Creating Sensory Experience for Visually Impaired Children

Design Project II

Creating Sensory Experience For Visually Impaired Children

Submitted By
Shweta Kamble
126250006

Guided By
Prof. Sudesh Balan

Visual Communication
(2012-2014)
Industrial Design Centre
IIT Bombay

APPROVAL SHEET

The project titled 'Creating Sensory Experience For Visually Impaired Children', is approved for partial fulfilment of the requirement for the degree of 'Master of Design' in Visual Communication Design.

Guide .....

Chairperson .....

Internal Examiner .....

External Examiner .....

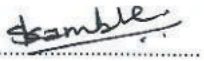
Date 16/01/2014

DECLARATION

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources.

I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/ data/ fact/ source in my submission.

I understand that any violation of the above will be cause for disciplinary action by the institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.



Students Signature

Shweta Kamble
126250006

Date
14/11/2013

ACKNOWLEDGMENT

Personally I am taking lot of efforts in this project. However, The research stage would not have been possible without the kind support and help from the Professors . I would like to extend my sincere thanks to my project guide Prof. Sudesh Balan. I am highly indebted to his guidance and constant supervision.

I would like to extend my thanks to Prof. G. G. Ray for providing necessary information and guidance on every step of concept development of the project and for his support and inputs in completing the project successfully.

This project bears on imprint of many people. I would like to thank all the students, teachers and staff of the blind schools, who rendered their help and cooperation during my visits and period of my project work.

I would like to express my special gratitude towards my family and friends for their kind co-operation, encouragement, attention and time which helped me in completion this task. A special note of thanks to the library staff Mr. Mohankumar, all the Teachers from blind schools and children who always helped me in my every visit. This project would not have been possible without the encouragement from Industrial Design Centre (IDC) IIT, Bombay. I am grateful to Prof. Sudesh Balan for the valuable inputs on the project report and presentation. I would like to thank all of them for giving me such an opportunity to work in this area.

CONTENTS

ABSTRACT

This project aims to create a sensory experience for children who are visually impaired. Children with visual impairments slowly become more acute in their other senses over a period of time. The lack of one sense increases the importance of the remaining ones. They become more sensible to touch, smell, sound etc. They use their fingers to understand a text written through Braille, remember people or places through fragrances and understand the space around them through sound.

The world around visually impaired children is drastically different from the experience of a person with normal vision. When a person with vision experiences the world, it is primarily through “what they see” but for the visually impaired person, “What they touch, smell and hear is what they experience”.

This project is concerned with visually impaired children of pre-Braille class (5 years to 10 years) who stay in residential blind schools. There are considerable amount of students who remain in the same class for years due to hampered growth. Also, Children are in a completely different environment when they go home during weekends. This problem is widely known, yet very less attention is paid towards it. My project aims to engage students in physical and mental activity when they are at home. At the same time this activity will help them to improve sensory co-ordination, because knowledge of Braille demands sensitive hand, fingers and co-ordination between sounds (ear) and touch (hands).

The research led to prototypes aimed at engaging visually impaired children in active play. The goal for the designs is to create an aid which empowers children to build cognitive, social, and physical skills. The project will identify these skills, nurture to use them effectively and help them to learn the concept of Braille. The idea is to make them physically and mentally strong which will help them for pre-Braille development and at the same time make their sensory experience richer.

INTRODUCTION

For children who do not have visual access to the world, the world around them needs to be recreated into a form which is accessible. This project is my sincere attempt to meet the unmet communication needs of visually impaired children and make it accessible to them easily. Imparting this information is more useful in their early stage of pre-Braille class.

This is often done through verbal descriptions, exploration of environment and presentation of tactile models and graphics. Through tactile models and graphics child begins to be able to relate one object or concept with another; a relationship can be observed with images that appear on a page. The concepts are represented using comparative language and it can be easily demonstrated with a number of tactile drawings. e.g. big - little bag, longest - shortest road etc.

Learning capacity of a young child is fundamentally different from an adult. The difference is not only the quantity, unlike the adult, the child can simply absorb, without effort, through participating in society actively. Concept development and sensory awareness begin in early stage and continue to develop throughout a child's life. They are intertwined in every part of one's life, whether as a preschooler learning right to left, as a child learning Braille, or as a teenager learning to use cardinal directions. When these skills are continuously reinforced in all aspects of a child's life, and throughout daily routines, the child will ultimately gain greater independence in his/her life.

The first stage of this development period is from birth to five years; This is the most important time in a child's development. During this period the child absorbs all available impressions in detail. The child responds most to human actions, especially the human voice. We need to give them more and more sensory experience to make their mind most absorbent during this critical period of their life.

In the class room and the play area where visually impaired children spend most of their time, they become more comfortable about the environment. But, when they go to new places or environment they take more time to adjust with that space. This thing happens with home and school also. Children spend most of their time in school and become friendly to the environment and the school routine because most of the blind schools are residential. During weekends they go home and many parents lack the knowledge to treat their child in better way. This results in a gap between school and home. My sincere attempt is to make parents aware and engage students in activity. This can happen in school also. Tactile learning needs individual attention. When there are group of children in class, it is impossible for teacher to pay attention to each and every student at the same time

Having discovered through research and the passive behaviour in blind children, the question arose, **"how can we design objects which can engage visually impaired children productively and actively in their environment?"** The problems are many, most important is to focus on single area and tackle it successfully.

PRIMARY GOALS

1. **Pre-Braille development of child**
   Due to hampered growth there are considerable number of students who remain in the same class for years together but with proper training (physical/mental) and spatial attention for their pre-Braille development will help to reduce this time considerably.

2. **Improve their association with sensory input and make sensory experience richer.**

SECONDARY GOALS

1. **Improve spatial skills**
   Internal representation of space in which all activities, events and objects having a relation to the physical world. It should create a mental imagery in the child's mind which will help him manipulate and understand the surroundings.

2. **Improve physical and mental coordination**
   Knowledge of Braille demands sensitive hands and fingers. A good coordination between two hands and the ear is essential to learn and use Braille.

PROBLEMS & INSIGHTS

After the primary data collection, some issues were identified related to the major activities in our social system. It also gave insights, which could lead to design interventions.

Problems

1. Shortcomings of our system for visually impaired children like absence of adequate infrastructure for blind schools and physiotherapists for over all physical development of the children.

2. Many children have a lot of physical callenges other than visual impairments.

Insights

1 . Learning by repetition and experimentation Pre-Braille class needs to cover spatial skills, cognitive skills, motor skills, tactile skills, self care skills, orientation & mobility and coordination in one year. These skills are continuously reinforced in all aspects of child's life throughout the year. If there is gap or discontinuation in this process, children may fail to remember it.

2. Imparting tactile skills needs compulsory individual attention.

CHALLENGES

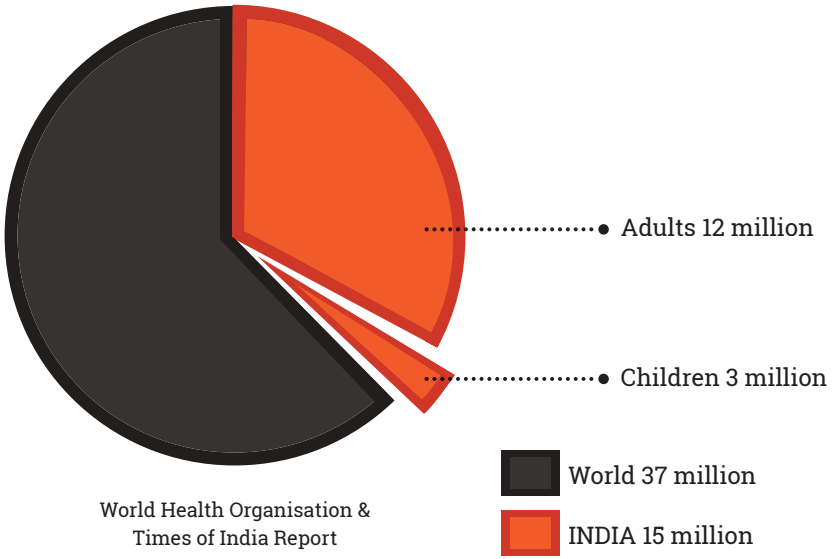
1. Every visually impaired child's grasping ability is different from the other but there is need to design an aid which will be beneficial to all.

2. Design a tactile aid which is sensitive enough to give their fingers and hands a nerve stimulating experience and also which will help them to do the activity successfully.

3. Train them to coordinate their one sense with the other mentally and physically.

4. Train them to handle mental model of Braille, i.e. six cell grid. This would give them a basic idea and help understand Braille later.

BACKGROUND



World Health Organisation &
Times of India Report

India is now home to the world's largest number of blind people. 37 million people across the globe who are blind, over 15 million are from India alone, which also includes 3 million children. What's worse, 75% of these are cases of avoidable blindness, It is because of shortage of optometrists and donated eyes for the treatment of corneal blindness. While India needs 40,000 optometrists, it has only 8,000. [1]

Data collection was done in following steps to understand the overall background of the project.

1. What are the different types of visual impairments?
2. What is Braille and tactile images and how they learn the same?
3. How does a visually impaired child experience his environment?
4. What are the works done in India for visually impaired children?

This will help me to understand the overall history and present conditions to work further in this field.

There are different types of visual impairments?

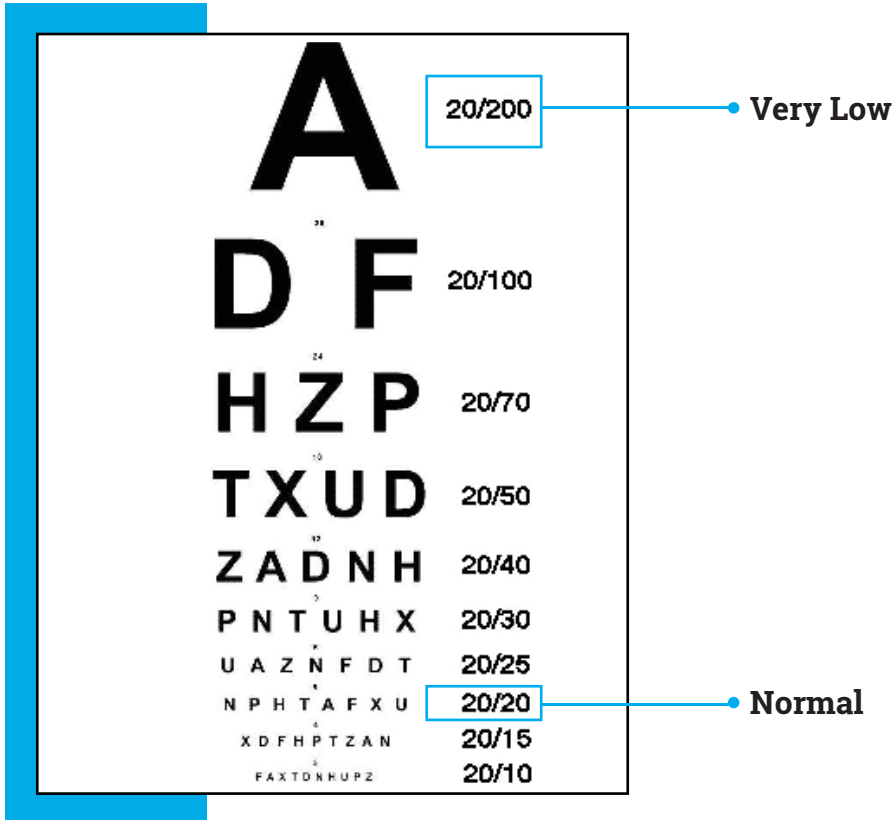
- Fully blind
- Partially Blind

Fully Blind: A person who has only 5% vision & less than that or his visual impairment is so severe that the percentage of vision fits in this category

