

**INTERACTIVE, VISUAL LEARNING-BASED TOOL FOR  
HEARING-IMPAIRED CHILDREN TO IMPROVE  
LANGUAGE**

**22\_23-J 18**

Status Document - 2

Lelkada L L P S M

IT19001708

BSc (Hons) in Information Technology  
Specializing in Data Science

Department of Information Technology

Sri Lanka Institute of Information Technology  
Sri Lanka

May 2023

**INTERACTIVE, VISUAL LEARNING-BASED TOOL FOR  
HEARING-IMPAIRED CHILDREN TO IMPROVE  
LANGUAGE**

**22\_23-J 18**

Status Document - 2

Lelkada L L P S M

IT19001708

BSc (Hons) in Information Technology  
Specializing in Data Science

Department of Information Technology

Sri Lanka Institute of Information Technology  
Sri Lanka

May 2023

# TABLE OF CONTENTS

<b>1 Introduction .....</b>	<b>4</b>
1.1 Introduction to Research Project .....	4
2.2 Introduction to Individual Component .....	5
<b>2 Work Planner Records .....</b>	<b>6</b>
<b>3 GitLab Contribution History .....</b>	<b>8</b>
<b>4 Field Visits .....</b>	<b>9</b>
<b>5 Meetings .....</b>	<b>13</b>
5.1 Physical Meetings.....	15
5.2 Online Meetings .....	15
<b>6 Screenshots of Chats .....</b>	<b>20</b>
<b>7 Snapshots of Mobile Application User Interfaces .....</b>	<b>26</b>
<b>8. Snapshots of Development Tasks.....</b>	<b>28</b>
<b>8 Gantt Chart .....</b>	<b>30</b>
<b>9 Work-breakdown Structure .....</b>	<b>31</b>

# **1. INTRODUCTION**

## **1.1 Introduction to Research Project**

The key to effective language learning for hearing-impaired children is to provide a personal and experience-oriented environment that utilizes their residual hearing. Traditional learning applications that only offer a limited set of vocabulary and activities do not provide a comfortable learning environment for children. Instead, it is important to bring the learning environment into the child's own world to attract them to the platform.

Just as normal-hearing children learn their first language through repetitive and frequent interactions with someone on the same level, hearing-impaired children should also be provided with similar experiences. This can be achieved by offering vocabulary and activities related to the child's background, culture, and environment while also ensuring that their residual hearing is functioning properly with appropriate devices. It is essential to simulate and respond to the child's auditory experiences in order to effectively use their residual hearing.

The learning platform should provide materials that are suitable for the child's current linguistic ability and age. The words and sentences included in these activities should be at an appropriate level of difficulty to ensure a seamless learning experience. When developing teaching materials, the level of phonographic and contextual difficulty should be considered.

Incorporating learning materials that are contextually similar to the words the child has learned can help to improve their vocabulary and help them understand the links and patterns within the language. To ensure that previously learned words are frequently and repetitively used, new content should be presented in a way that combines previously learned material appropriately.

Regardless of the child's background, it is important to ensure that learning materials presented through the application are appropriate for their age and level of learning. Content censoring should be done for each individual element presented to ensure that the context and intonation of the materials are suitable for the child's understanding.

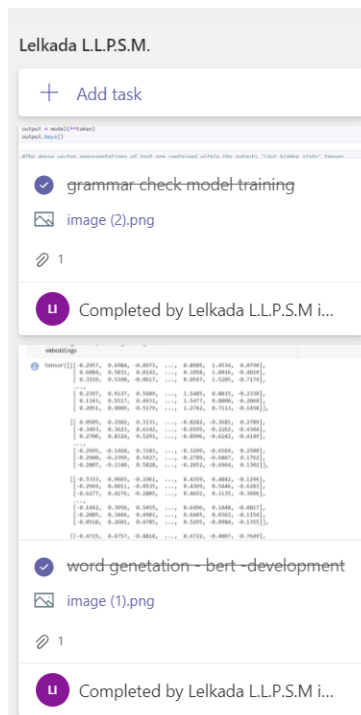
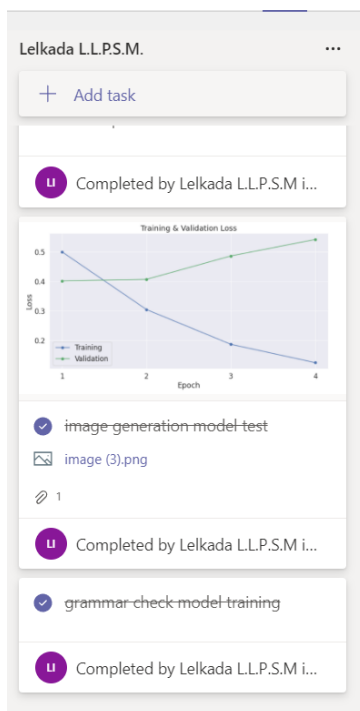
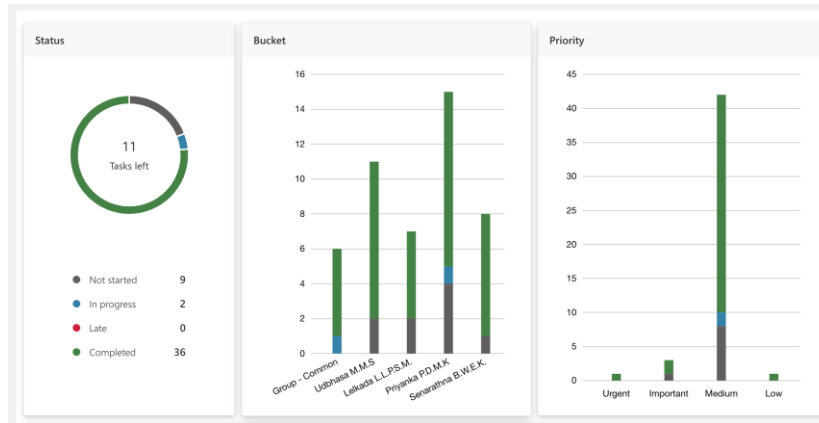
## **1.2 Introduction to Individual Component**

The primary aim of this study is to develop a learning platform that focuses on experience-based learning for hearing-impaired children, enabling them to acquire their first language through interactions with elements familiar to them. This platform aims to minimize the linguistic skill gap between hearing and non-hearing peers by leveraging residual hearing and replicating the natural language acquisition process. The learning materials provided should be appropriate for the child's level of linguistic skill, facilitating a seamless language-learning experience.

To improve vocabulary and comprehension of syntax and semantics, the platform generates contextually similar words and sentences based on previously learned content. This approach helps the child understand and connect various elements they encounter in their daily lives, mirroring the language acquisition process of their hearing peers. Furthermore, presenting content in a way that aligns with the child's interests helps keep them motivated to continue using the platform.

The learning platform's contents are carefully curated to ensure that they are suitable for children, regardless of their background. The child's own world is the foundation of the learning platform, but its contents are scrutinized to ensure that they are child-friendly. False negatives are unacceptable during the content censoring process.

