Product Design Project III

“Design of Teaching-Learning Aids for Blind Children”

PATRIC JOHN **146130005**

Guide : prof. R Sandesh

FRESH **START**

Possible areas for p3

Analysis & selection

Toy design for blind children

Blind

Definitions, basic terminology

Visual impairment | **Visual Disability** | Visual handicap | **Low vision** | Levels of visual impairment

Types of blindness | Causes of blindness **| Causes of Blindness in Infants**

Diagnosis | **Symptoms and signs** | Treatment

impact Of Visual Impairment On Development

Motor Development | Hands , Body , Self- Concept

Cognitive Development | Construct of World, Object Permanence, Causal Relationship, Constancy, Classification, Conservation

Social Development | Relationships, Self- Help

Language Development | Imitation, Use of Language, Personal Pronoun, Experience

Study on the products/aids/equipments/accessories for the blind

Alerting indicators, Identifiers/Labels/Tactile markers etc, Walking sticks and other mobility aids, Tools for assistance, Office items & stationary items, Kitchen etc.

Previous **IDC projects** in the related area

Primary data collection

NAB

(National Association for the Blind)

"We help the blind help themselves"

People i met

HOD, Educational Department.(NAB)
Teachers who give support and assistance in learning for the Blind children.

Areas for Design Intervention

(Need)Education - Teaching-Learning Aids for kids to understand/learn/familiarize/concrete the concepts of Maths(especially in Geometry)

(Opportunity) Skill development - Toys/Games/products/aids to develop various skills of children.

(Opportunity) Vocational training - Developing tools/products/aids/ for vocational training

XRCVC

The Xavier's Resource Centre for the Visually Challenged

Breaking Barriers... Achieving Access

People i met

Teachers who give support and assistance in learning for the Blind children.

Areas for Design Intervention

(Opportunity) Education - Teaching-Learning Aids for kids to understand/learn/familiarize/concrete the concepts of Maths & Science.

Education- Maths
(Need)

Skill Development
(Opportunity)

Vocational Training
(Opportunity)

Objective : To help blind children, to continue with regular maths after upper primary standard

To identify the **"Method"** for further progress, I need to

2.Study and a look at the existing methods/ways of learning/understanding the Maths

1.Study and a look at the existing methods such as Learning aids, Teaching aids and Games with the centre.

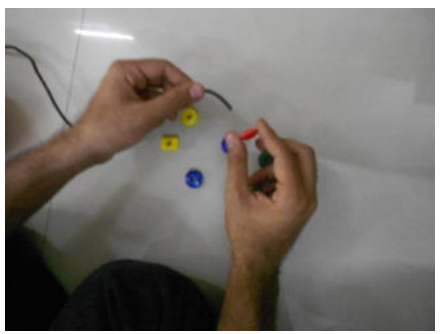
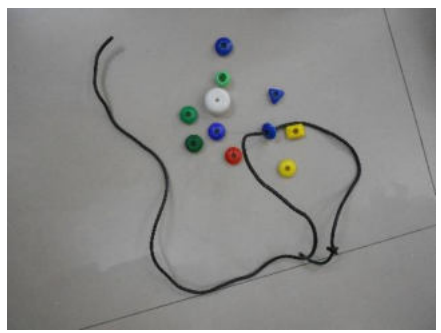
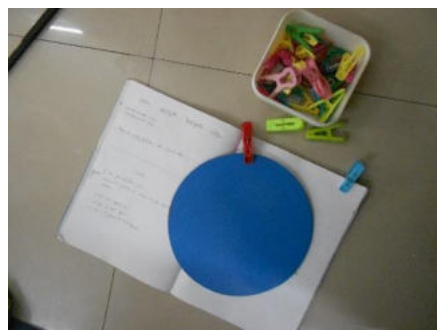
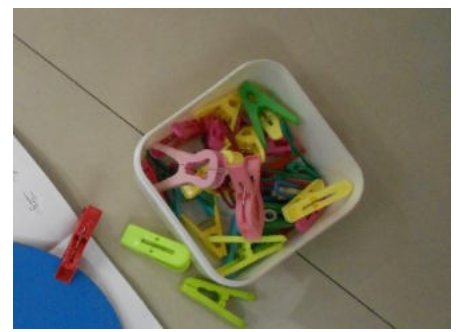
Study and a look at the existing methods such as

Learning aids, Teaching aids and Games with the centre.