Partially Blind: A person whose vision is affected by visual problems such as:

1. Having no peripheral vision (No vision around the centre of the eye when looking straight ahead)
2. Having significantly reduced eyesight
3. A person who has acquired sight loss later in his life because of an accident, low vitamin deficiency or Diabetic retinopathy

Contrary to popular belief, most blind or partially sighted people can see to some extend. Just how much one can see will vary from person to person. A minority of blind people can distinguish light but nothing else. Some people have no peripheral vision, some people see everything as vague blur, others see patchwork of blanks and defined areas or some people are born with no vision & significantly reduced vision, Others lose vision due to accidents or natural aging process, these are the eye conditions that can also cause sight problems. [2]



http://www.eyeexamcostguide.com/wp-content/uploads/2012/09/Eye-Exam-Chart-Snellen-Chart.jpg

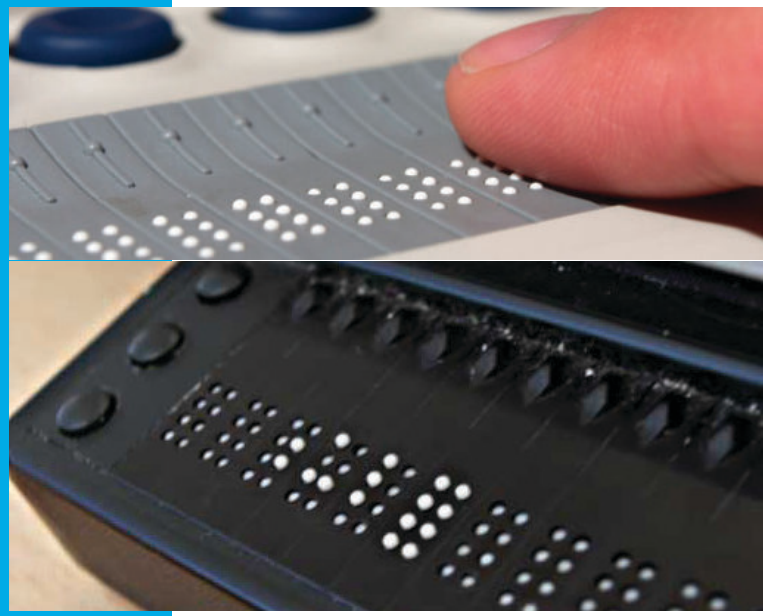
Visual Acuity

20/20 vision (visual acuity) is considered **"normal"** vision, meaning you can read a letter at 20 feet that most human beings should be able to read at 20 feet.

20/200 means you can read at 20 feet a letter that people with "normal" vision can read at 200 feet. So at 20/200, your visual acuity is very poor.

The classic example of an eye chart is the Snellen eye chart, developed by Dutch eye doctor Hermann Snellen in the 1860s. There are many variations of the Snellen eye chart, but this one is the most commonly used. [3]

http://mtdeafblind.ruralinstitute.umt.edu/TactileSystems.asp



http://en.wikipedia.org/wiki/File:Refreshable_Braille_display.jpg

What are Braille and tactile images and how they learn and experience it?

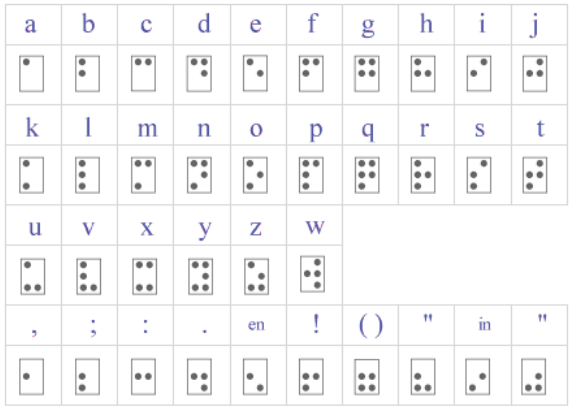
Braille

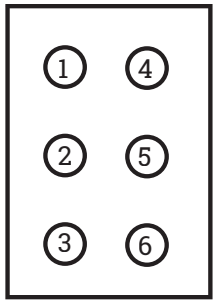
A form of written language for the blind, in which characters are represented by patterns of raised dots that are felt with the fingertips. Braille is multilingual language. You don't need to learn different Braille for different regional languages. Everything depends upon pronunciation.

Visually impaired people use their fingers to read the text written though Braille. There are two types of Braille which are used in India.

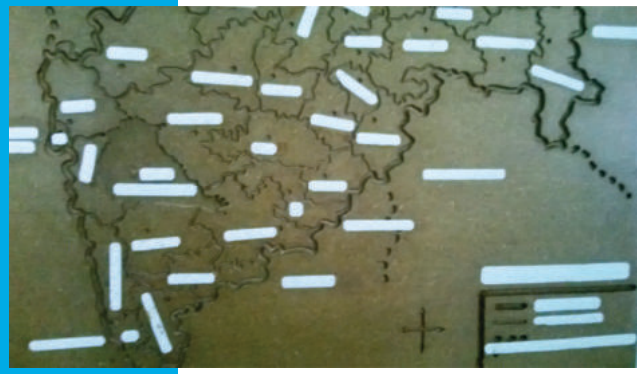
1. Bharati Braille 2. English Braille

The basic grid of a Braille alphabet character consists of six dots on a die, in two parallel vertical lines of three dots each. From the six dots that make up the basic grid, 64 different signs can be created. Reading direction of Braille is the same as for regular type and the rules for hyphenation that apply for regular fonts also apply in Braille. [4]





http://www.acharya.gen.in:8080/disabilities/br_intro.php



Tactile Graphics

Graphics which are perceptible to the sense of touch and characterized by or conveying an illusion of tangibility. Along with the sense of smell, vision, hear - touch is the most primitive and universal of sensory purpose of life. It requires time and efforts to understand it. There are various techniques to produce tactile images.

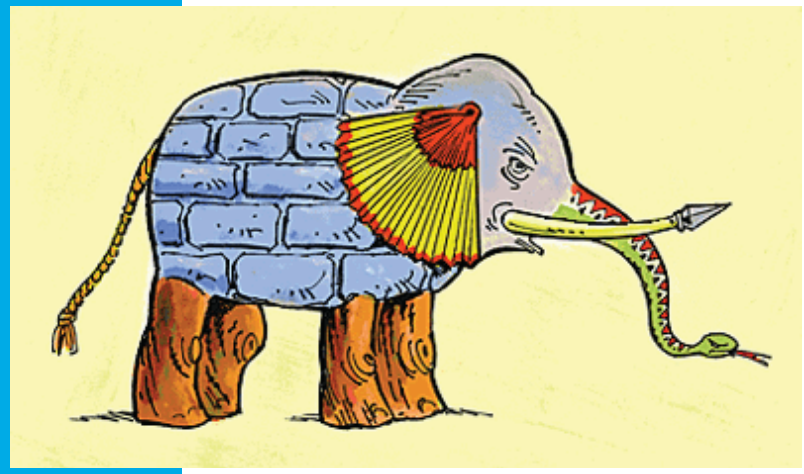
We make use of our senses to perceive things in life but if one of our senses goes missing then we have to make use of our other senses little bit more to have same level of perception. Graphic / images provides more knowledge to the reader effectively. Tactile reader has to understand the position in space or environment to do the directed activity (spatial knowledge).

The ability to learn through pictures and diagrams is crucial for the acquisition of knowledge. It is desirable that parents and professionals work together to enable children who are blind to learn through tactile graphics. In the early learning stages tactile images can be enhanced by the accompaniment of audio input, making the image more meaningful and interesting. Children who are blind need to have well developed tactile graphic reading skills. They can use graphics as the medium for acquiring concepts, spatial skills and accessing the academic curriculum.

Eg: **“Can you put the book on the top of the blue book.? “** but when we ask the same question to visually impaired, then we need to change our sentence and we need to form it like this,
Can you put the book underneath the table?

Words like under, above, near, below, in front of, back, behind etc. gives them physical experience. We need to teach or guide the visually impaired about the tactile images at very early stage to develop early literacy skills.

http://cdn.c.photoshelter.com/img-get2/I0000C2q3HLOIG0A/fit=1000x750/RDH-India-handicapped-2007-10-12-MG-9231.jpg



http://wordinfo.info/words/images/elephant-blind-compo.gif

How does visually impaired children experience their environment?

Sighted learners see any object whole as a part but visually impaired child learns exactly the opposite way. They touch such things part by part and create one-whole mental imagery.

Eg: **Six blind men and the Elephant** (Story)

Six men who all were blind went to experience an elephant so that by observation they can satisfy their curious minds. First man touched the elephant's stomach and he said, "God bless me, He is very much like a wall". Second man touched the tusks, He cried and said, "Oh what have we here, very round smooth and sharp. elephant is like a spear. Third man approached the elephant, He took his trunk within his hand and said, "I feel elephant is like a snake". Fourth man reached out to his hand and felt the limbs and said, "This is clear enough that elephant is like a tree. Fifth man chanced to touch the ear and said, "Any blindest man can tell what this resembles to most, "This is like a fan". Sixth men touched the tail and said elephant is like a rope.

So each one of the six blind men was right at his own place, each one was partly right But, as a whole they all were wrong. So, sighted learners see an elephant whole as a part . For a blind "What they touch is what they see" and whereas a sighted gets information from "where they look". The story describes how each one of their physical experience is dramatically different from person to person. Partially blind people relate their current experience to past life. [5]

EXISTING WORK DONE FOR VISUALLY IMPAIRED CHILDREN

Fittle

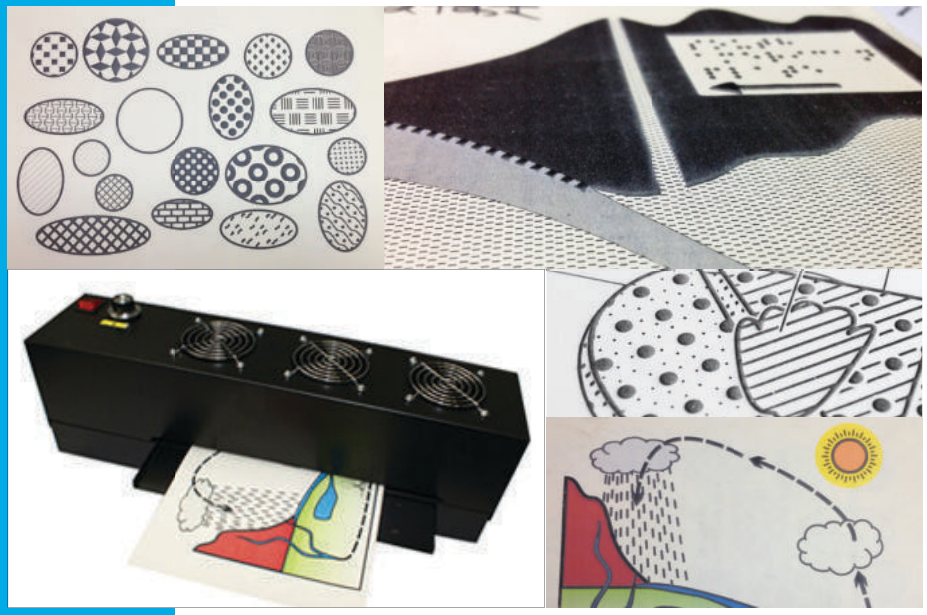
It is an accessible learning toolset for visually challenged kids, through a playful puzzle, kids can learn new words and visualize shapes of objects that these words stand for. By feeling Braille letters embossed on the word blocks, and then feeling the shape that he/she has fit together, the kid can touch/experience what the object might feel like in real.