## 2. WORK PLANNER RECORDS



[illegible]

Activity log & Individual Progress Tracker - Saved

Search Excel

File Home Insert Draw Page Layout Formulas Data Review View Automate Help

Calibri 11 B

A16

	A	B	C	D
1	Date	Description		
2	12/7/2022	Discussing with a educator about the educational background of hearing impaired children		
3	13/7/2022	Preparing topic assesment document		
4	14/7/2022	Review and revise topic assesment document with supervisor		
5	15/07/2022	Research about existing NLP for ASL		
6	16/07/2022	Research about importance of developing linguistic skills at an early age		
7	17/07/2023	Adding more content to the topic assesment document based on the findings		
8	18/07/2024	Review and revise topic assesment document with group members		
9	18/07/2022	TAF document submission		
10	19/07/2022	Research existing solutions to develop language skills at early stages		
11	28/07/2022	Prepare a questionnaire for field visit		
12	2/8/2022	Field visit to Ratmalana Deaf School		
13	2/8/2022	Field visit to Ratmalana Audiology Center		
14	11/8/2022	Meeting with co-supervisor to clarify some doubts regarding the project		
15				
16				
17	15/8/2022	Collecting kid's story books to create demo corpus		
18	16/8/2022	Research and understanding how word2vec algorithm works		
19	16/8/2022	Discussion on field visit with supervisors		
20	5/9/2022	Field visit to Wickckramaarachchi hearing care centre		
21	/2022	Proposal report & proposal presentation planing with team members		
22	/2022	Progress discussion with supervisor and co-supervisor		
23	/2022	Proposal report - individual diagram finetuning with team members		
24	/2022	Proposal report progress discussion with co-supervisor		
25	21/9/2022	Field visit to Ratmalana Deaf School		
26	23/9/2022	Finalised the individual component diagram		
27	24/10/2022	Requested permission for a field visit to CEUIC		

< = Group Saluka Parami Esala Mudeesha Ideas +

### 3. GITLAB CONTRIBUTION HISTORY

2

22\_23-J 18

Project ID: 1586

Star 0 Fork 0

39 Commits 2 Branches 0 Tags 23.1 MB Files

master

22\_23-j-18 / +

History

Find file

Web IDE

Clone

adding detection models

Esala Senarathna authored 1 day ago

47db272d

README

Auto DevOps enabled

Add LICENSE

Add CHANGELOG

Add CONTRIBUTING

Add Kubernetes cluster

Name	Last commit	Last update
IT19001708	text similarity calculation model added	2 days ago
IT19142838	adding detection models	1 day ago
IT19188928	lip detetct	2 days ago
IT19954974	member folders added	1 month ago
.DS_Store	Daily changes	1 week ago
README.md	Update README.md	3 months ago
core.369	data clean script added	3 days ago

#### Parami Lelkada

25 commits (it19001708@my.sliit.lk)





## 4. FIELD VISITS

### 4.1 Physical Meetings

Photographs taken on field visit to CEHIC

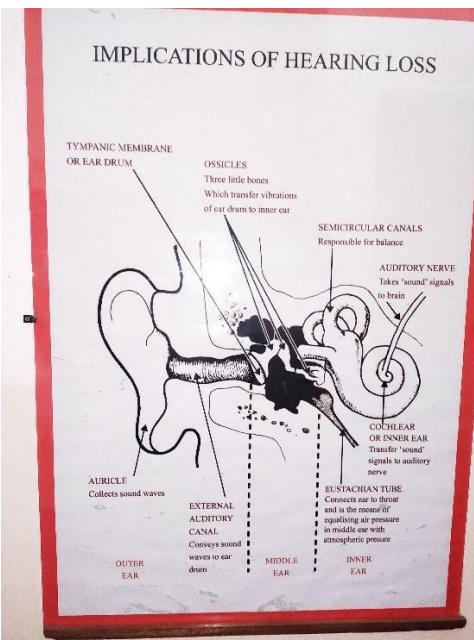
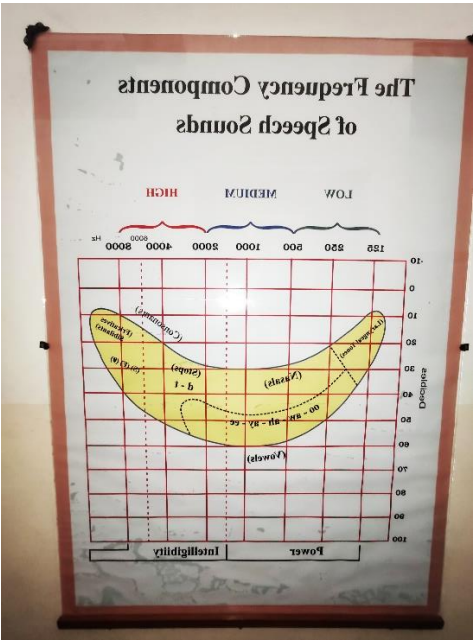








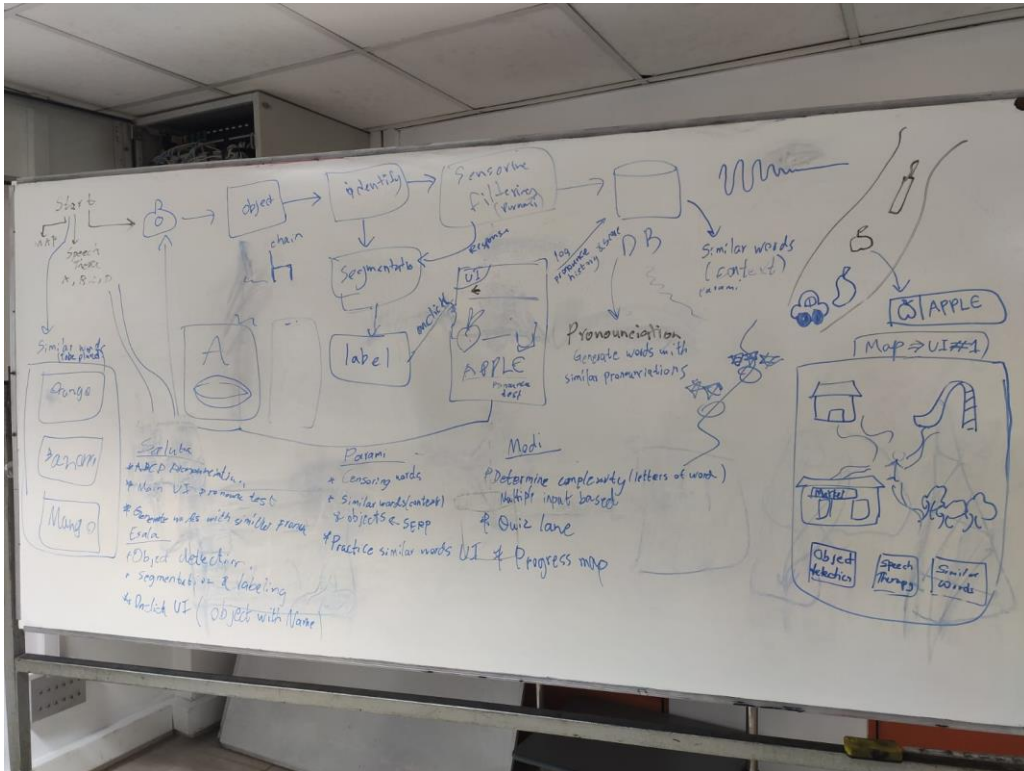
Photographs taken from field visit to Wickramarachchi Hearing Care Centre



