04.2020
11	Experiments related to plant respiration	1 month	16.04.2020	16.05.2020
12	Unit Testing	5 days	27.05.2020	2.06.2020
13	Preparation of the Research paper	6 days	4.06.2020	10.06.2020
14	Videos related to plant functions	1 month	12.06.2020	12.07.2020
15	Unit Testing	3 days	13.07.2020	16.07.2020
16	Component Testing	4 days	22.08.2020	27.08.2020
17	Preparation of the final report	6 days	27.09.2020	02.10.2020
18	Integration	6 days	03.10.2020	10.10.2020
19	Integration Testing	6 days	11.10.2020	18.10.2020
20	User Acceptance testing	5 days	18.10.2020	24.10.2020



Requirements

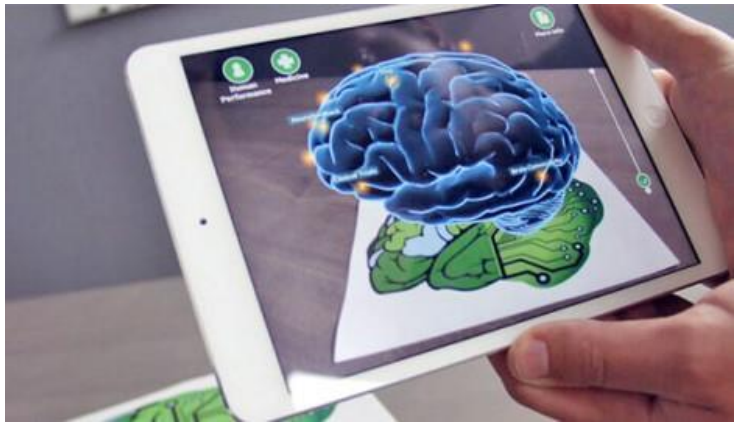
Functional

- Processes related to plants.
- Interior structure of plant Cells and tissues

Non Functional

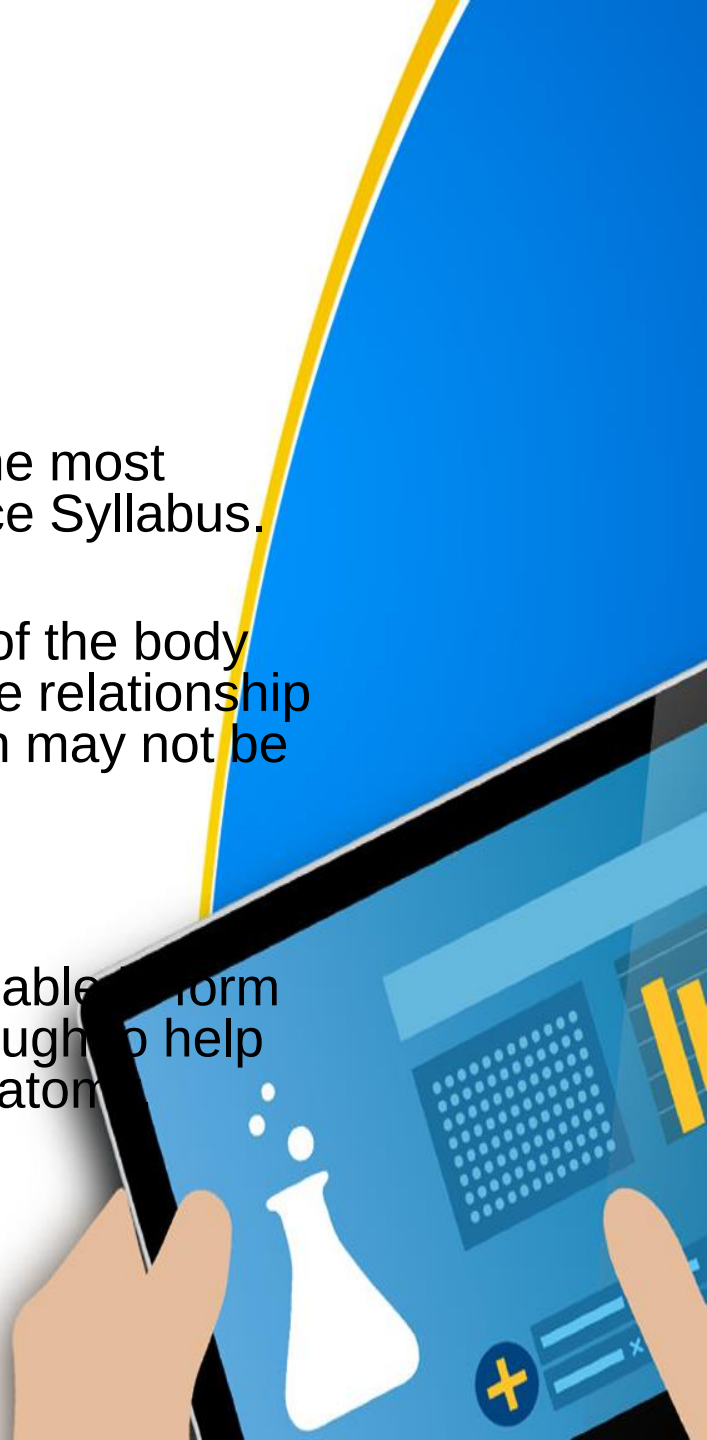
- Android OS
- Availability

Providing Human Biology with Augmented Reality



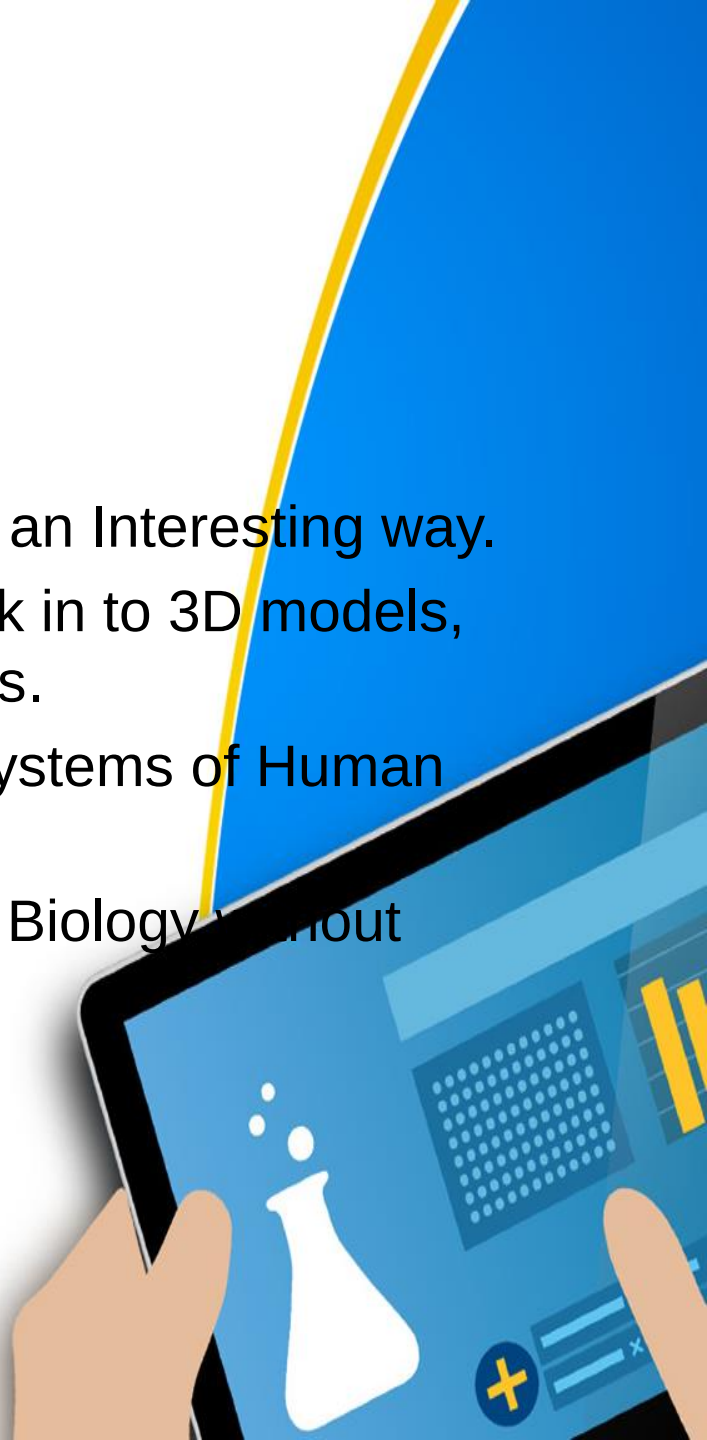
Background

- Human biology Section is one of the most important section in the O/L Science Syllabus.
- It is difficult to visualize the shape of the body anatomy, the position of organs, the relationship between organs and many children may not be able to conceptualize it.
- Mostly learning materials are available in form of book but it is still insufficient enough to help students in understanding body anatomy.



REQUIREMENTS

- A System to learn Human Biology in an Interesting way.
- Ability to convert Images in Text book in to 3D models, animations, Texts, Videos and Audios.
- Efficient way to Understand about Systems of Human Body and It’s processes.
- Experiments Regarding the Human Biology without Laboratory equipment.



Comparison of existing system and related work

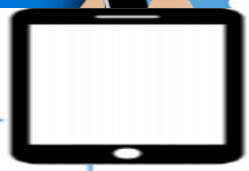
