

Selective Mutism

A Project Submitted in
Partial Fulfillment of the Requirements

for the Degree of
Bachelor of Technology
in
Computer Science Engineering

As part of the core course

“DESIGN THINKING”

By

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Our thanks and appreciation also go to our colleagues in developing the project and people who have willingly helped us out with their abilities.

DEFINING THE PHENOMENA INTEREST

Defining the phenomena of interest is one of the fundamental steps of the design thinking process. It helps us answer the following three questions of what is the phenomena, why, and how it is taking place.

The phenomenon of interest for people facing mutism is the subjective/cognitive experience of anxiety and fear in social situations. Mutism, also known as selective mutism, is a rare psychological disorder that affects a person's ability to speak in certain social situations, despite being able to speak in other situations. It is a psychiatric condition characterized by a failure to speak in specific social situations, such as at school. It can affect their social and academic functioning, making it difficult for them to form relationships and engage in activities that require verbal communication.

The rate of typical selective mutism was 18 in 10,000 children. People with mutism may feel isolated and misunderstood, leading to feelings of anxiety, depression, and low self-esteem.

Children and adults with selective mutism experience anxiety and fear in these situations, which can be debilitating and isolating. Desensitization is a psychological term used to describe the process of slowly facing fears and overcoming anxiety. Understanding the subjective experience of anxiety and fear in social situations is crucial for developing effective interventions and support for individuals with selective mutism.

Further research is needed to gain an in-depth insight into the experiences of those who face this difficulty and to enrich our understanding of this complex phenomenon. By shedding light on the subjective experience of anxiety and fear in social situations, we can help individuals with selective mutism to overcome their fears and lead fulfilling lives.

AIM AND OBJECTIVE

We aim to solve the problem faced by the mute people in having effective communication with normal people.

PROCEDURE

As we know design is not aesthetic, not an event, not a product, or an experience but it is a process. Throughout the process we went through various phases to achieve our goal which follows:

1. Empathize with the users:

In this phase, we empathized with the user and talk to them about their problems to understand their needs and what they want and after that, we answered the following questions.

❖ What is the phenomenon?

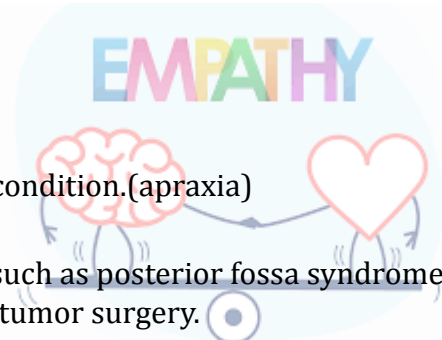
Mutism, also known as selective mutism, is a rare psychological disorder that affects a person's ability to speak in certain social situations, despite being able to speak in other situations.

❖ Why is it taking place?

- Physical Impairment: The coordination of numerous muscles in the mouth, throat, and respiratory system is required for the complex process of speech.
- Hearing Impairment: Due to the fact that spoken language is mostly learned through hearing, people who are deaf from birth or develop deafness early in life may never learn to talk.
- .Language Disorders: Some persons may struggle to create or understand speech due to language impairments such as stuttering, apraxia, or aphasia

❖ How is it taking place?

- Biological causes
- Mutism may be caused by a medical condition.(apraxia)
- Neurological damage
- Muteness may follow brain surgery, such as posterior fossa syndrome in children following cerebellar tumor surgery.



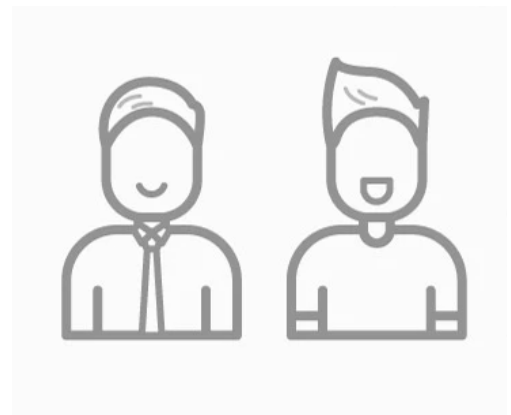
❖ Who are we studying?