## 5. MEETINGS

### 5.1 Physical Meetings

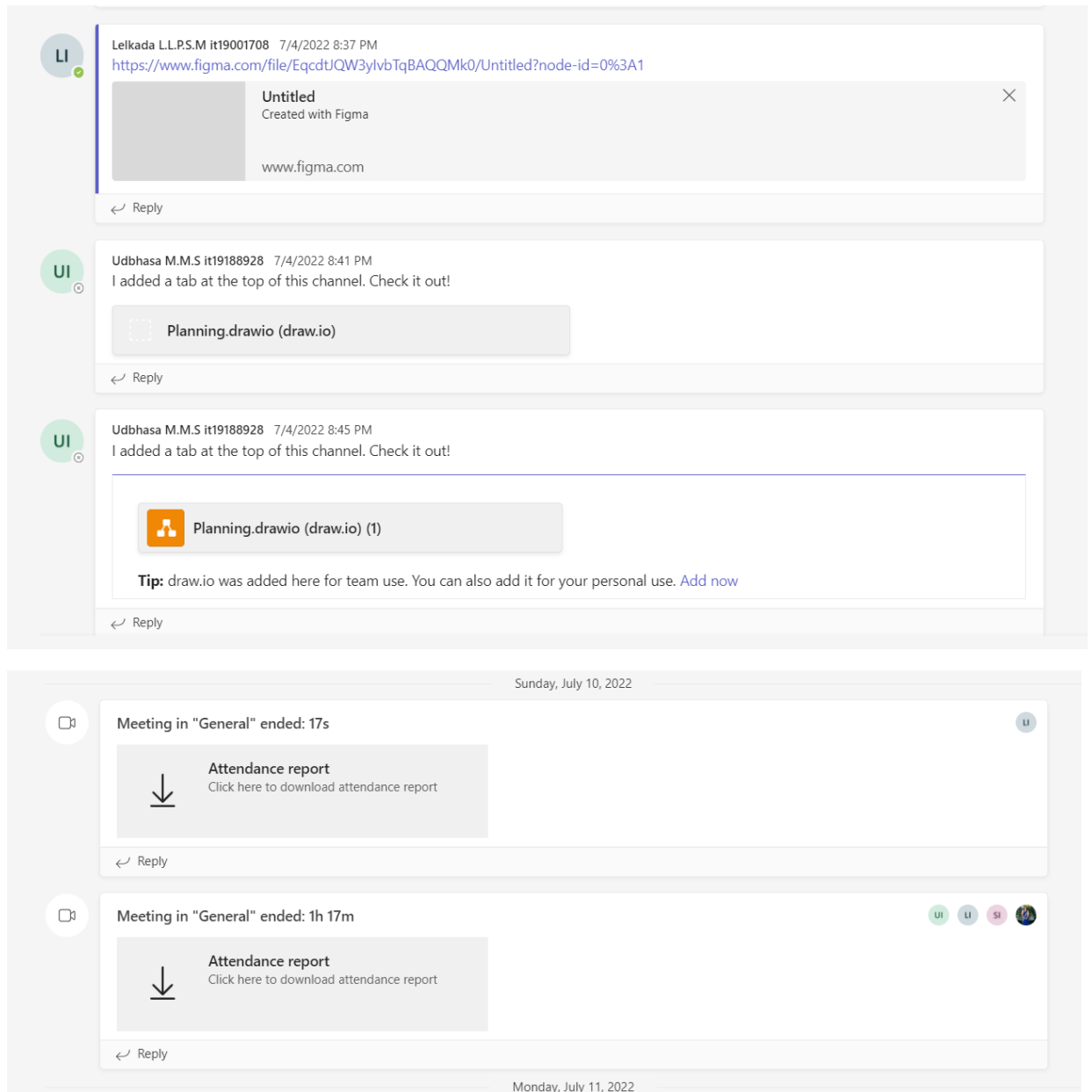
Photographs taken at physical group meetings and planning sessions





## 5.2 Online Meetings

Following snapshots are taken as a proof of online meetings conducted through MS Teams.



Tuesday, July 19, 2022

Meeting in "General" ended: 4h 16m

↓

Attendance report

Click here to download attendance report

↩ Reply

Tuesday, July 26, 2022

New meeting ended: 4m 19s

↩ Reply

Meeting in General started

3 replies from IT19142838, IT19954974, and IT19188928

↩ Reply

Wednesday, August 3, 2022

Sunday, January 22, 2023

Meeting in "General" ended: 1h 1m

↓


Attendance report

Click here to download attendance report

↩ Reply

Wednesday, January 25, 2023


Tuesday, September 19, 2022



Priyanka P.D.M.K it19954974 9/13/2022 1:22 PM

Individual Components

[solo diagram.drawio](#)

 solo diagram.drawio

...