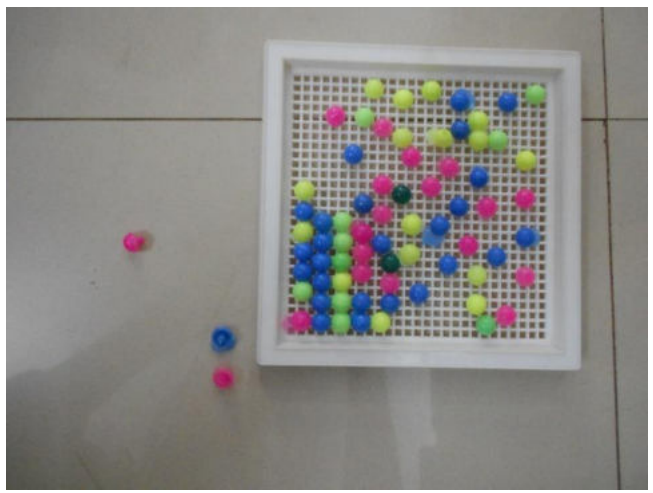
“ABC” of tactile learning

Beginning to learn

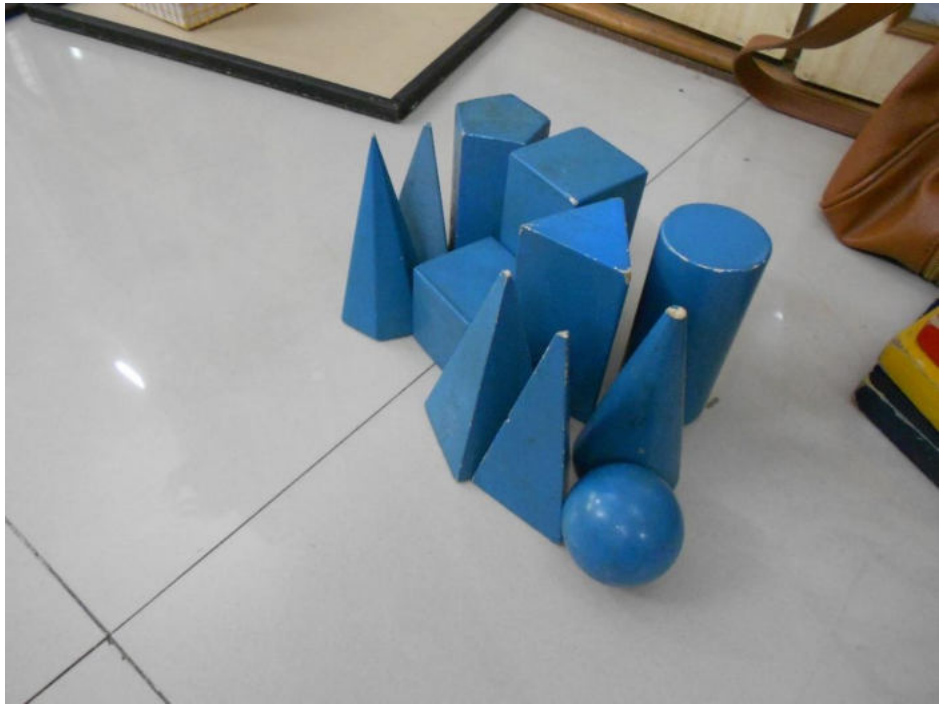
Before starting to learn about shapes, sizes, other attributes of objects the blind children have to develop good motor skills to hold,use and “identify” objects using their hands.