	3D view of Animal cell	3D view of systems in human body and 3D demonstration of Its Internal Organs	3D presentation of Processes of human body	3D demonstration Diseases and Disorders occur in each system of Human Body	3D Presentation of Experiments regarding to the Human biology
Web based AR app[6]	✗	✓	✓	✗	✗
Human body (male) VR 3D[7]	✗	✓	✗	✗	✗
Internal organs in 3D[8]	✗	✓	✗	✗	✗
Proposed System	✓	✓	✓	✓	✓

OBJECTIVES

- This application enables student to learn human body anatomy with 3D object interaction while using textbook.
  Application.
- Provides solutions for student who has difficulty in visualizing the anatomy of a 2D body shape into a 3D practice form.
- Impacts student learning in an effective and meaningful way.
- AR application for human body anatomy learning to be more interesting and easier for student to understand

METHODOLOGY – System Architecture

User



Mobile UI

Target Image on Text Book

Augmented Reality

- 3D view of Animal cell
- 3D view of systems in human body
- 3D presentation of Processes of human body
- 3D demonstration of how Diseases and Disorders occur in each system of Human Body
- 3D Presentation of Experiments regarding to the Human biology

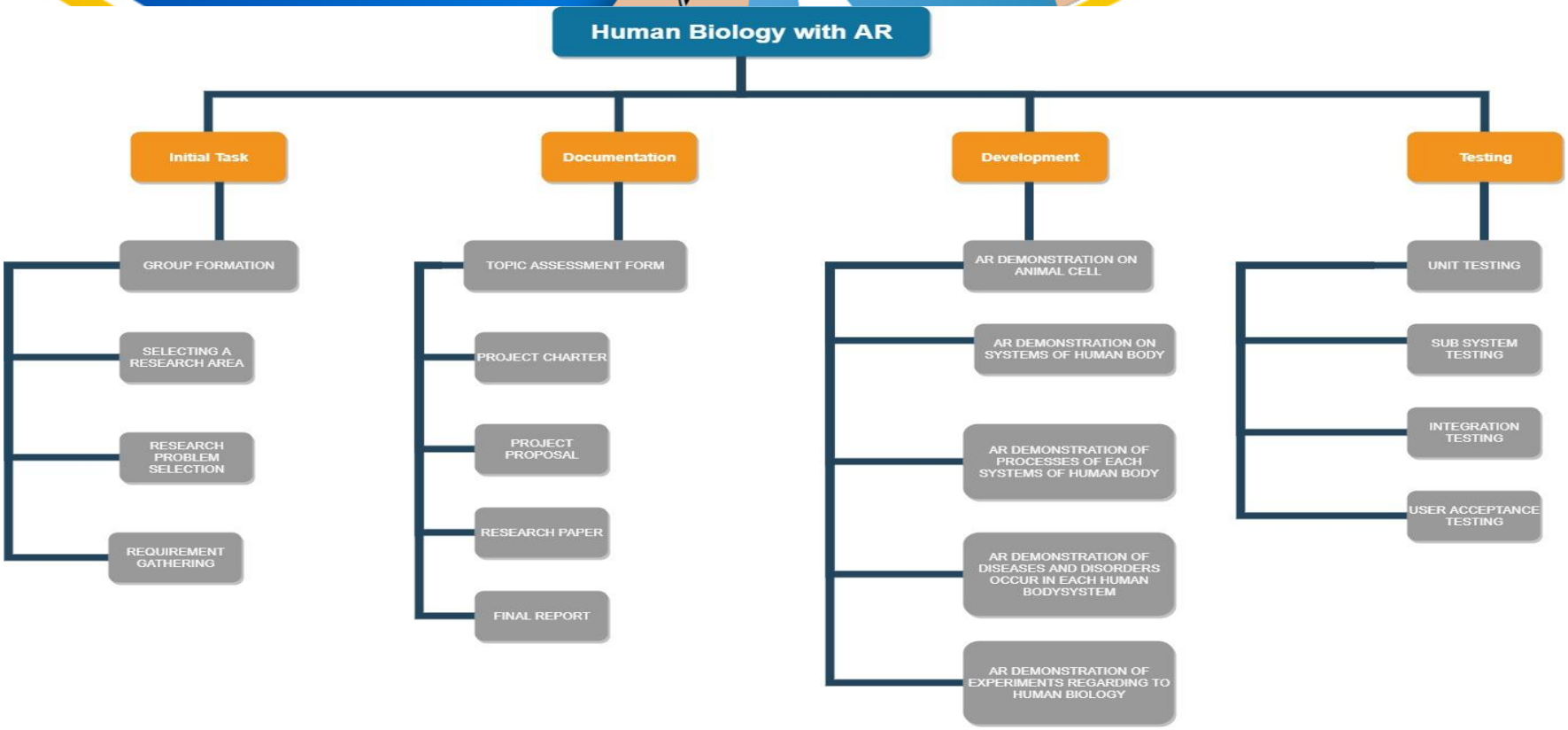
METHODOLOGY

AR DEMONSTRATION ON ANIMAL CELL	•Providing animations and Text to explain the animal cell
AR DEMONSTRATION ON SYSTEMS OF HUMAN BODY	•Providing animations and Text to explain the systems of the Human body •Providing audios to explain each system
AR DEMONSTRATION OF PROCESSES OF EACH SYSTEMS OF HUMAN BODY	•Providing animations and videos which will demonstrate the processes in systems of Human body •Providing audios to explain each Process •Providing some important Notes at the end of the each process.