↩ Reply

Meeting in General ended: 54m 20s

↩ Reply

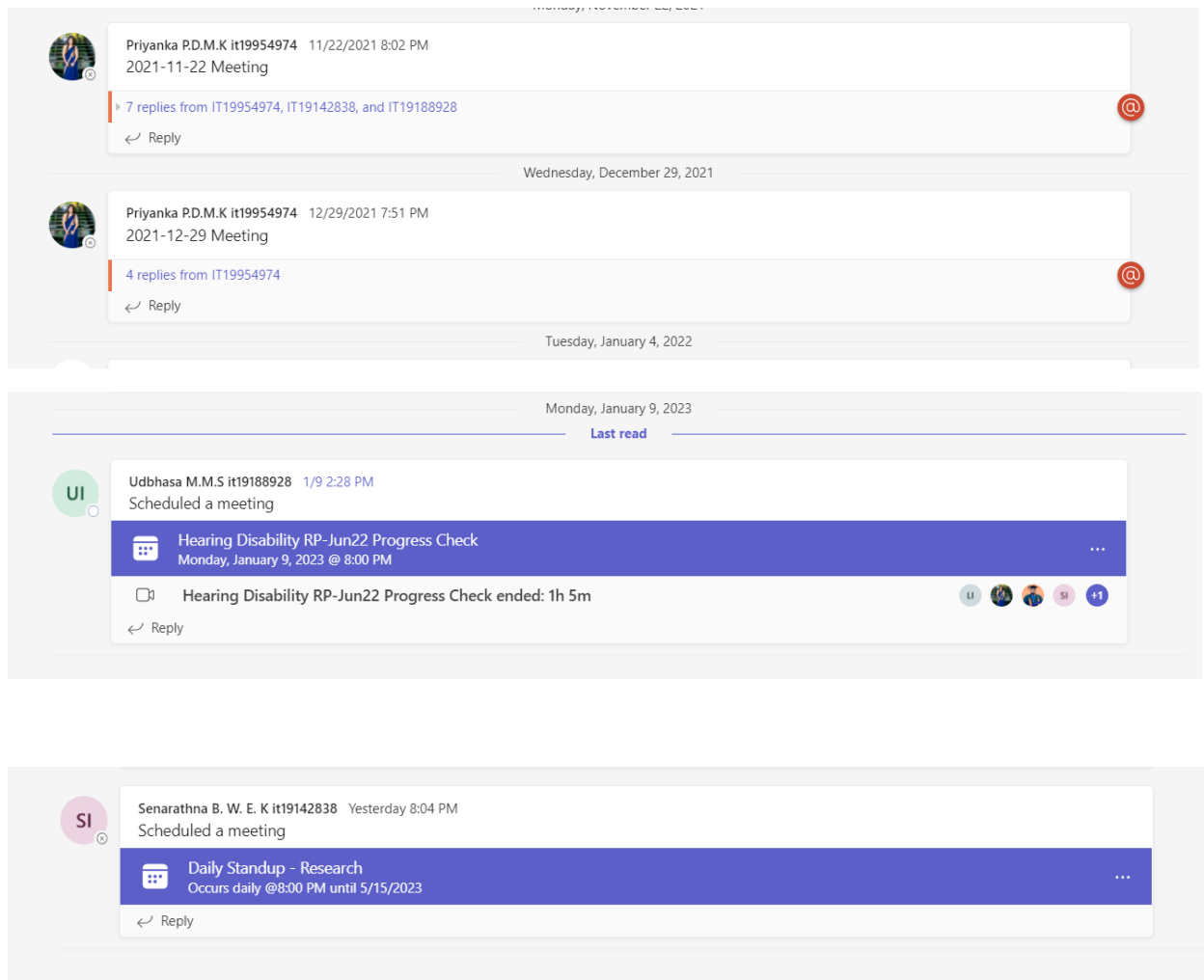
Meeting ended: 1h 3m

↩ Reply

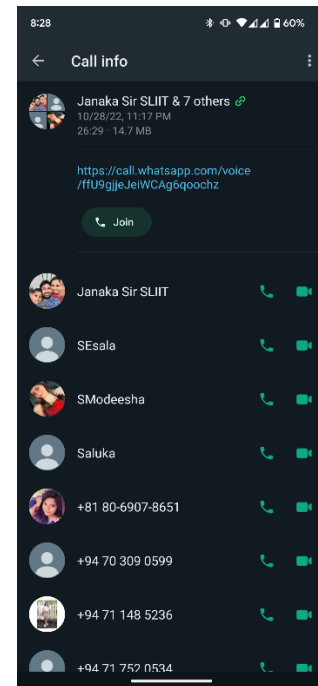
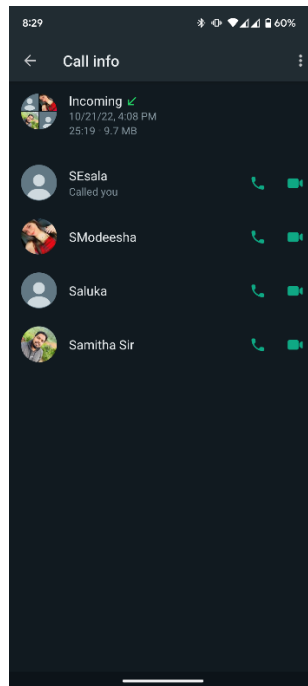
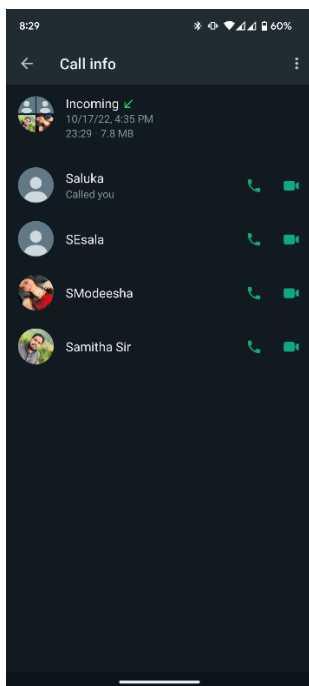
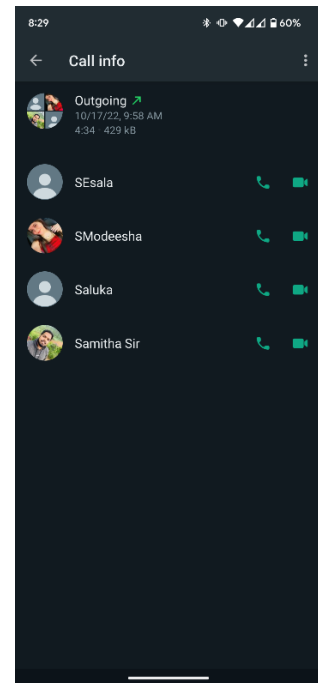
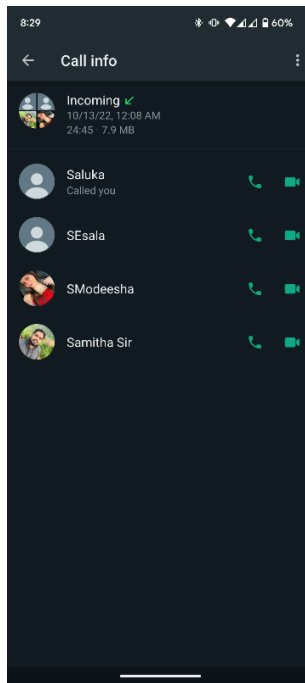
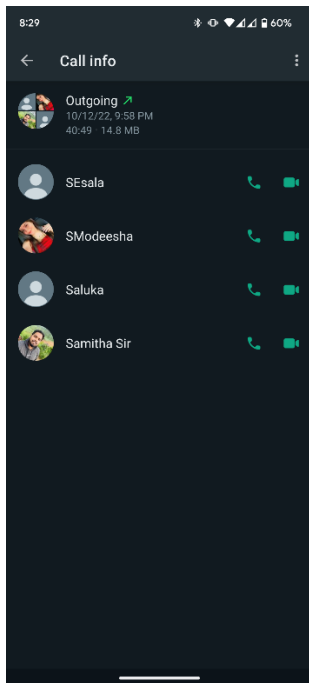
Thursday, September 22, 2022

