Creating Sensory Experience for Visually Impaired Children

Guide - Prof. Sudesh Balan | Shweta Kamble | 126250006

Touch

Sound

Vision

Smell

Taste

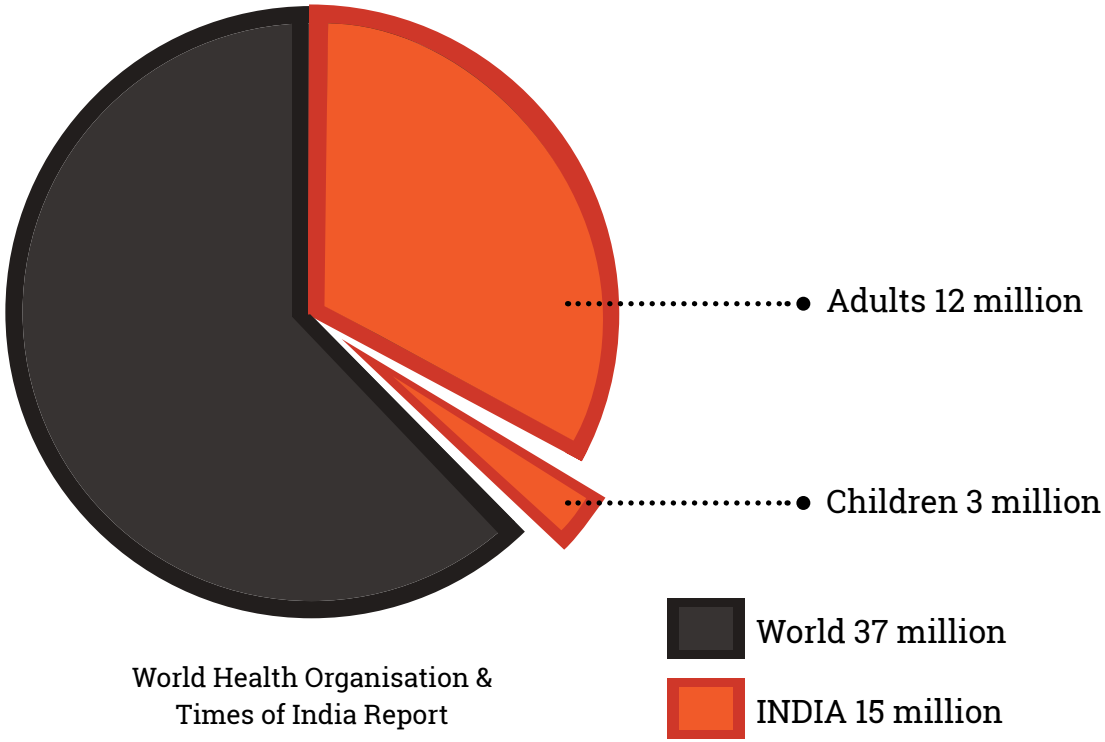
Touch

Sound

Vision

Smell

Taste



World Health Organisation &
Times of India Report

Blind Children are dying day by day

Two reasons:

First they are not getting treatment, very few hospitals equipped to treat children.

Second, they are uneducated, No idea about environment, meet with accidents.

Need to develop their sensory skills at early stage

VISUAL IMPAIRMENT?

Types of Visual Impairment

Visual Impairment means your vision is affected by visual problems such as having no peripheral vision (No vision around the centre of the eye when looking straight ahead)

Having very low eyesight - 20/200
It 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.

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FULLY BLIND

A person who has only 5% vision & less than that

Visual impairment is so severe that the percentage of vision fits in this category

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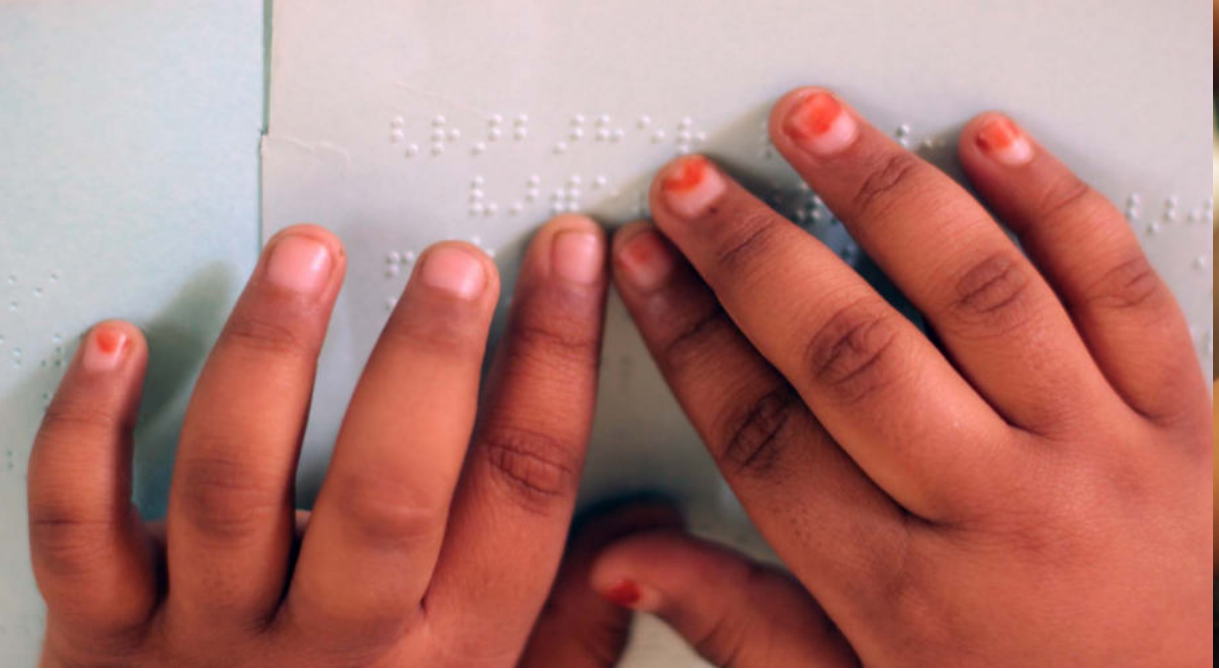
PARTIALLY BLIND

Visual problems such as:
No peripheral vision

Significantly reduced eyesight

Acquired sight loss because of an accident, low vitamin deficiency or Diabetic retinopathy



- Visually impaired use Braille information which is always in text form

- Graphic and images is a effective medium for sighted person.

- Tactile graphics to understand position and space.

- Understand Braille through fingers

- Remember person & places through fragrances

- Identify space around through sound

- Creates unique mental imagery

What they SEE ?

What they
TOUCH, SMELL, HEAR & TASTE?

WORK DONE FOR VISUALLY IMPAIRED CHILDREN

Fittle - To touch is to believe

Accessible learning toolset - playful puzzle

Learn new words and visualize shapes

Words embossed in Braille

Yahoo - Japan - **Hands on search**

Search function with 3D printer (solid object)

Children can call out what they want at machine

Search gets activated by voice recognition

Prof. Pawan Sinha (MIT)

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.

ANTARCHAKSHU
- The Eye Within (Workshop)

Xavier's Resource Centre for the visually Challenged (XRCVC)

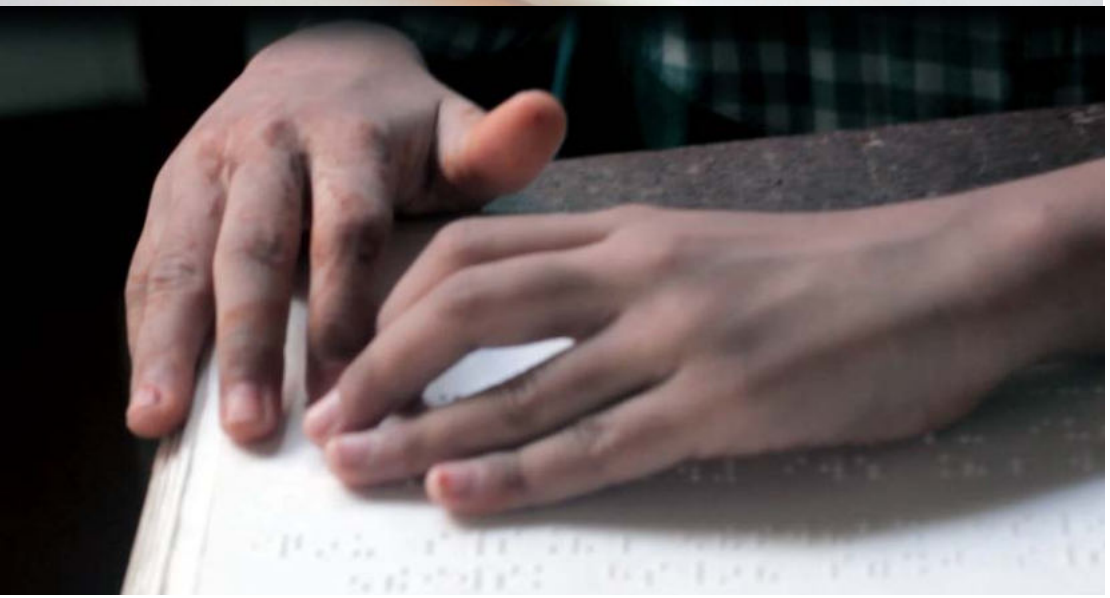
Create awareness about life of visually impaired people

If you know about something? better 'you' experience it

Shortcomings of our system

BRAILLE AND TACTILE GRAPHICS?

http://kateelizabethconner.com/wp-content/uploads/2011/03/Braille-003.jpg



a	b	c	d	e	f	अ	आ	इ	ई	उ	ऊ	ए
k	l	m	n	o	p	क	ख	ग	घ	ङ	च	छ
u	v	x	y	z	w	ट	ठ	ड	ढ	ण	त	थ

BRAILLE

Characters are represented by patterns of raised dots that are felt with the fingertips.

Braille is multilingual language.

1. Bharati Braille
2. English Braille

Grid of a Braille alphabet character consists of six dots on a die, in two parallel vertical lines of three dots each.

म + र + आ + ठ + ई = मराठी

TACTILE GRAPHICS

Graphics which are perceptible by the sense of touch

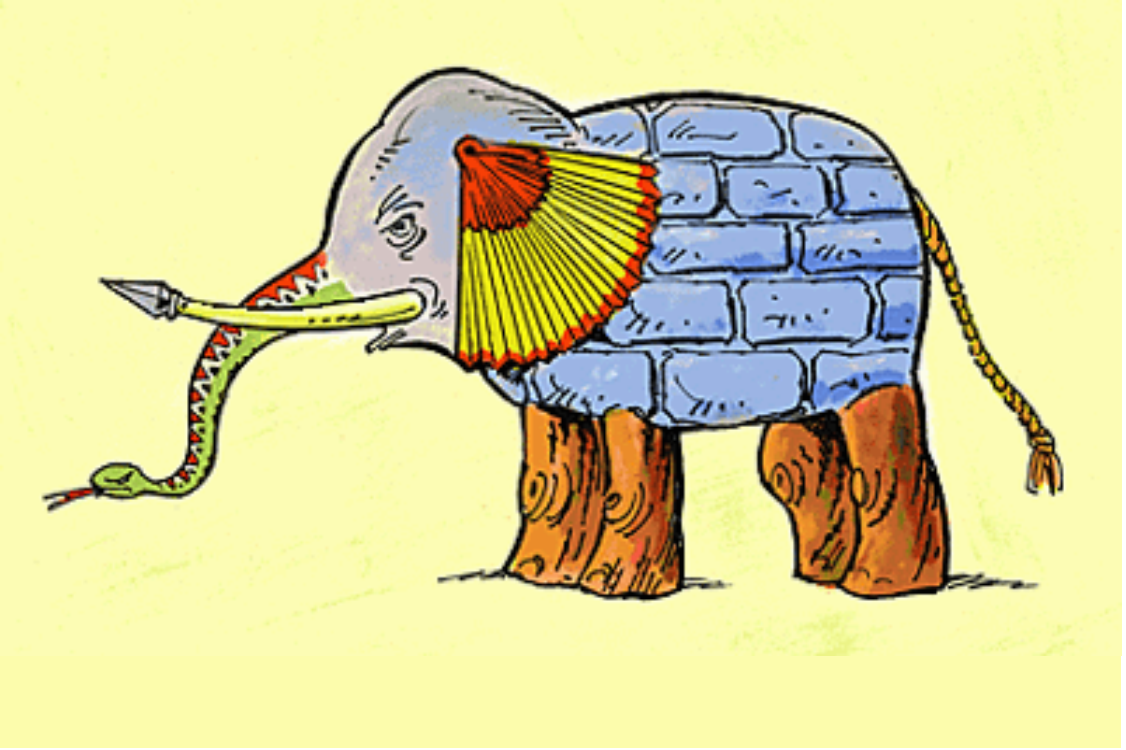
Requires time and efforts to understand it.

Various techniques to produce tactile images

Groove

Raised hump

http://1.bp.blogspot.com/-dmL7Dhx0qDQ/UYEhKyt1uGI/AAAAAAAAAMo/pSZ6WaxtsMg/s1600/indian_elephant_male_01.jpg



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

HOW VISUALLY IMPAIRED EXPERIENCE THINGS?