METHODOLOGY

AR DEMONSTRATION OF DISEASES AND DISORDERS OCCURS IN EACH HUMAN BODY SYSTEM	• Providing Videos , animations and texts to explain Experiments • Providing audios to explain the Experiments
AR DEMONSTRATION OF EXPERIMENTS REGARDING TO HUMAN BIOLOGY	• Providing Videos , animations and texts to explain Experiments • Providing audios to explain the Experiments

METHODOLOGY – Work Breakdown Structure



METHODOLOGY – Gantt Chart

	Task Name	Duration	Start	End
1	Forming a group	1 day	04.10.2019	05.10.2019
2	Selecting a research area	6 days	6.10.2019	12.10.2019
3	Identify an existing problem	5 days	13.10.2019	18.10.2019
4	Requirement gathering	1 month	18.10.2019	30.11.2019
5	Topic registration form Preperation	3 days	30.11.2019	03.12.2019
6	Charter Preperation	4 days	18.01.2020	22.01.2020
7	Preparation for the Proposal presentation	6 days	22.01.2020	28.01.2020
8	Preparation for the Proposal document	3 weeks	28.01.2020	14.02.2020
9	AR Support on Animal cell	1 week	15.02.2020	22.02.2020
10	Unit Testing	4 days	23.02.2020	27.02.2020
11	AR Support on Systems of Human body	2 month	27.02.2020	27.04.2020
12	Unit Testing	5 days	28.04.2020	02.05.2020
13	Preparation for the research paper	6 days	03.05.2020	09.05.2020
14	AR support on Experiments Regarding to the Human biolog	1 month	10.05.2020	10.06.2020
15	Unit Testing	4 days	11.06.2020	15.06.2020
16	AR Support on Processes regarding to the each system	2 months	16.06.2020	16.08.2020
17	Unit Testing	7 days	17.08.2020	24.08.2020
18	AR Support on Diseases and disorders regarding the Syste	3 weeks	25.08.2020	15.09.2020
19	Unit Testing	3 days	16.09.2020	19.09.2020
20	Component testing	1 week	20.09.2020	27.09.2020
21	Preparation for the final report	6 days	27.09.2020	03.10.2020
22	Intergration	6 days	03.10.2020	10.10.2020
23	Intergration Testing	6 days	11.10.2020	18.10.2020
24	User acceptance Testing	6 days	18.10.2020	24.10.2020
25				
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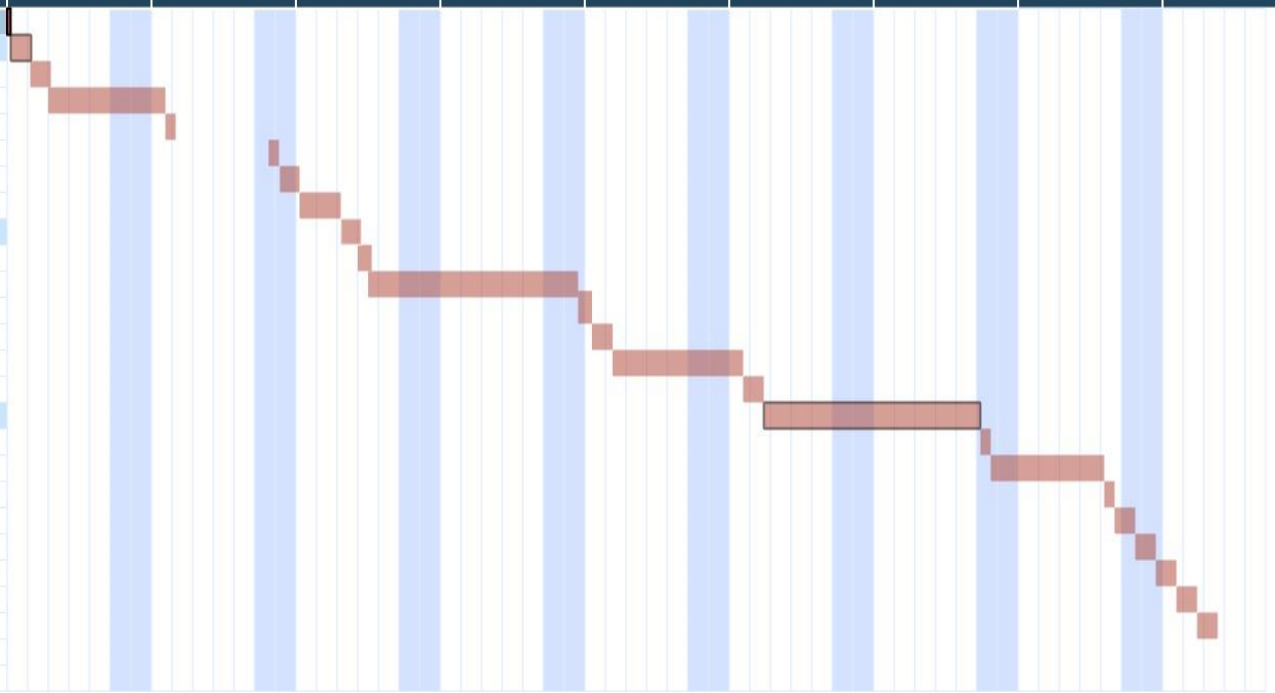
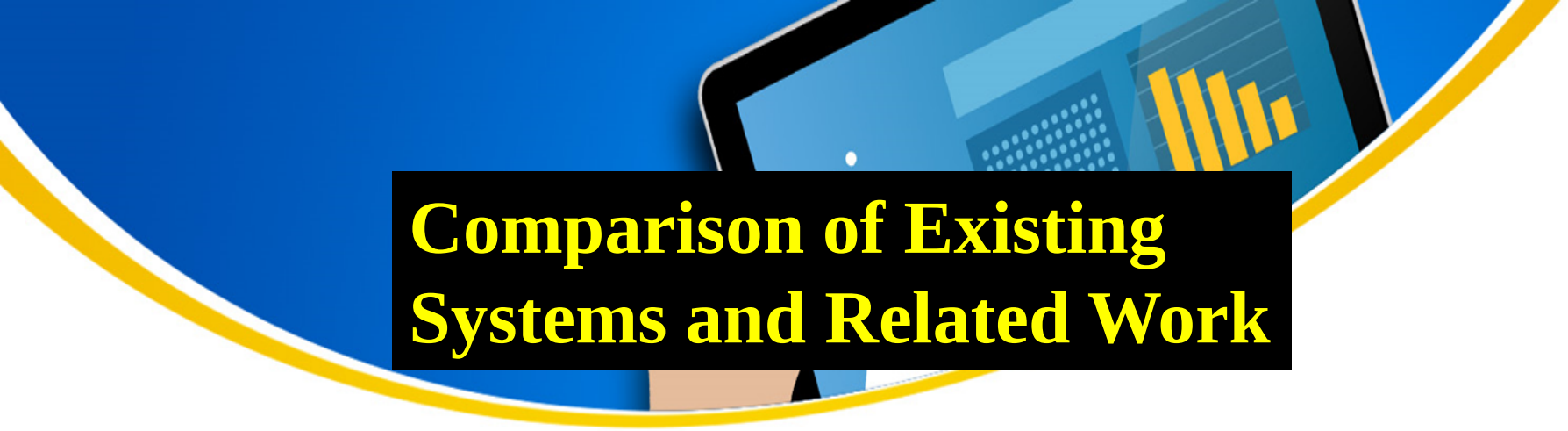