In this case, we will be studying those users who cannot speak verbally in their day to day life. Most of these people are facing mutism from birth due to the several factors such as neurological damage, biological causes, physical impairment.

We will be studying those people so we can help them in some way so that they are able to develop a good communication with normal people and the procedure so they do not face any difficulty in presenting their views /having a normal conversation with people in such a way that is easy and convenient for both the mute people and normal people.

2. Persona

A user persona is a semi-fictional character based on your current customer. User personas are very helpful in helping a business expand and improve because they reveal the various ways customers look for, purchase, and utilise products. This allows you to concentrate your efforts on making the user experience better for actual customers and use cases.



The persona in question for us is the set of people who are involved in some business, household work, institutions, companies etc. Also, the people who have teaching occupations, students, teachers etc.

❖ Our first persona is Kavita.

Mrs Kavita is 42 years old and works as a housekeeper.

She has been working as a housekeeper for quite a time now.

OPPORTUNITY FOCUS

People are facing miscommunication as they are not able to understand the mute people completely /get to know exactly what they want to convey due to which misunderstanding occurs resulting in less efficiency.

SOLUTION

We will be providing an interface where the handsign will be converted to

text messages

❖ **Our second persona is MAYA**

Ms. Maya is 27 years old and she works as a researcher in the field of environmental preservation.

OPPORTUNITY FOCUS

People are facing difficulty in interpreting the hand signals due to which they are preferring other people for job opportunities .

SOLUTION

We will be integrating the handsign to text messages platform in a handglove to track the hand gestures and make it more engaging.

3. Empathy canvas

In this phase we talked to the users and empathized with them and answered some questions:

❖ **Who are we empathizing with?**

- **Persona-1: Kavita**
 - Any housekeeper or any person who is an working individual who faces communication issues due to mutism .
 - They are facing a situation where there is no affective /proper communication with other people.
- **Persona-2: Maya**
 - These are people who are working individuals in private companies and need to take part in several audits,showcase their skills ,present their views and many more activities.
 - They are facing a situation where they are not able to communicate and present themselves through speaking.

❖ **What do they need to do?**

- **Persona-1:Kavita**
 - They need and want to have a better communication with people

but they cannot do so at the moment due to mutism.

- They need to make decisions regarding the various activities that involving speaking and how they differ from the normal people .
- They will know that they are successful when they are able to talk in a normal manner with other people.

- **Persona-2: Maya**

- They need to have a good communication with their collagenous and other senior worker in order to bring a good efficiency in their work
- Their job is to research on various information in the field on environmental preservation and present their views for the same to the higher authorities in the form of ppts and reports.
- They will know that they are successful when they will be able to present and showcase their true potential in front of the higher authorities and when they feel their way of communicating in no longer any barrier to present themselves in front of many people .

❖ **What do they See?**

- **Persona-1: Kavita**

They see people getting irritated by them because they are not able to explain themselves

- **Persona-2: Maya**

They see facial expressions, body language, and other nonverbal cues that are often used in communication and feel inferior in their workspace.

❖ **What do they Say?**

- **Persona-1: Kavita**

They have a hard time communicating.

- **Persona-2: Maya**

They continue to utilize writing and sign language as a means of communication, but this poses a barrier to understanding.

❖ **What do they Do?**

- **Persona-1: Kavita**

She is making an effort to keep herself busy with tasks or jobs that don't involve much communication

- **Persona-2: Maya**

She works in a reputable company where she does research and give a presentation on each task assigned to her weekly .

❖ What do they Hear?

- Persona-1: Kavita
People often call her dumb making her feel shy or uncooperative.
She face misunderstanding, judgment, Anxiety, fear.
- Persona-2: Maya
People often think that she is less intelligent or capable. Her friends don't understand or appreciate the challenges of selective mutism and hence tease individuals who struggle to speak in social situations.