Story - 6 blind men and elephant

Each one was partly right. But, as a whole they all were wrong

Sighted learners see an elephant whole as single thing

Tusk = Spear
Stomach = Wall
Limbs = Tree
Ear = Fan
Tail = Rope
Trunk = Snake

BLIND SCHOOL VISITS

Actual experience and Discussion

Kamala Mehta School for Blind
Dadar - west

Pre-Braille class helps to know & get used to the school atmosphere

Develop audio skill through voice modulations

Resources are not enough for teaching and learning

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Victoria Memorial Blind School
Mumbai Central

Audio is more convenient and easy to understand; best medium for distance learning.

Using tactile and audio one after another is better

Tactile graphics are more useful for concept understanding

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The Poona School and Home for Blind Girls- Pune

Spatial Awareness is significant part of learning in Pre-Braille school.

Understanding of relationship between two objects

Exposure to the variety of tactile images

PROBLEMS

Due to hampered growth there are considerable number of students who remain in the same class for years

Physical callenges other than visual impairments

Absence of physiotherapists

INSIGHTS

Learning by repetition and experimentation

Teacher should continuously reinforce all the skills throughout the year.

Due to gap or discontinuation in this process, children may fail to remember it.

Tactile skills need compulsory individual attention.

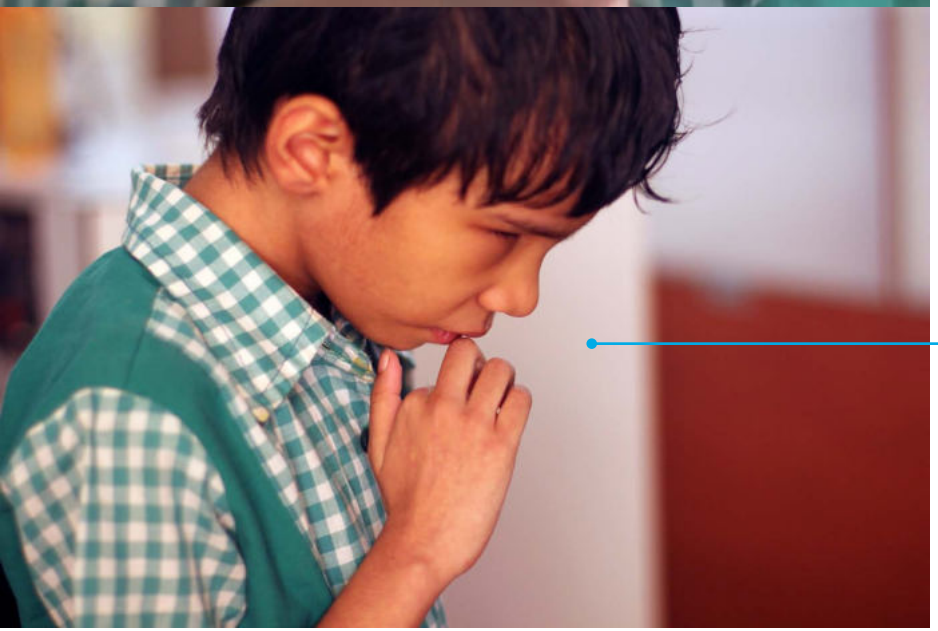
PRIMARY GOALS

1. **Pre-Braille development of child**
2. **Improve their association with sensory input and make sensory experience richer**

SECONDARY GOALS

1. **Improve spatial skills**
2. **Improve physical and mental coordination**

Physical disability



Coordination problem

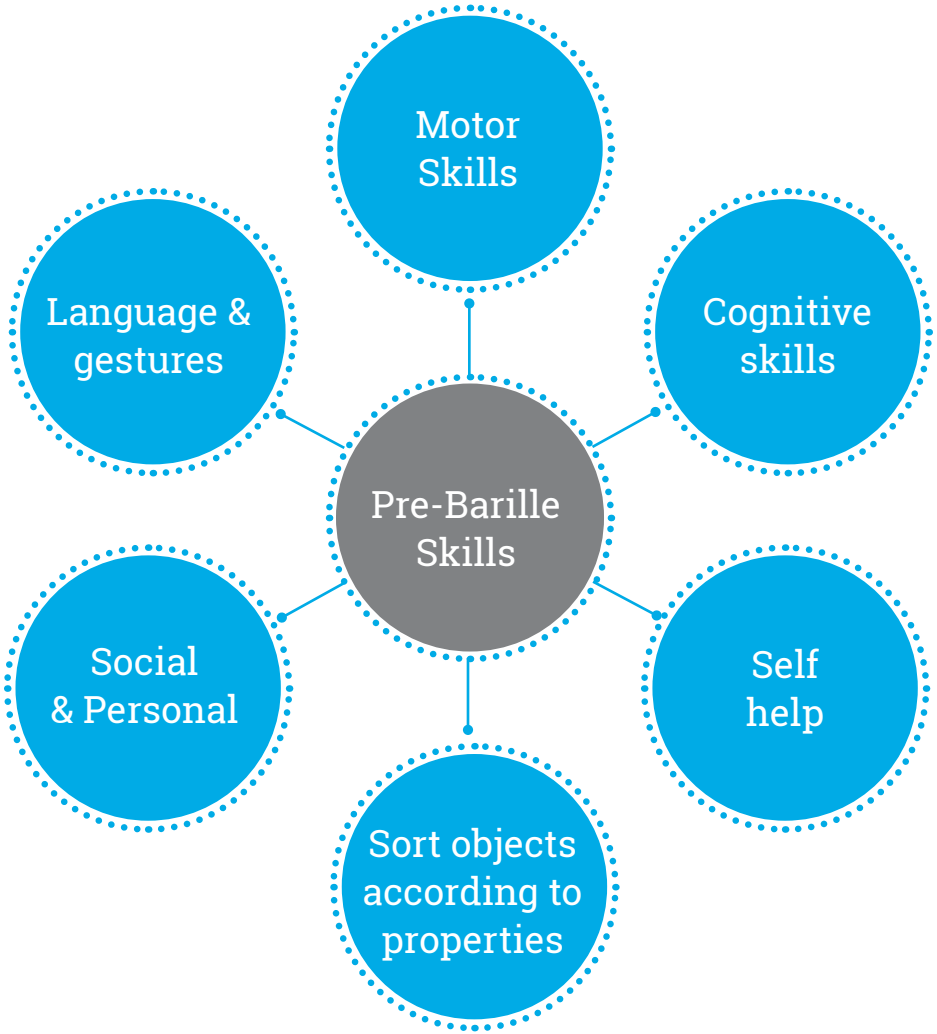
CHALLENGES

Grasping ability is different, need to design an aid which will be beneficial to all.

Design a tactile which is sensitive enough

Training to coordinate senses mentally and physically

Mental model of Braille


Motor Skills
Language & gestures
Cognitive skills
Pre-Barille Skills
Social & Personal
Self help
Sort objects according to properties

SENSORY DEVELOPMENT AND COORDINATION WORKSHOP

Kamala Mehta Dadar School for Blind

OBJECTIVE

To find out how their brain coordinates with other senses in the absence of vision.

To find out effective medium between audio and tactile for the early stage

To observe them more closely. Be with them, talk with them and find out how they think.

TASKS

Touch - Sorting out objects, textured blocks, cloth samples

Listening to different sound and identify them.

Smell - Identify different objects by it's odour

Taste - Hot/cold, sweet/salty/sour

FINDINGS

Tactile graphics or images are good for teaching them any new concept with the help of audio

Audio is more convenient than tactile graphics or images

They see everything in a special unique way.

Excited to experience new things

Lack of coordination between brain and other senses.

Whatever you tell them they will follow

DISCUSSION

Firstly see the visually impaired child as a child with all of the growing-up problems like other children and secondarily as a child with a visual impairment

They need information even when they don't ask for it

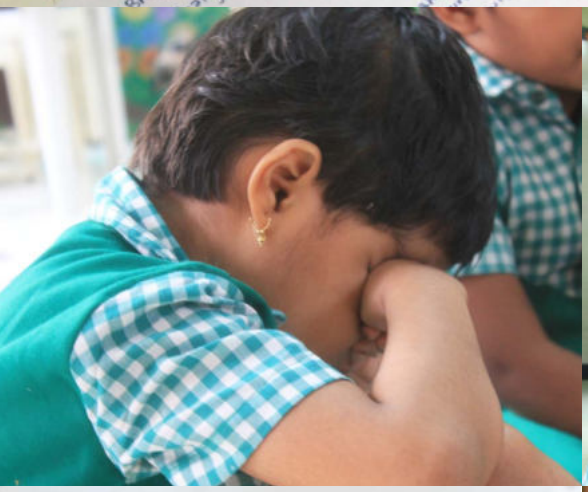
Blind children need to learn how eyesight works and how to interact with sighted people. It's a part of learning about blindness

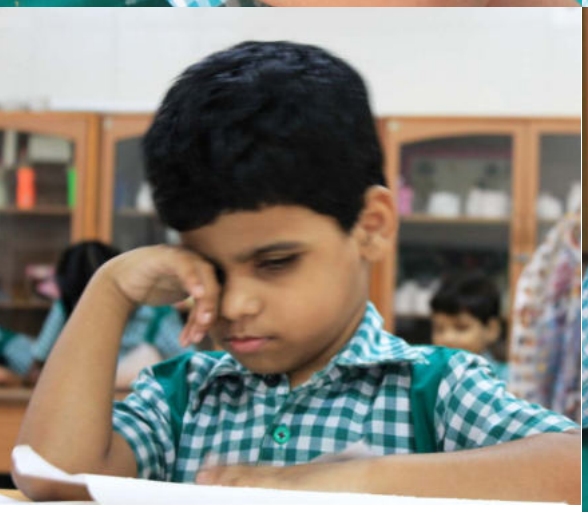
SUGGESTIONS

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

Avoid using facial expressions, unless you accompany with a verbal statement

Emphasize listening skills in the visually impaired child for following directions, listening for details





Behavioural Study

Rubbing eyes excessively

Constant frowning

Shutting or covering one eye for visual tasks

Head-tilt or head-turn when looking at something

Excessive blinking

Undue sensitivity to light

Excessive irritability during close work

Stumbling or tripping over objects

Clumsiness in reaching

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.

EXISTING LEARNING AIDS AVAILABLE IN THE MARKET

For fully Blind and Partially Blind Children

SLIDE-TWIST-N-SOLVE

This is a puzzle of geometric shapes

Move the pieces left and right, up and down, then twist and swoop for another dimension (great for developing important hand muscles)

Each shape has a raised pattern so it is easy to identify by touch.

There is also a solution key on the back and can also be recognized by touch.

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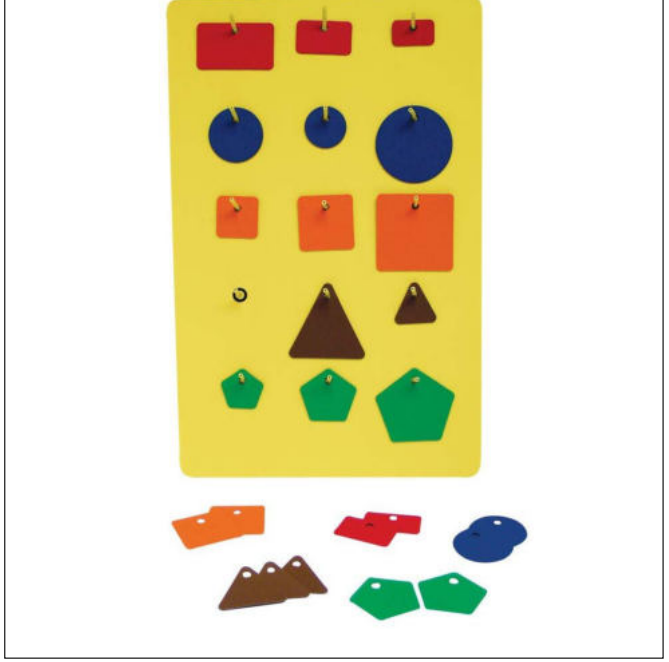
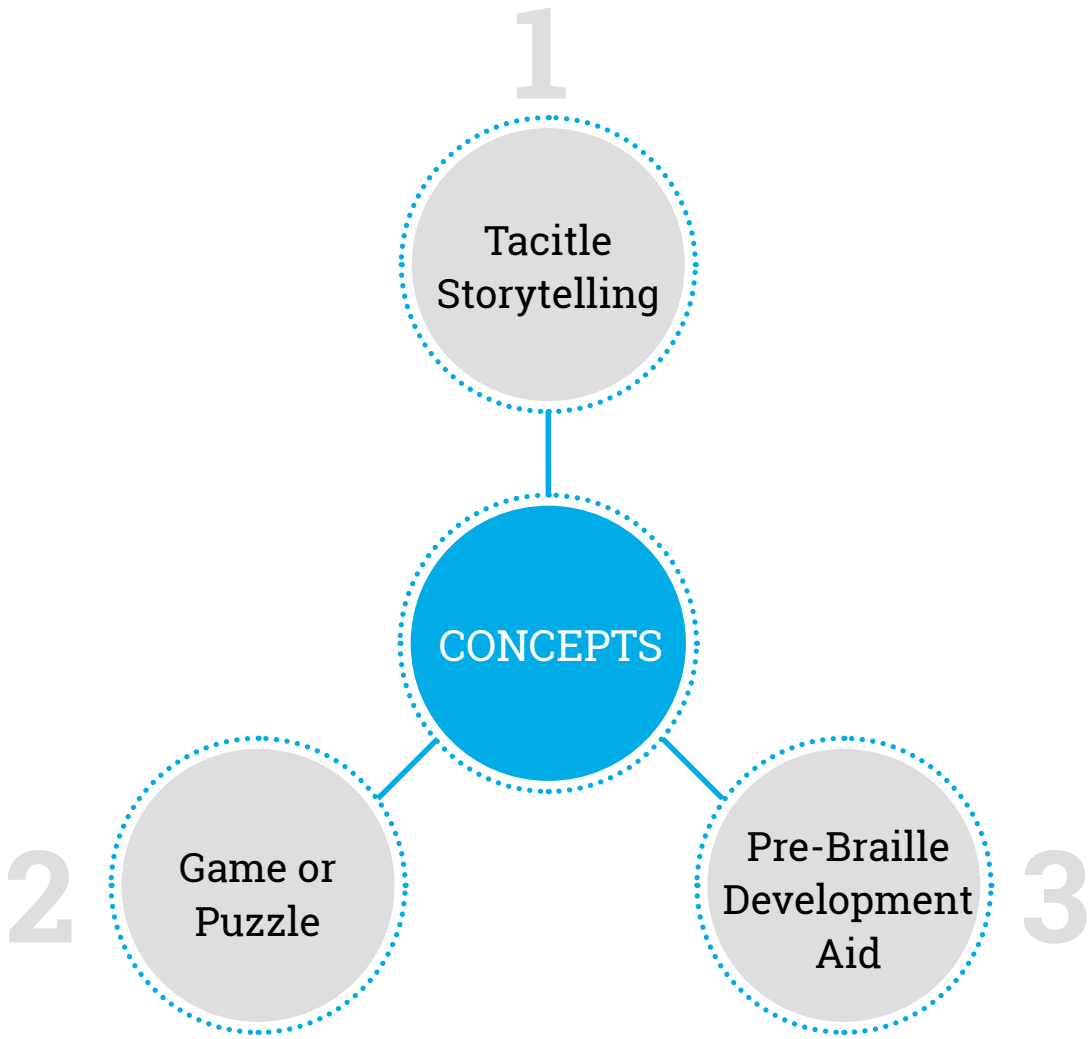