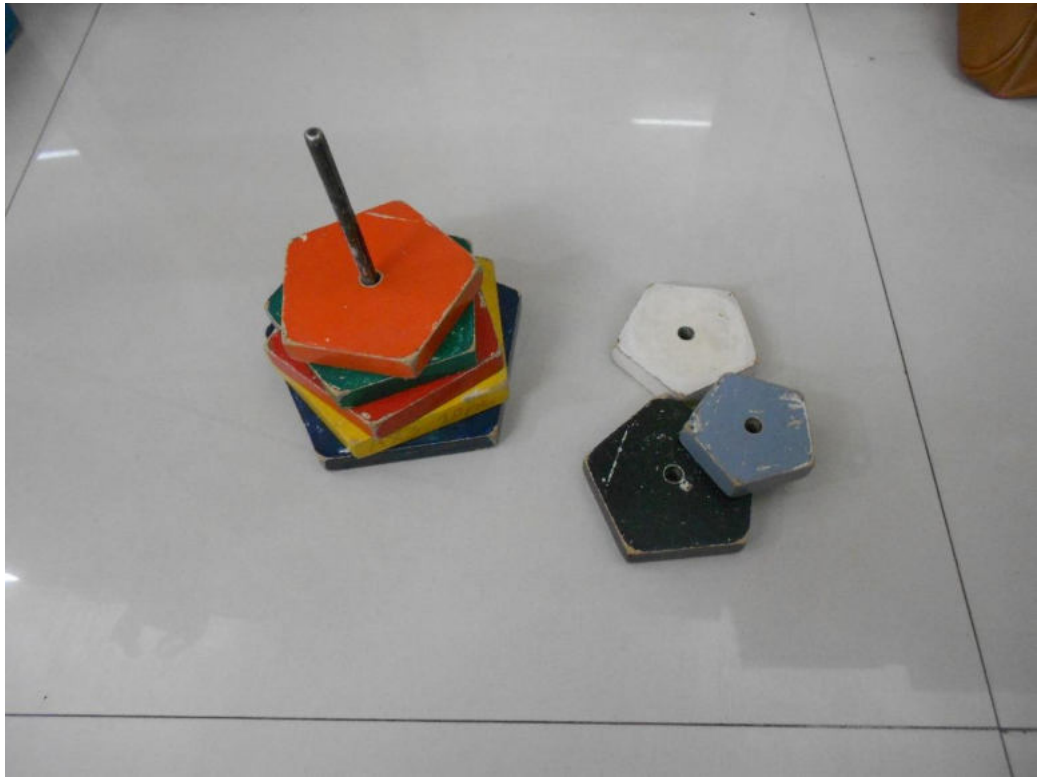





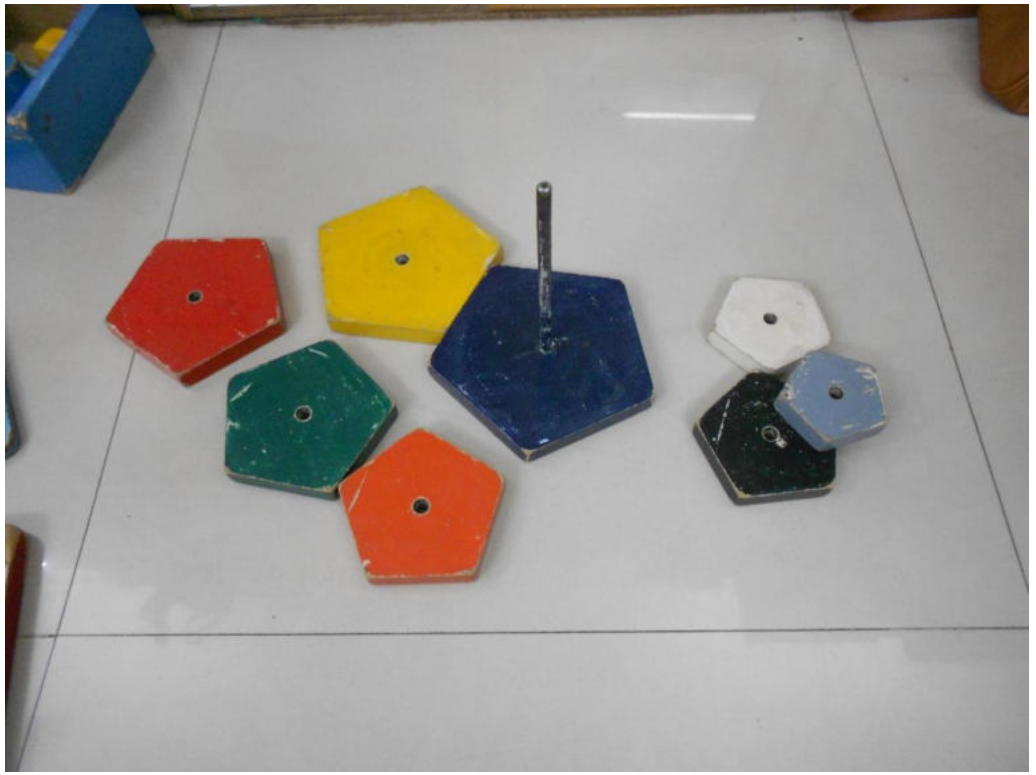


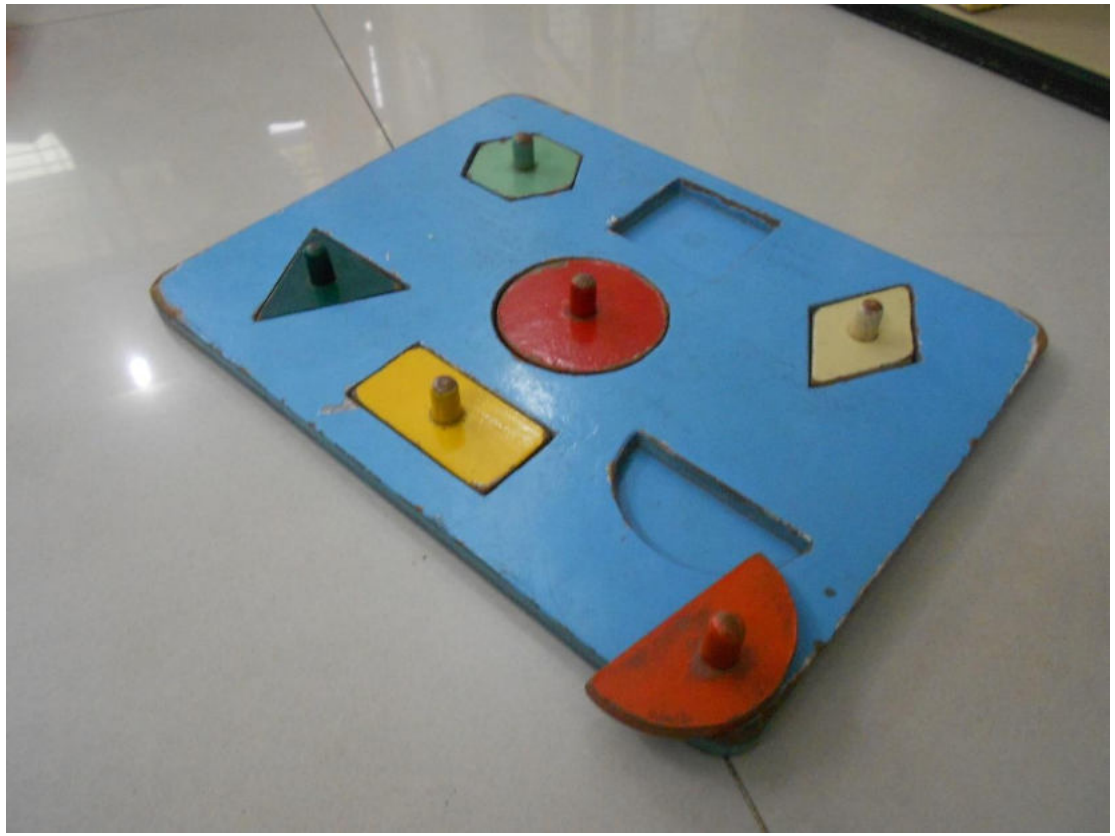



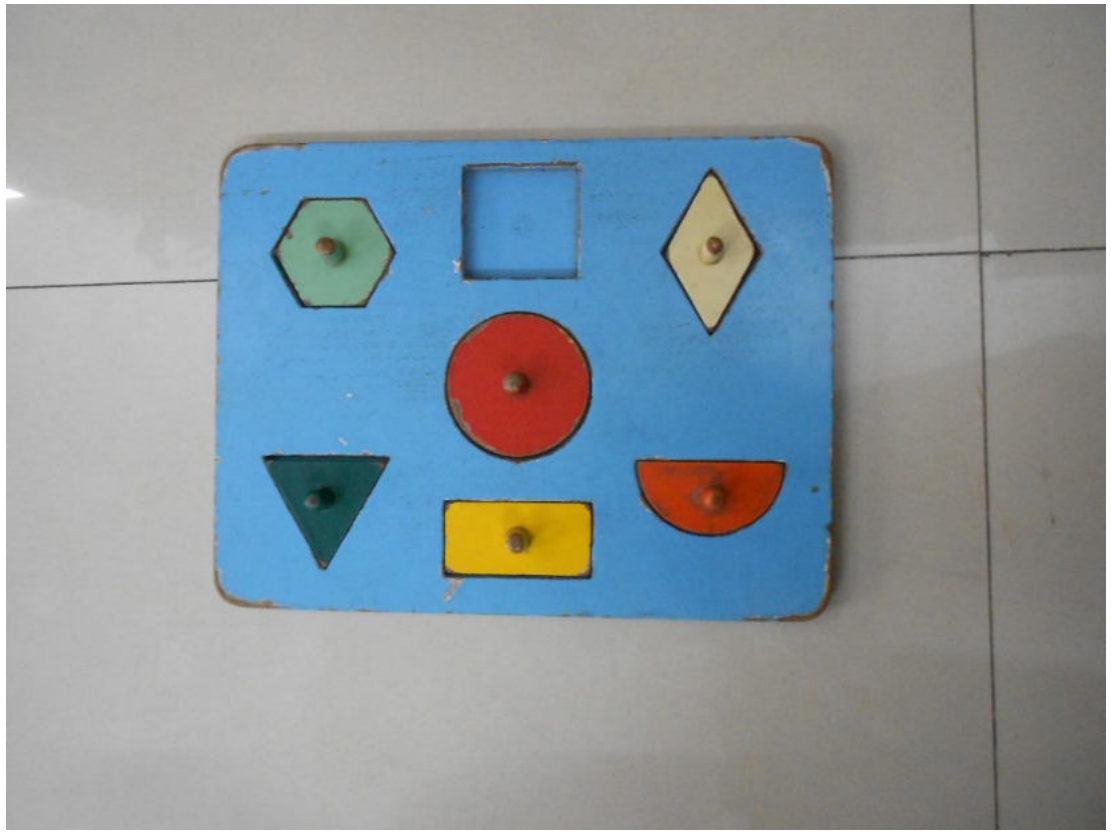

