



Design Project IV

Interactive Textiles

Tanya Saini

Semester 7

Guided by Dr. Ketan Vadodaria

S2000037

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Introduction

Welcome to the documentation of my Interactive Textiles Course at Prabhat Education Foundation, where I focused on creating a practical and engaging textile activity cube for children with disabilities. The goal of this project for me was to blend creativity, education, and empathy to provide an inclusive learning experience.

In this course, I explored the world of interactive textiles, combining various mechanisms to develop the Textile Activity Cube. This cube is more than just a plaything; it's a tool crafted to promote motor skills, encourage sensory play, and deliver important lessons through a narrative, with a particular emphasis on teaching healthy habits.

This document offers a detailed overview of my journey—from the initial concepts of this design project to the ideation and implementation of the Textile Activity Cube.

Let's dive into the nuts and bolts of my exploration into interactive design and inclusive education.

Week 1

Brainstorming and mindmapping to understand interactive textiles and their applications to form the baseline and guide us to research in a particular field of product development.



Week 2

1. Home Furnishing E-Textile Collection

- Brief; To develop a collection of home furnishings which incorporates E-Textiles in everyday household objects which we interact with - such as night lamp, curtains, wallpaper, rugs/carpets. Space design will also be an aspect to be included.
- Techniques of E-textiles that can be used ; touch sensitive LED incorporated fabrics, thermochromic fabric, PUFF ink, UV protective, Moisture sensors, de-staining, etc.
- Stakeholders; Home furnishing companies such as HomeCentre, IKEA, etc. Consumers, Manufacturers, transporters, Textile engineering companies and colleges.

2. Animal Care - System and Space Design for pets at NID

- Products which prevent dogs from eating from the trash bins, entering hostel rooms and gates, classrooms,etc. a place for the dogs to be checked on campus by vets, comfortable and anti-microbial collars and wearables. Temperature regulation during extreme weather. SYSTEM DESIGN. Wearables with sensors included to keep a constant check on the health of the pets.
- Stakeholders; People feeding dogs and taking care of them, vet hospitals, sanitation departments, trash collectors, students, faculties, manufacturers for dustbins.
- Techniques that can be used; Sustainable material incorporation, Ultraviolet regulation wearables, ECG monitoring, etc.

3. Textile Jewellery - Biomimicry based

- Creating a collection of textile jewellery which uses biomimicry to depict a living being's visual patterns, lifestyle or features , eg. - batting of wings in a butterfly.
- Stakeholders; Biotechnology colleges, Engineering colleges, jewellery makers, textile engineering colleges and companies, e-manufacturers, dyeing and sewing experts, consumers, etc.
- Techniques which can be used; E-textiles, thermochromic, Sewing components, value addition, soft robotics, etc.

Final Brief in Animal Care

To create a system of tracking live locations of the dogs at NID campus to make it easier to locate them when a vet ambulance comes for checkup, feeding on time and treatment prescribed to them. Application which connects with the GPS trackers. Collar . ADDING VALUE TO THE EXISTING SYSTEM.

Make it interactive so that their health is monitored using a particular wearable device - heart rate, movement throughout the day, body temperature, etc.

Areas with certain elements like dustbins, cars and campus areas can be used to notify according to the time spent by dogs interacting with that element of the map.

Phase 1 of Research

- Stakeholders
- existing products
- required material, technology, information and knowledge
- look for people who can help
- Dog wearables
- Dog health monitors
- Dog anatomy
- PRIMARY RESEARCH
- Various problems faced by the stakeholders
- Process of feeding / treating a dog on NID campus
- People who are scared of dogs can also use this app?

Process

Electronics sourcing
Material choosing
Building an app
Connecting information to the app
Using wireless components
Storing data and analyzing dog patterns

Existing Products

FitBark
PetPace
Fi collar
Whistle
Wagz
Smart harnesses
GPS location apps and collars

Required material and techniques

Durable
Easily washable
Easily wearable
Not too chunky or heavy
Comfortable material

Stakeholders

People who like dogs
People who take care of community dogs
Vets
Ambulance organizations
Guards
Students of the community

Dog anatomy

Pulse near the neck
Heart rate near chest
Paws and sweat glands
Normal heart rates
Tail wagging and posture
Ears position

Dogs on Campus



Shree Danev

Having a heart rate sensor seems to be a good decision since the dog's pulse can tell about their internal health and if they have suffered some trauma in that time period.

Caretakers

I wish I could know where they run off to, it's difficult to even feed them medicines if they're not around.

Jivdaya

When we come to treat some of them, we have to look around for too long and it hinders with smooth treatment since we have to go to many more places.

Kakas

When we save food for them, it sometimes goes bad because they roam around the whole campus. It would be easier to feed them in our free time if we knew where they are.

Vets

The dogs require a thorough checkup whenever they get injured or something is internally wrong with them. It would be a good idea to have a heart rate and temperature sensor to tell if something is wrong with their health.