The idea is to take interactive learning to every visually challenged kid across the world. The concept involves breaking down objects into as many blocks as there are alphabets in the word. E.g. 4 blocks for F-I-S-H. The visually challenged kid fits together the blocks by feeling and putting together the right contours of the blocks. He can then read the word “fish” embossed in Braille. He can also feel around the contours of the entire block, which is shaped like a fish, to understand what the form of a fish is. [6]

Barrier break solutions

Their aim is to create awareness, give training, provide solutions and bring assistive technology to India through the specially designed products for visually challenged people. Focus is to make a difference in the lives of the person with disabilities and provide them equal opportunity. In the workplace, 75% of their staff is visually impaired, who do all their daily activities like typing, reading, working independently. The founder says that “Technology has reached to much higher levels and very few use Braille to carry out their day today activities”.

Barrier break has developed many products which will help visually impaired people such as Easy Link, Desktop Magnifier, Tactile Image Printer, Software’s like screen reader, supernova etc. [7]



http://www.zychem-ltd.co.uk/images/zyfuse-service.jpg

http://lizzardfashion.com/wp-content/uploads/2012/08/Sinha-700.jpg

Project Prakash- Pawan Sinha

Prof. Pawan Sinha is an Indian scientist who won the Presidential Early Career Award for Project "Prakash". Pawan Sinha and his team provide free vision restoring treatment to children who are born blind and study how their brains learn to interpret visual data. His Ted Talk on "How brain learns to think" explains that, " How the brain's visual system develop and how does brain analyse images into distinct objects. As per his research we need dynamic information to teach children. He adds further, if a child is visually impaired, then his chances of getting treatment are extremely slim which is equal to none in India because there are enough hospitals for adults but very few hospitals are equipped to treat visually impaired children in India. [8]

http://sawareru.jp/en/

Yahoo - Japan

Yahoo JAPAN integrated the “Search” function with a 3D printer and developed the “Hands On Search” machine. The item which you search comes out as a solid object.

“Hands On Search ” machine is introduced to School for the Visually Impaired, affiliated by University of Tsukuba. Tactile is very important for children with visual disabilities. This is why Yahoo-Japan introduced “Hands On Search” machine to Tsukuba. In the future internet will bring smile on everyone’s face.

Visually Impaired children can call out whatever object they want to touch in front of the machine. The search will be activated by voice recognition and once the 3D data was found, the search result will be printed as a solid object. Child can feel that 3D object and it’s detailing. [9]

BLIND SCHOOLS VISIT

As soon as, I have started my research, I have visited many blind schools from Pune and Mumbai to get actual experience and discussion.

1. **Kamala Mehta School for Blind (Dadar)**
2. **Poona Blind School (Pune)**
3. **Victoria Memorial Blind School (Mumbai Central)**
4. **.. XRCVC Antarchakshu Workshop (CST)**

KAMALA MEHTA SCHOOL

KAMALA MEHTA
Dadar School for Blind (Girls)

The school's academic education varies from pre-school to S.S.C. & College going students along with hostel facility to visually impaired girls coming from varied socio economic backgrounds belonging to any caste, creed & religion.

I had been to class first (pre-Braille Class). This class is well equipped to improve their sensory training. They use different mediums like crafts, textures, dance, audio stories & songs. This class also helps children to know & get used to the school atmosphere, which enables them to adjust to school setting. Teachers were telling them stories through voice modulations and telling children to imitate the same voices. Children were learning through fun, they were enjoying but I still felt resources are not enough for them to learn at that stage.

Teacher also mentioned that every girl's grasping ability is different , some girls take more time to learn new things. We need to pay extra attention towards those girls and have to keep everyone on same level so they can go in the next class.

POONA BLIND SCHOOL

I discussed with many pre-Braille school teachers about their experiences of teaching and understanding individual child's need. They said that visually impaired children, who have small amount of vision always, give pressure and stress on their eye to see any object. This can be harmful for them; there are chances of losing that partial vision too. In future if they become fully blind and as they are not comfortable or not fully depend upon other senses thus it becomes difficult for them to survive. But if they are using their small amount of vision then we should provide them some facilities and enhancements right now through which their partial vision can sustain longer.

In our fast–speed society, it is difficult to search for the perfect toy which will teach children. Many opportunities and tools which exist within our own homes and surroundings. The benefits of using household items and daily routine objects are many. We only need to provide activities and opportunities which are rich, varied, and which help to develop concepts and life skills at school as well as home said Mrs. Pujari the principal of the school.

My Findings after visit and discussion with teachers and principal:

Spatial Awareness is significant part of learning in Pre-Braille school. The relationship between objects becomes evident when presented in graphical form. For example a scene of an urban home, if we convert and present it with tactile graphic then the positioning and sizing of the entities can be easily compared. The house is bigger than the dog, the windows may not touch the ground, the roof is on top of the house etc. A great deal of information can be absorbed incidentally through exploration of a diagram. There is need to exposed variety of tactile images to children.

THE VICTORIA MEMORIAL SCHOOL FOR THE BLIND

My visit to Victoria memorial school, Mumbai Central mainly covers the interaction with pre-school and primary school teachers.which was based on my initial concept of a tactile story book.

Following are the points from the discussion with teachers:

1. Story should be short and precise; duration should not be more than 7 minutes.
2. Use same type of learning method or techniques for partially blind and totally blind students.
3. Tactile graphics are more useful for concept understanding and audio is the best medium for distance learning.
4. For tactile graphics there should be contrast in two textures. Children should not confuse with two textures.
5. For partially blind high contrast colour can be used or black and white will also do.

Teacher 1:

Audio is more convenient and easy to understand any subject but before that if we teach them concept through tactile then it is beneficial for them. Instead of using tactile and audio at same time we can use it one after another. It will serve the purpose.

Child should concentrate on tactile and then only he will understand the audio which is related to it.
Differentiate shapes of food grains; Identify different shapes through objects; Paper tearing, clay, paper folding, shoe lace. Story modification is important for visually impaired children, we need to relate the story to their personal experience or life.

It will take at least 3 years that is standard 4th to understand, write and read Braille independently.
Need energy and pressure to write Braille through stylus. Some stories need visualisation or else we need to modify it or add sound.

Partially Blind - we need to show them visuals by adding contrast and for fully blind - we need to add sound and physical objects or tactile to teach the concept. Fully blind never forgets the concept once they learn thoroughly.

Mobility training: Communication skills, Confidence to face the different types of people, facing accidents, moral support or don't get demoralise, mental preparation, mental brush-up to be in the environment.

ANTARCHAKSHU WORKSHOP

Antarchakshu 2013

http://www.mid-day.com/imagedata/2011/sep/bl3.jpg

Antarchakshu - The eye within

It is an event organized by the Xavier's Resource Centre for the visually Challenged (XRCVC), St. Xavier's College, Mumbai. It aims to spread awareness amongst the sighted community about the rules that the visually impaired are entitled to do, but rarely get the benefit of because of the ignorance amongst the sighted world.

I had an experience of blind fold in a controlled environment under an expert supervision where the guiding person was compassionate, vivid and clear in instructions. They had created environment of a bank. My experience was getting richer and richer by the successful completion of each given task.

As they say if you wish to know more about someone/ something, then you have to be in his/her shoes, only then you can learn from that experience. It will help you to realize the shortcomings of our system for visually impaired people, which we often taken for granted. There isn't a single activity which is hard or impossible for visually impaired people, they just need little support from us in the beginning after which they can independently do all their tasks.

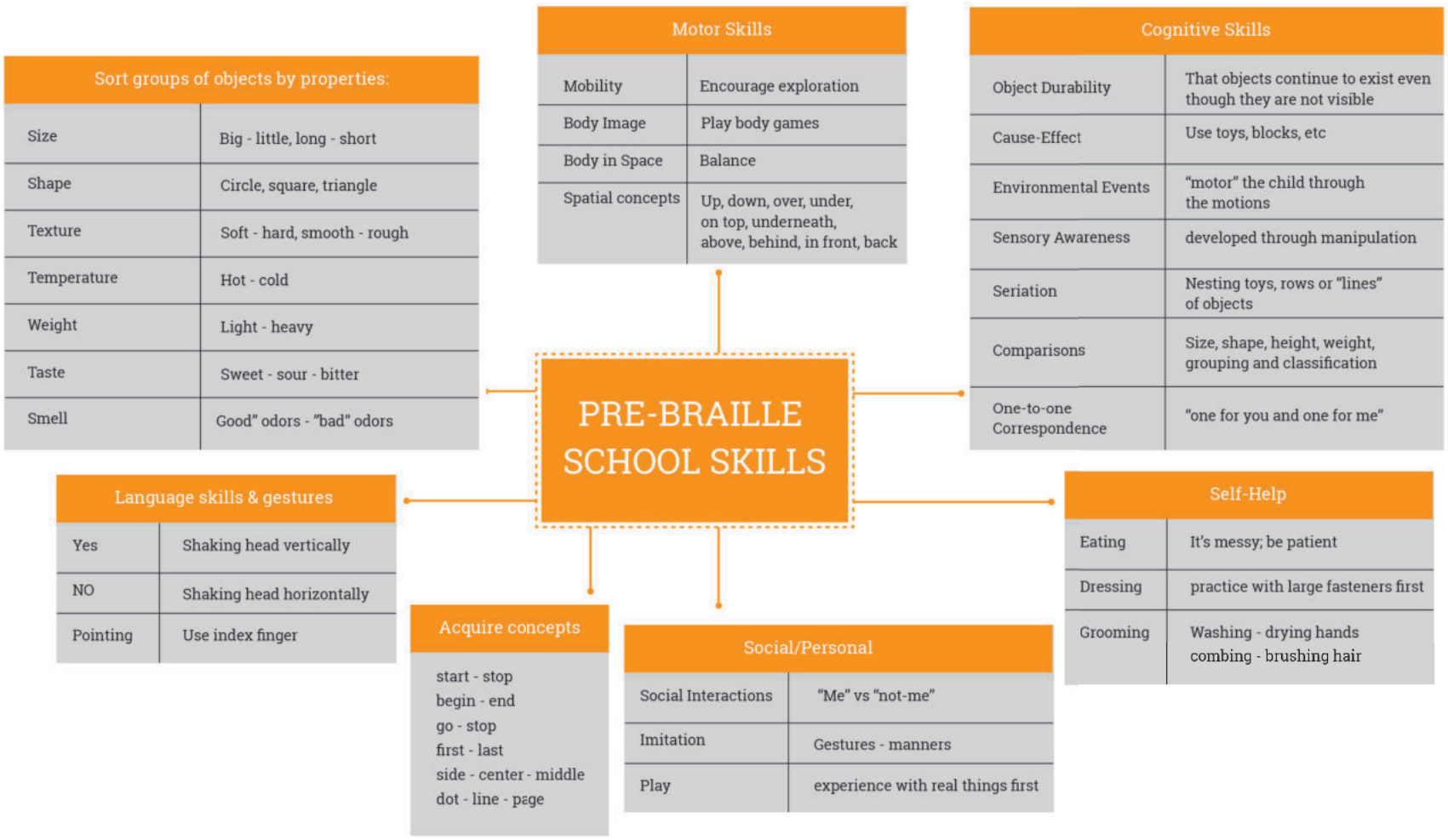
We really need to rethink on thr what difference we are making in the society or contributing something to the society with the power of sight.