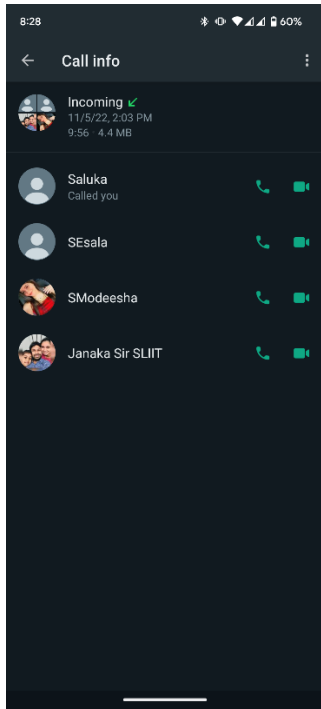
16



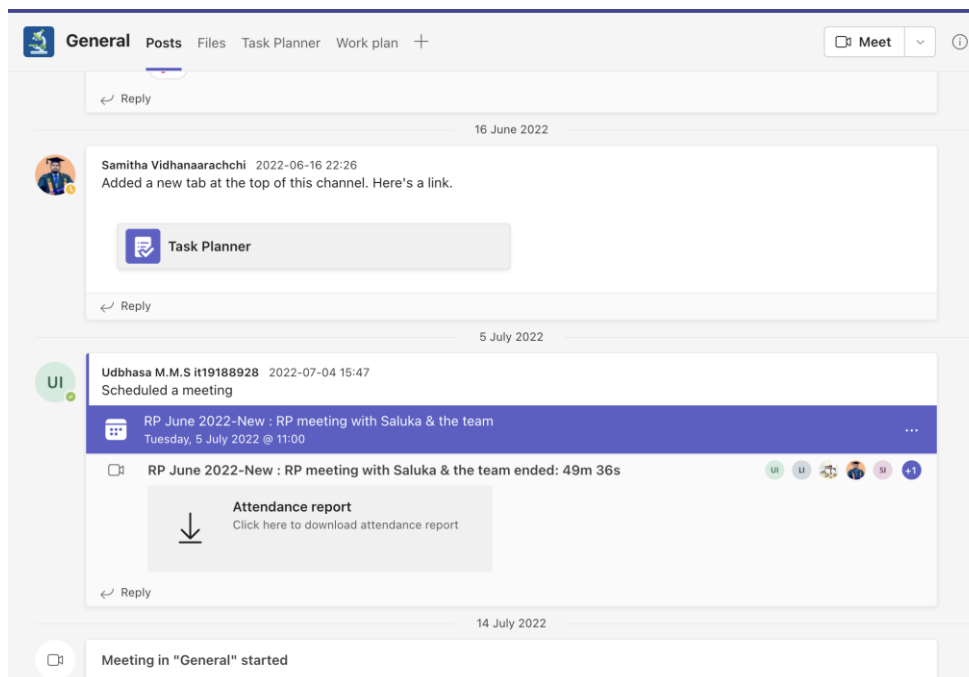
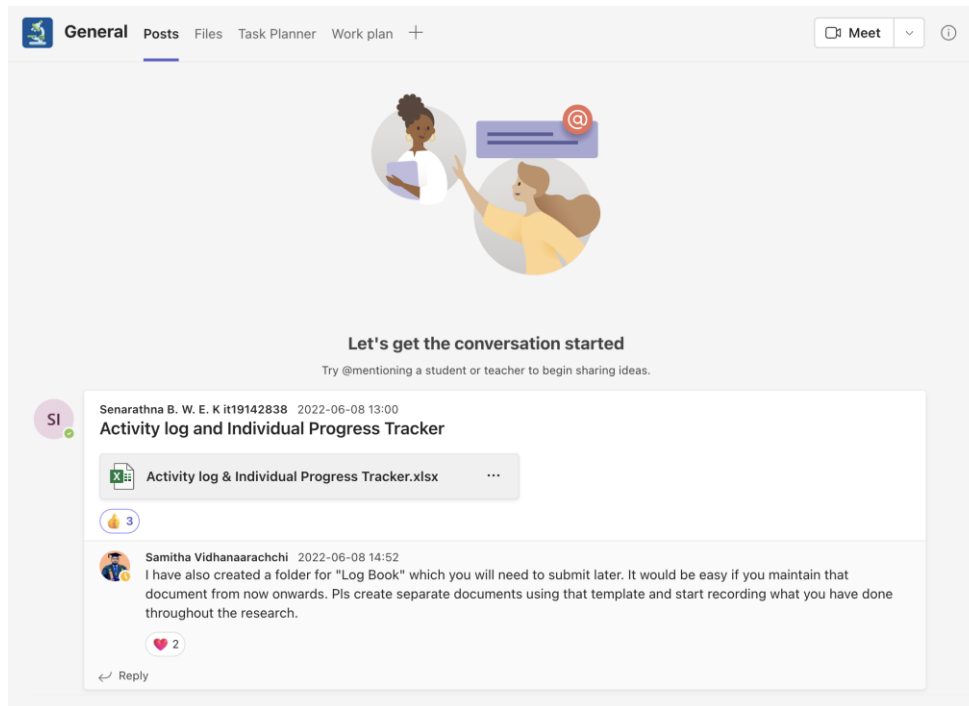


Following snapshots are taken as a proof of online meetings conducted with supervisor and co-supervisor via WhatsApp.





## 6. SCREENSHOTS OF CHATS



10 September 2022

UI

Udbhasa M.M.S it19188928 2022-09-10 14:27 Edited



This audio cd was received as a gift to [Lelkada L.L.P.S.M it19001708](#) during her last visit to Delkanda Wikramarachchi hearing care centre.

Audio clips : [Speech Audiometry in Sinhala](#)

[See less](#)

Reply

5 October 2022

UI

Udbhasa M.M.S it19188928 2022-10-05 22:42

I added a tab at the top of this channel. Check it out!



Work plan

Reply

10 October 2022

LI

Lelkada L.L.P.S.M it19001708 2022-07-04 20:37

<https://www.figma.com/file/EqcdtJQW3yIvTqBAQQMk0/Untitled?node-id=0%3A1>



Untitled

Created with Figma

[www.figma.com](https://www.figma.com)

Reply

UI












Udbhasa M.M.S it19188928 2022-07-04 20:45








I added a tab at the top of this channel. Check it out!



Planning.drawio (draw.io) (1)

Reply

	<b>General</b>	Posts	<b>Files</b> ▾	Task Planner	Work plan	+	 Meet ▾
+ New ▾		↑ Upload ▾	🔗 Share ▾	🔄 Sync	↓ Download	⋮	☰ All Documents ▾ 🔍 ⓘ
Documents > <b>General</b> 🔍							
	Name ▾	Modified ▾	Modified By ▾	+ Add column			
	Log Book	June 8, 2022	Samitha Vidhanaa...				
	Speech Audiometry in Sinhala	September 10, 20...	Udbhasa M.M.S it...				
	Activity log & Individual Progress Tracker....	December 13, 2022	Lelkada L.L.P.S.M ...				
	CEHIC Questionnaire.docx	October 26, 2022	Udbhasa M.M.S it...				
	Meeting Minutes.xlsx	September 11, 2022	Priyanka P.D.M.K i...				
	SLIIT endorsement letter 22_23-J 18 .pdf	September 26, 20...	Udbhasa M.M.S it...				
	TAF.docx	October 14, 2022	Lelkada L.L.P.S.M ...				
	TMP-2022_23-29-ProjectCharter.docx	August 16, 2022	Senarathna B. W. ...				

	<b>General</b>	Posts	<b>Files</b> ▾	Task Planner	Work plan	+	 Meet ▾
+ New ▾		↑ Upload ▾	🔗 Share ▾	🔄 Sync	↓ Download	⋮	☰ All Documents ▾ 🔍
Documents > General > <b>Speech Audiometry in Sinhala</b>							
	Name ▾	Modified ▾	Modified By ▾	+ Add column			
	01 Track 1.mp3	September 10, 20...	Udbhasa M.M.S it...				
	02 Track 2.mp3	September 10, 20...	Udbhasa M.M.S it...				
	03 Track 3.mp3	September 10, 20...	Udbhasa M.M.S it...				
	04 Track 4.mp3	September 10, 20...	Udbhasa M.M.S it...				

823 kB

MEDIA

DOCS

LINKS

01/03/2022

PDF

Notability Notes.pdf

1 page • PDF • 171 kB

01/06/2022 ✓

Esala SLIIT

XLSX

Team Log.xlsx

XLSX • 14 kB

08/06/2022

Esala SLIIT

PDF

Plus\_Go\_Intelligent\_Complementary\_Ride-Sharing\_System.pdf

7 pages • PDF • 823 kB

08/06/2022

Esala SLIIT

PDF

HopOn\_A\_Personalized\_Ride-Sharing\_System\_based\_on\_So...

6 pages • PDF • 2 MB

08/06/2022

Esala SLIIT

PDF

Decision\_Support\_System\_Employee\_Recommendation\_using...