Existing Products and Technology



FitBark
Whistle
PetPace
Apple Airtag
Wagz



Week 4

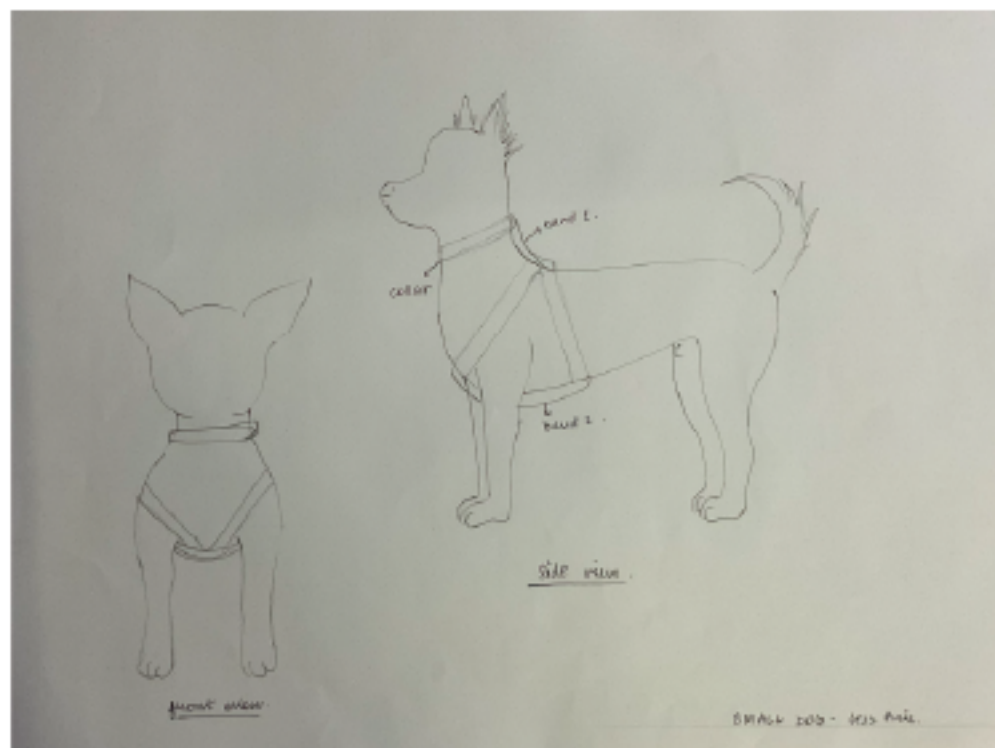
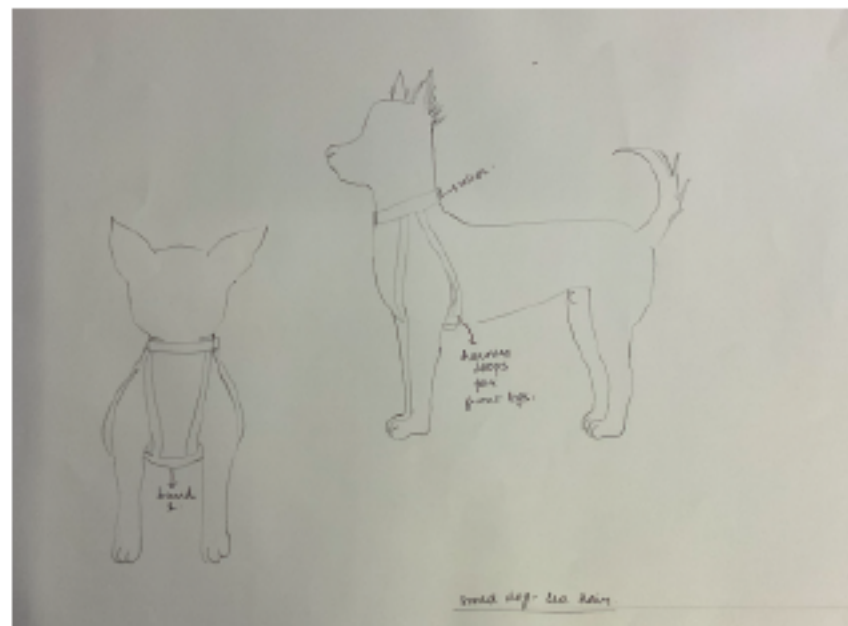
Phase 2 of Research

- Technology - how everything works
- How solar panels might help
- Sketches of the collar
- Integrating weavable textiles ?
- sampling of such products ?
- compile primary research and start going to secondary

XSMALL	SMALL	MEDIUM	LARGE	XLARGE
				
Up to 20 lbs	20 - 30 lbs	30 - 50 lbs	50 - 90 lbs	90 lbs and Up
Dachshund • Shih Tzu • Yorkshire Terrier	Beagle • French Bulldog • Miniature Schnauzer	Australian Shepherd • Bulldog • Shetland Sheepdog	Boxer • German Shepherd • Labrador Retriever	Great Dane • Mastiff • Rottweiler
Collar Size 8"-12"	Collar Size 10"-16"	Collar Size 14"-20"	Collar Size 18"-26"	Collar Size 20"-28"
Harness Size 10"-19"	Harness Size 14"-24"	Harness Size 18"-30"	Harness Size 22"-38"	Harness Size 27"-43"

Collar and harness sizing varies by design. Reference individual specifications for actual range.