Learning the Cycles of Biosphere and Production of Gases with Augmented Reality

Objective

- **Provide support to understand each biosphere cycle using 3D visualization**
- **Provide an opportunity to get the experience of production of gases**
- **Provide support to measure the knowledge level of a student using a questionnaire.**



Comparison of Existing Systems and Related Work

	3D Animations	Natural Existence of Compounds and Their Productions	Videos on Specific Areas in Biosphere Cycles	Demonstration of Production of Gases	Specific to local O/L syllabus
Student Notes	X	Text based	X	X	X
Chemistry Formulas	X	Text based	X	X	X
Lab Practical	X	X	X	Text Based	X
Proposed App	✓	✓	✓	✓	✓

Methodology

AR Demonstration on Biosphere Cycles

- **Displaying 3D animated images and videos to provide a good understanding about the internal process of each cycle.**

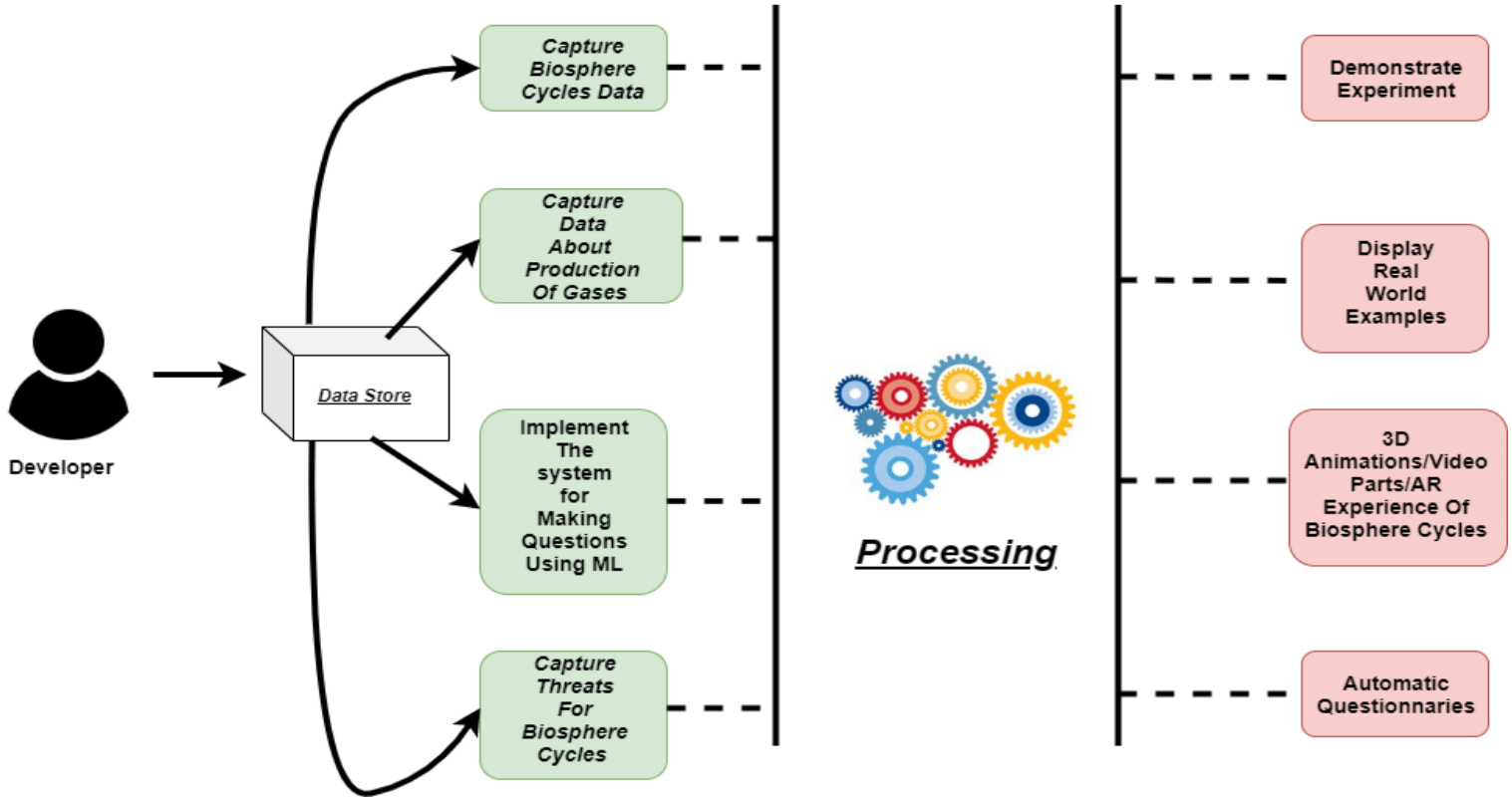
Experiments related to Production of Gases

- **Providing videos which demonstrate the experiments given in the captured activity.**