08/06/2022

←

MEDIA

DOCS

LINKS

05/08/2022

DOCX

TMP-22-XXX-ProjectCharter.docx

DOCX • 33 kB

13/08/2022 ✓

Modeesha - SLIIT

DOCX

RpTopicAssessmentForm\_TMP-2022\_23\_07.docx

DOCX • 325 kB

13/08/2022

Esala SLIIT

Forwarded

PDF

Sample.pdf

8 pages • PDF • 10 MB

14/08/2022

DOCX

TMP-2022\_23-29-ProjectCharter.docx

DOCX • 1 MB

19/08/2022 ✓

Syncing older messages. [See progress.](#)

←

MEDIA

DOCS

LINKS

📄

cehic letter.docx

DOCX • 13 kB

22/09/2022 ✓

➦ Forwarded

Project Proposal - Practice session

Item	Name	Start Date	End Date	Status
1	Project Proposal	20/09/2022	20/09/2022	Completed
2	Meeting Schedule	20/09/2022	20/09/2022	Completed
3	Meeting Schedule	20/09/2022	20/09/2022	Completed
4	Meeting Schedule	20/09/2022	20/09/2022	Completed
5	Meeting Schedule	20/09/2022	20/09/2022	Completed

📄

Meeting Schedule.pdf

1 page • PDF • 386 kB

14/10/2022 ✓

Esala SLIIT

📄

Gantt Chart.xlsx

XLSX • 9 kB

14/10/2022

Download "Gantt Chart.xlsx"

➦ Forwarded

Project Proposal - Practice session

Item	Name	Start Date	End Date	Status
1	Project Proposal	20/09/2022	20/09/2022	Completed
2	Meeting Schedule	20/09/2022	20/09/2022	Completed
3	Meeting Schedule	20/09/2022	20/09/2022	Completed
4	Meeting Schedule	20/09/2022	20/09/2022	Completed
5	Meeting Schedule	20/09/2022	20/09/2022	Completed

📄

Meeting Schedule.pdf

1 page • PDF • 386 kB

15/10/2022 ✓

Syncing older messages. [See progress.](#)

←

MEDIA

DOCS

LINKS

Esala SLIIT • Research Gang

15/07/2022 >

Esala SLIIT

📄

Flowchart Maker

app.diagrams.net

<https://app.diagrams.net/#Wb!29uygl8BXkOiRE9SNzCPR0YEoEt9-ctlkim2wBrPEwxGiryI6dIItpvK90f5H9Ow%2F01Y3U3S37R2JOE56IT6JDZZNPDJW3S6PRF>

21:07

Esala SLIIT

🔗

https://mysliit-my.sharepoint.com/:w:/g/personal/it191...  
mysliit-my.sharepoint.com

https://mysliit-my.sharepoint.com/:w:/g/personal/it191...

Esala SLIIT • Research Gang

13/07/2022 >

Esala SLIIT

➦ Forwarded

Research topic submission issues

Please fill this form to express your ideas about the research topic submission. Only forms.gle

🔴

🔴

🔴

🔴

🔴

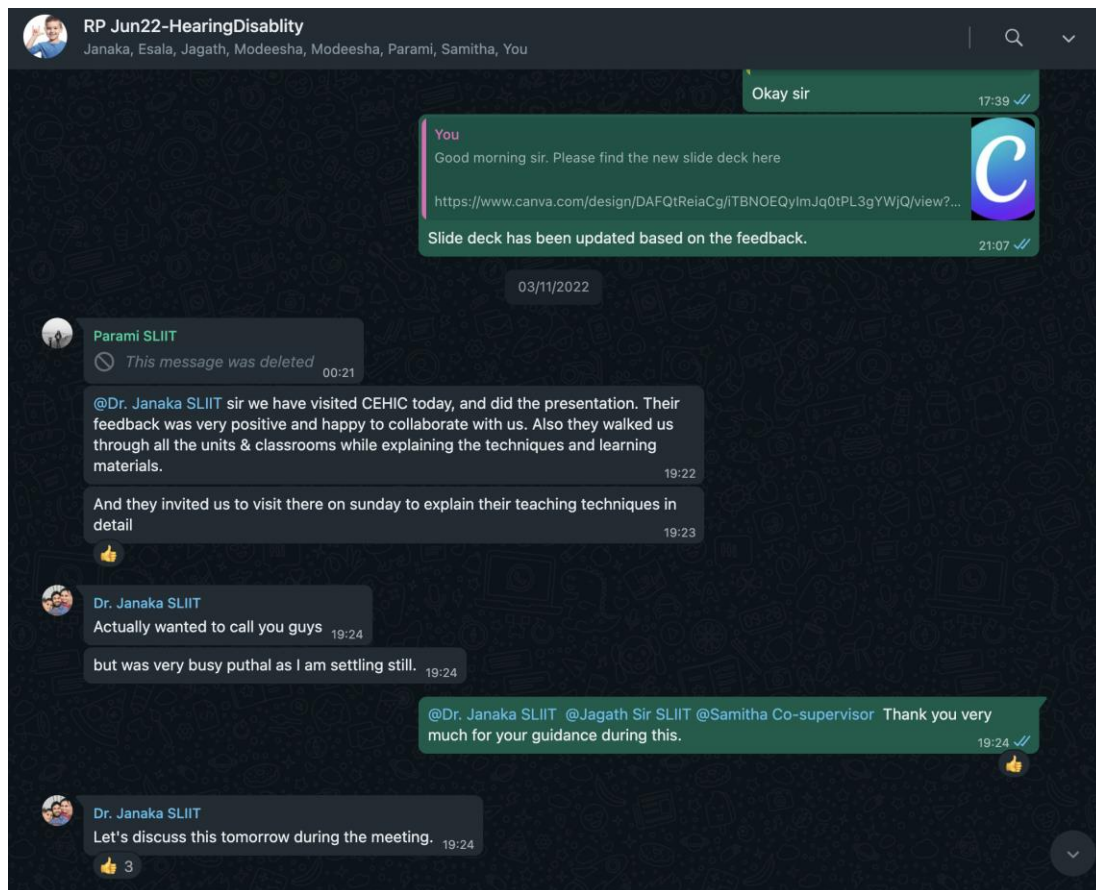
🔴

<https://forms.gle/gMKG6WmTrUpUxt5e6>

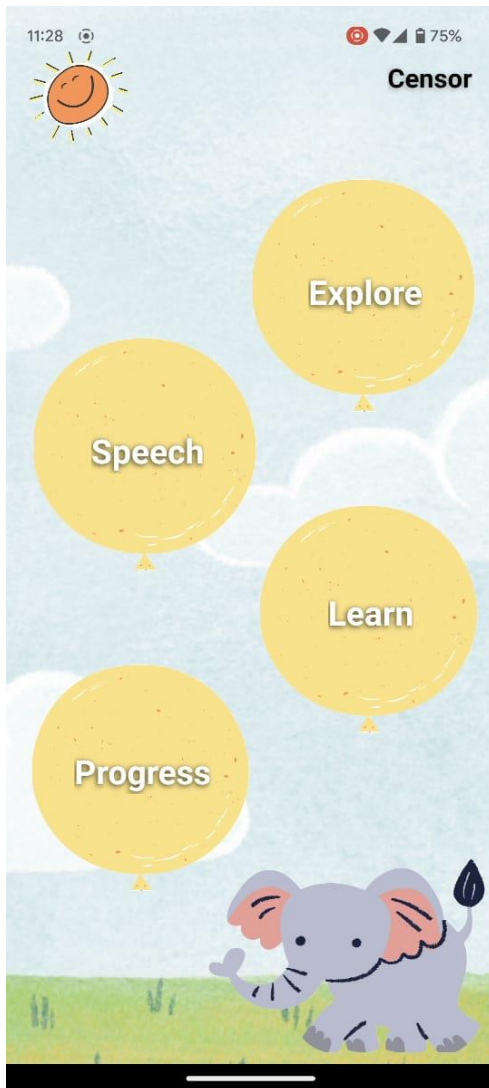
Syncing older messages. [See progress.](#)