“ABC” of tactile learning

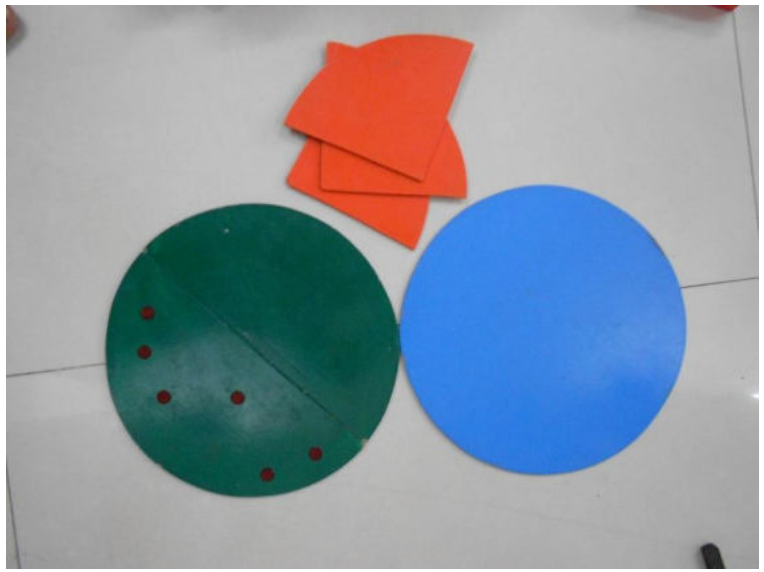


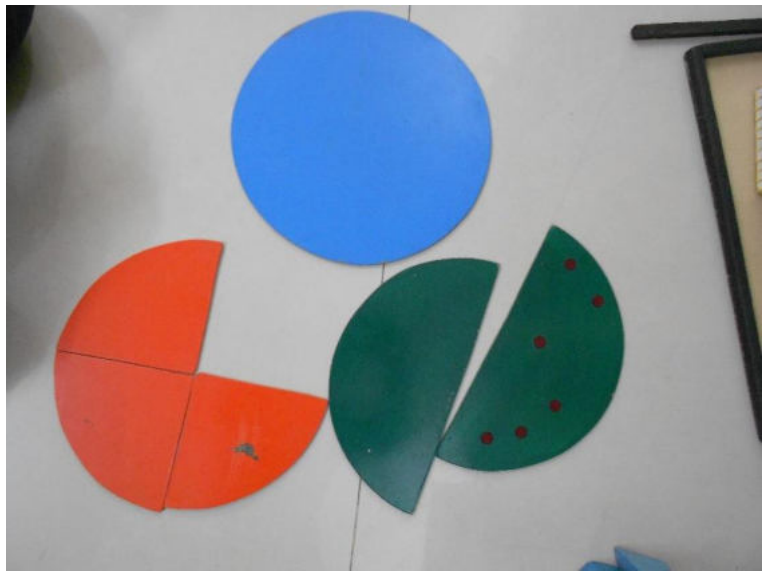