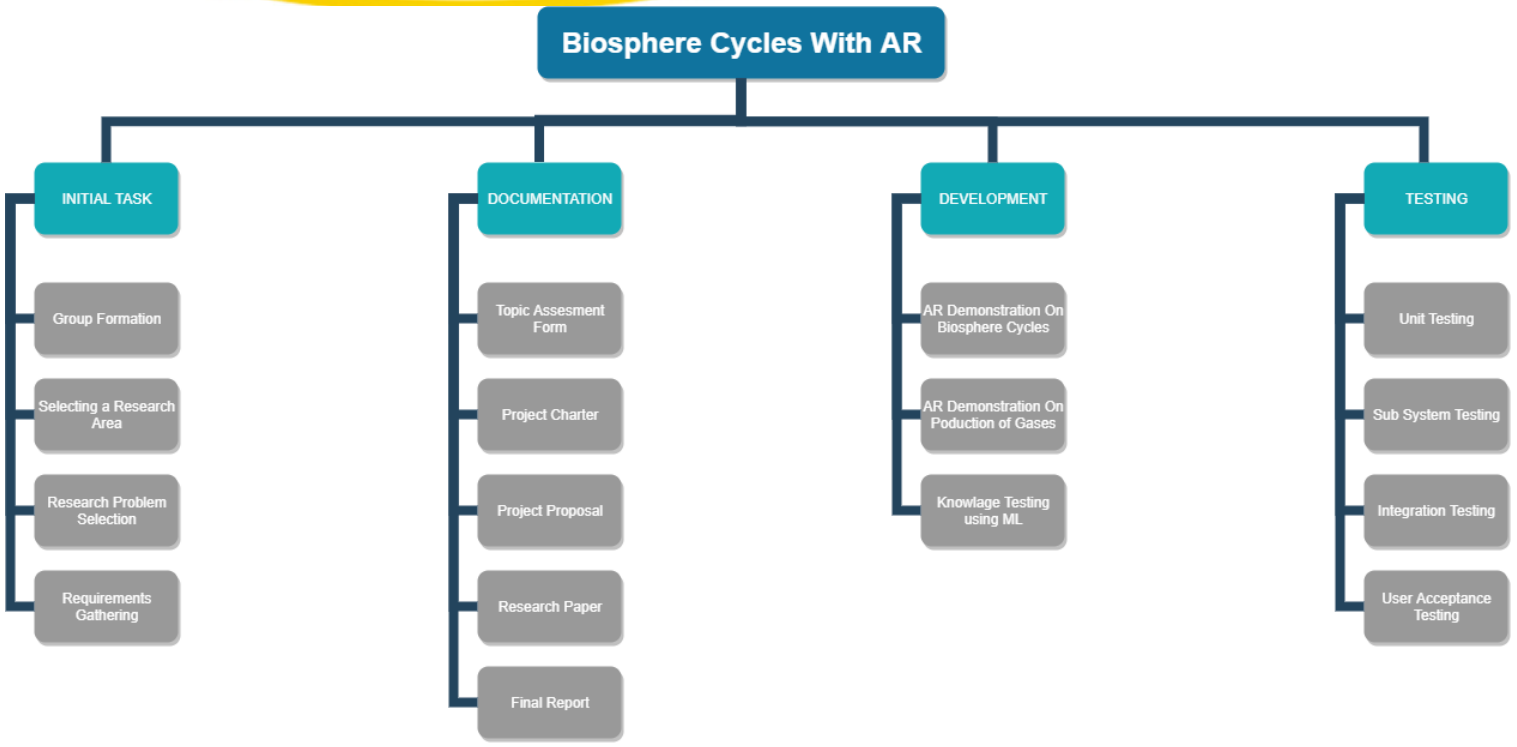
Questions related to Biosphere Cycles and the Production of Gases