❖ What do they Think and Feel?

- Persona-1: Kavita
Pain: Fear of negative evaluation
Gain: Needing validation and understanding
- Persona-2: Maya
Pain: Frustration with communication difficulties.
Gain: Wanting to communicate effectively.

4. Problem Definition

In the problem definition phase we get a deeper insight into the problem statement.



Problem Statements

❖ We first asked **5 whys** to our users:

- **Why are you facing problems while doing your daily task /work?**

Ans: Because I am facing mutism from a very early stage and donot have much resources to overcome my weakness.

- **Why are you facing Mutism ?**

Ans: Because of Biological issues

- **Why is the Sign language not understood by the people you come across with ?**

Ans: They donot have the knowledge and understanding of the sign language and they usually dont come across with people facing mutism ,neither they have any family member facing the same issue.

- **Why no product is present?**

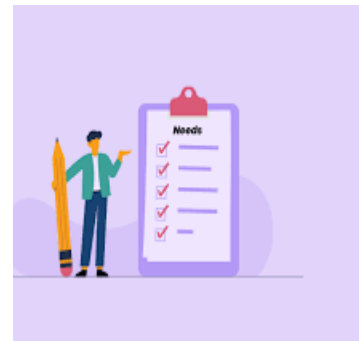
Ans: Because I believe no one has taken the initiative to make any affordable or easy to carry product.

- **Why has no one taken any initiative?**

Ans: Because no one thinks that it matters, but the someone or the other should have taken some initiative to develop a communication channel product between the normal and people who are facing mutism .

❖ **User needs statements.**

The user need statements were user-focused and assisted us in determining the needs of the users. Analysing the information obtained from the empathy canvas and the 5-why questions was also essential in this step. Based on the five why questions we addressed to our users, we were able to state numerous user needs. The user-needs statements comprised the following:



- The user is a normal working person who needs to communicate with a wide variety of people and do the day to day household chores like go to a shop to buy what he/she desires, and he needs to communicate verbally in order to know the availability of goods .
- The user is a housekeeper who needs to communicate with other people to get to know the areas where the persona can assist in doing the household chores .The user need to do so to establish a better understanding between the person they are working with .

❖ **How Might We statement.**

The "how might we" questions helped us get the ideation process going by focusing on potential solutions. Our responses to these questions are just one of many possible solutions that can be used to tackle the problem, and the "how might we" statements encouraged us to explore numerous potential methods and ways in which we can serve the needs of our users.

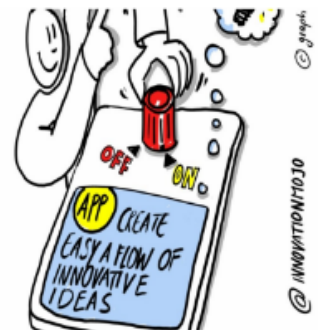
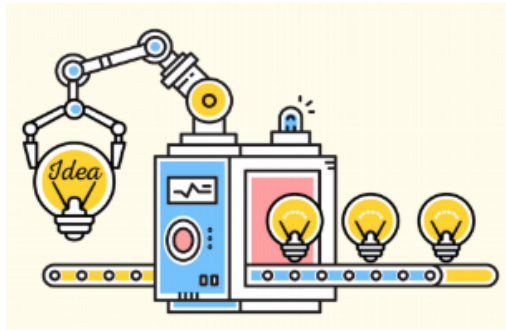


- **How might we give the customers a way to communicate easily**

and affectively with other people?

What we can try to do, is make a platform in which the user can showcase their hand signs and the platform with displaying the meaning of the hand sign .This idea is not the complete solution, as it may be inconvenient for the people to carry a device having the platform .We have to work out ways to make it more convenient for everyone to use.

5. Ideation



After completing the Problem Definition Phase, we went on to Ideation and for that we used a method called “ADRAI”. It is the process where you generate ideas and solutions through sessions such as Sketching, Prototyping, Brainstorming, Brainwriting, Worst Possible Idea, and a wealth of other ideation techniques. Ideation is also the third stage in the Design Thinking process.