Visually impaired people can do almost everything with the use of their other senses.

Findings:

1. Instructions need to be extremely gentle.
2. Tone of the instructions should be very compassionate.
3. If you are guiding any visually impaired person, don't leave them in open space, let them have contact with something. (nearest objects)
4. If you are giving any directions/assisting someone don't point, give clear verbal information and directions.
5. If you enter or leave from the room of visually impaired person, let them know when you are entering or leaving the room.

I did the user research on the target age group of 'Pre-Braille students' by visiting various Blind schools. Through which I found out that Pre-Braille class has following syllabus:
It includes different types of skills which are important for learning Braille as well as be in the environment independently.



PHYSIOTHERAPIST

Vision and movement are closely linked in many respects. The physiotherapist will find many areas of common ground when working with the visually impaired child. Our vision has a vital role in confirming where we are in space. Vision confirms what our balance tells us and stabilises us when our balance is upset. We have all experienced the sense of moving backwards in a car or train when the vehicle next to us moves forwards.

Inputs from Physiotherapist

1. Improvement in the range of a child's arm and hand movements so that they can use their hands to explore

2. Exercises to "rouse up" the hands and improve touch sensitivity

3. Child should sometimes walk without their boots so they can feel the surface of the floor

4. We should use sensory cue or object of reference to prepare a child for their physic session?

Other than listening instructions and joining shapes which are the key activities of my project, following points are also important:

1. To add buttons that needs pressure

2. To add sound that will give response to each of their every activity

3. Index finger and thumb use

4. Use of toy key which also needs pressure

5. Fingers as well as use of palm

Dr. Bhimpure
Physiotherpist at Poona Blind School

SENSORY DEVELOPMENT AND COORDINATION WORKSHOP

Introduction

This sensory workshop included multiple sensory development tasks and games for children. Workshop was scheduled for five days from 7th to 11th October 2013. It is aimed to develop and coordinate their senses which will help them to identify objects through touch, remember places/people through smell and pay attention towards sound to get information and communication; also help them to identify different tastes. My basic intension to organise this workshop was to interact with visually impaired children and identify their need and problems which they are facing in day to day activity. It helped me to know, which things interests them, what are the different methods of teaching them, how we can engage them in different activities, which are useful in their learning and very importantly convince them to “ask questions to get information”

Objective

- To develop basic concepts through alternative senses.
- To find out an effective medium of storytelling.
- To observe the blind and visually impaired children more closely. Be with them, talk with them and find out how they think.
- To find out how their brain coordinates with other senses in the absence of vision.
- To find out the most effective medium between audio and tactile for the early stage
- To observe value of teamwork.
- To stimulate thinking and creativity

Task preparation for workshop

Identify properties by finding the one object in a group of two:
big-little, soft-hard, wet-dry, smooth-rough, hot-cold, long - short, wide - narrow, fat - thin, round - square
Identify location by placing an object:
in-out, over-under, on top-underneath,
in front-in back
Identify weight by finding an object in a group of two that is:
light-heavy
Identify sound tone as:
ohigh-low, loud-soft, fast-slow
Identify by taste:
sweet-sour, hot-cold
Identify: one-more than one, few-many

Kamala Mehta Dadar Blind School
Sensory Workshop

Date:
7th Oct 2013 to 11th Oct 2013

Time:
1.15 pm to 5 pm

	Observation	Experience	Understanding	Conclusion
Task One Using Touch: sorting by touch texture blocks, cloth samples	Talking about what things feel like, smooth, rough, soft, hard, furry, bumpy, etc.	Most of the textures are known to them, feeling the texture with both hands	tracing raised lines following a line with the index finger	They should use both hands to feel the texture
Task Two Using Hearing: listening to sounds in the environment birds, traffic, airplanes, voices, motors	Taliking about diffrent sounds, asking questions about it and imitating	Enjoyed various new sounds and tried to find relation with environment	listening for details in stories read to him/her, singing songs especially songs with actions, using rhythm while singing	Best medium for distance learning as well as a group learning
Task Three Using Smell: Talcum powder, scent, Vicks, tooth-paste, fragrance sticks, rotten guava etc.	Talking about how things smell like, "good" and "bad", remembering their personal experience	Curious to know what smell it is, started asking questions about it.	Before eating anything new, smell help them to recognise it	Can identify people and places because of their smell
Task Four Using Taste: feeling of hot and cold beverages before having it. e.g., tea and ice-cream, tamrind, chilli powder, salt etc	Talking about how things tastes (e.g., "sweet", "bitter"and "sour") their facial expressions changed.	Their facial expressions tells everything	Taste and feeling of an perticular thing is good or bad.	Taste is depended upon their personal liking





FINDINGS FROM WORKSHOP

1. Tactile graphics or images are good for teaching them any new concept with the help of audio but when you mix audio with tactile, they cannot pay attention to both at the same time. So first they need to learn concept through a tactile then only children can get to know details through audio.

2. Audio is more convenient than tactile graphics or images.

3. visually impaired children see everything in a special unique way.

4. Once they trust you then whatever you tell them they will follow.

5. They are always excited to experience new things/ objects.

6. There is lack of coordination between brain and other senses.

7. Children learn through repetition and experimentation.

8. Teamwork is the best medium but first we need to tell them what is teamwork.

9. Before doing any experiment with children be sure to make it simple and safe.

10. If we are designing something for them it should be sustainable.

11. Need to develop their physical and mental coordination with Braille.

BEHAVIOURAL STUDY

Visually Impaired Children behaviour:

Only a teacher teaching at the Blind-School knows visually impaired child's unique visually-related needs, functional behaviours and knows specific-skills.
e.g: basic concepts, sensory awareness, listening skills, self-help skills, social skills, etc.

As with all young children, cognitive testing for children with visual impairments below the age of 4 is probably inappropriate. A visually impaired child's cognitive ability may be better estimated by a verbal evaluation than a performance test.

- Rubbing eyes excessively
- Constant frowning
- Shutting or covering one eye for visual tasks
- Head-tilt or head-turn when looking at something
- Leaning forward to see better
- Excessive blinking
- Undue sensitivity to light
- Excessive irritability during close work
- Stumbling or tripping over objects
- Clumsiness in reaching

Note: These behaviours assume that there are no other problems such as motor difficulties.

DISCUSSION WITH TEACHERS

Pre-Braille teacher sharing her experience:
It is important to see the visually impaired child first, as a child with all of the growing-up problems like other children and secondarily as a child with a visual impairment. Some visually impaired children are be shy and some are aggressive; some are passive and dependent on others while some want to do things “all by themselves’. The visually impaired child needs to be accepted but not always protected, loved but not “petted,” and we should understood them not “tolerated”.

The Early Childhood (pre-Braille) Teacher must think of the visually impaired child as a child who is eager to learn, but who may need some modified techniques. The Early Childhood Teacher can use most of the good teaching methods applicable to children with normal vision. At the preschool level, there are few adaptations needed, since the concept-building experiences needed by sighted children are also essential for the visually impaired child. They may need to presented at very concrete levels.

Mrs. Swapna
Pre-Braille School
Kamala Mehta School for blind, Dadar

Pre-Braille teacher assistant sharing her experience:
Blind children must learn to get information from sighted people for many different purposes. This is part of a life-long process. A sighted child sees the colors and a blind child doesn't. But both must learn what the culture agrees is okay in using colors. Like other children, blind children need to learn about appropriate and inappropriate behaviour. This gets a little complicated sometimes because blind children should do some things differently. They need information even when they don't ask for it and don't take it. We must keep reminding them when we see inappropriate behaviour.

We cannot read our children's minds. But there are some general things we do know. A child who is born blind does not know what it is like to see. Until he or she is old enough to begin to understand how other people do things, blindness seems normal. Therefore, a small child will not feel bad about blindness until someone teaches him or her (directly or indirectly) to feel bad.

Mrs. Saroj
Pre-Braille School
Kamala Mehta School for blind, Dadar

http://static.indianexpress.com/pic/uploadedImages/bigImages/B_Id_416802_teacherstudents.jpg

Discussion with group of Blind school teacher

When a blind child is little he or she may not have much interest in what you see. If you are driving along the road and describe beautiful scenery, and your child may totally ignore you. Because children express no interest, that doesn't mean you should quit talking about what you see. But do it in small amounts. You know that you get information from all directions through your eyes, both close up and far away. Your child doesn't know what you see. Slowly, he/she will learn-if you keep talking. It is important that a blind child learn how to interact with people who are getting information visually. In one sense your child may borrow your eyes to read a story, learn about colors, identify a noise, and so forth.

Sight is convenient and blind people rely on sighted people for certain things. This is not bad, but good and proper. Blind children need to learn how eyesight works and how to interact with sighted people. It's a part of learning about blindness. But, too much reliance upon someone else's sight take away the child of skill and confidence. Thus, a blind child must learn how to balance trusting their blind techniques and understanding the uses of vision. It is part of growing up for a blind child.

Teachers from
Victoria Memorial school for blind

SUGGESTIONS BY TEACHERS

Here are a few specific suggestions by teachers to be followed when interacting with Blind or visually impaired children. These points helped me a lot during interaction at the sensory workshop, I had organised with pre-Braille school children.

1. Address the visually impaired child by name when talking just to him/her.

2. Touch his/her arm or shoulder if you feel he/she is not attending, so that he/she will know you are including him/her in whatever you are discussing.

3 Avoid using facial expressions, unless you accompany the facial expression with a verbal statement.

4. Emphasize listening skills in the visually impaired child for following directions, listening for details in a story or simply improve receptive language.

5. Make as many concrete, sensorial oriented and interactive experiences as possible.

6. If a child has some useful vision, don't be afraid to ask what an object looks like to him/her, it may help you understand what the world looks like through the child's imperfect eyes. It may also help the child to understand what he/she is seeing.

7. A major focus for children with visual impairments is to encourage them to interact with people and the environment and not to be isolated.

FAMILY SUPPORT

The importance of family in the life of a visually impaired child is reflected in the individual child's personal life as well as it will follow during the visually impaired student's educational years. During the earliest years of a visually impaired child's life (from birth up to age 3). It is necessary to maintain early childhood intervention records by child's family regularly.

It isn't helpful to make comments such as: "I wish you could see the birds out the window," Or "I wish you could see the pictures in this book." But we can say, "Do you hear the birds singing? They sound nice. They have pretty colored feathers which look nice, too." or "This is a funny picture. It shows an elephant in a dress! Isn't that silly? Do you remember the elephant you rode on at the zoo? Can you imagine it in a dress!" We need to converse with them in a positive way.

Your child needs reassurance that blindness is okay even before he/she really understands what blindness is. This is true because of what others say about it, and because a blind youngster may have fears that are associated with their lack of vision. If you have created an atmosphere where it's okay to talk about blindness, your child will have the language, and the "permission" he needs to express some of the things he or she is thinking or experiencing about it.

My observation after many visits to various blind school out of which many are residential where children stay in the school campus for five days and during weekend they go back home. During weekends they are completely in different environment where parents don't know how to deal with them. There is huge gap between school and home, no doubt child enjoys his/her time at home but when he/she comes back to school he/she takes time to adjust again with the school environment because of the two day gap.