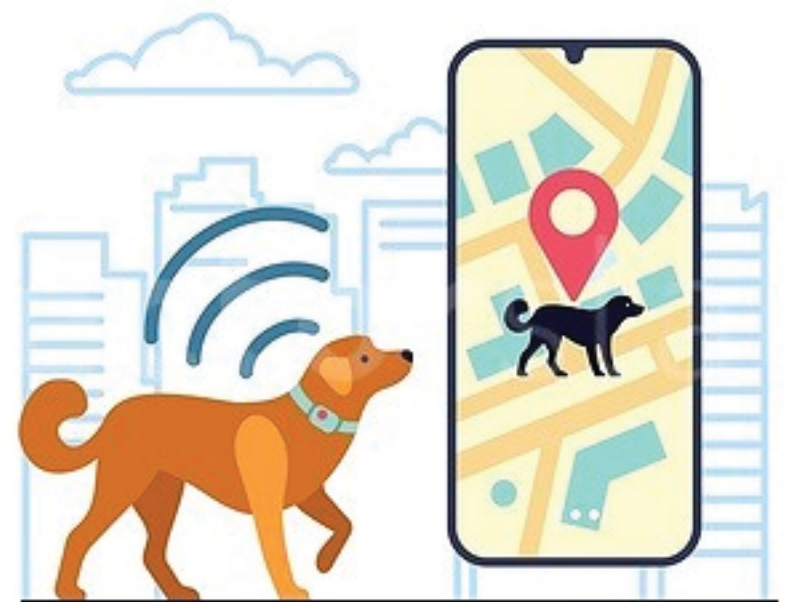
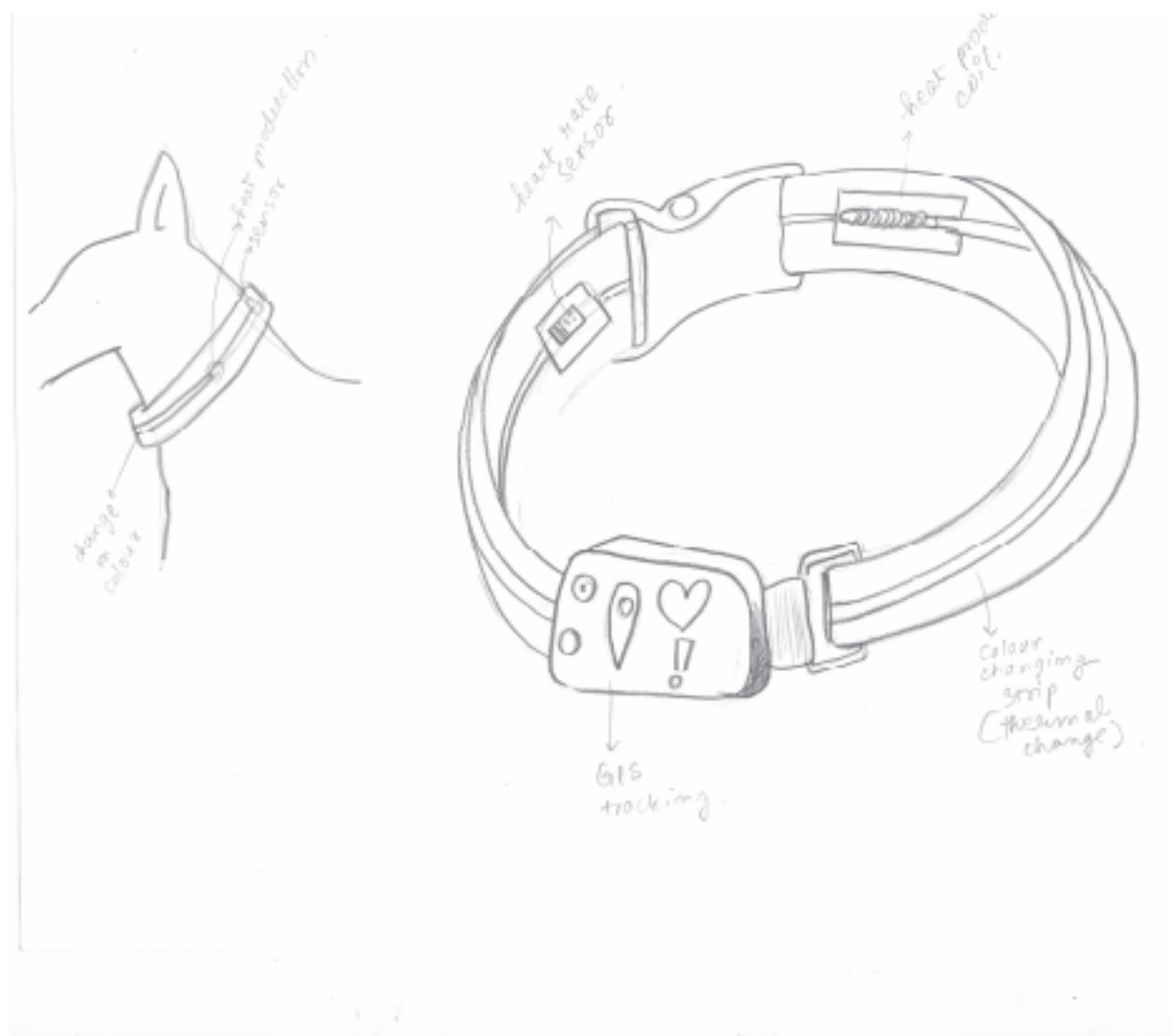
Sketches for Placement and Fit



Week 5

Choosing and finding the right material after a lot of deliberation





Sketch of Smart Dog Collar and app!



Talking to Bhaumik Nagar about app building and the technicalities of a smart collar.

Week 6



Prabhat Education Foundation serves children and adults with special needs, helping them to achieve their full potential in and around Ahmedabad, India.

What they do ?

The Prabhat Education Foundation reflects a journey that began in 2003 through the identification and nurturing of children with learning difficulties struggling in mainstream schools. In time, the widespread reality of physically and mentally challenged children in and around Ahmedabad became apparent, and Prabhat moved into serving special children, as well as their families affected by stigma, ignorance and denial. Realizing the need for access to care, education and learning of this group, Prabhat conceptualized an institutional facility to provide systematic rehabilitation services that could be accessible for those challenged by poverty and mobility. Working with and through local communities became Prabhat's hallmark.

An Education centre for :

- Children with disabilities
- Early Intervention (4-6 years of age)
- Basic Teaching (7- 14 years of age)
- Life skills for 15 - 25 years old
- Support for Adults with disabilities and Old age care
-
- Rural areas - in Ahmedabad
- Lower income class
- Parents for the children with disabilities



Diya making for sale during occasions such as Diwali, by children and adults



Belts made for swings in school playgrounds and community parks with wood and fabric



Week 7

Empathizing and analysing - meeting the children of Pra-
bhat, learning more about the history of the Foundation and
the reasons behind their
processes and amenities.





The children of Prabhat are playful, caring and intelligent in their conversations.

Having a day visit to the centre, I observed how they interacted with their peers, educators and their tools.

The age groups that are made for various programmes are not confined, i.e., individuals having difficulties in their own age groups can be given a different learning than the mainstream group they are supposed to be in.



Prabhat's VISION



Week 8

Having discussions with the people of Prabhat, observing the children being taught and researching various ways they help the members there.

Many policies and individual plans are also present for the benefit of any person in the various age groups.