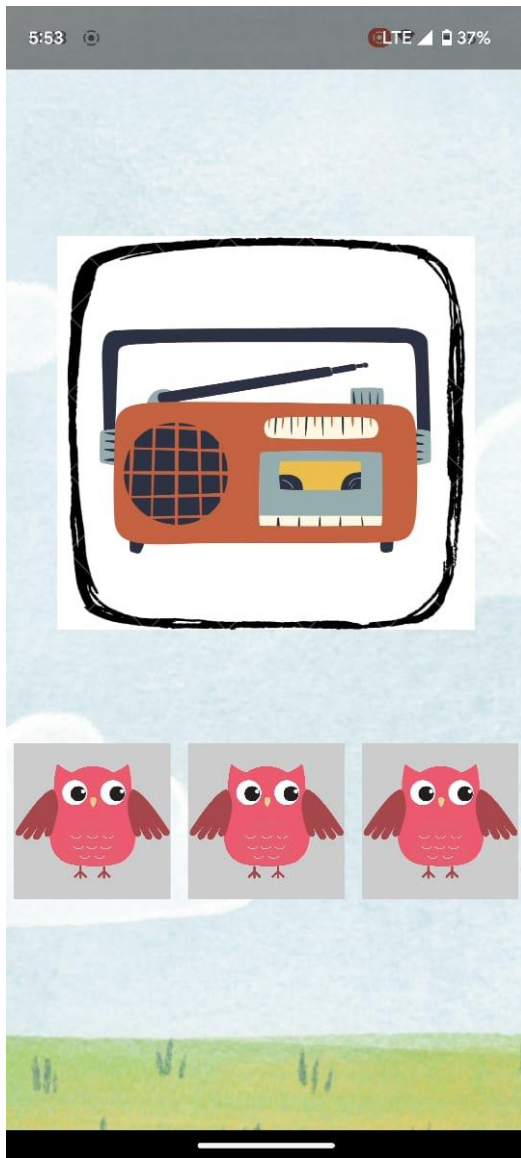
24





## 7. SNAPSHOTS OF MOBILE APP USER INTERFACES

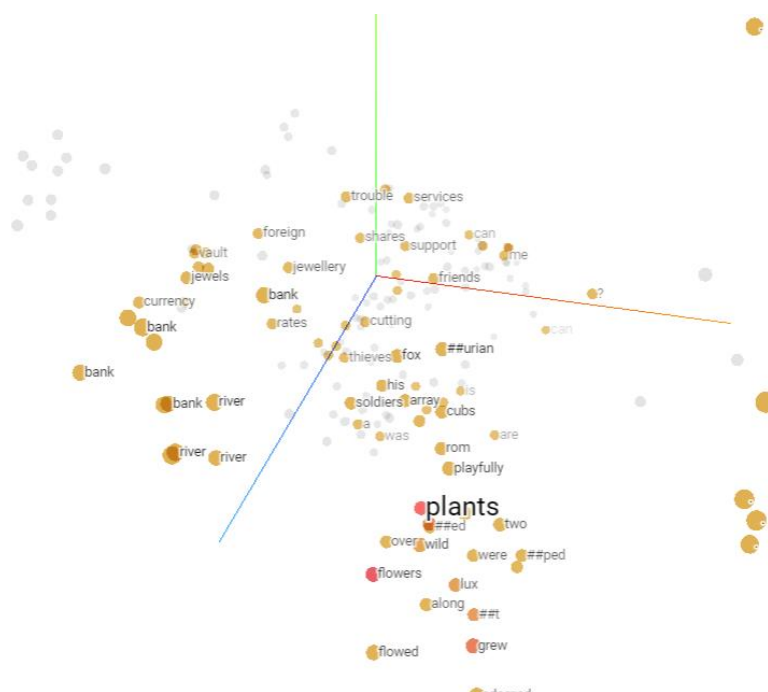


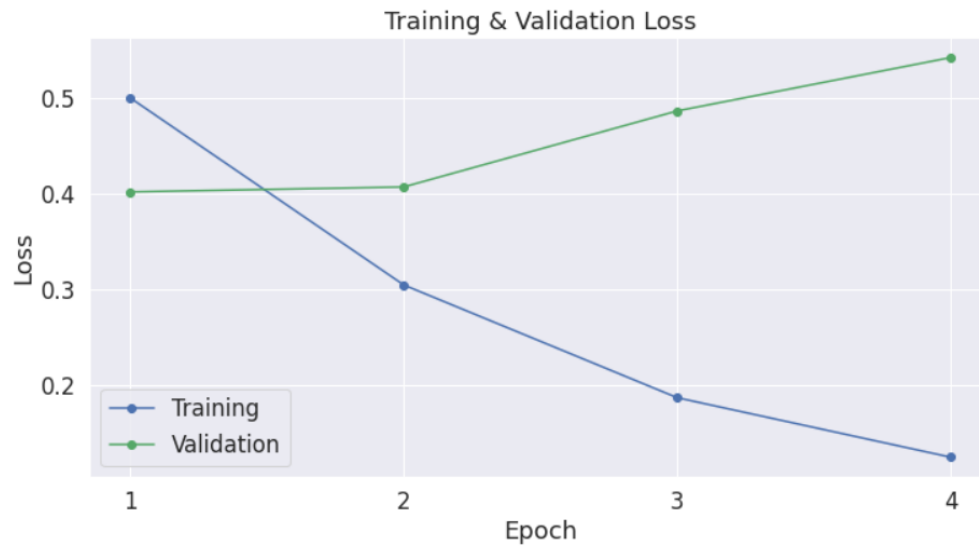


## 8. SNAPSOTS OF DEVELOPMENT TASKS

```
#The dense vector representations of text are contained within the outputs 'last_hidden_state' tensor
embeddings = output.last_hidden_state
embeddings
```

```
tensor([[[[-0.2957,  0.6984, -0.0973, ...,  0.8905,  1.4534,  0.0790],
          [ 0.6084,  0.5831,  0.0142, ...,  0.1058,  1.0816, -0.4010],
          [ 0.3159,  0.5390, -0.0617, ...,  0.0547,  1.5205, -0.7174],
          ...,
          [ 0.2397,  0.9137,  0.5609, ...,  1.5485,  0.8015, -0.2330],
          [ 0.1343,  0.9317,  0.4931, ...,  1.5477,  0.8000, -0.2060],
          [ 0.2051,  0.9009,  0.5179, ...,  1.2742,  0.7113, -0.1458]],
        [[ 0.0505,  0.2502,  0.3131, ..., -0.8282, -0.3681,  0.2789],
          [-0.3493,  0.3623,  0.6142, ..., -0.6595, -0.2262, -0.4304],
          [ 0.2700,  0.8324,  0.5291, ..., -0.8996, -0.6242, -0.4149],
          ...,
          [-0.2995, -0.1460,  0.3183, ..., -0.3299, -0.6569,  0.2500],
          [-0.2900, -0.2399,  0.5427, ..., -0.2789, -0.6867,  0.1762],
          [-0.2807, -0.1340,  0.5828, ..., -0.2052, -0.6964,  0.1302]],
        [[-0.5333,  0.9603, -0.1961, ...,  0.4359,  0.4842, -0.1296],
          [-0.2969,  0.6011, -0.0535, ...,  0.4369,  0.5446, -0.6283],
          [-0.6277,  0.4276, -0.2805, ...,  0.4691,  0.1135, -0.3606],
          ...,
          [-0.1442,  0.3956,  0.5455, ...,  0.6496,  0.1448, -0.0817],
          [-0.2085,  0.3466,  0.4901, ...,  0.6445,  0.0362, -0.1154],