My effort is to make parents aware of this problem and design a solution where child can continuously engage in the physically and mentally which will surely help them to improve his skills without any environmental gap. [10]

OBJECTIVE

Design & develop an aid for visually impaired children, where they can use touch, sound to visualize mental images, and which will help them to develop pre-Braille, physical, mental and sensory coordination.

TACTILE AND AUDIO/MUSIC

Before testing the tactile and audio, following things you should take into consideration

1. The child's present levels of development in the areas of physical, cognitive, speech and language, psychosocial, and self-help skills.

2. The family's strengths and needs, as they relate to enhancing the child's growth and development.

3. Specific early intervention services needed for specific case of child, The child's current level of educational performance.

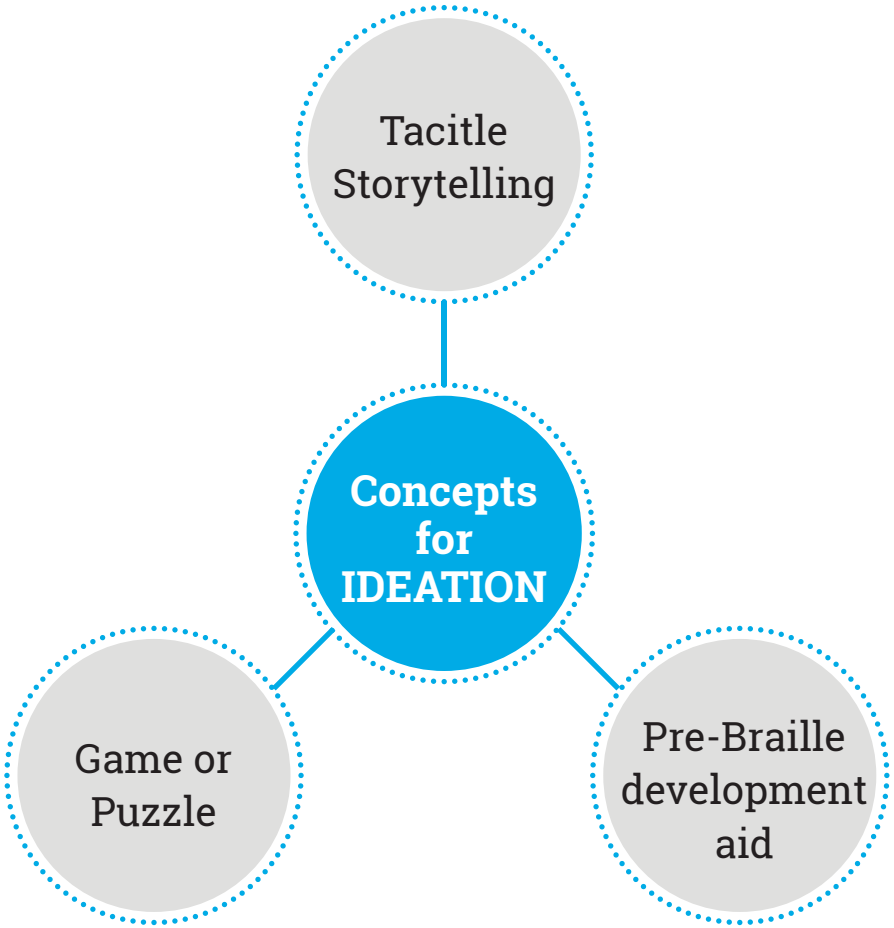
4. Annual goals and short-term objectives of each and every child.

5. Specific special education and related services to be provided.

Audio/ Music

The ability to perceive sound is very important for all visually impaired children. Auditory awareness is an excellent tool for the child to develop and can be done in a variety of ways with a variety of toys and instruments. The child can first team about the instrument and what it does and how to produce the sound. They can team the difference between fast and slow, between high and low, and between loud and soft sounds. [13]

IDEATION


Tacitle Storytelling
Concepts for IDEATION
Game or Puzzle
Pre-Braille development aid

CONCEPT ONE

Based on the problems and discussion and observation in sensory workshop the following ideation was done.

Tactile Storytelling

Using tactile picture book at an early stage is helpful to develop early literacy skills. It is important to make that tactile graphic strong enough. Visually impaired child should not interpret it in wrong way. Children should relate the story easily with their personal life since their visual storage is very limited. There are different kinds of storytelling.

Likewise Poems with music, voice modulations; audio with action or audio with touch. Children can read tactile images through touch and it will guide their brain to create mental images.

Following story was thought of initially.

Race around the world

One day on Mount Kailash Lord Shiva and Godess Parvati offered a single fruit to their two sons Kartikeya and Ganesha. But, both of them wanted to have the whole fruit. As there was only fruit their parents came up with novel idea to settle this problem. They asked both of their sons to go around the world three times and whoever reaches back earliest would get the whole fruit in reward. The moment this was announced; Kartikeya hopped on to his pet peacock and set off around the world once, twice. But Ganesha simply walked around his parents three times. When Kartikeya came back he was surprised to see Ganesha with the fruit. He questioned, to which replied saying “You may have gone around the world but I went around my own world, My parents”. Even the parents were satisfied with Ganeshas wit and rewarded him.

Interpretations of mythological story

1. Ganesha knew that his pet vehicle is mouse and understood that a mouse cannot compete with the peacock so he very smartly walked around his parents. He chose the different way to complete the task and even he had intelligence to think different.

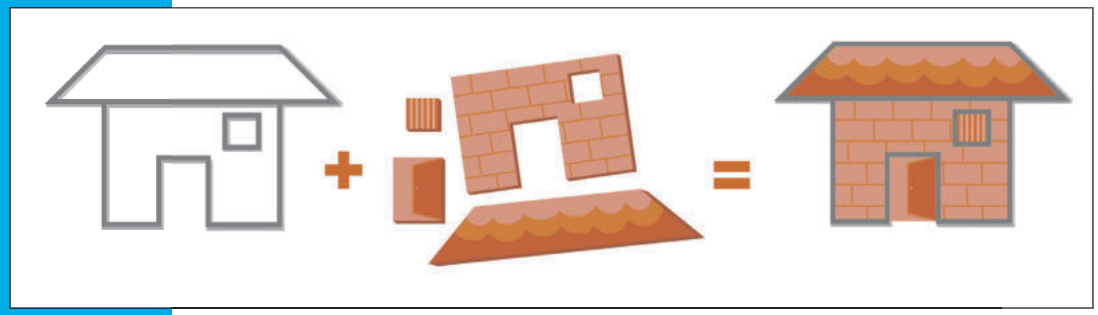
2. In the very same way visually impaired people cannot see the world as we the sighted people see around us. They visualise mental images based on their experiences and create their very own world which matters them most.

Findings

1. This story will be too complicated for children at their preschool age.
2. It is too long and also it does not directly communicate with the children.
3. It has some indirect meanings which are very difficult for children to understand it.
4. This story has many characters which are not familiar to children so it would be very difficult for them to relate it.

The feedback from professors was to narrate the same message in different way also if it is tactile representation of the story then why such a big story. Story should be simplified and short which will be easy to understand by them. Children should perceive the moral of the story correctly and experience the essence of the story by their other senses.

CONCEPT TWO



Puzzle one

This puzzle includes different parts of house and visual impaired children have to manage and fix it in the given stencil. These shapes have different textures which the child can feel by his/her hand.

As sighted children react to things differently in their early stages of life, if they are shown something new, they not only see it but they also put hand over and around it to feel and experience it. In the very same way a blind child also experiences new things around them albeit without vision, they do it in a more intense manner. They have their own peculiar way of doing it; they use their one hand to find reference and other hand to find location.

Findings

1. In the designing of any puzzle reference point is very important for a child to get correct location.

2. It should create a clear mental image of the object because visually impaired children constantly depend upon imagination.

3. The idea was basic and it was not communicating better other than managing shapes in given space.

4. If you are not communicating in clear way with the visually impaired children then you are practically invisible for them.

Puzzle two

“Puzzle with a Texture Twist”

In this puzzle the shape of the parts is Challenging, yet friendly; unusual, yet familiar. The child has to move the pieces in such a way that each shape can fit in each part of the stencil. Left and right, up and down, then twist and swoop for another dimension. This activity is great for exercising and developing important hand muscles. Each shape has a texture pattern at one side so it is easy to identify by touch which is the upper side. That makes it ideal for blind and visually impaired children. To help identify correct orientation of the stencil, there is a raised reference line at the bottom.

Findings

1. This puzzle is creative, imaginative, safe and also fun for the children.

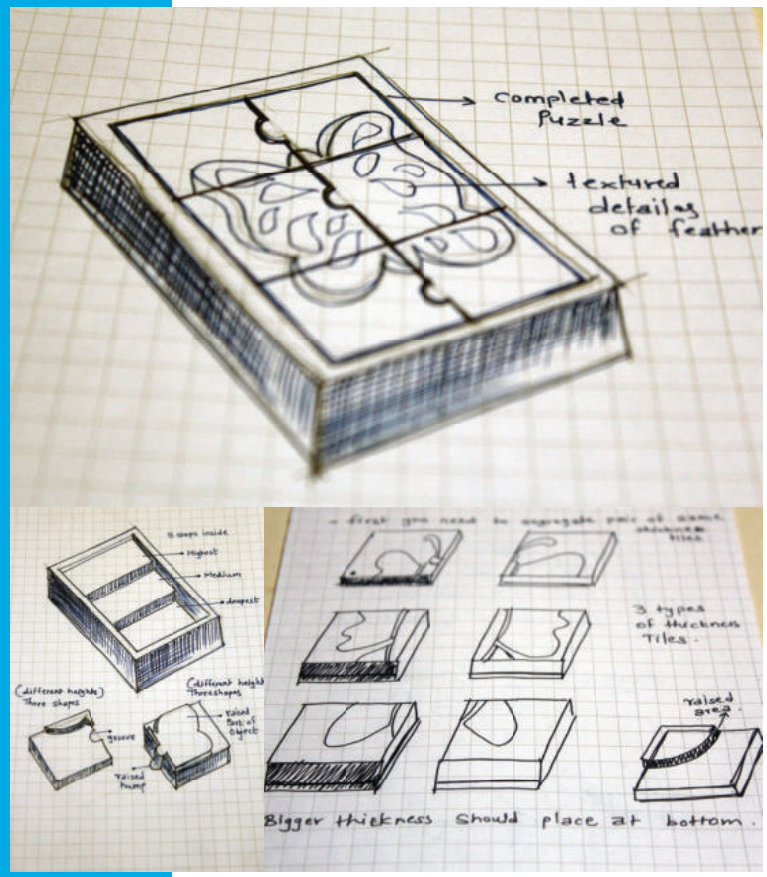
2. It covers communication and co-ordination between tactile and the brain, develops activities for learning and stimulate independence.

4. Advantage of this puzzle is “No individual attention required”

5. There is absence of 3D objects.

6. We can introduce interlock system to make it more playful.

CONCEPT THREE



Pre-Braille development aid

This tactile aid is developed with an audio input. This aims at visually impaired children to play alone at home. It includes six tiles which will follow the six cell grid of Braille. Each tile has a raised shape which when collectively put together makes an object. Each tile has a different height. Children can group up tiles which are of the same height. Then they have to put those tiles in correct location and order, concluding which the child can feel the tactile image of object by using his/her hand.

This activity will help develop spatial relationships, learning persistence; as the picture emerges piece by piece it gives the experiencing of joy that comes with ultimately solving the puzzle. Cognitive and communication skills develop as children explore and learn about what's pictured.