Talk with Pranavbhai Shah, person in charge of overseeing all academic programmes and individual education programmes at Prabhat Foundation.

I also gave a presentation on what I would like to do with the Foundation which could help its students learn through textiles.



Week 9

Researching more and compiling the information collected from visiting the Foundation and looking through their website.

Early Intervention & Young Education.

[Kashmira Ben]

Activity for daily living
more physical movt.

PRE-PRIMARY

- prepare for normal education (ABCD, 1234)
- learn their family members, writing their names, etc.

PRE VOCATIONAL

wheelchair aid, hearing aid, etc.

MAINSTREAM SCHOOLING

311 बिनादि? - workers & teachers need to be trained.

VOCATIONAL

Syllabus - level of understanding (observation & assessment)

Learning on the basis of: - age
- level
- capability.

GROSS

- open bottle

FINE

- buttoning
- unbuttoning
- open keychain

[INDEPENDENCE!]

BEHAVIORAL ISSUES?

- TRAINING FOR GUARDIANS ON HOW 2 HANDLE.

WHICH TRADE WILL THEY GO TO?
HAND-EYE COORDINATION.

(PUNCTUALITY & RESPONSIBILITY,
GOOD DEEDS & WORDS.)

SUMMARY & NUMBERS

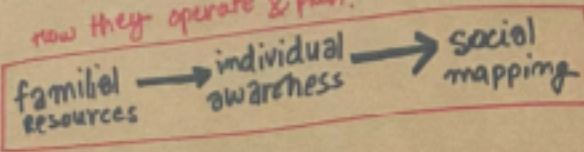
DISABILITY	0-6	7-18	19-45	46 ↑	Total.
ORTHOPEDIC HANDICAP	37	164	855	199	1255
MENTAL RETARDATION	80	466	188	8	742
CEREBRAL PALSY	73	119	30	2	230
MULTIPLE DISABILITY	25	136	32	10	223
VISUAL IMPAIRMENT	15	44	41	32	132
HEARING "	44	81	131	9	265
MENTAL ILLNESS	-	5	11	11	27
SPEECH IMPAIRMENT	-	3	-	-	3
LEARNING DISABILITY	16	105	-	-	121

The summary of number of people in each age group with different disabilities being taken care for at Prabhat

Collaborations w/ diff. universities!!

[Pranavbhai Shah.]

How they operate & plan?



Learning disabilities
 curable incurable
 ↓
 Disability Certificate
 (40% or ↑)

STATE & NATIONAL DISABILITY - (any disability)

for parents & guardians.

Talking to doctors for awareness. (diff. belief systems)

every week. Textile Waste

foundation for Education

↳ Early Intervention
 ↳ Above 18 (Reservation schemes. From life to employment)

Children w/ disabilities

CEREBRAL PALSY.
 ↓
 SPEECH ASSESSMENT

EYE'S COMMUNICATION
 ↓
 [increase the range]*
 WORD → SENTENCE

Sound touch
 Smell
 Pressure
 balance

Sensory Toys

PRABHAT FOUNDATION

↳ Income Generation
 ↳ Parental Guidance (Training for guardians)

↳ Diya making
 * Belts for swings
 * Screen printed Pottis
 * tie-dye

Religious Advice,
 Social Burden.

Therapy at home.

Physiotherapy

Speech Therapy

motor skills
 ↓
 fine gross

Rural Ahmedabad.

Below PL Lower Middle class.

[Age appropriate Education Multiple Teams!]

→ Individual education programmes based on child's needs.

Total Rehabilitation.

→ near many industrial factories & shops
 ↓
 less greenery
 → dust & roads.
 → hustle bustle
 → near villages & slums.

FLASHCARDS

cards for communication.
 ↓
 visual cues.
 (e.g. buying from vegetable vendor).

Speech & communication
 Biggest challenge.
 Speech therapist - plan for & no

Cognitive Issues.

- How to teach them?
 Therapy- Education Communication Connection.

Dept. in Gujarat:
 * Social Welfare Dept.
 * Health Dept.
 * Education Dept.

Different disabilities observed in children of Prabhat

Learning disabilities

Physical disabilities

Multiple Disabilities

Communication disorders

Cerebral Palsy

Autism

Hearing & Visual impairment

Interviews with Kashmira Ben, Guardians of children of Prabhat and Discussions with faculties and workers of Prabhat

The children are quite playful and like to touch anything they see.

"For my child, I would like something to help them memorise important things like our address or my phone number."

The children should learn movements which enable them to take up as many skills that might be useful in the future for their income generation.

Being in a community, they learn to share, be kind and have each other's backs. Something which is important to us, becomes important to them. We want them to become independent in the future, and try out best to give them as normal a childhood can get.

Who am I working for?

Children from the ages of 5 - 13
years old.

Rural Ahmedabad.

Cognitive Disabilities.

Learning and Cognitive Disabilities in Children

What are learning disabilities?

Learning disabilities are disorders that affect the ability to: Understand or use spoken or written language. Do mathematical calculations. Coordinate movements.

A cognitive impairment (also known as an intellectual disability) is a term used when a person has certain limitations in mental functioning and in skills such as communication, self-help, and social skills. These limitations will cause a child to learn and develop more slowly than a typical child.

Different Learning Disabilities

Dyslexia - is a learning disorder that involves difficulty reading due to problems identifying speech sounds and learning how they relate to letters and words (decoding). Also called a reading disability, dyslexia is a result of individual differences in areas of the brain that process language.

Dyspraxia - Dyspraxia, also known as developmental co-ordination disorder (DCD), is a common disorder that affects movement and co-ordination. Dyspraxia does not affect your intelligence. It can affect your co-ordination skills - such as tasks requiring balance, playing sports or learning to drive a car.

Dyscalculia - is a learning disorder that affects a person's ability to understand number-based information and math. People who have dyscalculia struggle with numbers and math because their brains don't process math-related concepts like the brains of people without this disorder.