❖ A – Articulate:

• Who are we?

We are a group of 5 having the capability to solve AI related problems and problems involving machine learning concepts.

• What do you do?

We aim at improving the communication gap between people facing mutism and normal people so that there is better communication between the both.

• What is your objective?

To Build a device that helps people understand the meaning of the sign language that is showcased by the people affected by mutism.

• Purpose?

To propose a device/platform or assistance through which the people facing mutism are able to communicate easily with normal people.

propose such a model that makes communication better for people affected by mutism.

❖ **D – Deconstruct:**

Possibilities	Stories on Persona	Inspiration	Sense Market
Providing personal assistance	Getting assistance from people who know how to communicate in sign language	Effective, Communication, between everyone	Workplace, schools, institution
App for interpreting sign language	An app that can recognize the hand signs and convert them into text messages	Understanding the mute people through AI model	shops ,markets, reception, etc
A device that will trace the movement of fingers and display the meaning	An easy way for people to communicate in their own languages	Easy and effortless communication	workspace, institutions, schools, shops

❖ **R – Reconstruct:**

Assemble	Brainstorm	Rearticulate
AI model	Device for hand signals detection	Tie up with technology experts and AI experts
Sign language detection	apps for displaying hand signs as text	
Sign language to text converter	A handglove that can detect the hand movements and actions and interpret them as text signals	

❖ A – Assess:

• Accessing Idea(OLD)

We were making a completely outdated and dysfunctional hardware-based system that was embarrassingly inaccurate and unusable.

• Accessing Idea(NEW)

Our revolutionary new program will be the ultimate solution to accurately and seamlessly trace hand signals, providing unparalleled precision and crystal-clear clarity for even the most complex hand gestures.

❖ I – Implement:

• New Idea or Old Idea?

We have chosen the new idea i.e software, that is to provide better accuracy and clarity

• What actions to take?

- Our first action is to study the required skills and software/language to build this software
- Create/search for the appropriate dataset which contain graphics of hand signs
- Train the Random forest model which will give



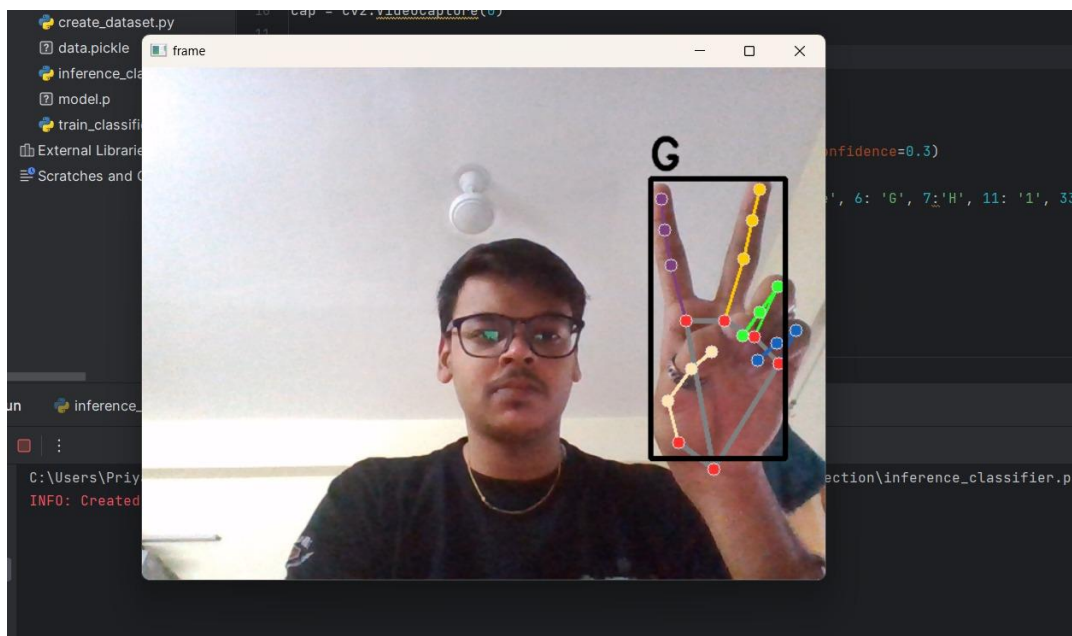
- Integrate the program
- Try to make it more user friendly host the app

6. Prototype

After evaluating all the possibilities we have finalized an app where we will be identifying the hand signs and converting them to text messages .we decided upon creating this.