SHAPE BOARD

This will help you to classify different geometric figures according to size, shape, color, or position on a pegboard

It consists of 15 geometric figures and a board with three columns of five pegs

Includes five different shapes (square, rectangle, triangle, circle, and pentagon) in small, medium, and large sizes


1
Tacitle Storytelling
CONCEPTS
2
Game or Puzzle
Pre-Braille Development Aid
3

CONCEPT ONE

Tactile Storytelling - Race around the world

Ganesh and Karthikeya
"The Race Around the World"

http://vighneshwarpoojamandal.blogspot.in/

Two interpretations of the story

Ganesh chose the different way to complete the task and even he had intelligence to think different

Visualise mental images based on their experiences and create their very own world which matters them most

Findings

Too complicated for children at their pre-school age

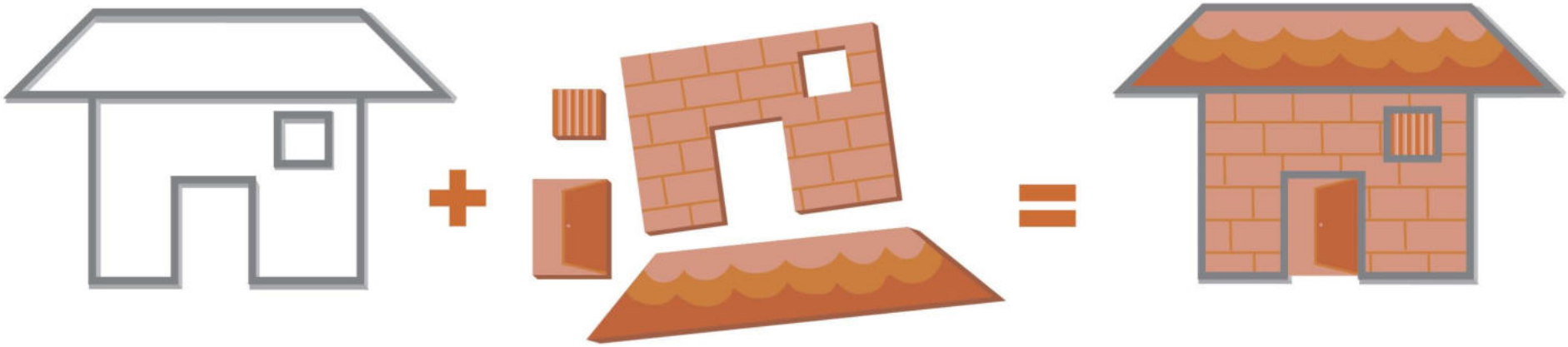
Too long and also it does not directly communicate with the children

Indirect meanings which are very difficult for the children to understand

Many characters are not familiar to children so it makes it difficult for them to relate

CONCEPT TWO-A

Puzzle - House



About the Puzzle

It includes different parts of house

Manage and fix it in the given stencil.

It has different textures which the child can feel by his/her hand.

Once they match everything then they will understand the concept.

Findings

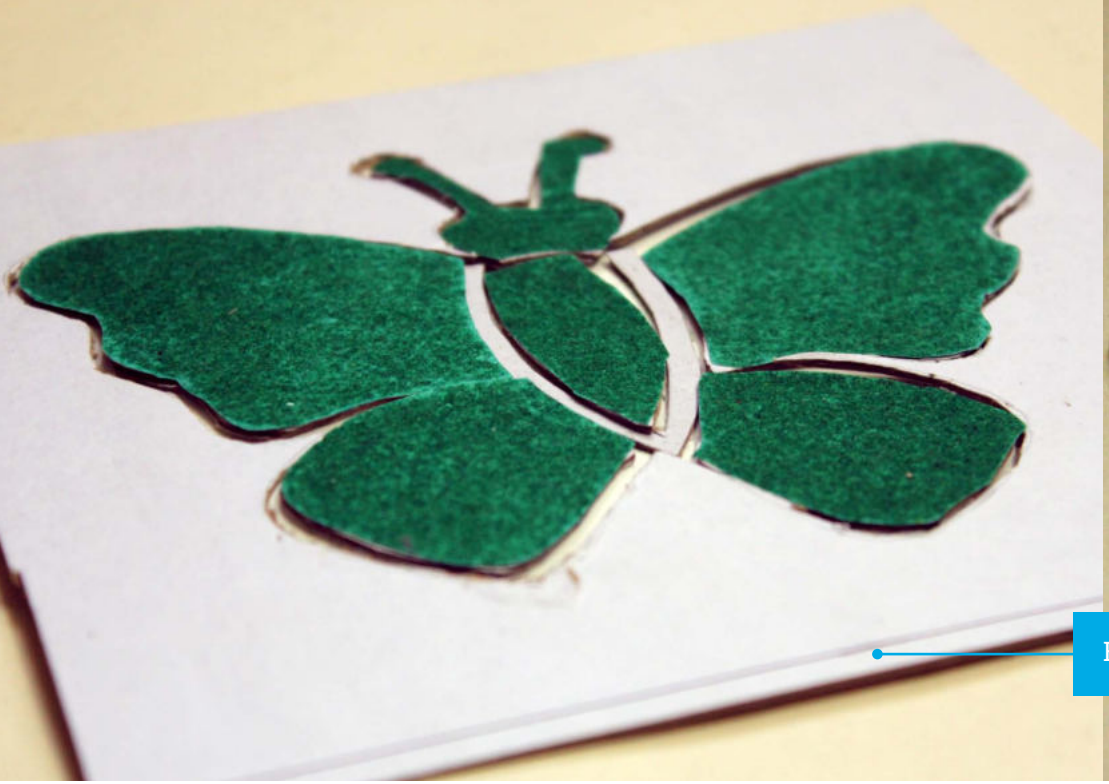
Reference point is very important for a child to get correct location.

Idea was basic and it was not communicating better other than managing shapes in given space.

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

CONCEPT TWO-B

Puzzle with Texture Twist



About the Puzzle

Place the pieces in such a way that each shape can fit in each part

Creative, Imaginative, Safe

Textured pattern at one side

Raised reference line at the bottom.

Findings

Communication and co-ordination between tactile and the brain,

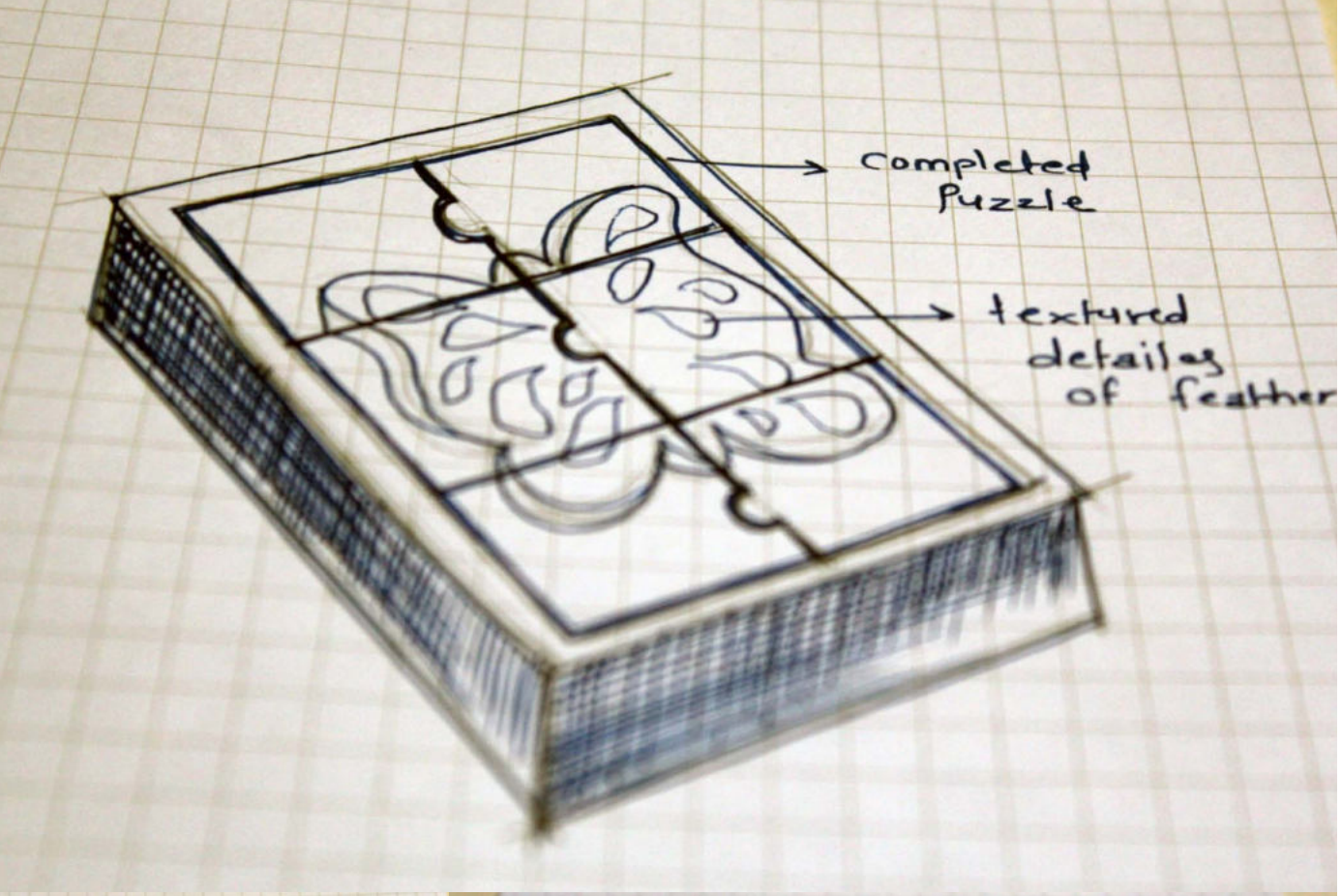
“No individual attention required”

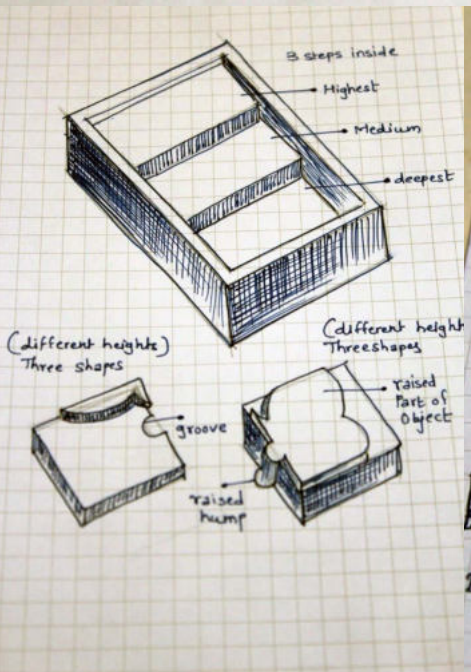
There is absence of 3D objects

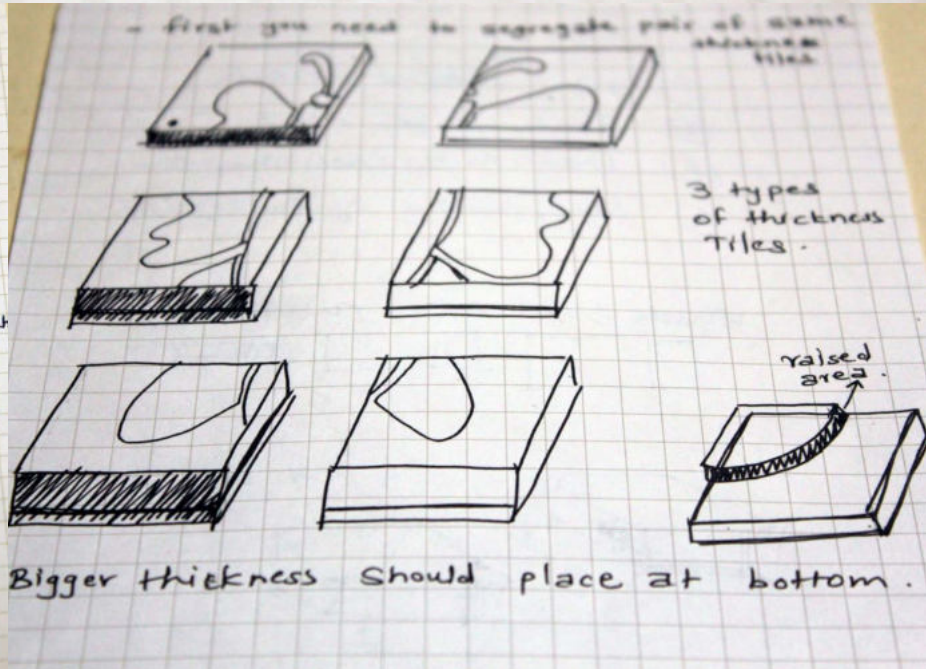
Can introduce interlock system to make it more playful

CONCEPT THREE

Pre-Braille Development Aid







Audio input (Butterfly poem & instructions in CD)

A board which has three steps inside.