Dysgraphia - is a neurological disorder characterized by writing disabilities. Specifically, the disorder causes a person's writing to be distorted or incorrect. In children, the disorder generally emerges when they are first introduced to writing.

Motor Skills

Motor skills are skills that enable the movements and tasks we do every day. Learning these skills is a crucial part of child development.

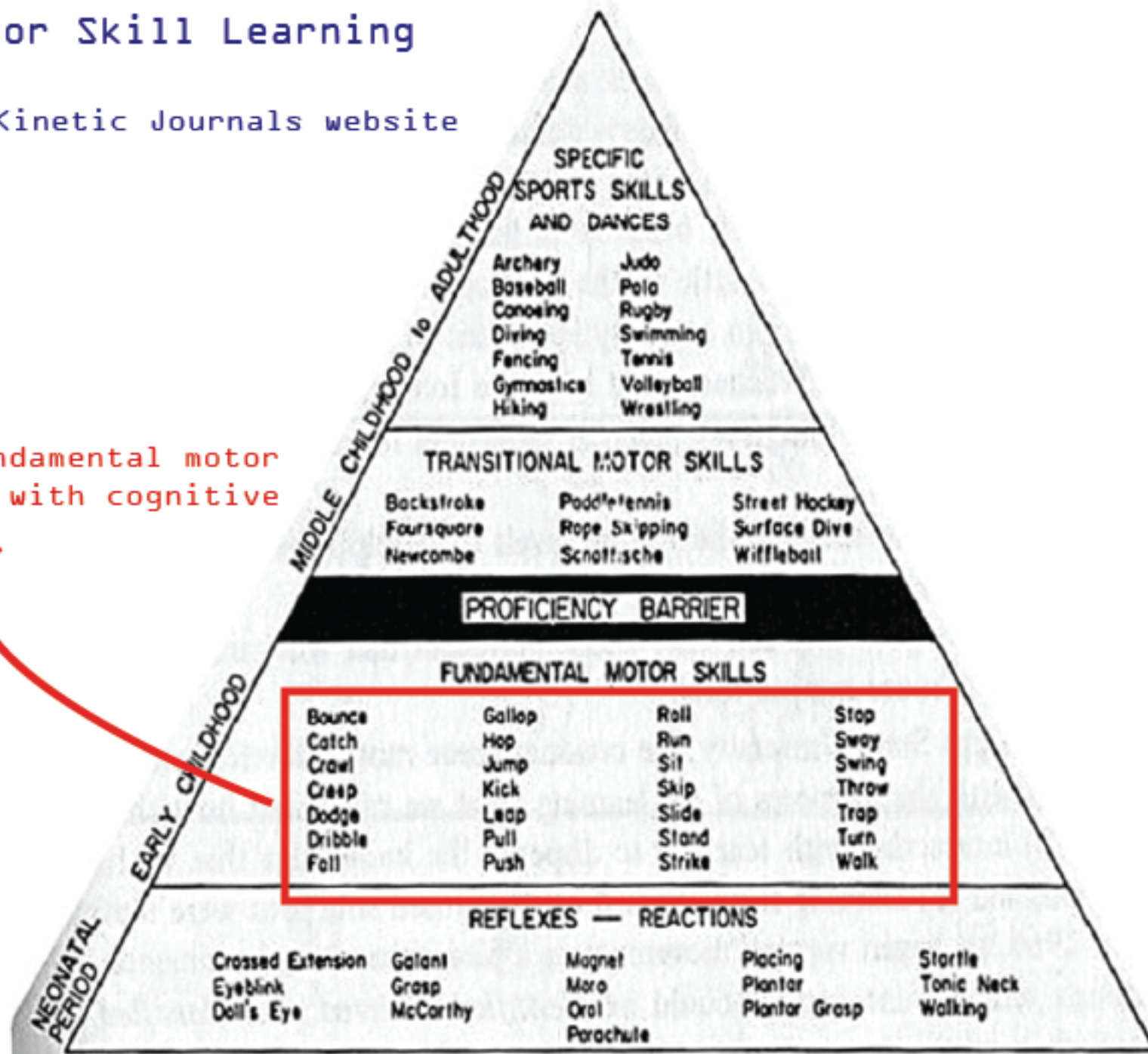
FINE MOTOR SKILLS are those that require a high degree of control and precision and use the small muscles of the hand or wrist (such as using a fork or crayon).

GROSS MOTOR SKILLS use the large muscles in the body to allow for balance, coordination, reaction time, and physical strength so that we can do bigger movements, such as walking, running, and jumping.

Pyramid of Motor Skill Learning

Taken from Human Kinetic Journals website

Working with the fundamental motor skills for children with cognitive disabilities



Different activities provided by Prabhat to improve motor skills and learning

Physiotherapy - Physical disabilities

Occupational therapy - physical, sensory and cognitive disabilities

Speech therapy - speech disabilities

Sensory toys and activities - cognitive and learning disabilities

Tactile toys - cognitive and physical disabilities

Sensory toys and activities for children

Stacking, fitting, wrist movement, sound matching, textural stimulation, sensory fabric and more.

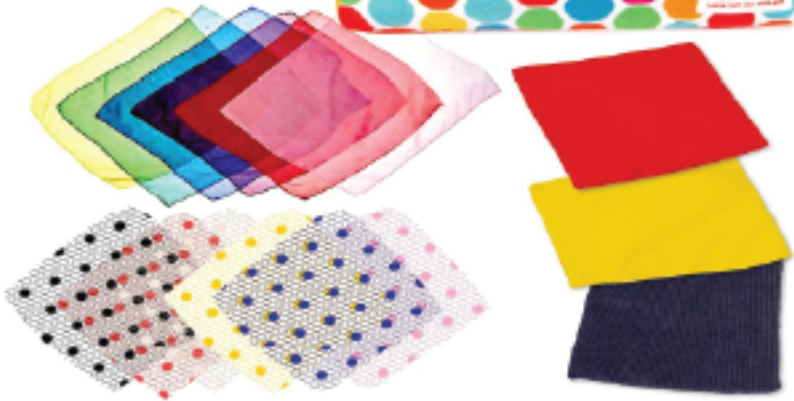


Tactile toys



The only textile made tool which has some mechanisms for motor skills practice; it is simple, and has some sensorial purpose as well.