This will be the best-suited solution for our problem statement. Our idea is to make it easier for the user to communicate with people and make it comfortable for them to communicate. The idea will not be easy to implement but if we dare to implement this application is going to make the future easier. The existing Market is not currently adopting this system ,but if we find and deploy such solution we can have a share in the Market.



Picture of Hand Sign to Text converter application

We have designed an application using python modules and libraries that can help our users to understand our idea and get familiar with our application.

Key Features Of our Application:

- Accepting 42 Feature points of one hand
- Able to capture 3D path rather than 2D path
- Able to predict a letter, and few word

Everything to know about Mutism

Absence of speech while conserving or maintaining the ability to hear the speech of others. Mutism is typically understood as a person's inability to speak, and commonly observed by their family members, caregivers, teachers, doctors or speech and language pathologists.

Treatment:

1. **Cognitive behavioral therapy (CBT):** Among the most effective methods of treating symptoms of selective mutism is CBT. This action-based and problem-solving talking therapy is carried out by highly trained therapists, where you or your older child can benefit from further understanding of the disorder and anxiety in general. The therapist will provide a range of techniques for managing anxiety during triggering situations, focusing on how negative thoughts and feelings may be contributing to anxiety symptoms. Younger children can still benefit from CBT, although the focus will be less on detailed understanding of anxiety and how your child feels they fit in with the world around them, and more about assessing their general wellbeing.
2. **Stimulus fading:** The child may talk at ease with someone, such as a parent. In stimulus fading, another person is introduced to the situation. Then, as they become included in talking, the parent withdraws and talking continues.
3. **Desensitisation:** This method attempts to reduce the fear of certain people hearing the sound of you or your child's voice. Many people with social anxiety and selective mutism will feel more comfortable through non-vocal means of communication such as instant messaging or emailing, which can be used before increased exposure. Exchange of voice recordings and voicemail messages builds to more direct forms of communication such as telephone or video conversations.
4. **Shaping:** With two-way communication among people other than close friends and family being the desired goal, shaping uses techniques which

steadily move towards this through activities such as reading aloud or taking part in interactive reading games. This is before graduating to face-to-face conversation when ready, and is particularly useful for treating young children with the condition as an entertaining form of engagement.

5. **Graded exposure:** This involves gradual exposure to scenarios which cause increasing levels of anxiety. Increasing a child's exposure to these scenarios can create positive reinforcement from positive experiences.
6. **Positive reinforcement:** Selective mutism usually stems from your child associating pressured talking with a negative experience. In order to reinforce that all forms of communication can be acceptable, responding positively to any type of communication can help your child learn to feel under less pressure to speak and not have to feel relief every time such a moment passes.
7. **Family therapy:** Due to the fact that families and friends can have a significant impact on whether treatment for selective mutism is successful, family therapy can help you as parents to learn how to manage the condition and support your child with verbal and emotional encouragement when needed.
8. **Medication for selective mutism:** There is no specific medication for the treatment of selective mutism. However, medication may be appropriate for the treatment of other disorders associated with selective mutism, including anxiety or depression, usually only suitable for older children, adolescents and adults. Antidepressants can help to relieve anxiety and depression symptoms enough for therapy to be effective, especially if you or your child have not initially responded well to therapeutic techniques.

Our Interest: Sign Language

Sign language is manual communication commonly used by people who are deaf. It's a natural and visual form of language that uses movements and expression to convey meaning between people. The gestures or symbols in sign language are organized in a linguistic way. Each individual gesture is called a sign. What we are focusing on is the american sign language.