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.

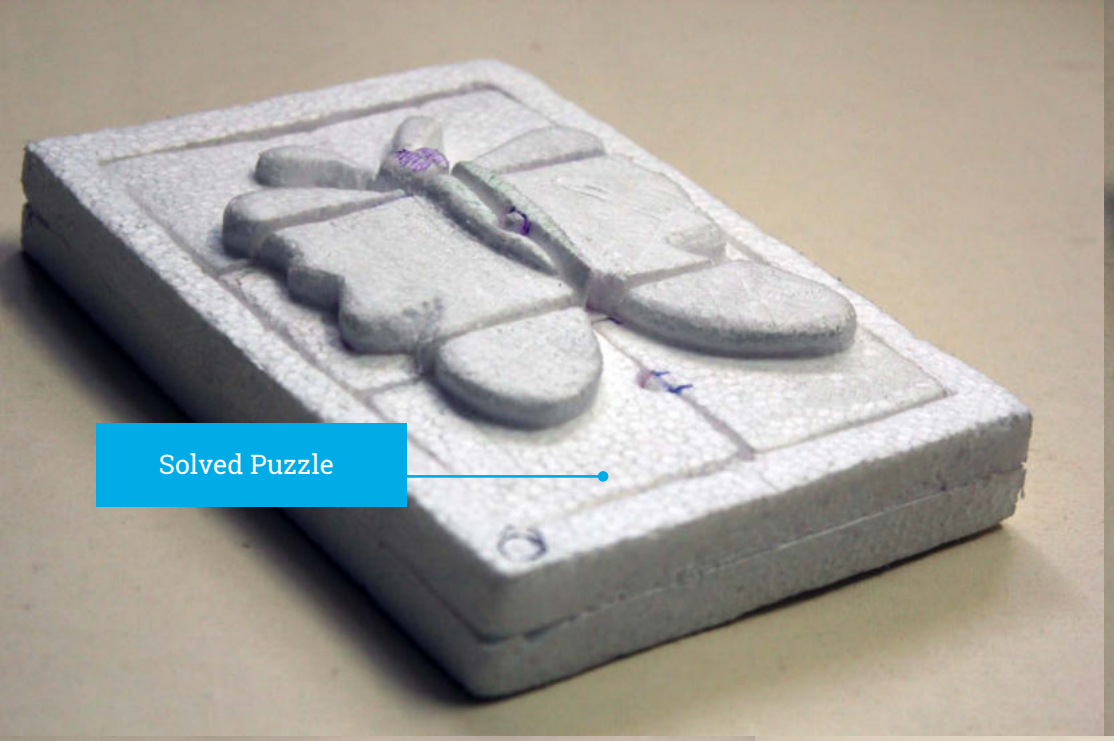
Group up tiles which are of the same height.

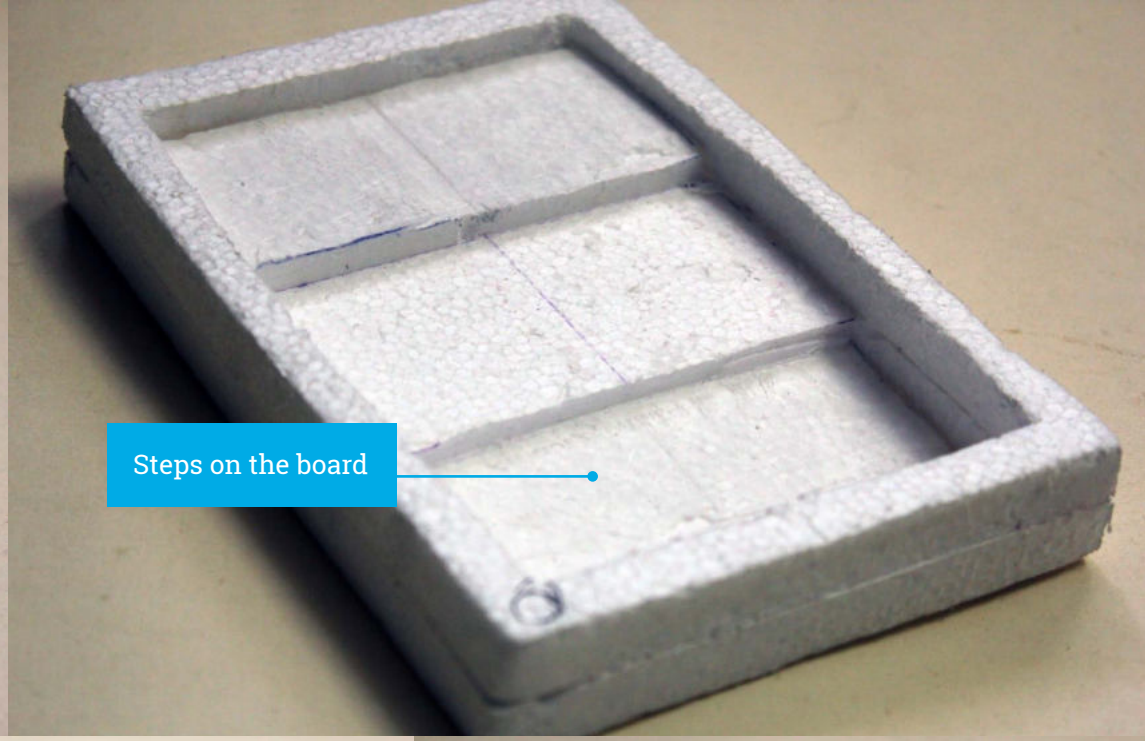
Put tiles in correct location and order

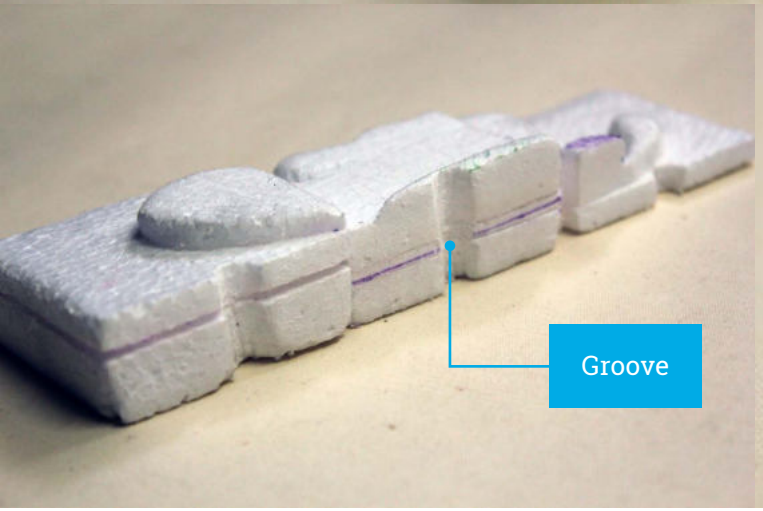
- Total product orientation
- Each shape orientation
- Location of each shape
- Combination of two box location

FIRST PROTOTYPE

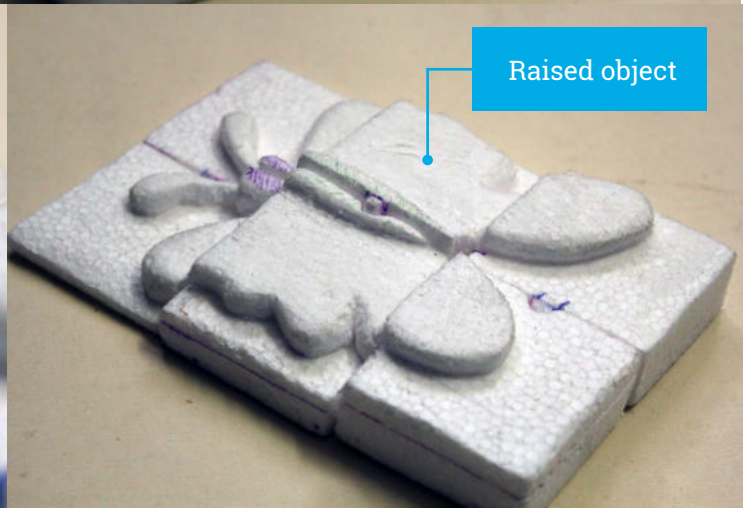
Pre-Braille Development Aid
Material - Thermocol


Solved Puzzle


Steps on the board


Groove


Raised hump


Raised object

PROTOTYPE TESTING

Pre-Braille Development Aid
Sighted Users with blindfold

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

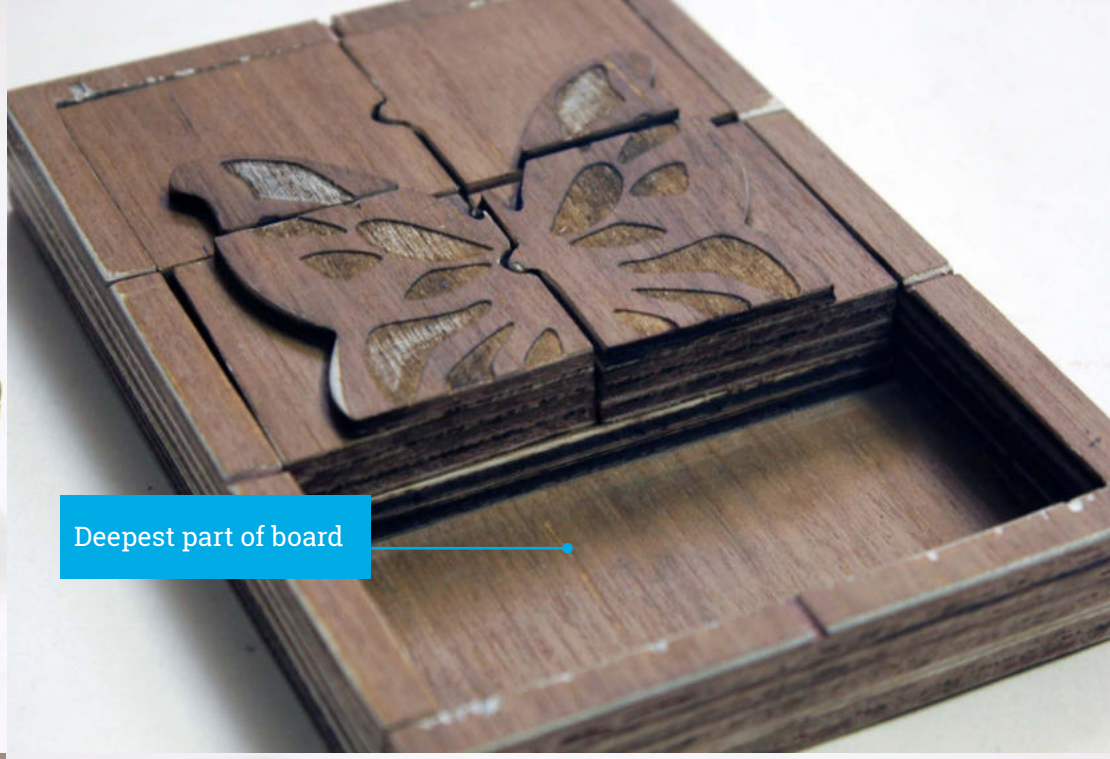
Confusion between medium and thick level of height