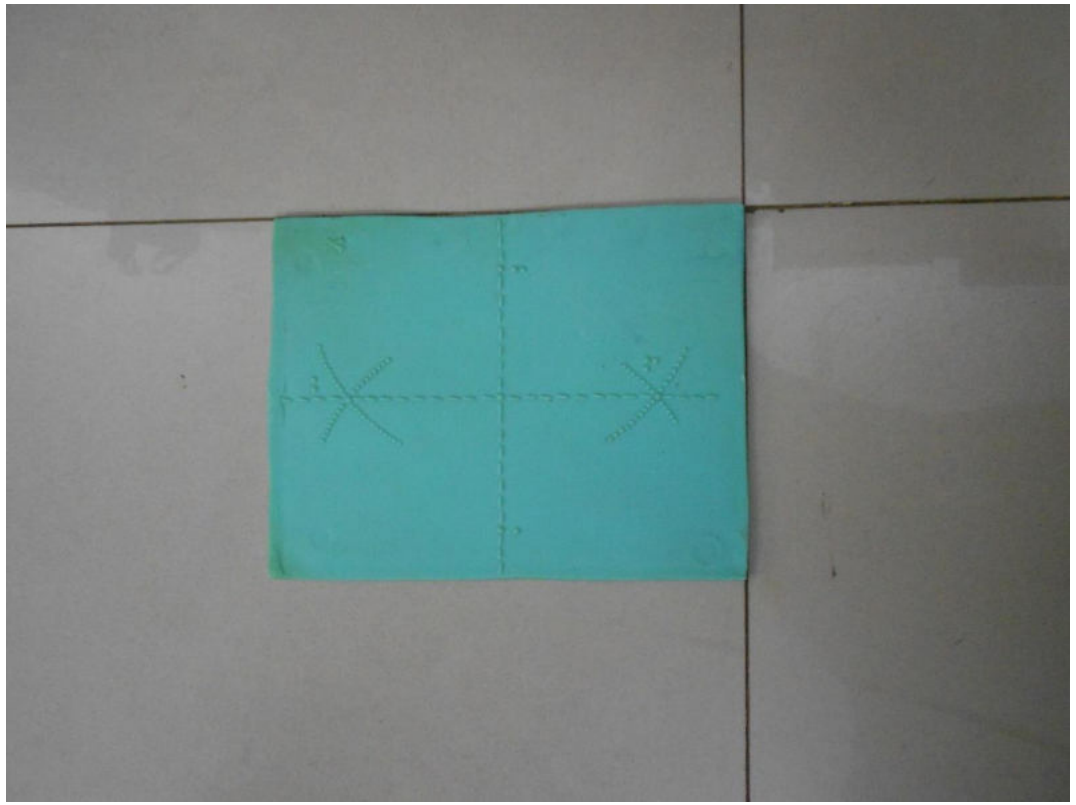


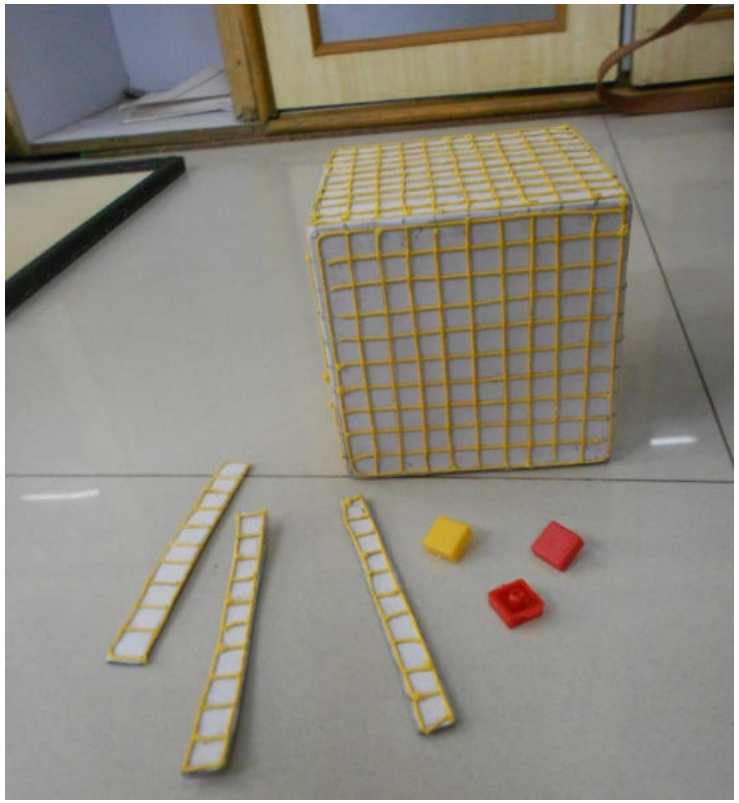


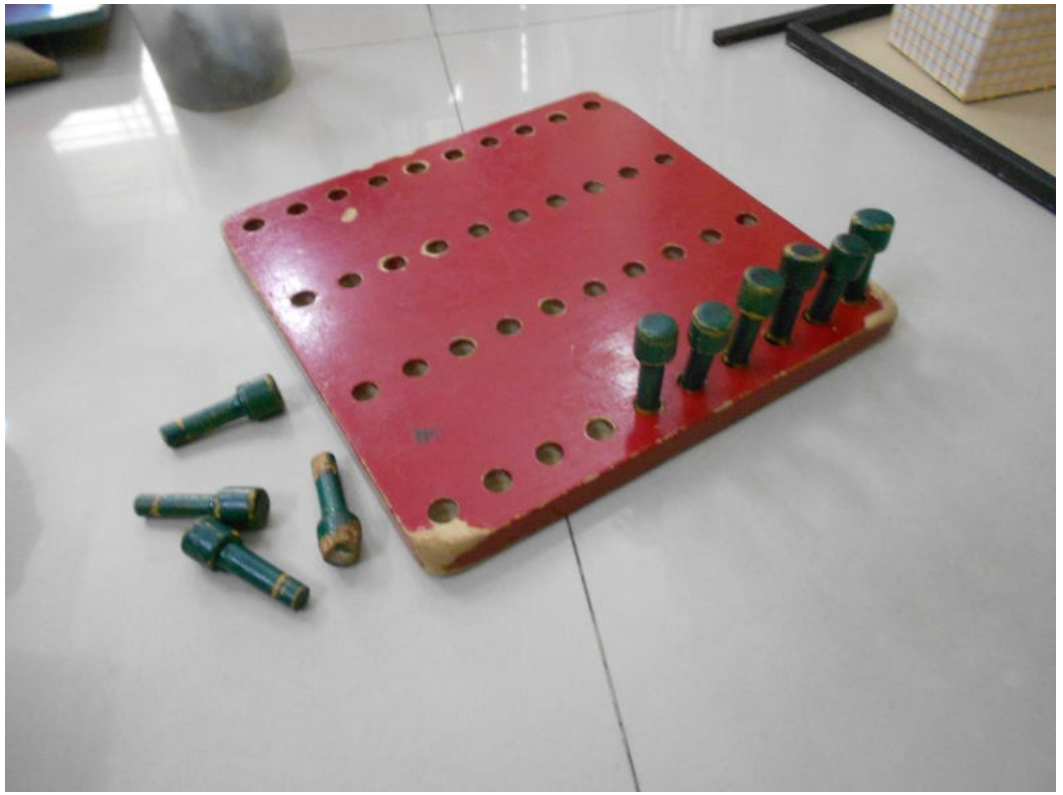



२ कि.ग्रा.
२
कि.ग्रा.
१ कि.ग्रा.
१
कि.ग्रा.
५००ग्राम
५००
ग्राम
२००ग्राम
२००
ग्राम
१००ग्राम
१००
ग्राम
५० ग्राम
५०
ग्राम
२० ग्राम
२०
ग्राम


१ लिटर
५०० मिली.
२०० मिली.
१०० मिली.
५० मिली.
२० मिली.