7. Testing:

It was a very crucial phase where the truth was revealed. When conducting a user test on your prototype, it is ideal to utilize a natural setting (i.e., the normal environment in which your users would use the prototype). If testing in a natural setting proves difficult, try to get users to perform a task, or play a role, when testing the prototype. The key is to get users to be using the prototype as they would in real life, as much as possible.

HYPOTHESIS TESTING

HYPOTHESIS 1: We believe that our application will be user-friendly.

Test- Testing live with our user

Metric- An overall rating of 4 out of 5 for user- friendly.

Learning- The application should be more user-friendly such that people who don't have much experience in these types of applications can use it.

Decision: Friendly UI of this application and a tutorial video which could make it more user-friendly etc.

HYPOTHESIS 2:

We believed that our Application had sufficient functionalities and people would get more aware of the application.

Test- Testing live with our user

Metric- We showed the application made to our users to give them a glimpse of how the application can help them to communicate and can be used. Then we also showed them the application designed by us. They liked our idea but told us of some changes which we can have in the future .

Learning- We need to present data more efficiently, visual illustrations.

Decision- We plan to have more extensive research, make our data-set wider and add more functionalities which will then increase our application abilities.

Some questions that we asked our user and they answered using our application:

1. How much do you rate this app on a scale of 5 in terms of user-friendliness?

Ans: 4 rating for user-friendly.

2. Have you seen similar products?

Ans: There is no application that is converting live sign language into words/letters.

3. Will you suggest it to others or not?

Ans: yes I will suggest it to my friends and people dealing with the similar phenomena

4. Was this helpful and tell you about your overall experience?

Ans: It was overall a good experience.

5. Were we able to meet your expectations?

Ans. Yes

A snapshot with our user testing our Application.



8. KEY LEARNINGS

Design thinking turned out to be both an ideology and a process that seeks to solve complex problems in a user-centric way. It is a non-linear process, in which the various steps of the design thinking process, such as Empathy, Problem Definition, Ideation, Prototyping, and Testing, overlap with each other. While in this process, a person goes back and forward through these steps as if in an infinite loop. The design-making process focused on achieving practical results and solutions that are:

- **Technically feasible:** They can be developed into functional products or processes.
- **Economically viable:** The business can afford to implement them.
- **Desirable for us:** They met a real human need.

DESIGN THINKING PROCESS

1-EMPATHIZE

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3-IDEATE

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5-TEST

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2-DEFINE

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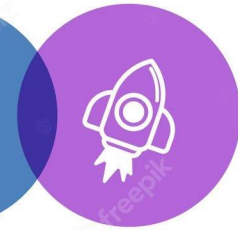
4-PROTOTYPE

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6-IMPLEMENT

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UNDERSTAND

EXPLORE

MATERIALIZE

Mindsets used

It was a deep human-centered process that tapped into abilities we all had, but got overlooked by more conventional problem-solving practices. It required an experimental, collaborative and optimistic mindset which helped us to complete this project successfully.



Empathy



Optimism



Embrace Ambiguity



Make It



Learn From Failure



Iterate, ITERATE



Creative Confidence

9. FUTURE PLANS

1. One important aspect is building a wide dataset of hand gestures to ensure that the system is accurate and can recognize a range of different gestures. With a diverse dataset, we can train the machine learning models to recognize various gestures from different cultures, regions, and contexts.
2. Another important aspect is developing a dedicated application with a nice user interface. This will make it easy for users to interact with the system and for developers to add new features and functionalities. A user-friendly interface can also help to promote the system to a wider audience.
3. In addition, integrating the system into a hardware glove could increase its accuracy and make it more practical for real-world applications. This would allow users to control devices, such as computers or smartphones, using hand gestures.
4. Finally, a long-term goal could be to train the machine learning models to frame sentences based on the recognized hand gestures. This could enable the system to translate hand gestures into spoken or written language and facilitate seamless communication between individuals who speak different languages.

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