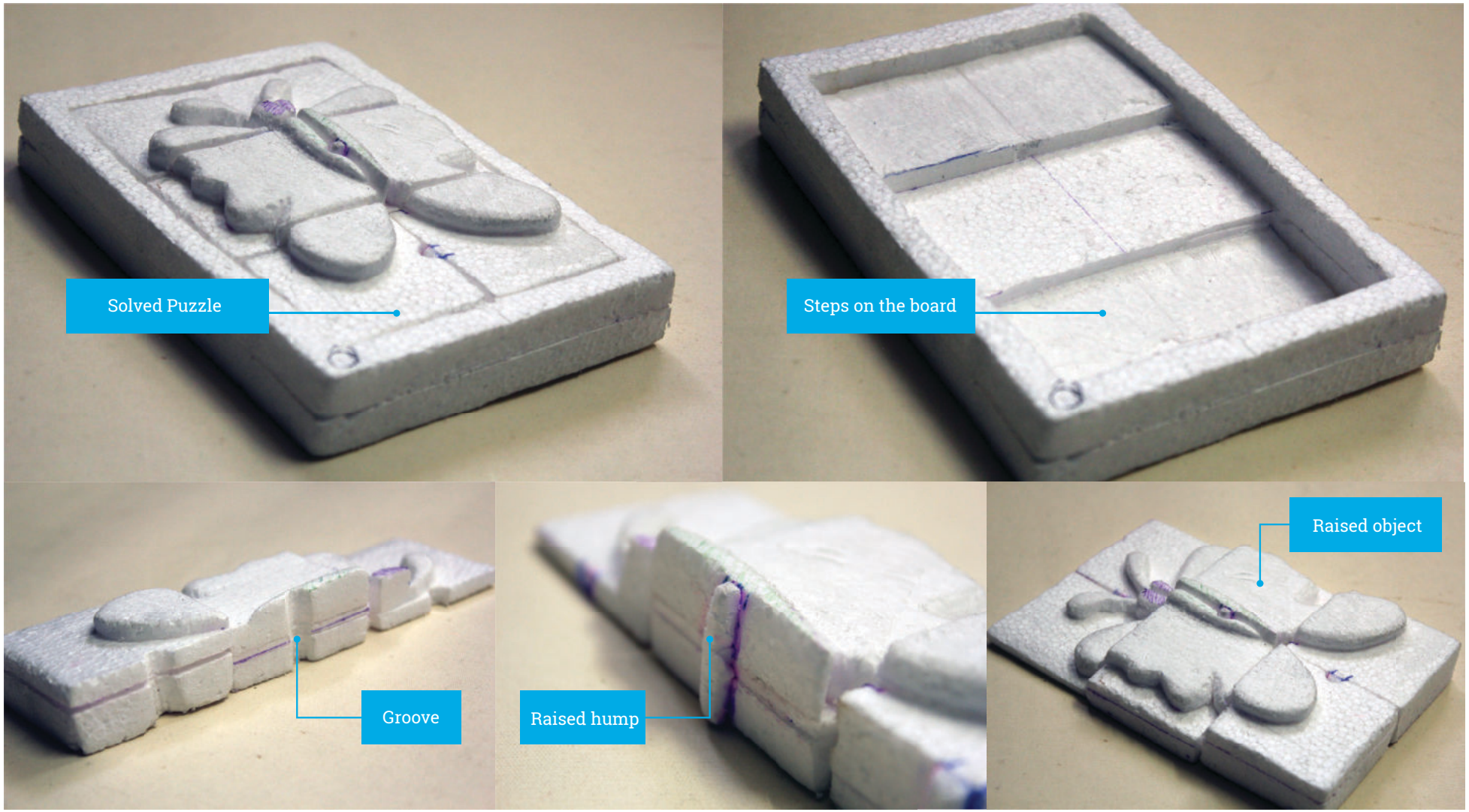
Puzzles with audio instructions reward proper placement of pieces. With the instructions in audio format the featured object makes a boon to the visually impaired.

Following points are important when doing an activity

- Total product orientation
- Each shape orientation
- Location of each shape
- Combination of two box location

FIRST PROTOTYPE

Medium - Thermocol



FIRST PROTOTYPE TESTING

I did the first prototype testing with two users with the help of blind fold.

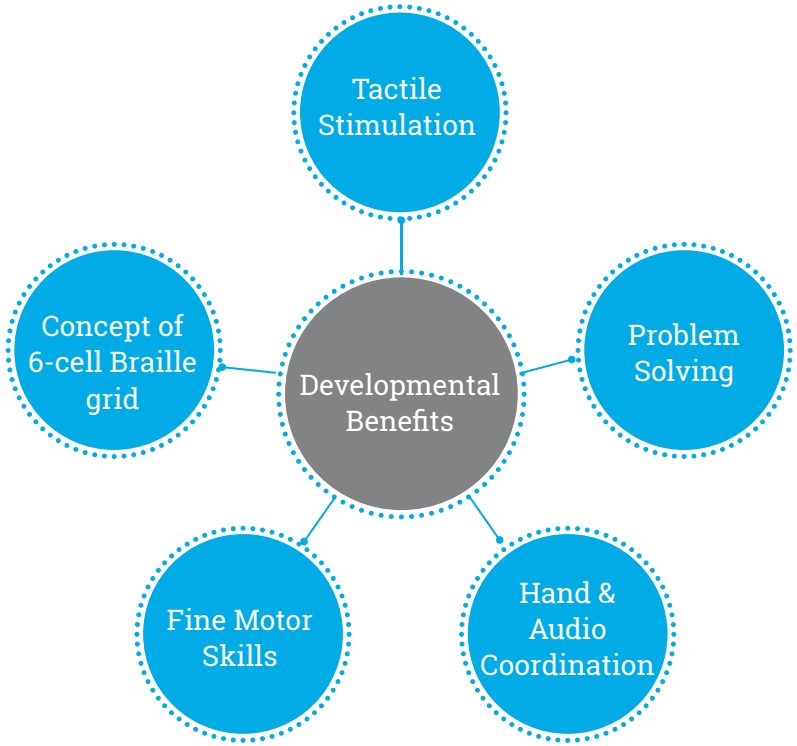
Findings

- Each shape orientation and location identified because of groove and raised hump.
- Combination of two box location identified because of different heights.

Problems

- One user identified that the object is butterfly and one user didn't.
- Need to add detailing in the object.
- Confusion between medium and thick level of height. Board orientation.

DESIGN DEVELOPMENT



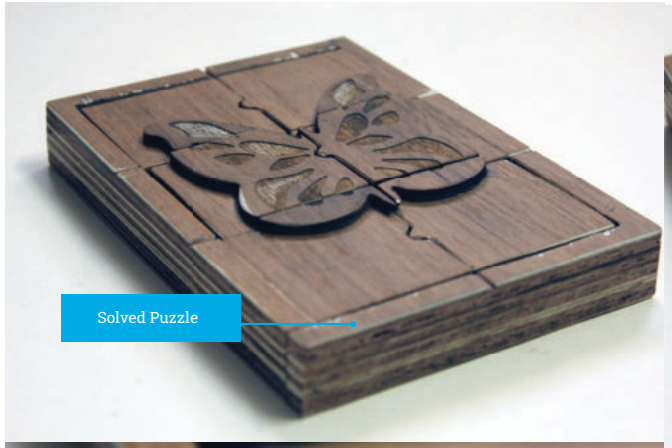
Once the initial ideas were in place and as the basic prototype testing was done; it gave a better view of which ideas could be combined to form the desired system. Though not all ideas were used but with good combination of the best ones, I have finalised the third and final concept of “Pre-Braille development aid with audio”. once the prototype testing and observational evaluation is done, I can develop the design as per the feedback and findings.

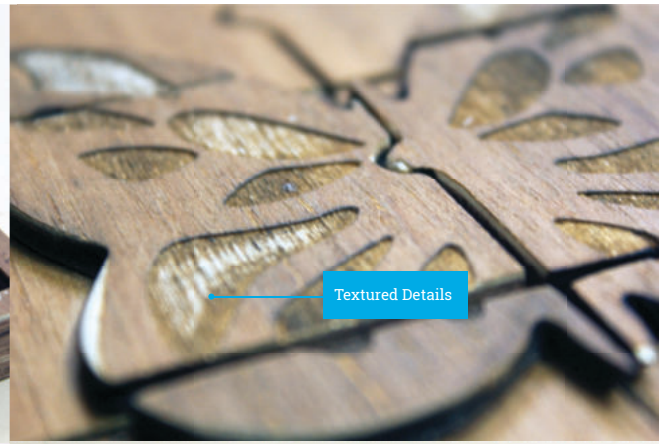
Developmental Benefits of finalised concept:

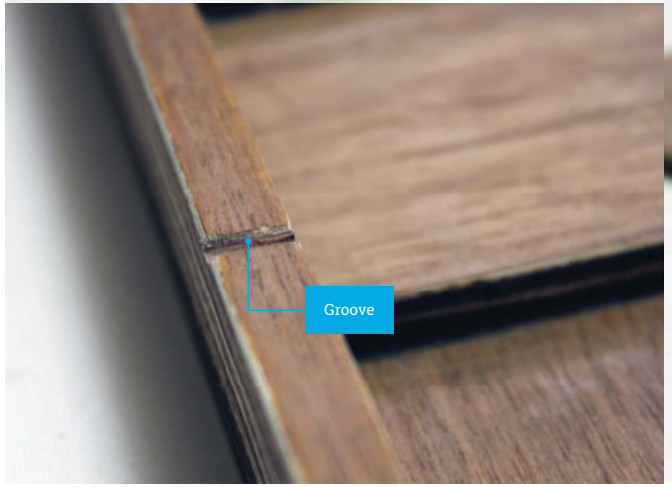
- Concept of 6-cell Braille grid
- Tactile Stimulation
- Problem Solving
- Fine Motor Skills
- Hand and audio/sound Coordination

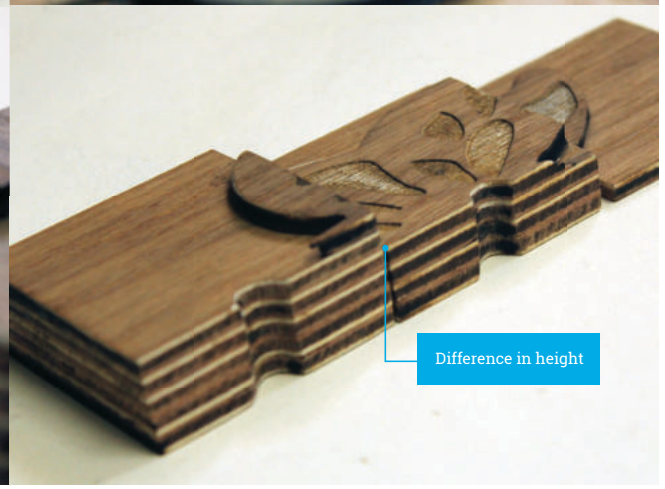
SECOND PROTOTYPE

Medium - Wood (Veneer)









SECOND PROTOTYPE TESTING

I did the second prototype testing with blind school girls

Findings

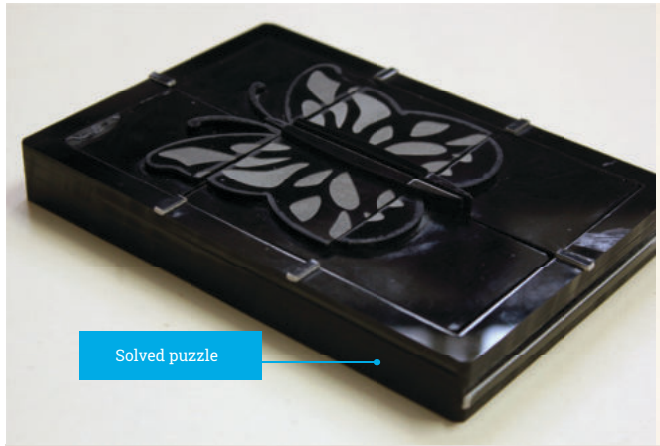
- Difference between second and third level height of shapes identified.
- Detailing on the feather of butterfly mentioned by user.