- **Providing questions to test student knowledge after the learning process.**

System Architecture

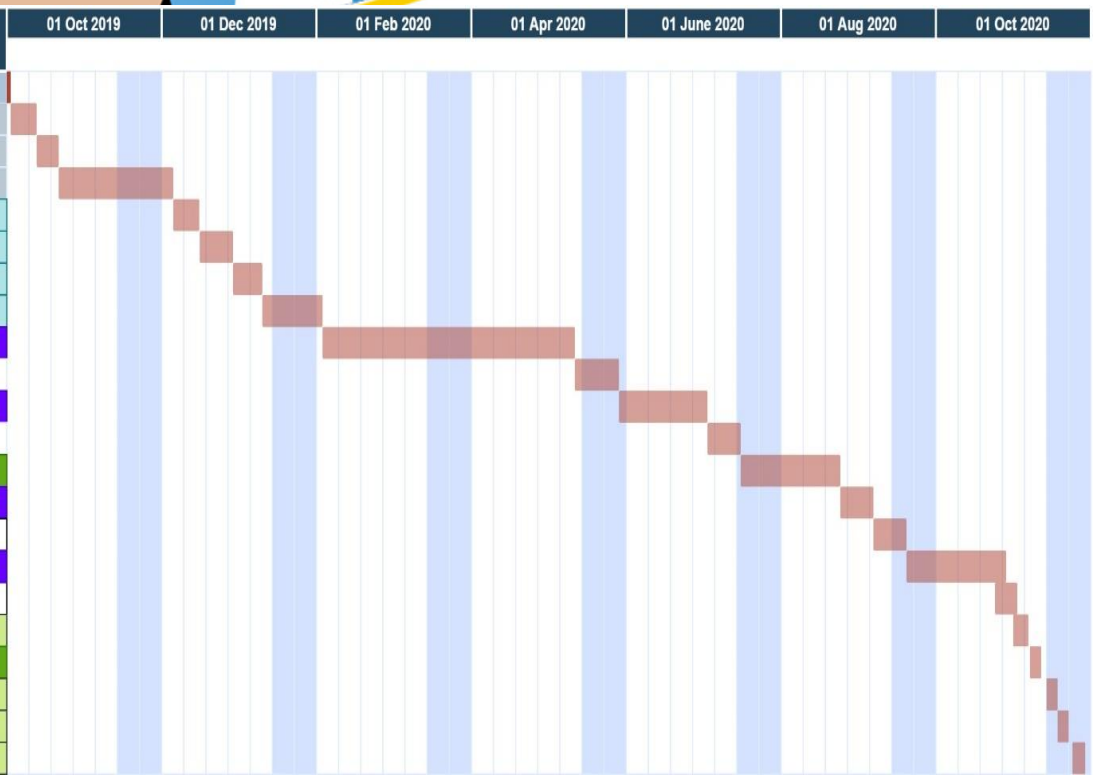


Work Breakdown Structure

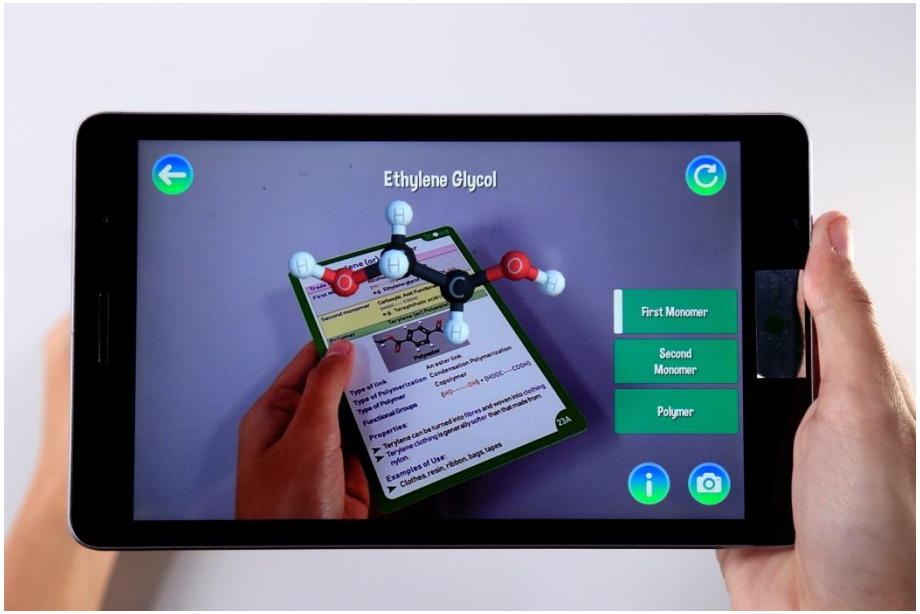


Gantt Chart

	Task Name	Duration	Start	End
1	Forming a group	1 day	04.10.2019	05.10.2019
2	Selecting a research area	6 days	06.10.2019	12.10.2019
3	Identifying an existing problem	5 days	13.10.2019	18.10.2019
4	Requirements gathering	1 month	18.10.2019	30.11.2019
5	Topic registration form preperation	3 days	30.11.2019	03.12.2019
6	Charter preperation	4 days	18.01.2020	22.01.2020
7	Preperation for the proposal presentation	6 days	22.01.2020	28.01.2020
8	Preperation of proposal document	3 weeks	28.01.2020	14.02.2020
9	Implementing AR support for the Water and Carbon Cycles	2 months	15.02.2020	10.04.2020
10	Unit Testing	5 days	10.04.2020	15.04.2020
11	Implementing AR support for the Nitrogen and Oxygen Cycl	1 month	16.04.2020	27.05.2020
12	Unit Testing	5 days	27.05.2020	02.06.2020
13	Preperation of the research paper	6 days	04.06.2020	10.06.2020
14	Implementing experiments related to natural gas production	1 month	12.06.2020	12.07.2020
15	Unit Testing	3 days	13.07.2020	16.07.2020
16	Knowledge testing using Maching Learning	1 month	17.07.2020	17.08.2020
17	Unit Testing	5 days	18.08.2020	22.08.2020
18	Component Testing	4 days	23.08.2020	27.08.2020
19	Preperation of the final report	6 days	27.09.2020	02.10.2020
20	Integration	6 days	03.10.2020	10.10.2020
21	Integration Testing	6 days	11.10.2020	18.10.2020
22	User Acceptance Testing	5 days	18.10.2020	24.10.2020

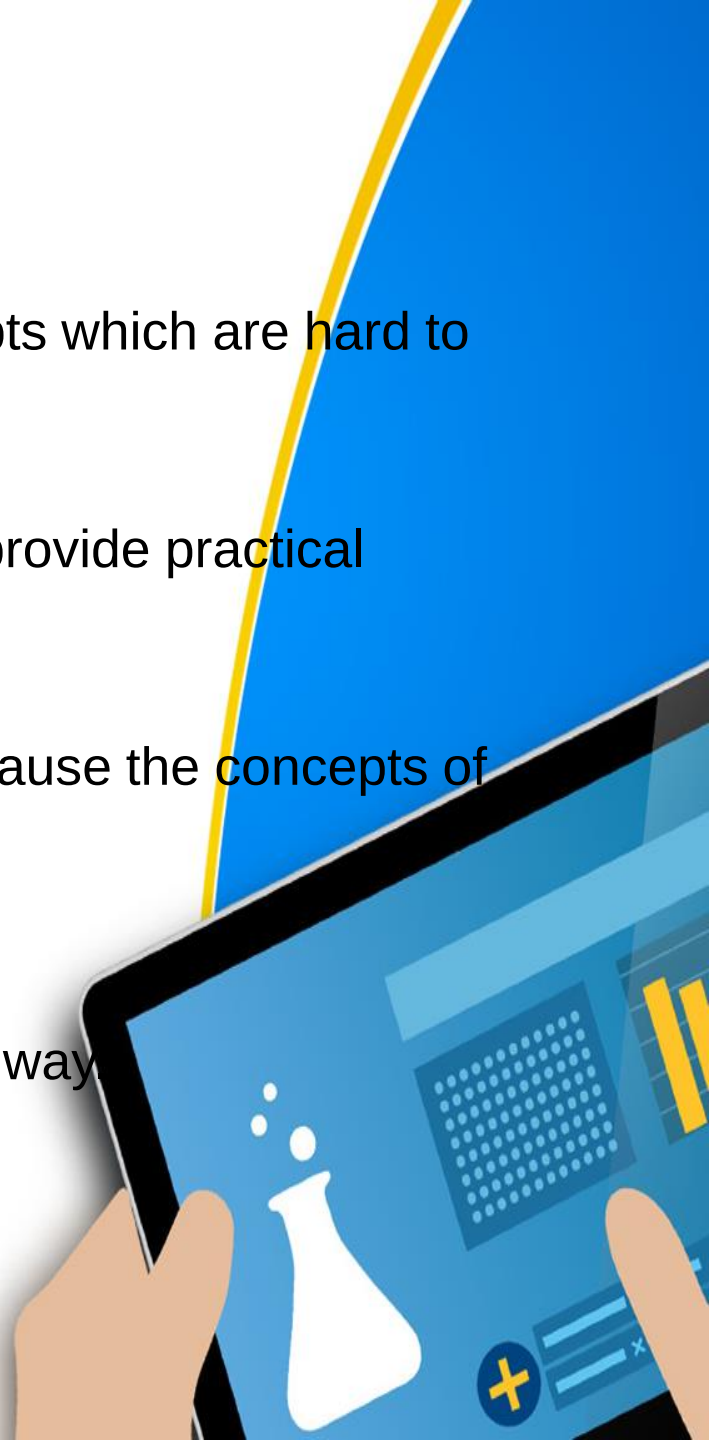


Providing Chemistry Support using AR



Background

- Chemistry is a complex subject with concepts which are hard to understand
- Some schools are not having the ability to provide practical experience for their students.
- Reading only notes will not be effective because the concepts of of chemistry is hard to memorise.
- It will be beneficial if students are having a method to study chemistry in an interesting way.