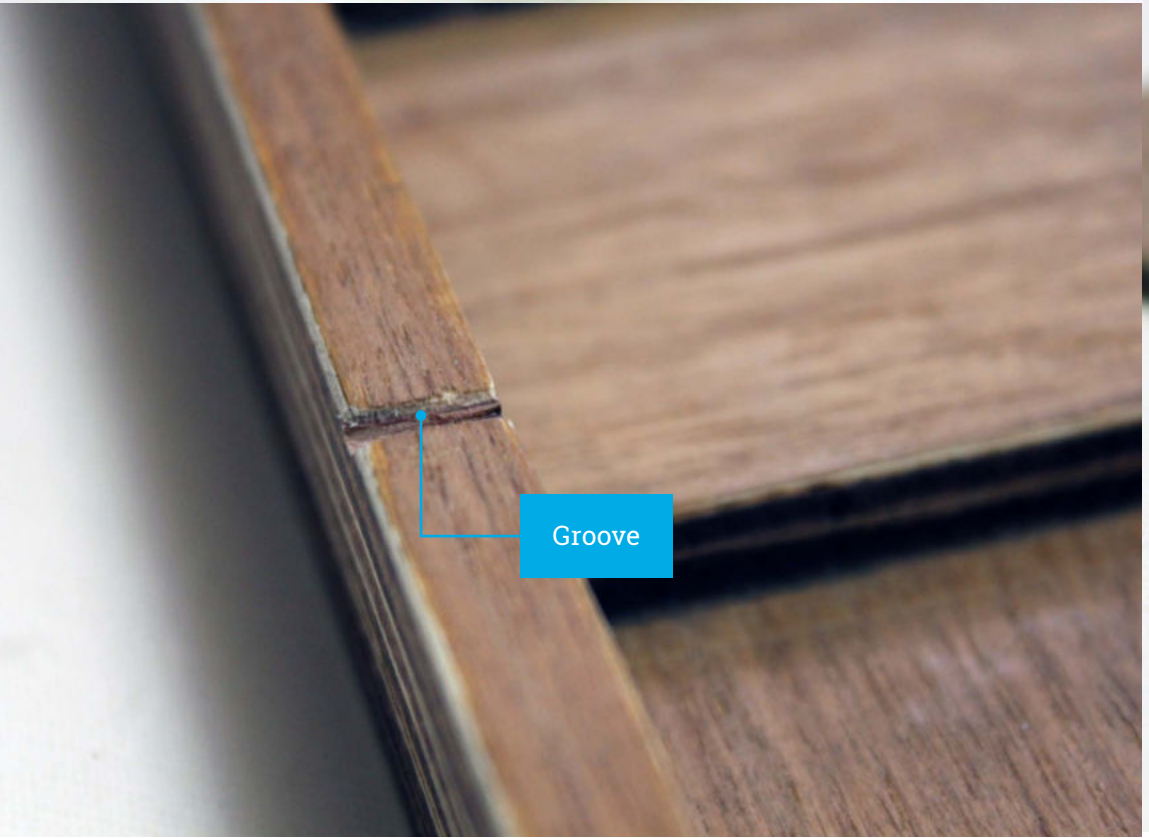
Board orientation

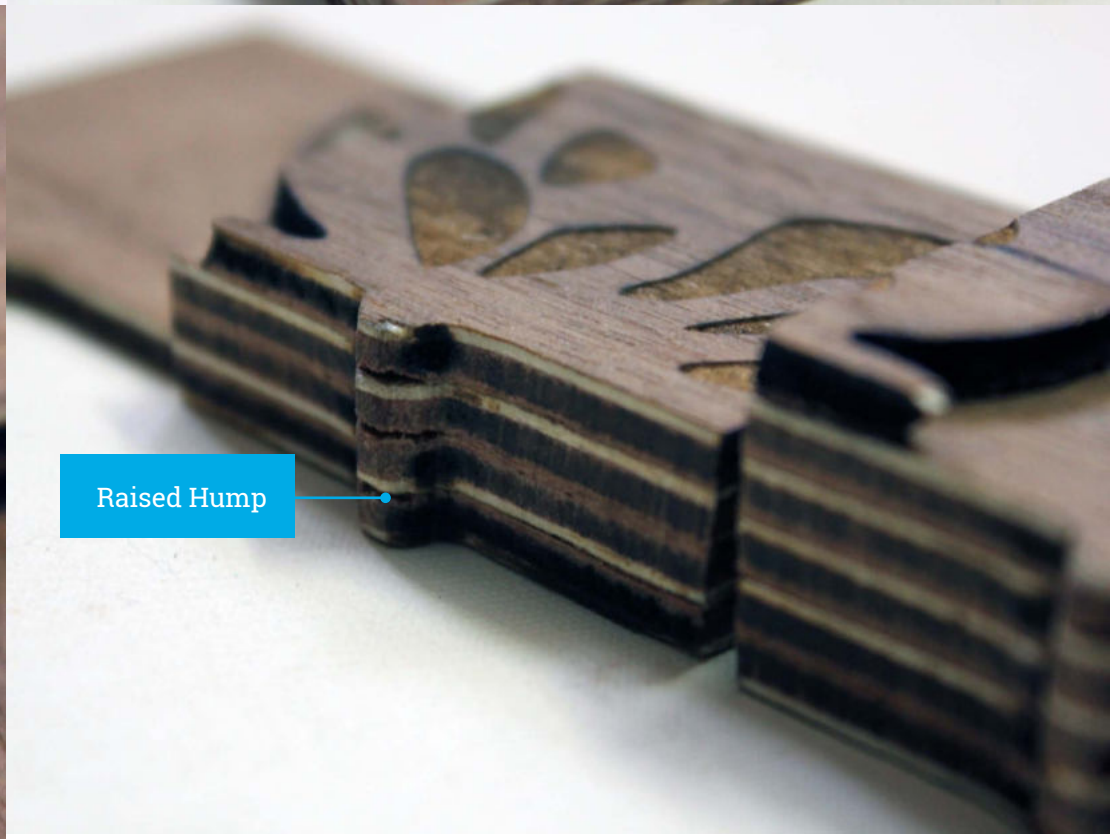
SECOND PROTOTYPE

Pre-Braille Development Aid
Material - Wood (Veneer)

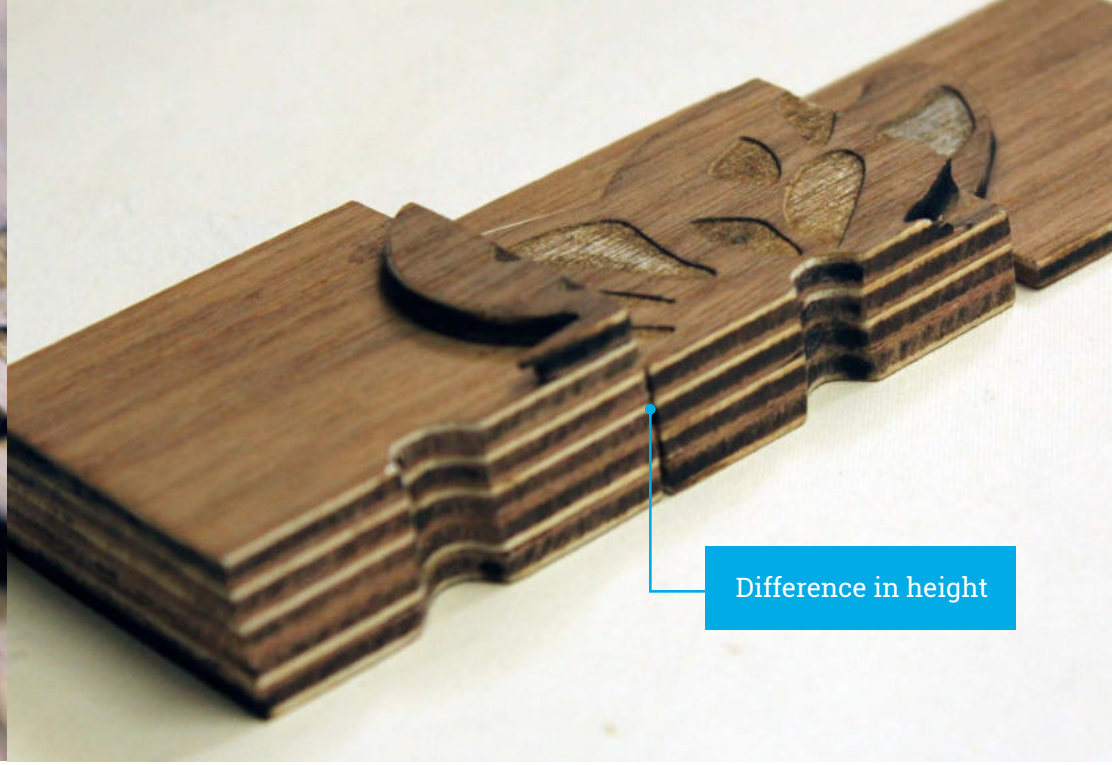

Solved Puzzle


Deepest part of board


Groove


Raised Hump


Textured Details


Difference in height

PROTOTYPE TESTING

Pre-Braille Development Aid
Blind girl - 6 years old

Findings

Difference between second and third level height of shapes identified

Detailing on the feather of butterfly mentioned by user.

Problems

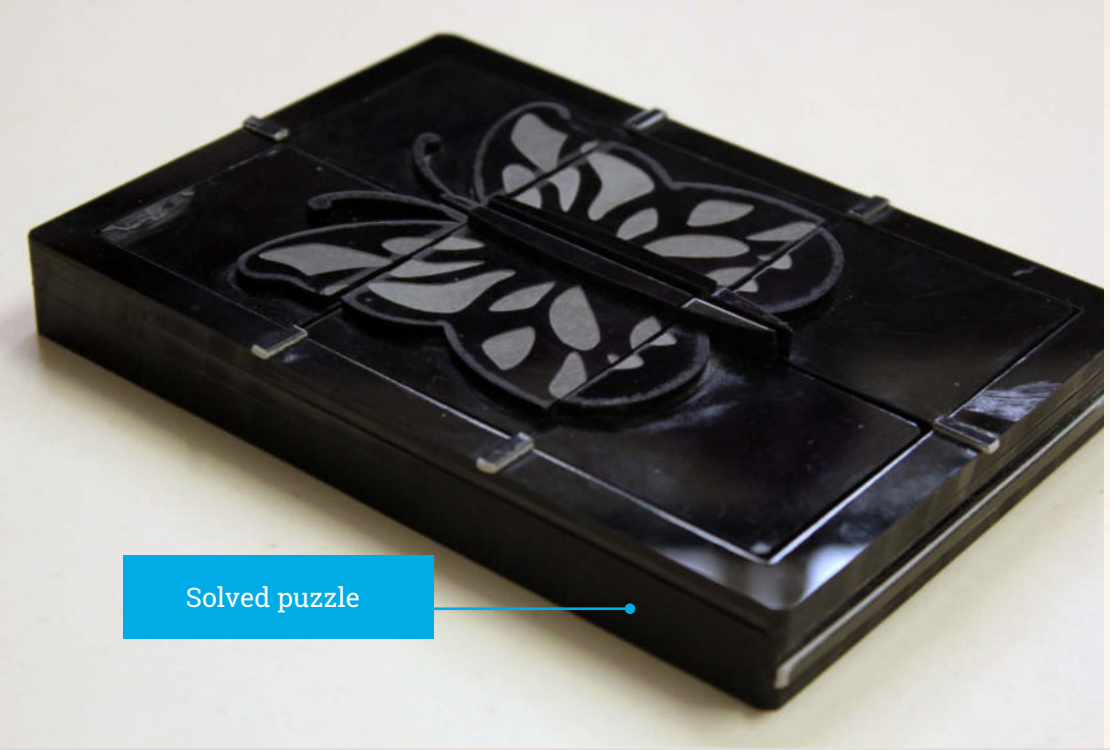
User did not notice the grooves on the four sides of the board.