Some existing toys in the market that are termed as 'sensory and motor skill building toys'.

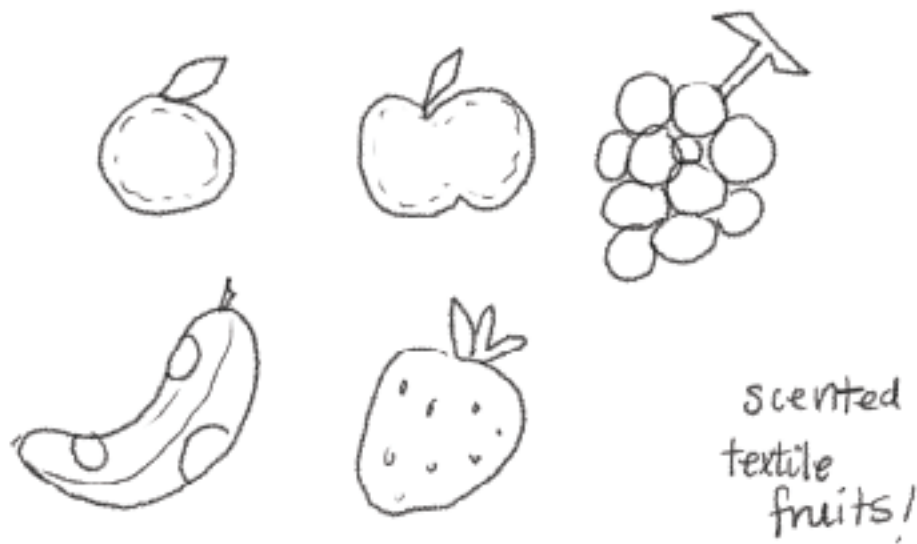


Week 10

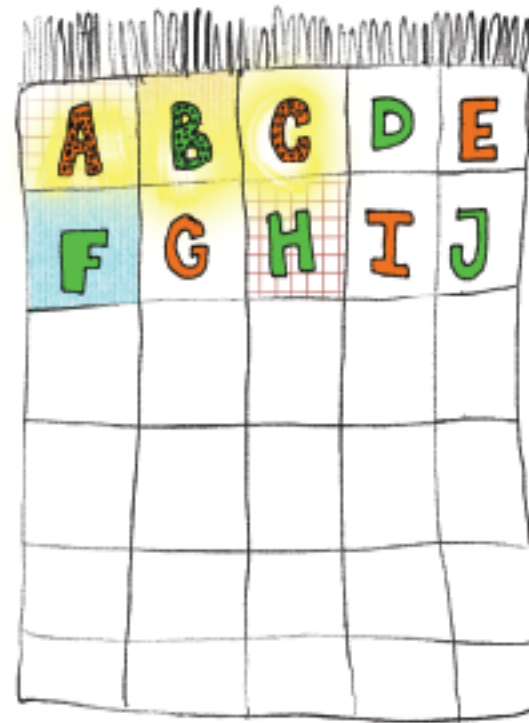
Problem statement: Despite there being many motor skill development toys for children of Prabhat, textile plays only the role of providing a handful of touch stimulation, where the tools are simply stitched and are not relatable to the age groups and what is valued as important in their daily living.

Brief 1 : To think of ways textiles can be made interactive and relatable for the children of Prabhat which would educate them in a fun and interesting way.

Some concepts and ideas which include mechanisms of E-textiles, olfactory recognition and learning.



To increase olfactory recognition



Interactive
mat game

- lights up when touched in a particular order.
- promotes touch & pressure, memory practice & sensory textures.
- + recycling scrap fabric.

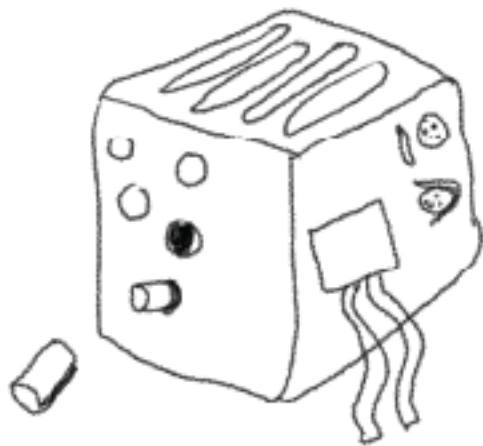
Feedback :

The toys have too complex of an explanation behind them and the parts will be lost as children hide the smaller components a lot of the times and misplace them.

The themes may not be relevant or useful for their day to day living habits and needs.

Fabric should be soft, not irritating to touch for too long and should be machine washable.

Since many different age groups can be interested in playing, make it useful for their daily living. Embibe some values in learning through play; such as what is good or bad, good hygiene, manners, etc.



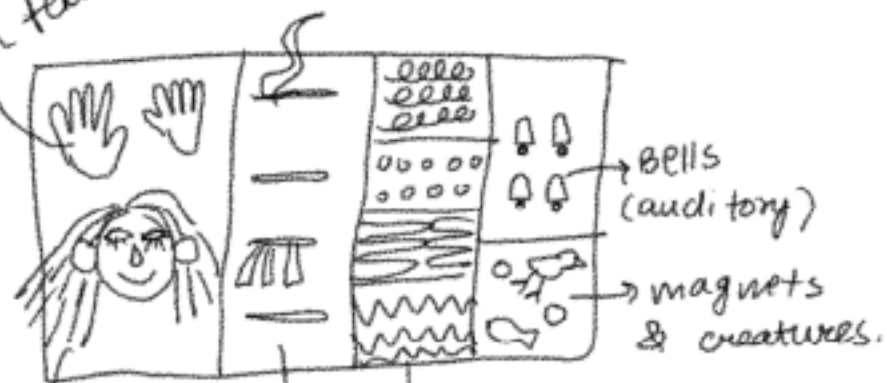
Soft

Activity
cubes.