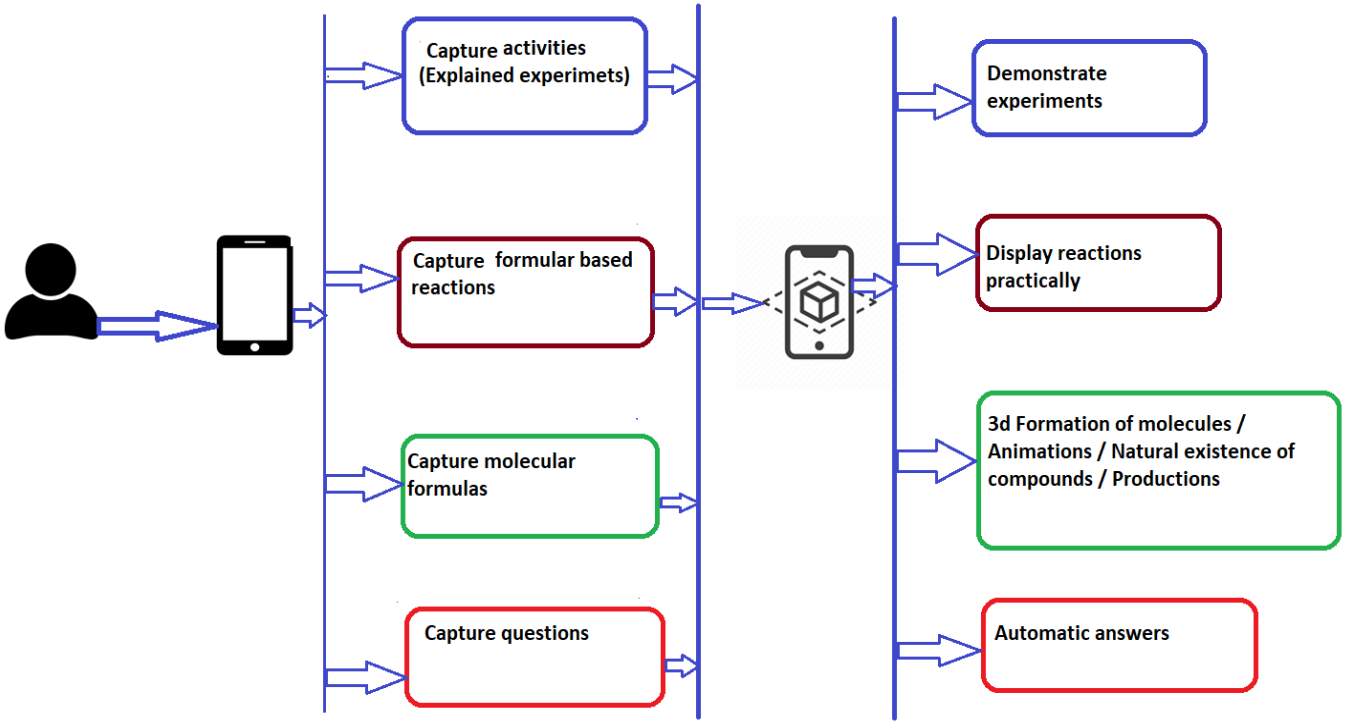
Requirements

- A system to learn O/L chemistry in an interesting way.
- A method to get a practical experience without using any equipment.
- Ability to convert text into 3d models , animations , videos
- Accessibility for students who are not having internet facilities.
- Easy way to get answers for the chemistry questions provided in the text book.
- Ability to provide further details together with 3D models.

Comparison of existing systems and related work

	3D animations and 3d molecular bonding	Natural existence of compounds and their productions	Videos on chemical reactions	Demonstration of chemistry practicals	Specific to local O/L syllabus
Chemistry Formulas [3]	X	X	X	X	X
Molecular kit [4]	NO animations	X	X	X	X
Chemistry notes [5]	X	Text based	X	X	✓
Lab in App[6]	X	X	X	✓	✓
Proposed App	✓	✓	✓	✓	✓

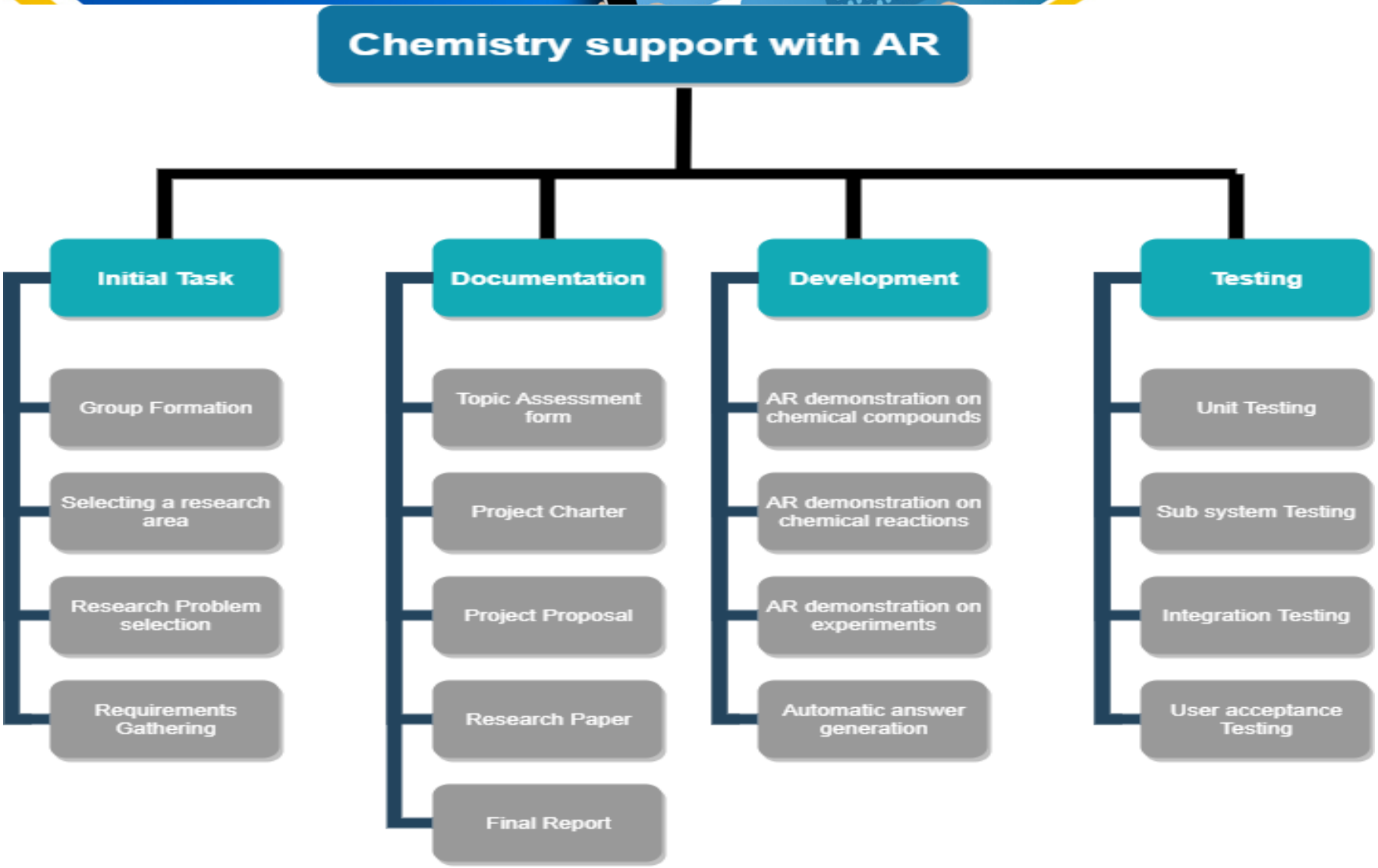
Methodology – System Architecture



Methodology

AR Demonstration of experiments	• Providing videos which demonstrate the experiment given in the captured activity • Providing audio to explain the experiment
AR support on text based reactions	• Providing animations and videos to demonstrate how the reactions happen in real world.
AR support on hydro carbons	• Display 3D models with animations of the molecular shape of the captured hydrocarbon formula. • Display 3D models of the natural existence of the captured hydrocarbon and productions done with it.
Automatic answers for exercises	• Automatic answers will be displayed when the questions in the text book are captured.