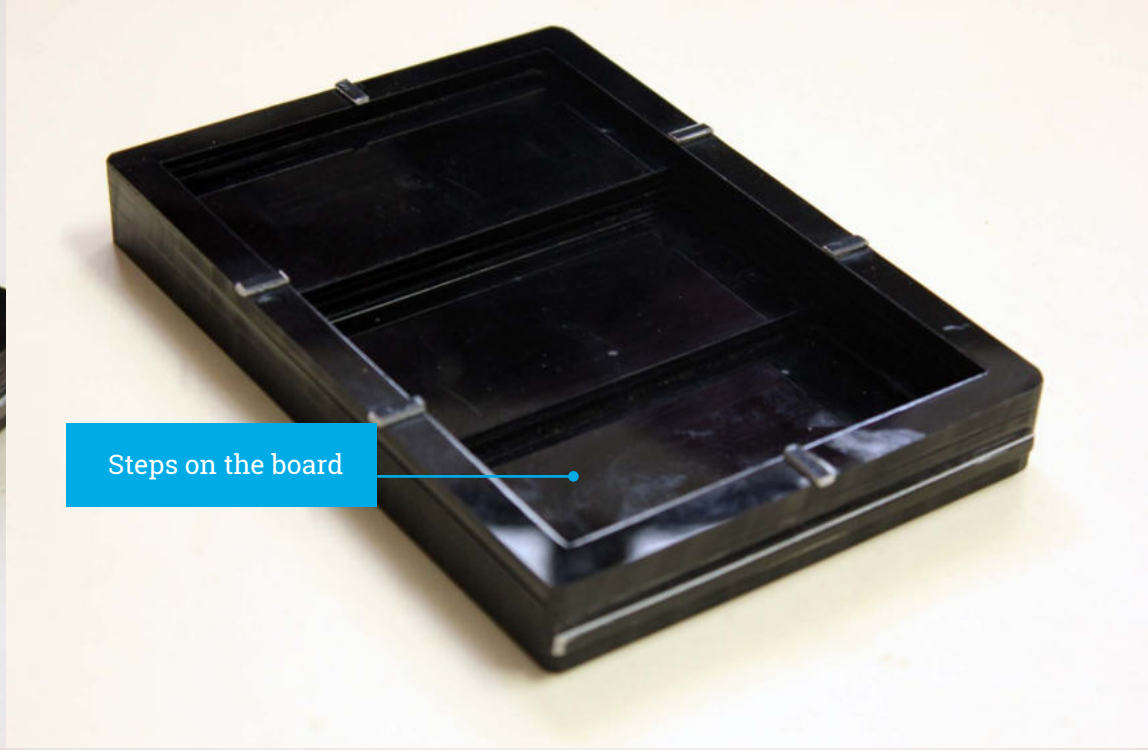
User was confused with the total board orientation

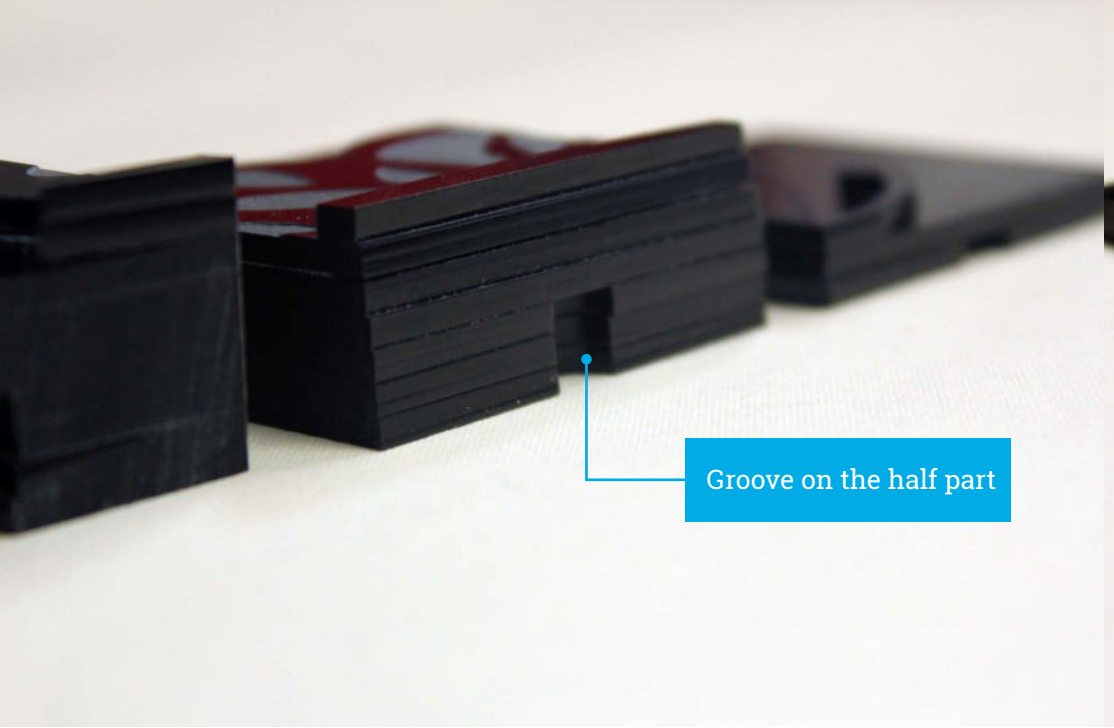
Wooden model should be finished or find some alternative material

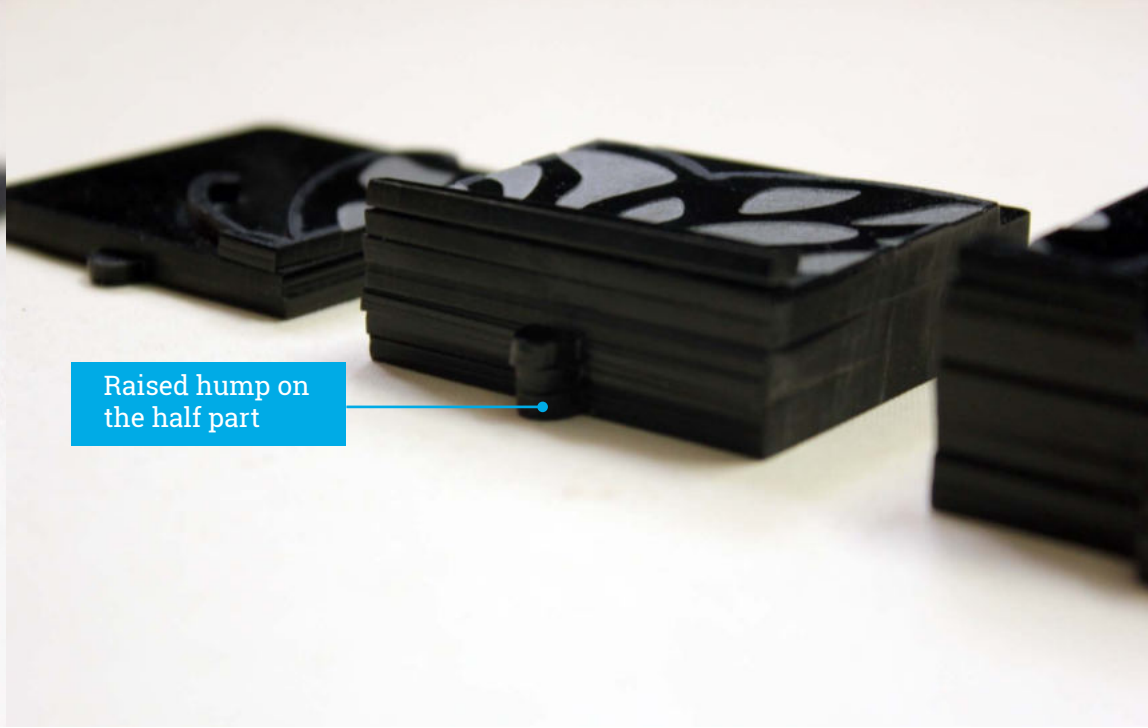
FINAL
WORKING MODEL

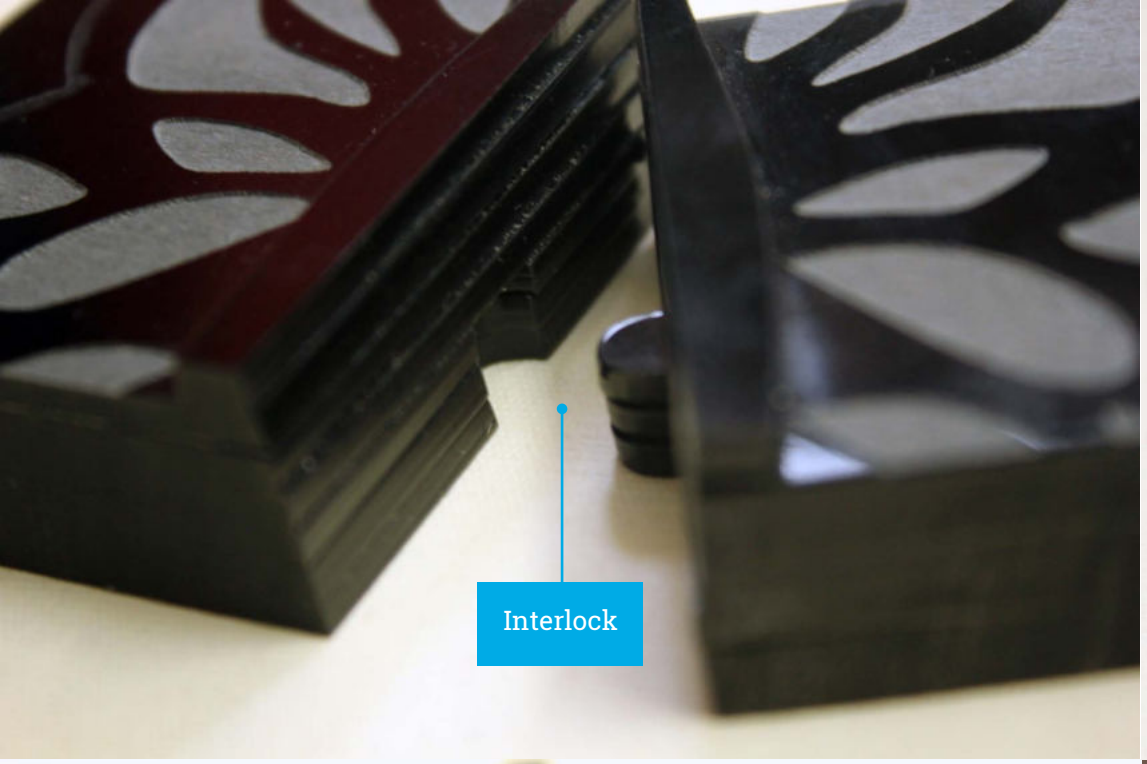
Pre-Braille Development Aid
Material - Acrylic