          [-0.0518,  0.2601,  0.4785, ...,  0.5295, -0.0984, -0.1355]],
        [[-0.4715,  0.6757, -0.8818, ...,  0.6722, -0.4007, -0.7649],
          [ 0.0566,  0.6669, -0.7236, ...,  0.9365,  0.0215, -0.8219],
          [-0.3619,  0.5638, -0.5678, ...,  1.0558, -0.4939, -0.2260]]])
```





```

from transformers import AutoTokenizer, AutoModel
import torch

# initialize our model and tokenizer:
tokenizer = AutoTokenizer.from_pretrained(modelPath)
model = AutoModel.from_pretrained(modelPath)

# initialize dictionary: stores tokenized sentences
token = {'input_ids': [], 'attention_mask': []}
for sentence in train_text:
    # encode each sentence, append to dictionary
    new_token = tokenizer.encode_plus(sentence, max_length=128,
                                     truncation=True, padding='max_length',
                                     return_tensors='pt')
    # print(new_token)
    token['input_ids'].append(new_token['input_ids'][0])
    token['attention_mask'].append(new_token['attention_mask'][0])

# reformat list of tensors to single tensor
token['input_ids'] = torch.stack(token['input_ids'])
token['attention_mask'] = torch.stack(token['attention_mask'])

# Process tokens through model:
output = model(**token)
output.keys()

# The dense vector representations of text are contained within the outputs 'last_hidden_state' tensor
embeddings = output.last_hidden_state
# embeddings

embeddings.shape

```

## 9. GANTT CHART

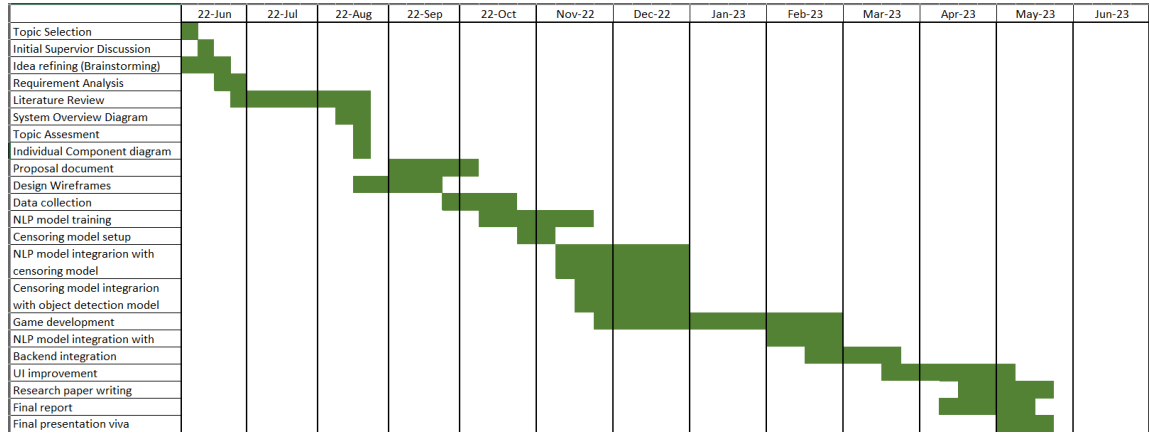


Figure 2: Gantt chart

## 10 .WORK-BREAKDOWN STRUCTURE

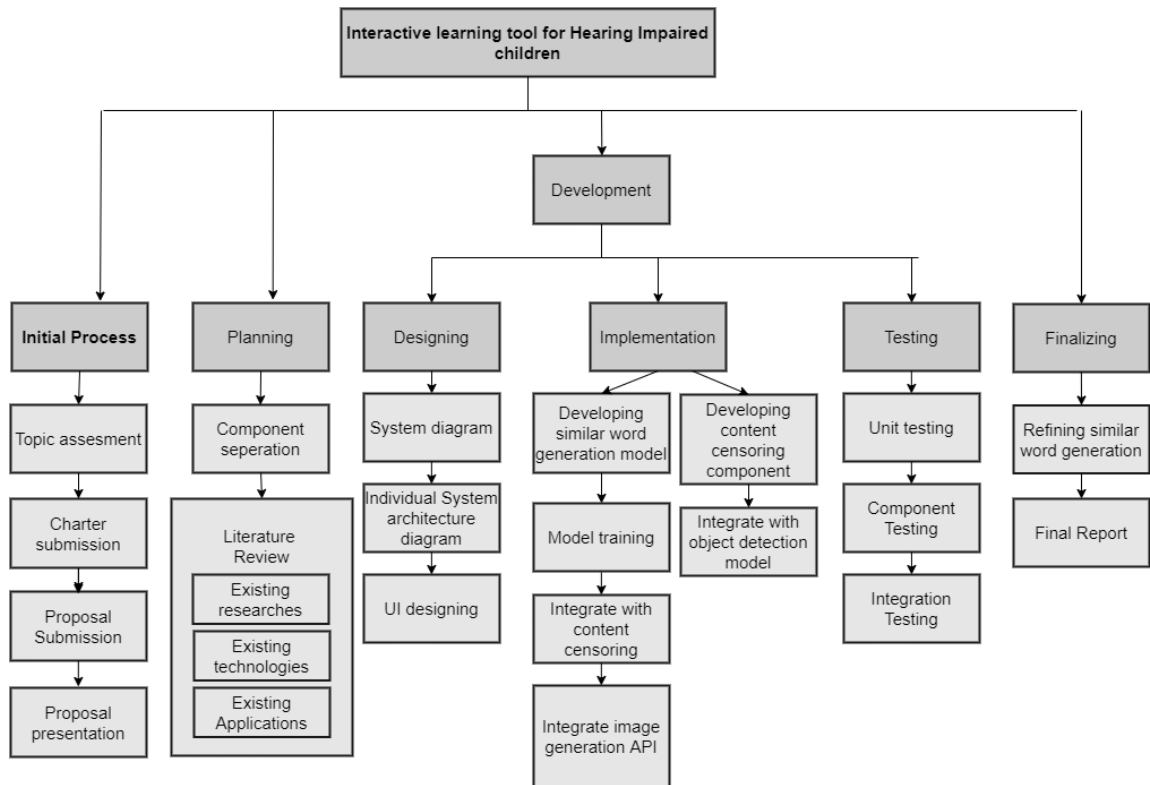


Figure 1: WBS