Methodology – Work Break down structure



Methodology – Gantt Chart

	Task Name	Duration	Start	End
1	Forming a group	1 day	4.10.19	5.10.2019
2	Selecting a research area	6 days	6.10.19	12.10.2019
3	Identifying an existing problem	5 days	13.10.2019	18.10.2019
4	Requirements Gathering	1month	18.10.2019	30.11.2019
5	Topic registration form preparation	3 days	30.11.2019	3.12.2019
6	Charter preparation	4 days	18.01.2020	22.01.2020
7	Preparation for the proposal presentation	6 days	22.01.2020	28.01.2020
8	Preparation of proposal document	3 weeks	28.01.2020	14.02.2020
9	AR support on chemical compounds	2 months	15.02.2020	10.04.2020
10	Unit testing	5 days	10.04.2020	15.04.2020
11	AR support on chemical reactions	1 month	16.04.2020	27.05.12
12	Unit testing	5 days	27.05.2020	2.06.2020
13	Preparation of the research paper	6 days	04.06.2020	10.06.2020
14	AR support on experimets	1 month	12.06.2020	12.07.2020
15	Unit testing	3 days	13.07.2020	16.07.2020
16	Automatic answer generation	1 month	17.07.2020	17.08.2020
17	Unit testing	3 days	18.08.2020	21.08.2020
18	Component testing	4 days	22.08.2020	27.08.2020
19	Preparation of the final report	6 days	27.09.2020	02.10.2020
20	Integration	6 days	03.10.2020	10.10.2020
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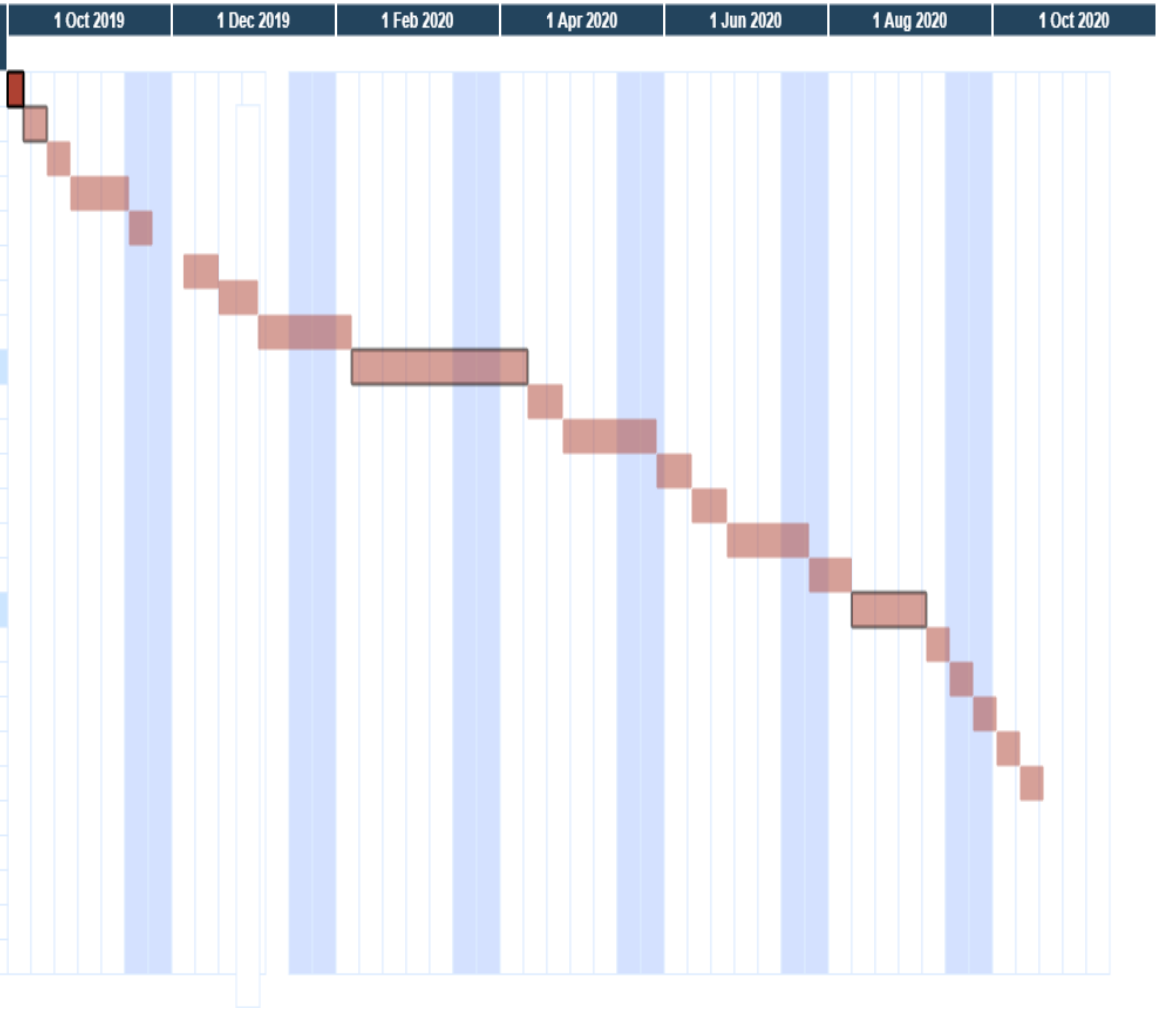

Objectives

❖ Providing AR support for chemistry in the O/L syllabus

- Chemistry experiments in the text book will be demonstrated using augmented reality.
- Formula based chemical reactions will be converted into practical demonstrations.
- Students can get a clear understanding on the formations of hydrocarbons and the productions done using those hydrocarbons.
- App will produce automatic answers for chemistry exercises given in the text book using AR

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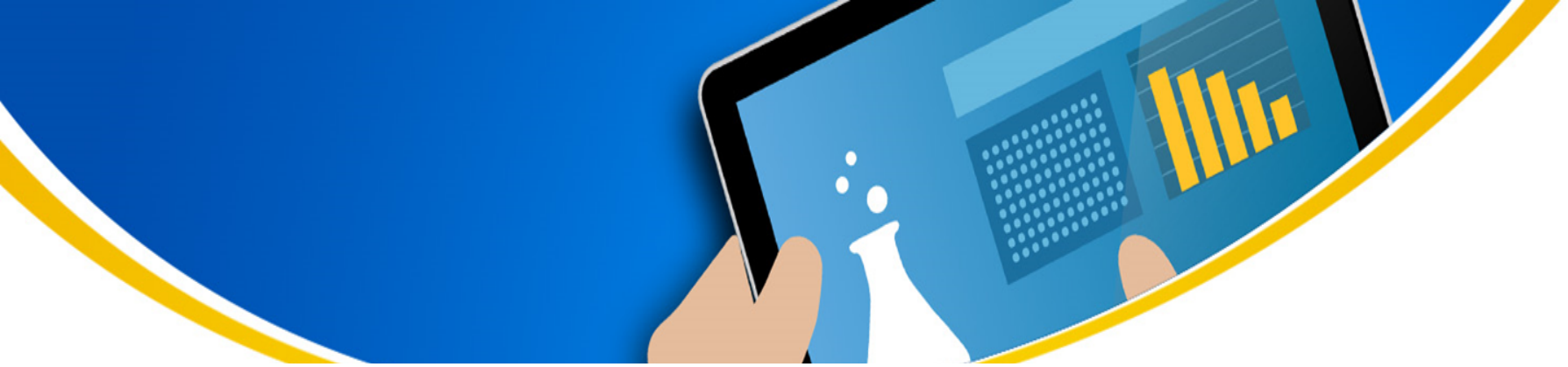

Thank you for listening

Questions…