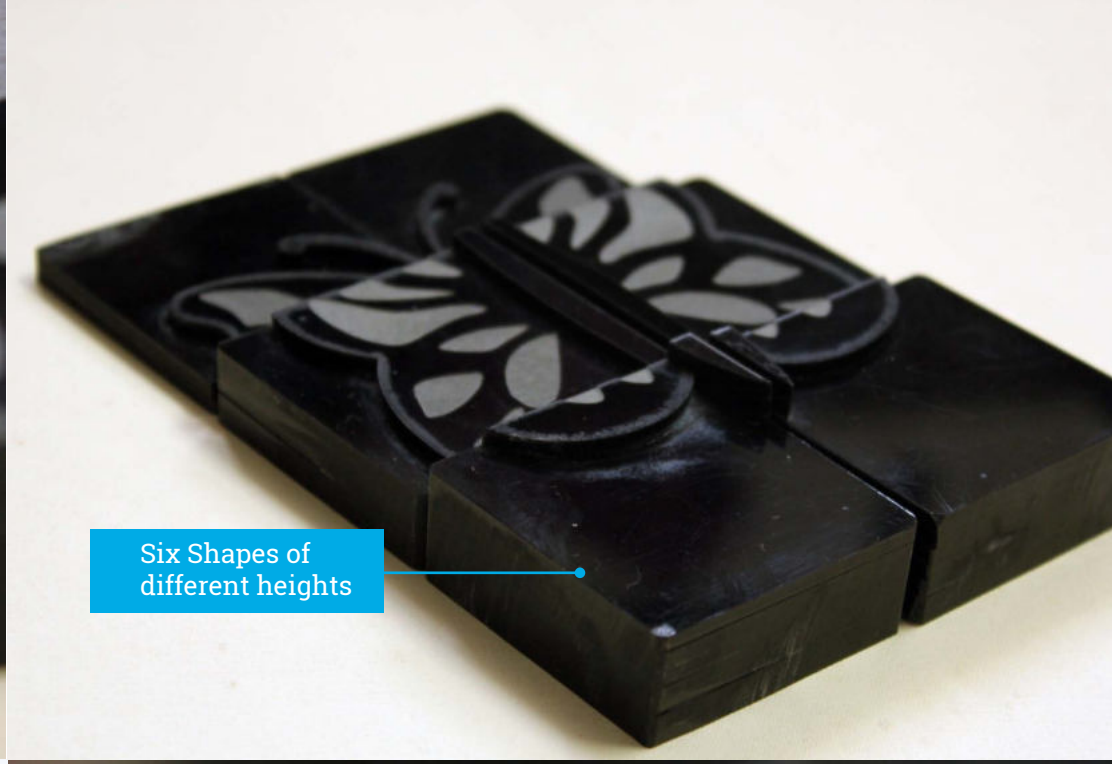

Solved puzzle

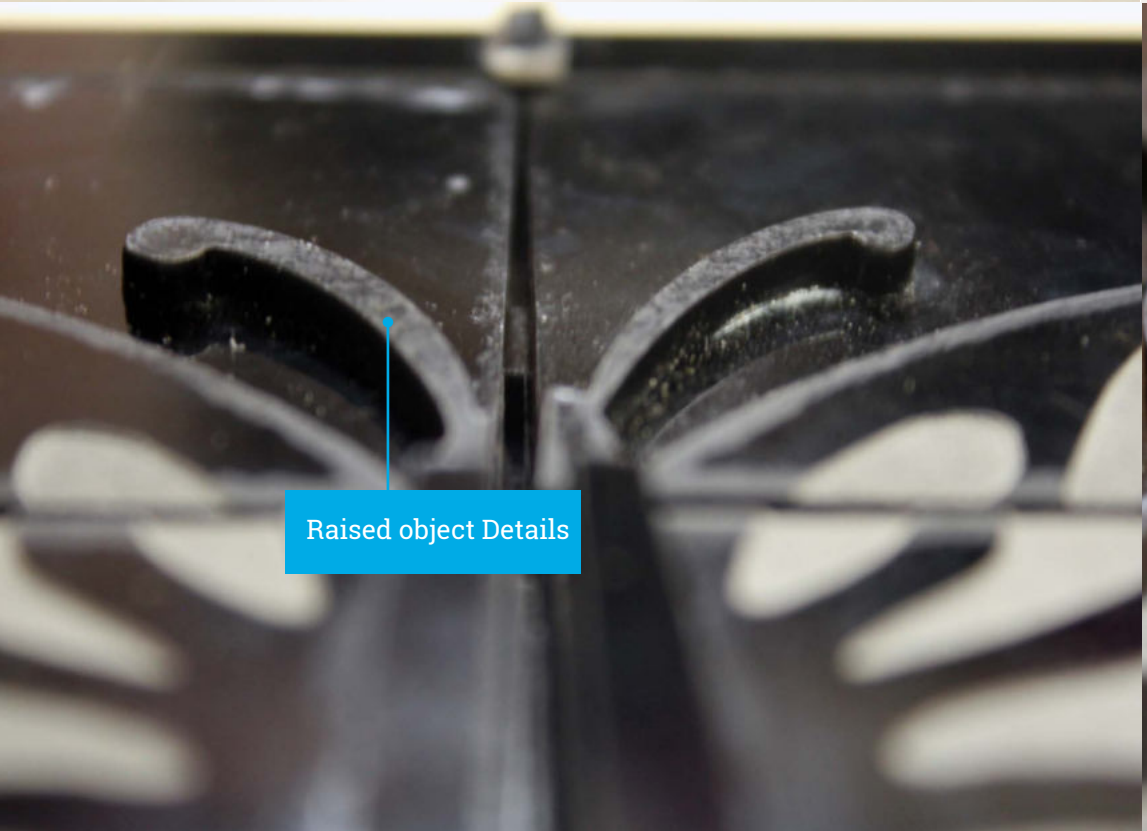

Steps on the board

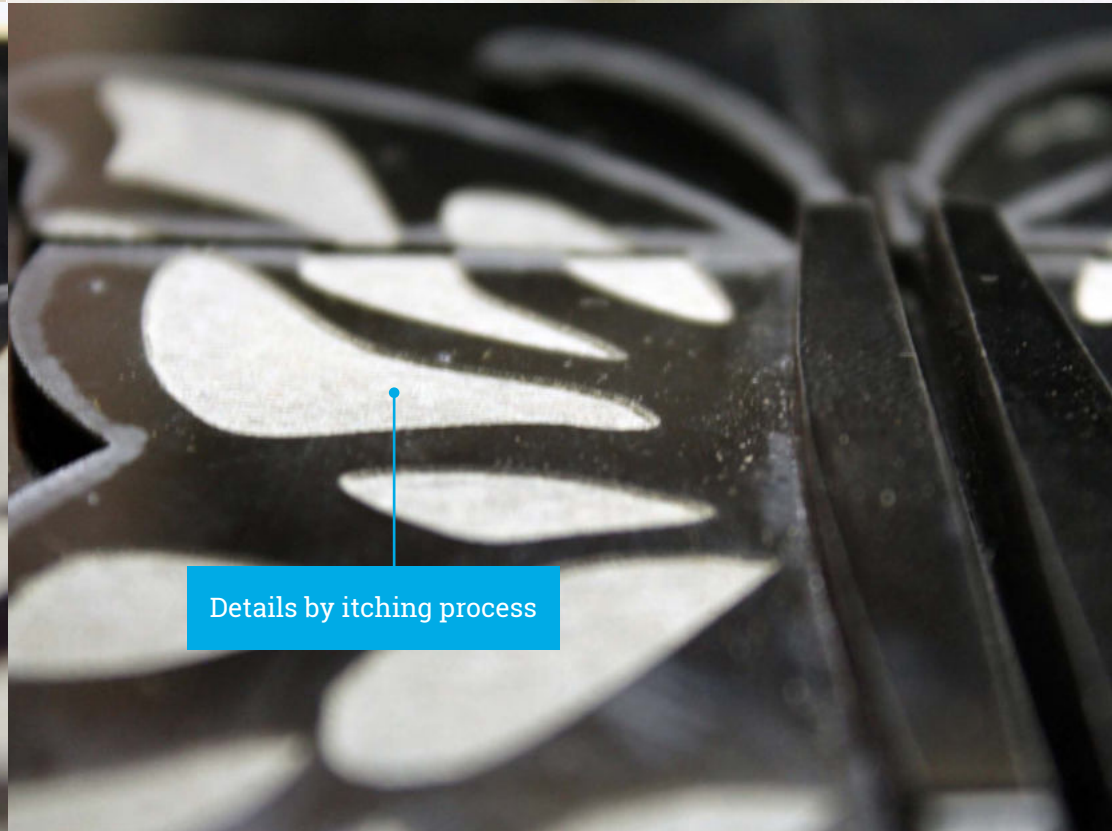

Groove on the half part


Raised hump on
the half part

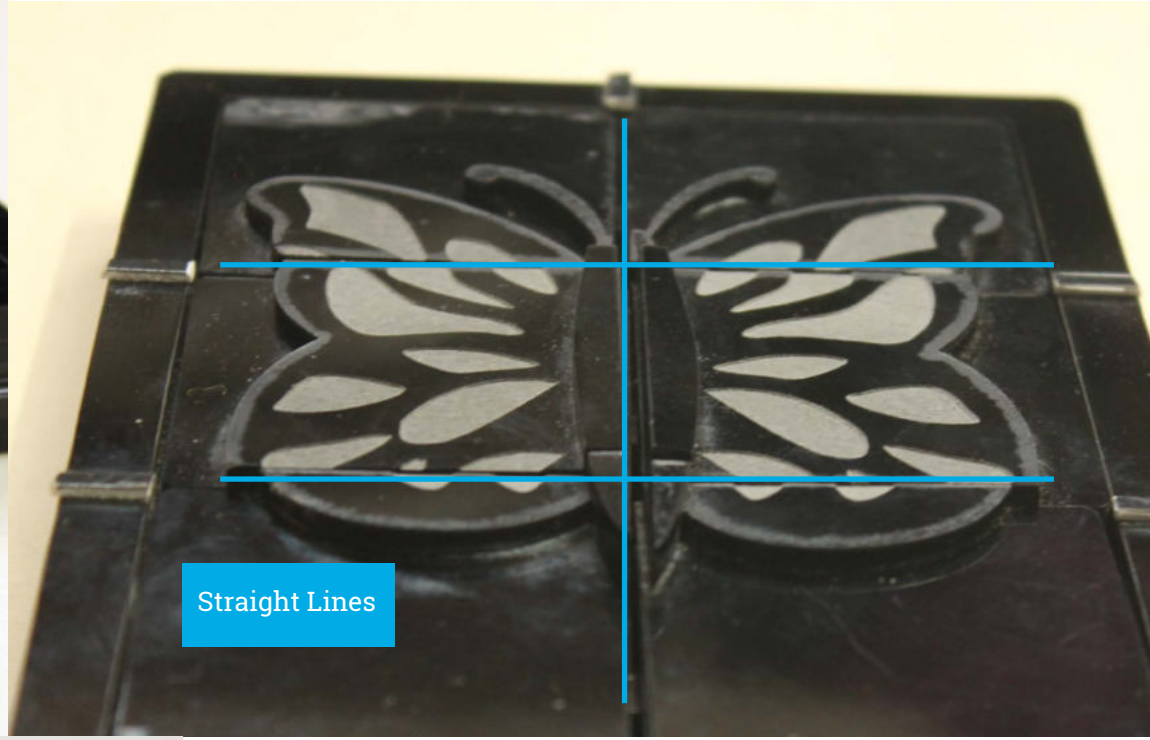

Interlock

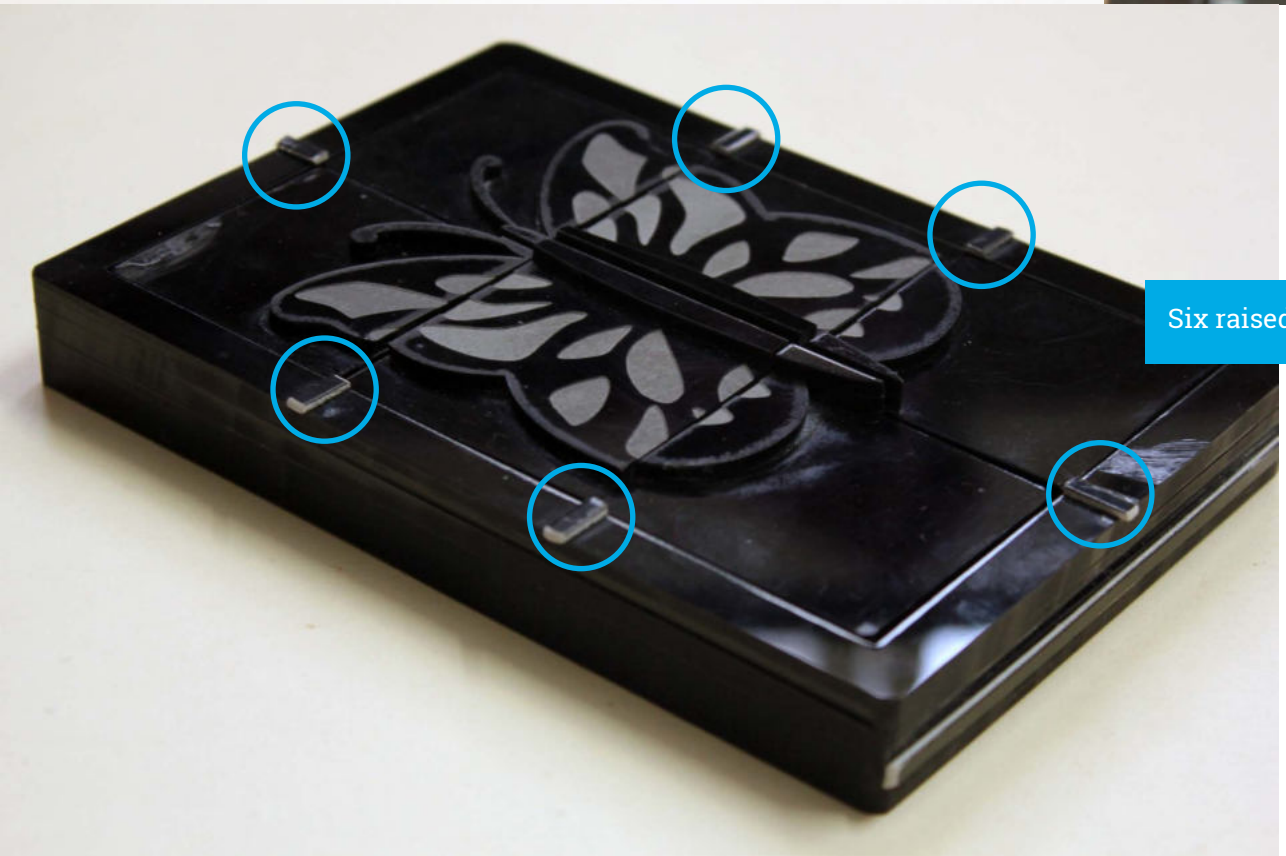

Six Shapes of
different heights


Raised object Details


Details by itching process


Raised line for reference


Straight Lines


Six raised hump on the top of the board

USER TESTING

Pre-Braille Development Aid
Blind girl - 5 years old

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?

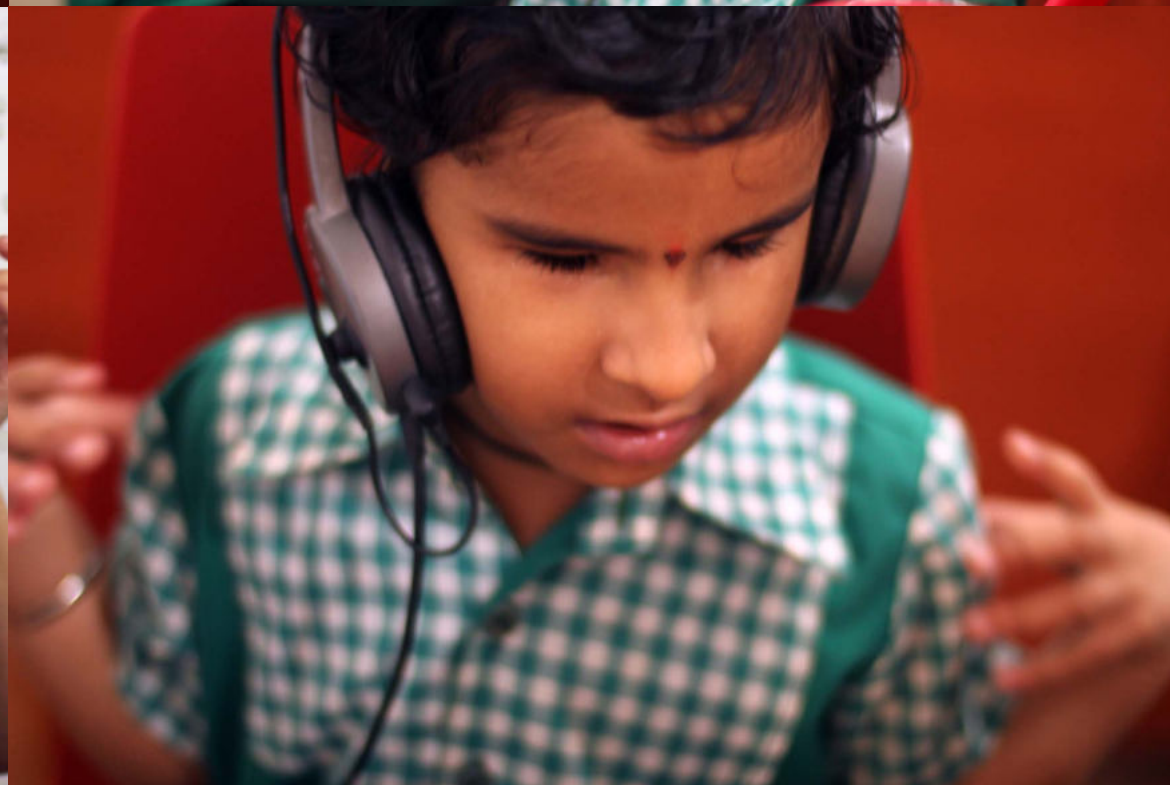
Butterfly Butterfly
Even I want to try
butterfly Butterfly
Will you teach me fly?