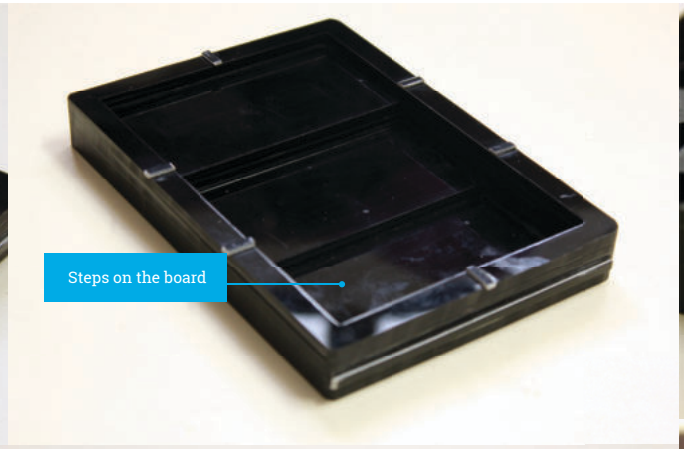
Problems

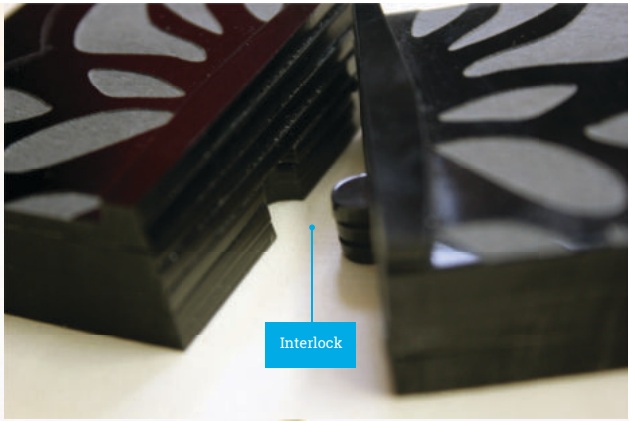
- User did not notice the grooves on the four sides of the board.
- User was confused with the total board orientation.
- Wooden model should be finished or find some alternative material.

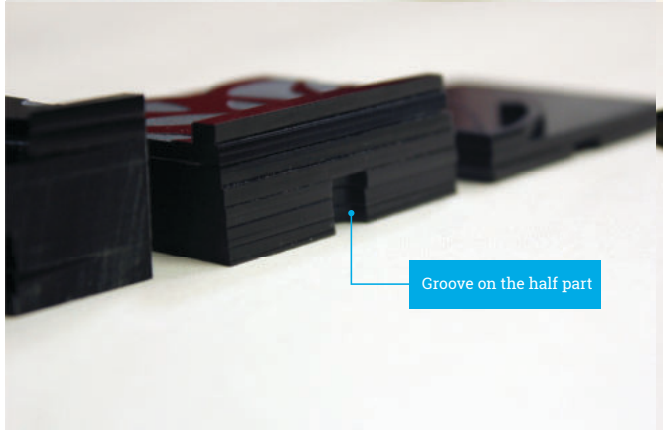
FINAL WORKING MODEL

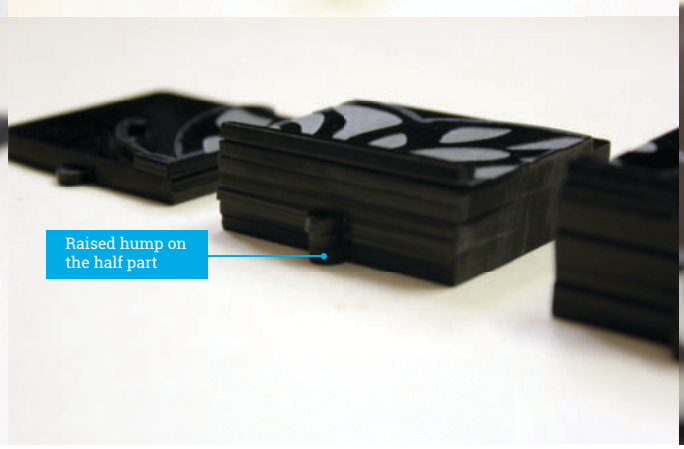
Medium - ACRYLIC

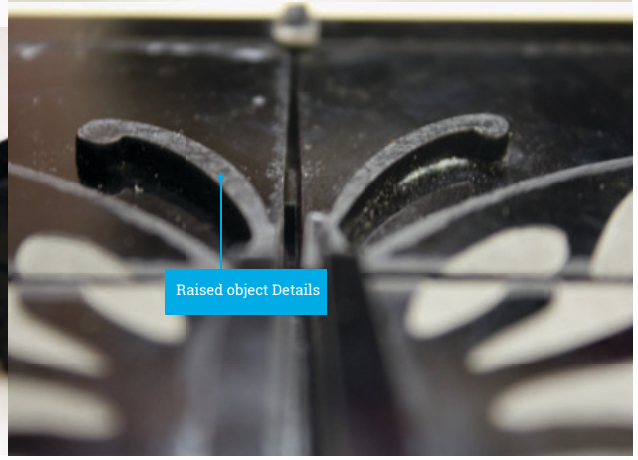


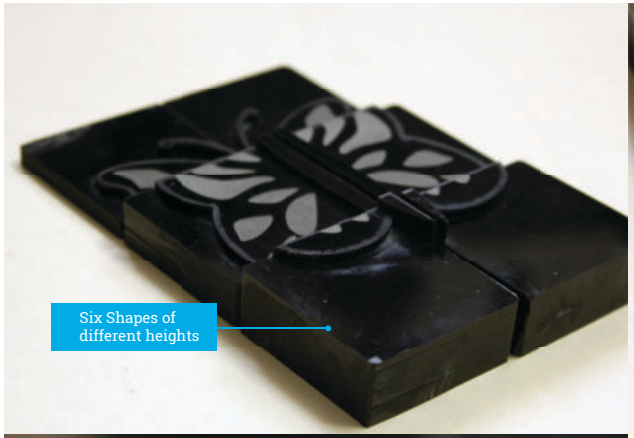




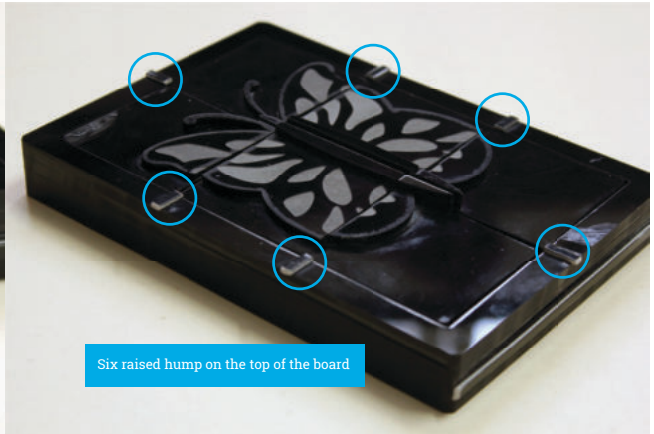


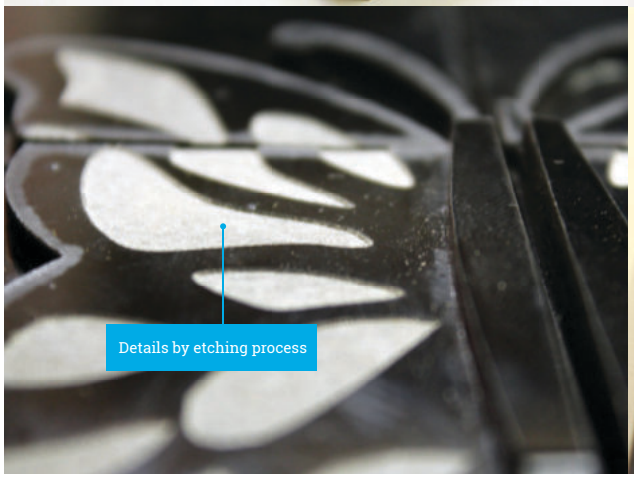


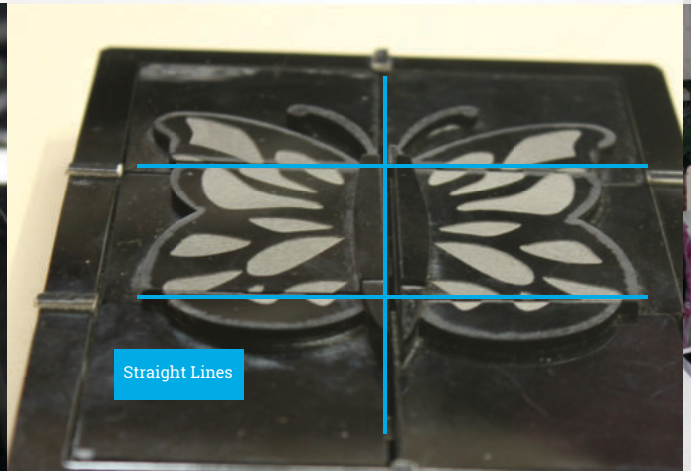



Six Shapes of different heights


Raised line for reference


Six raised hump on the top of the board


Details by etching process


Straight Lines

BUTTERFLY POEM

Butterfly Butterfly
You fly so high
Butterfly Butterfly
Up in the sky

Where does he live?

Butterfly Butterfly
Tell me your secret
Butterfly Butterfly
How do you fly?

How does it fly?

Butterfly Butterfly
In the garden you flutter
Butterfly Butterfly
To drink flowers nectar

What it does?

Butterfly Butterfly
Even I want to try
butterfly Butterfly
Will you teach me fly?

Why I like you?

Audio for Tactile Graphics

The poem of butterfly will be in audio format followed by the instructions to solve puzzle. At first the child has to listen to the poem and instructions then he/she can move towards solving the tactile puzzle.

As there are limitations to tactile images, they may need excessive classification, it may be difficult for the hands to locate and relate all the features of the image. It is often difficult to identify a tactile image alone. If the reader is guided through the various stages, there are the chances of a greater understanding. This guidance can take many forms, so I choose the audio format of instructions. Any model or image can be enhanced by verbal commentary.

If the child is able to learn incidentally and has had experience with tactile images he/she may not have any trouble understanding the Two Dimensional (2D) representation of a Three Dimensional (3D) image.

If possible in the early learning stages, tactile images should be put together with audio input. Then later the child should develop the skill of reading graphics without this audio backup.

I had tested this poem with blind school children in their audio lab.