- Pull Ribbons
- Push buttons
- magnets
- colour changing
- Textures.

Sensory play mat.

different
textures

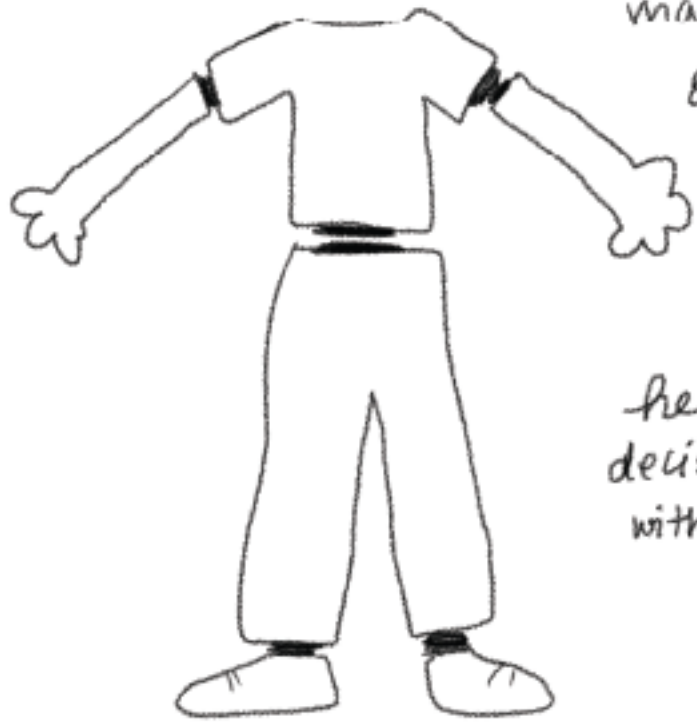


Bells
(auditory)

magnets
& creatures.

yarn
(can cut
hair, etc.)

hidden textures

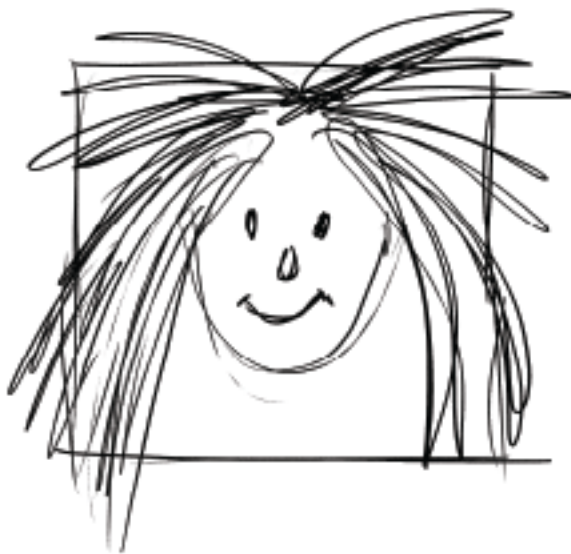
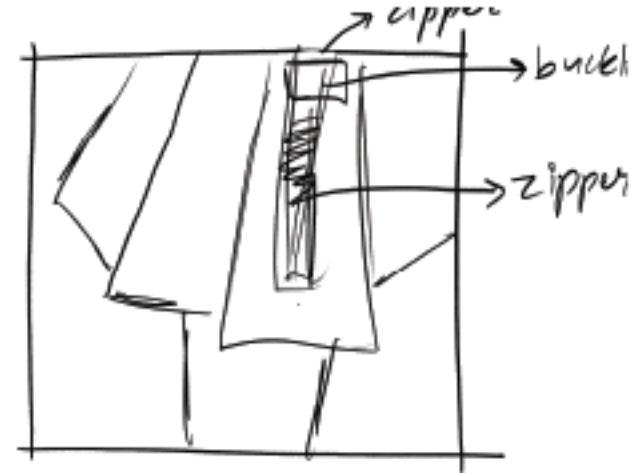
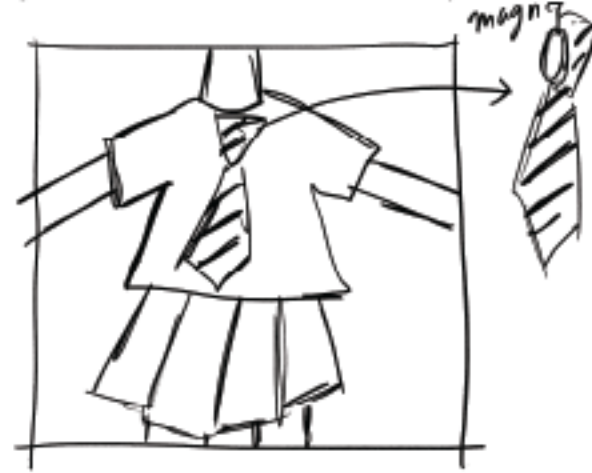


magnetic
outfit
puzzle

could
help in
decision making
with intention.

A simplified concept of things to do while getting ready for school.

Multiple mechanisms present to promote fine motor skills and to impart values to the children who play with this.



Redefined brief :

To make a textile toy which is relatable for the children of Prabhat while imbuing values that may shape the child's behaviour and mindset. To make it simple and interactive with playful elements and colours.

Learning Activity Cube:

- playful visuals
- durable fabric
- multiple textures

(hair,
buttons,
choolaces,
zipper.)



-braiding longer hair

(magnetic)
put on tie

-combing/cutting hair

- button & unbutton

-zipper (on & off)

-tying shoelaces

- shoes to be left half-stitched
- laces can be put & taken out.
- zipper can have a bigger handle.