Why I like you?

AUDIO JINGLE


C
CIRCLE

C
CIRCLE



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.

Findings

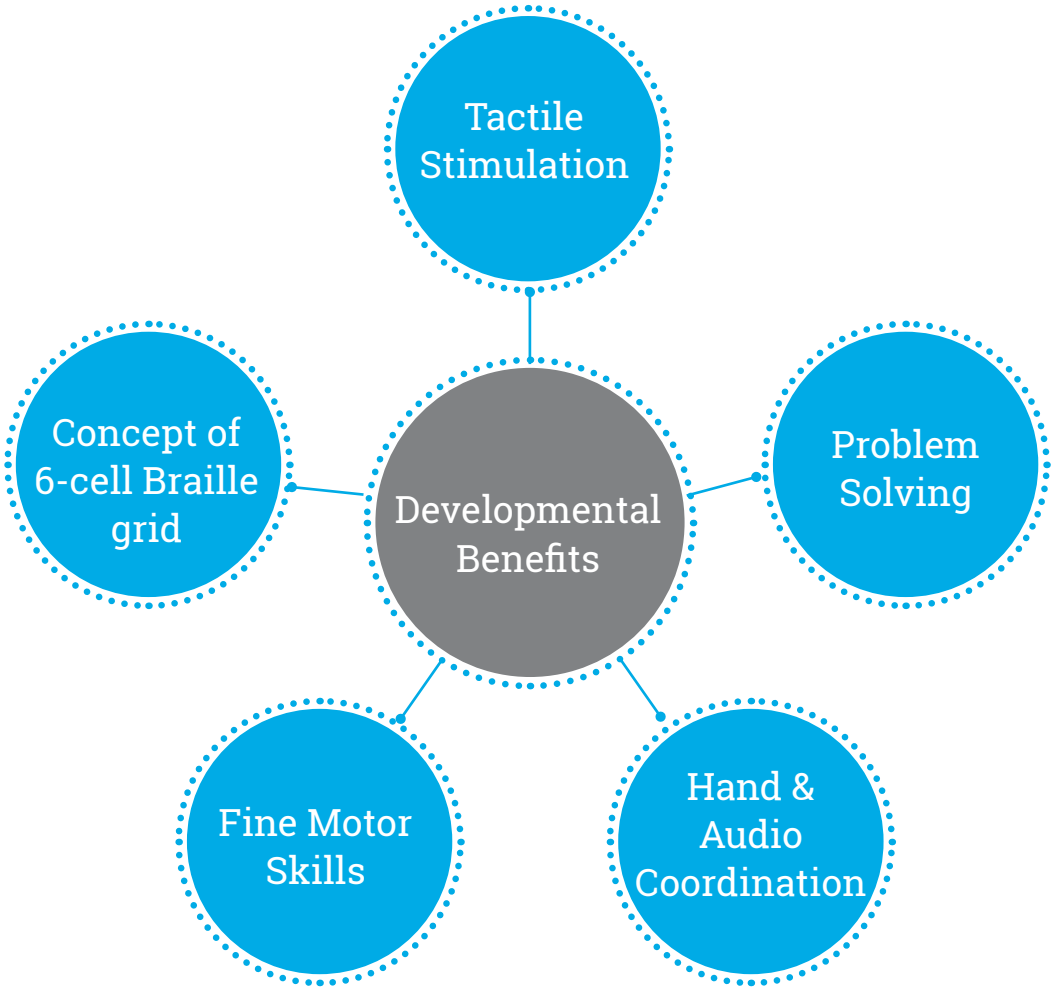
Board orientation was easy because of raised line on one side of the board.

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


Tactile Stimulation
Concept of 6-cell Braille grid
Developmental Benefits
Problem Solving
Fine Motor Skills
Hand & Audio Coordination

EVALUATION PLAN

Question to be answered after testing

Are the instructions precise and easy to be understood by visually impaired children?

Can the child differentiate between the varied heights of the objects?

Are the children following the reference point correctly?

After joining the puzzle, are the children getting the correct object?

Coordination between 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?

EVALUATION RESULT

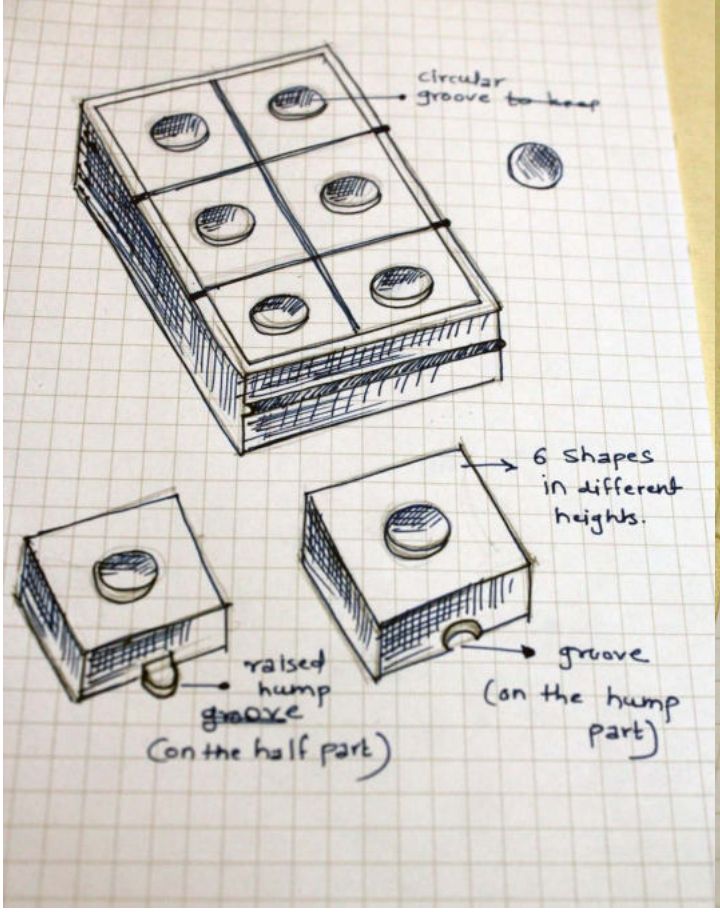
Question to be answered after testing	
Are the instructions precise and easy to be understood by visually impaired children?	✓
Can the child differentiate between the varied heights of the objects?	✓
Are the children following the reference point correctly?	✓
After joining the puzzle, are the children getting the correct object?	✓
Coordination between audio and tactile?	✓
Do the children get confused at certain points?	X
Can they play independently?	X
Is the material used in making the puzzle friendly to the children?	X

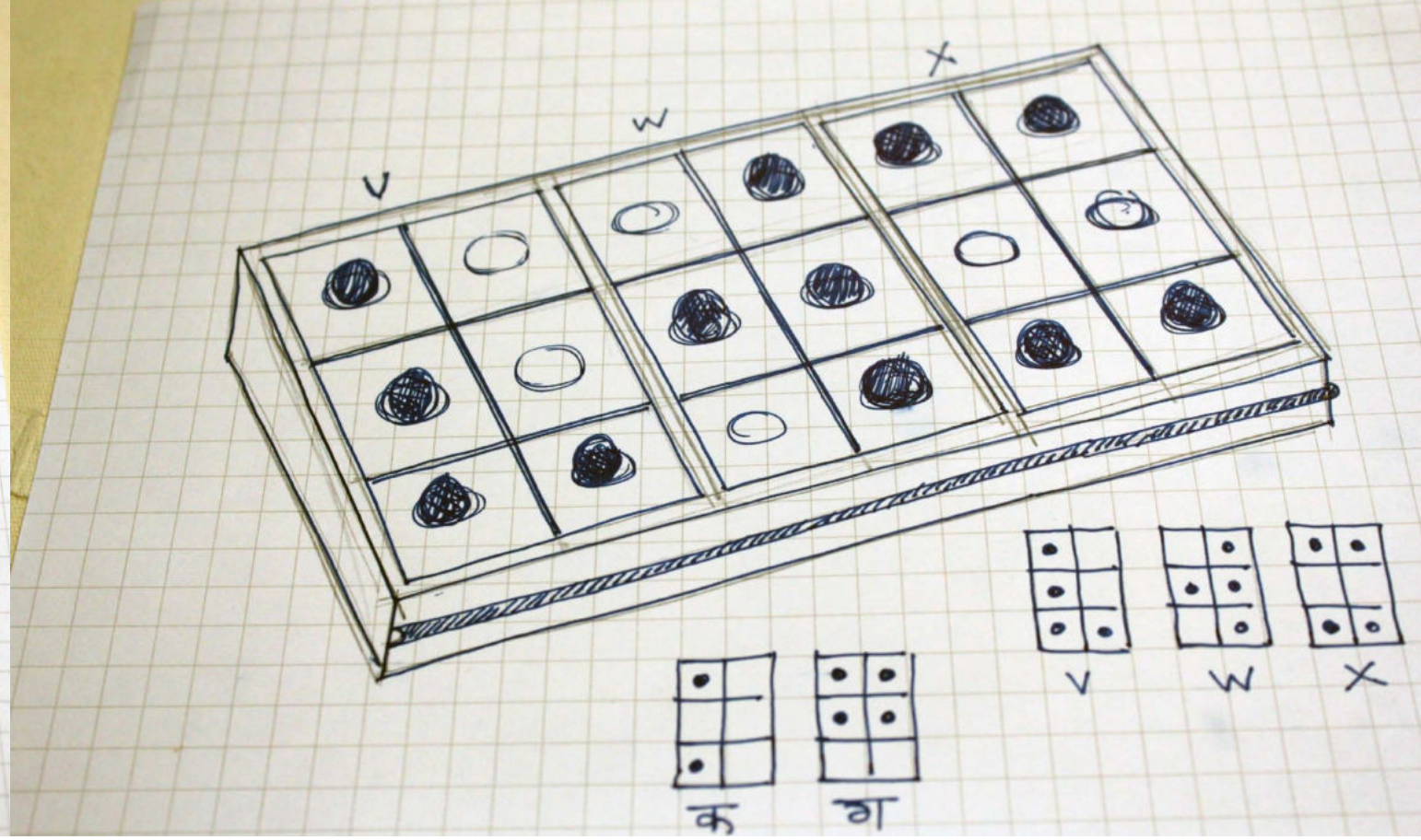
VIDEO

Blind school environment, discussion,
product testing and feedback

FURTHER EXPLORATIONS

Pre-Braille Development Aid
+
Introduction of Braille





About the Puzzle

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

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Mrs. Meera Badve
Founder of
Niwant Andha Mukta Vikasalaya

Blind school visit was the turning point for her.

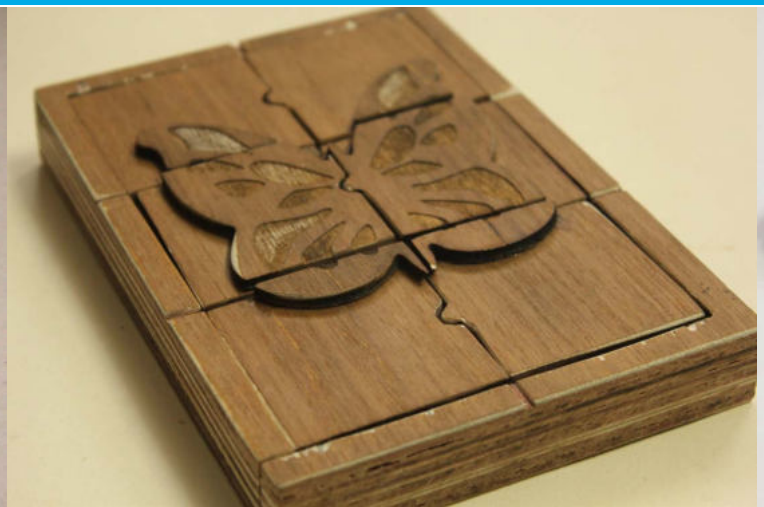
Working since 17 years for holistic development of visually-challenged young adults.

I read a small article about Niwant Andha Mukta Vikasalay

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

THANK YOU

Please Give your Valuable Feedback


REFERENCES

Movie

Scent of a Woman (1992)
Sparsh (1980)

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

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=

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

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

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

http://www.fittle.in/

http://barrierbreak.com/about-barrierbreak/
https://www.youtube.com/watch?v=lKDGHU3xjA0
http://sawareru.jp/en/

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

http://www.lilliworks.com/

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

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/

http://www.youtube.com/watch?v=9RJMKEJf63g

RESOURCES

Software And Tools
- Adobe Creative Suite
- Adobe Premier Pro
- Windows live movie maker
- Microsoft Office
- Online MP4 to MP3 Converter

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

Camera
Canon 550 DSLR
Lens - 18-55 & 50mm 1.4
Tripod - Simpex 333
Digicam - Canon Powershot

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

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
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