PROTOTYPE AND OBSERVATIONAL TESTING

Once the prototype was ready, my next plan was to evaluate that prototype with following points:

- Is poem interesting enough to easily recall by children again and again?
- Are the instructions precise and easy to understand by visually impaired children?
- Can the child differentiate between the varied heights of objects?
- Are children following the reference point correctly?
- After joining the puzzle, are children getting the correct object?
- Are children following the sequence with audio instruction? (Coordination with audio and tactile)
- Do the children get confused at certain points?
- Can they play independently?
- Is the material used in making the puzzle friendly to the children.

Minutely observing the above things when the child is playing the puzzle will help me for my further design development.

INSTRUCTIONS

What are the things you have in this puzzle?

- One board and 6 tiles

- The board has three descending steps starting from the top i.e; the top one is shallow then a medium step and the last one deep.

- Place the board in front of you in such a way that the deepest step should come at your side.

- Make sure that the bottom end of the board has a raised line.

- There are six tiles and each shape has a raised part of the object on one side and the other side is plain.

- You have to separate out two groups out of the 6 given tiles according to their groove and raised hump.

- Like a group of tiles, which has groove and second group of tiles which has raised hump.

- The tiles which have the maximum height i.e; the thick tiles will go on the deepest part of the board, the medium will go in the middle that and thinnest will go on the top.

- The group of tiles which has a grove place on the left side of the board and group of tiles which has raised hump place on your right

- Make sure raised object is on the upward side of the board.

- Once you place all six tiles on the board read the tactile object and details on it.

PROTOTYPE TESTING IN BLIND SCHOOL

I did the third and final prototype testing with blind school girls

Findings

- Board orientation was easy because of raised line on one side of the board.
- Audio poem helped user to identify features of the objects.

Feedback

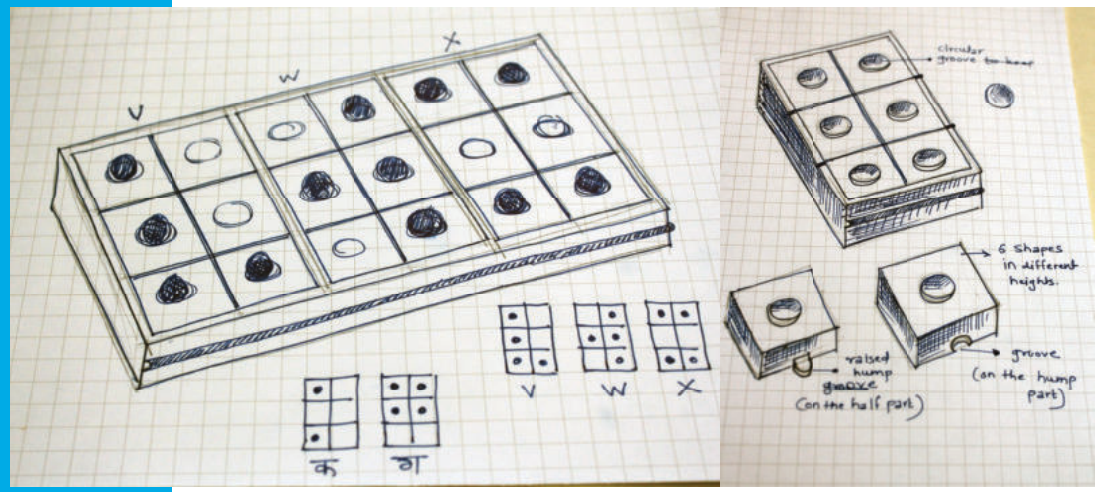
- Hand over hand method helped the user to get friendly with the material.
- This model can also be adapted to learn Braille through dots.

EVALUATION RESULT

Question to be answered after testing

1. Are the instructions precise and easy to be understood by visually impaired children? ✓
2. Can the child differentiate between the varied heights of the objects? ✓
3. Are the children following the reference pointcorrectly? ✓
4. After joining the puzzle, are the children getting the correct object? ✓
5. Coordination between audio and tactile? ✓
6. Do the children get confused at certain points? ✗
7. Can they play independently? ✗
8. Is the material used in making the puzzle friendly to the children? ✗

FURTHER EXPLORATIONS



After a final prototype testing is done, I found out that how can this same model we can adapt to learn barille.

Same puzzle model for learning Braille

- Each shape can have circular dents of same size instead of raised object
- Can play with six dots to create a letter in Braille
- On each dent the child can place a small ball over it
- We can increase the board horizontally to create a word
- In this model, size of the board can be small.
- It will help the user in reading and learning Braille dots

Suggestions from the jury panel

A pre-Braille Development Aid would have been in different material so that it would be easy and safe to play for blind children.

Use of object butterfly could have been replaced by something else.

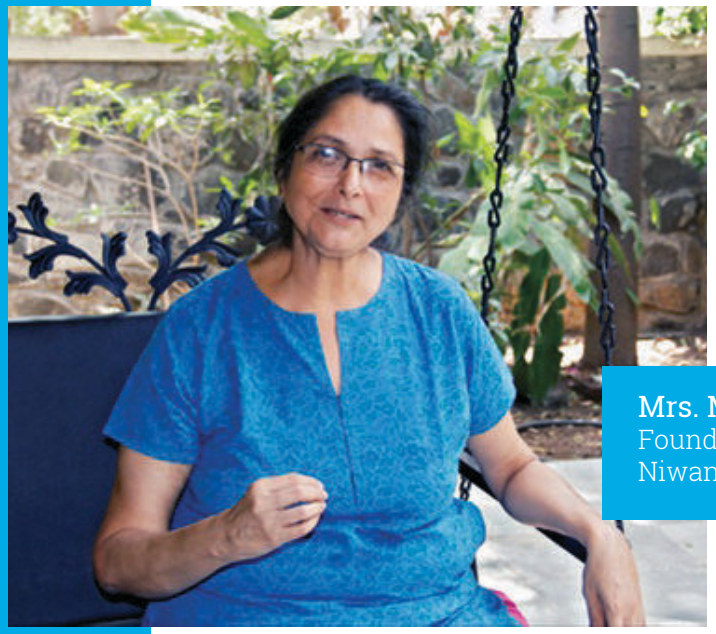
Audio jingle was not very expressive, it could have been much better.

CONCLUSION

Selecting a subject for my project wasn't difficult for me as there was an inner urge to contribute to the development of the society as a designer, I just had to narrow down on a particular aspect where I could touch the untouched part of the society and make best use of my knowledge to solve the problem. As a "Visual Designer" I always wondered that how we all take the gift of vision for granted, I was touched to see that there are people around me who are deprived of this beautiful gift and they don't see the world as I see, but I can help in making this world a beautiful place even for them to live in. Significant amount of work is done in this field but I found that considering India a lot of work is still to be done. Working with visually impaired children was my very first experience in life. Initially I had very basic knowledge about visually impaired people but once I interacted with Children, student's, teachers as well as parents, a sea of information was open for me. At first I started with partially blind children but then I found out that partially blind cases are more complicated and considering the time in which I had to complete this project, it wasn't enough to effectively work for them, so because of time constraints I had to narrow down my topic on completely blind children. Following which my research lead to visually impaired children's needs and problems then understand it thoroughly and then the vital point of the project was to give problem solving solutions.

The final result of Pre-Braille development aid with audio is still awaited. The product will get its final form by mid of November 2013 and I will be conducting a user study and testing after that. User testing and critical observations with actual users will provide me vital insights and findings which are very much important to do the further design development.

As a visual designer, I can definitely say that I have developed myself in various areas like research process, decision making, quick solution, and testing prototype and most importantly working with children.



Mrs. Meera Badve
Founder of
Niwant Andha Mukta Vikasalaya

Blind school visit was the turning point for Meera.

Working since 17 years for holistic development of visually-challenged young adults.

I read a small article about Niwant Andha Mukta Vikasalay

That inspired me a lot to work for visually impaired children.

RESOURCE

Software And Tools
- Adobe Creative Suite
- Microsoft Office
- Online MP4 to MP3 Converter

Fonts
Roboto Slab - Christian Robertson
Calibri (for rough draft)
http://www.fontsquirrel.com/

Papers
Picture books accessible to blind and visually impaired children by Beatrice Christensen Sköld, Reseracher/International Coordiantor, Swedish Library of Talking Books and Braille (TPB). Chair IFLA Libraries for the Blind Section

Tactile Storytelling by Philipp Meyer / May 2013

How to make tactile pictures understandable to the blind reader by PhD. Yvonne Eriksson, The Swedish Library of Talking Books and Braille

Guidelines for Working with Students Who Are Blind or Visually Impaired in Virginia Public Schools

A pilot study using a modified non-verbal methodology for ORBIS Southern Africa

Touch + Space: Active Learning for Visually Impaired Children by Rachel Gottlieb

BRAILLE by Mr. Harshad U. Joshi

Assistive Technology for Students who are Blind or have Low Vision Jaroslaw Wiazowski, Ph.D.

Involving blind children in the co-design of a Wii game by Liliane Kuiper-Hoyng, Rob Willems, Sven Schultz

BrailleTouch: Mobile Texting for the Visually Impaired by Brian Frey, Caleb Southern, Mario Romero

Using Apple Technology to Support Learning for Students with Sensory and Learning Disabilities by Trisha O'Connell, Geoff Freed, and Madeleine Rothberg Carl and Ruth Shapiro Family National Center for Accessible Media
WGBH Educational Foundation

Audio Cd's
Jingle Toons - Aajichya Goshti, part 1
Jingle Toons - Aajichya Goshti, part 1

Jingle Toons - Yere yere Pawasa
Jingle Toons - Patanga unch unch ja

Books
NAB - Talking Book Library

Movie
Scent of a Woman (1992)

REFERENCES

[1] http://articles.timesofindia.indiatimes.com/2007-10-11/india/27977420_1_avoidable-blindness-ophthalmologists-eye-diseases

[2] National Council for the Blind - General Guidelines on People with Visual Impairments. http://www.basis.ie/home/home.jsp?pcategory=12705&ecategory=13168&sectionpage=10339&language=EN&page=&link=link001&doc=10913&doclistid=13177&logname=NCBI%20General%20Guidelines&urlcode=

[3] http://www.allaboutvision.com/eye-test/ The Eye Chart and 20/20 Vision

[4] http://www.acharya.gen.in:8080/disabilities/br_intro.php http://www.fittle.in/

[5] http://www.youtube.com/watch?v=iBqgr5xZLz0

[6] http://www.fittle.in/

[7] http://barrierbreak.com/about-barrierbreak/

[8] https://www.youtube.com/watch?v=lKDGHU3xjA0

[9] http://sawareru.jp/en/

[10] Ref: blindness-what it means in the mind of a blind child by ramona walhof

[11] http://www.lilliworks.com/

[12] http://www.playabilitytoys.com/Slide-Twist-N-Solve-p/0080.htm, http://www.fredshead.info/2010/06/shape-board-from-aph html

[13] http://www.tsbvi.edu/instructional-resources/1913-creating-educational-toys-and-activities-for-children-who-are-blind-or-visually-impaired

lhttp://www.disabled-world.com/disability/types/vision/visually-impaired-blind.php

http://www.scientificamerican.com/article.cfm?id=prakash-blind-children-in-india-receive-gift-of-sight

Fleximan – new product from HUNGRY FINGERS. www.hungryfingers.com

http://www.youtube.com/watch?v=IWIy95JNVEs

http://www.youtube.com/watch?v=a0PSDoTw6pQ

http://www.kilikili.org/

http://www.tactustechnology.com/

"The only thing worse than being blind is having sight but no vision."

Helen Keller
Author and writer

http://upload.wikimedia.org/wikipedia/commons/b/bb/Helen_Keller.jpg