Fabric Material Choice

To make sure that the texture of the fabric I used would not irritate the children or make them avoid the toy, I researched on what materials would be best.

- Soft, less friction having fabric.
- Less abrasions on surface such as plastic, polished wood, round and filed shapes.
- Durable, long lasting material such as cotton satin which won't tear after many uses but is also soft to the touch.



Process of making Prototype



Hand-sewing edges of the cube for a stronger hold.



To play with the hair - braiding, combing, cutting or just running hands through it to feel the texture.



Zippering of a school skirt, using magnet to put the tie on the appropriate place.

Pictures of prototype



Unbuttoning and buttoning of shirt; tying and putting in the shoelaces through the eyelets. Helping in Fine Motor Skill building.

Pictures of prototype



Giving prompts to the children to play with the toy themselves and observing for feedback.





Observing how the children play and interact with the toy.



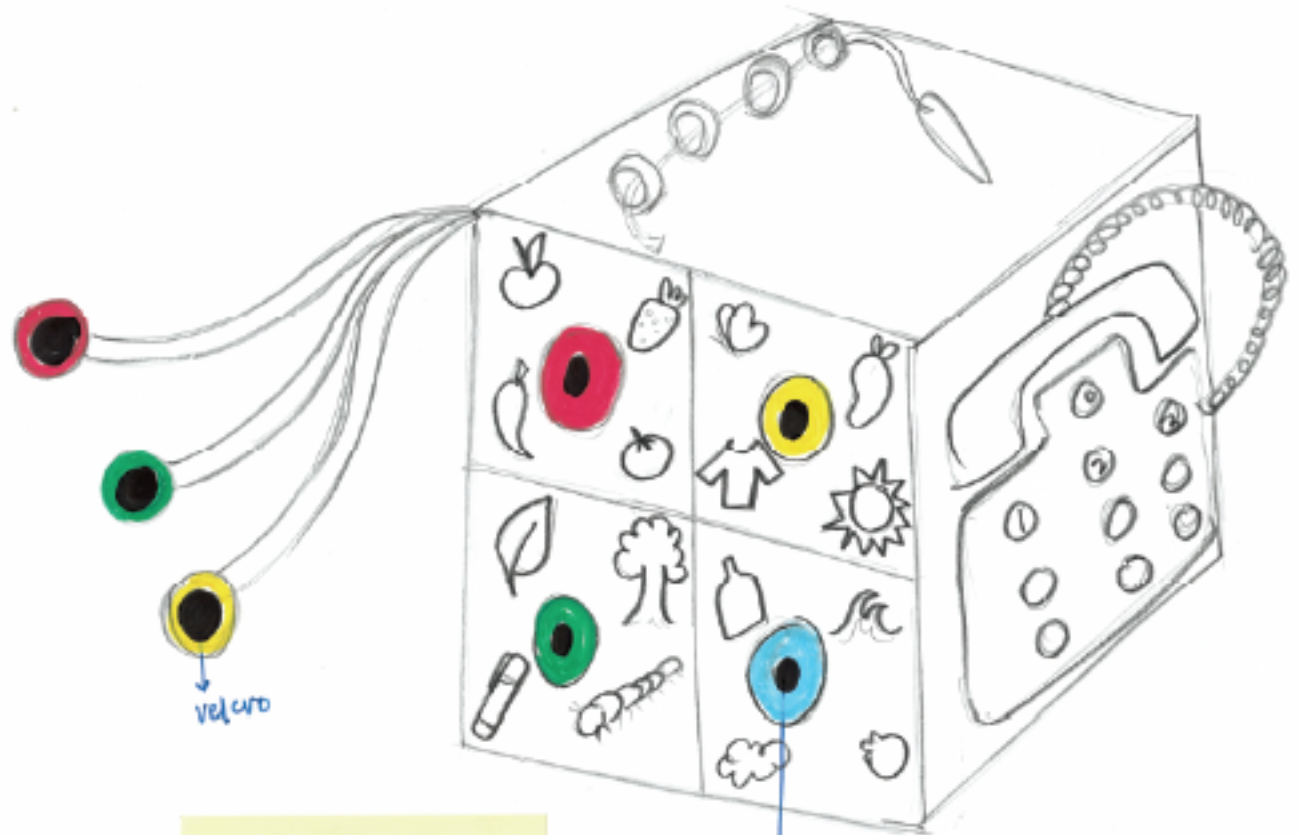
Feedback after use by the children:

- The shoelaces need to be easier to put in the holes.
- The hair needs to be longer and fuller for better play outcome.
- Fabric material needs to be more durable and strong.
- Adding an unrelated face of cube can be done to incorporate wrist movement and provide a calming exercise may be done.

Further Plans and Modifications

The plan is to create more activity cubes which can help children learn basic visual information and provide a sensory mechanism to validate their decisions and behaviours.

Colour faces, shape faces and learning important phone numbers are something to take forward as it helps them in better recognition of everyday habits and sensorial development.



Strings with
velcro patches to
match the
colours.

Wm

Acknowledgements

I would like to express my sincere gratitude to the Prabhat Education Foundation for providing the invaluable opportunity to collaborate on the interactive textiles design project aimed at enhancing the lives of children with disabilities. This endeavor would not have been possible without the support, guidance, and cooperation of the foundation.

Special appreciation goes to the dedicated staff and educators at Prabhat Education Foundation for their unwavering support throughout the project. Their commitment to the well-being and development of the children has been inspiring and has greatly contributed to the process of this design project.

I am also grateful to my guide, the staff at NID and my peers for giving me their valuable insights, provoking thought throughout the process of creating something memorable and fun.

This project has been a journey of learning, compassion, and innovation, and I am honored to have been part of it. The experience gained from working with Prabhat Education Foundation and the children has left a lasting impact on me, both personally and professionally.

Thank you to everyone involved for their contributions and dedication to creating a more inclusive and accessible future through interactive textiles.

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