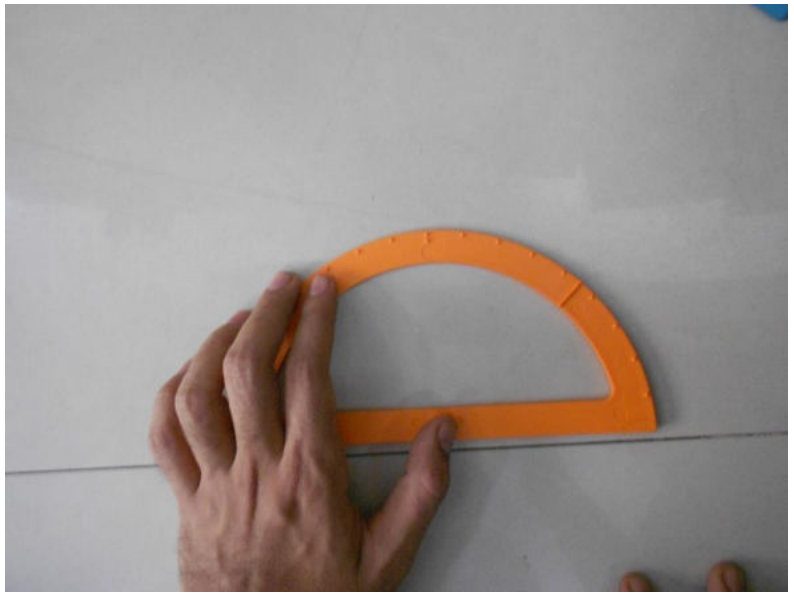


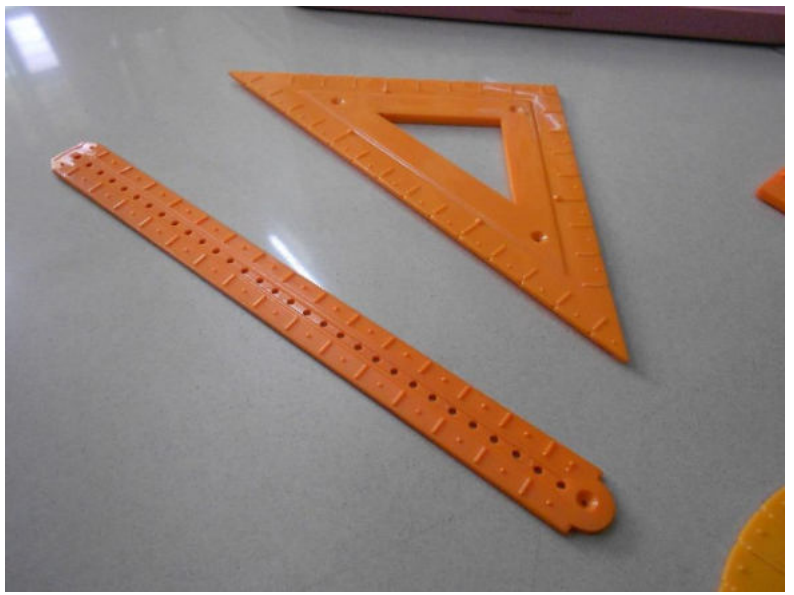


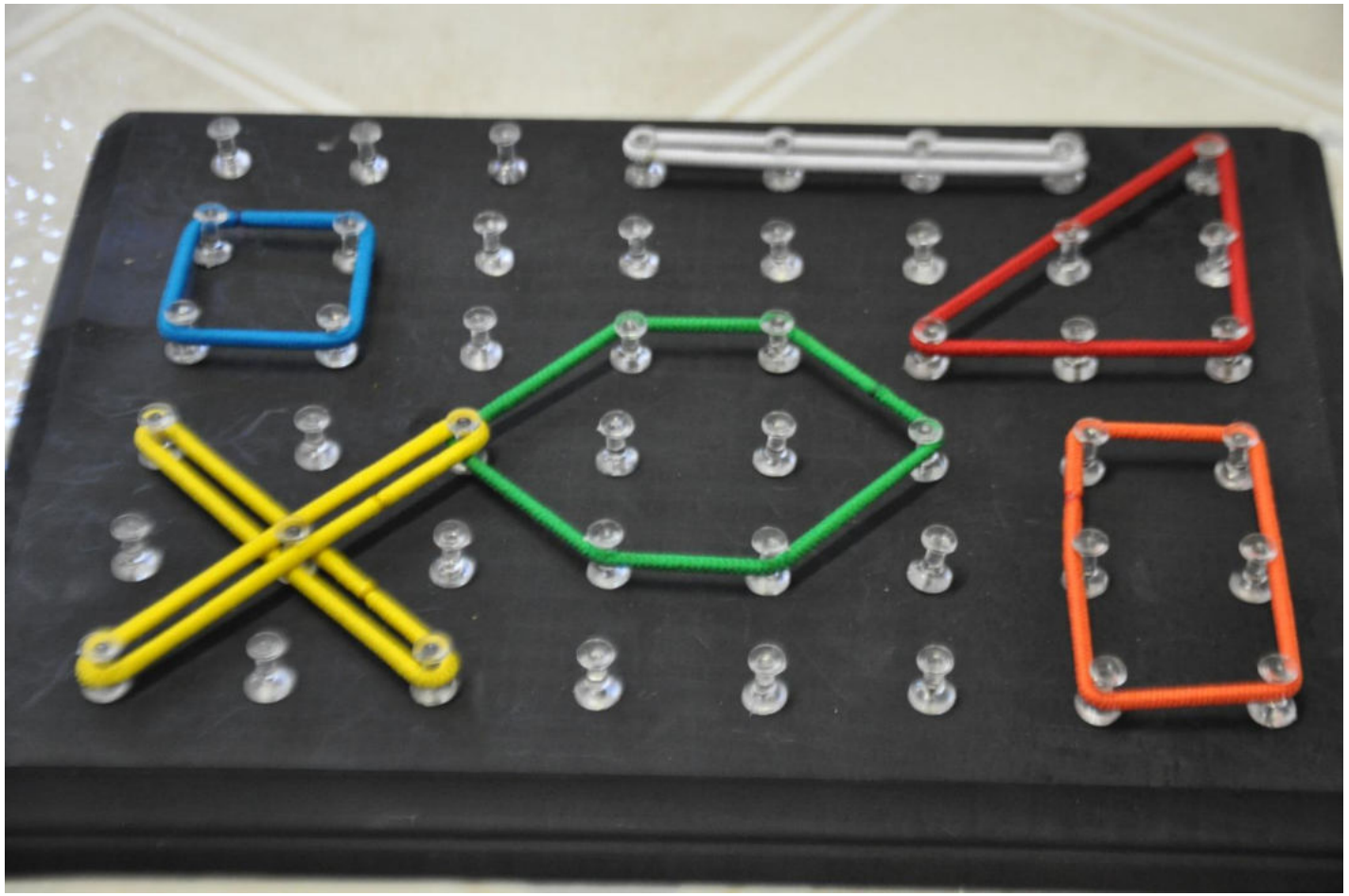


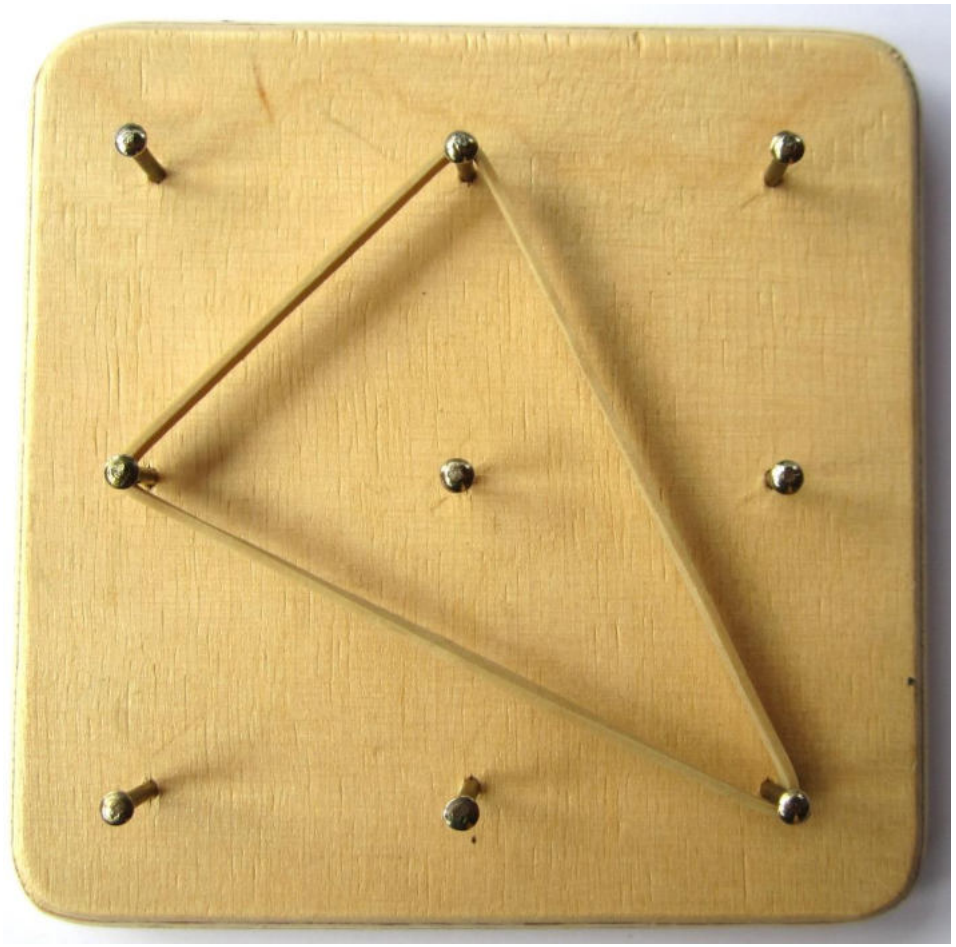

6
2


6
2









General Inferences after the study

- There is no further interaction with the products after the learning stage.
- There is less interest among children start using it and also less interest to go back and use again.
- Concreting of concepts happen very less and at a slow rate.
- Doesn't happen much interaction between kids with the current TLA.
- Names for products are not given /forgotten.
- Tasks for each products are not available/ the sheets are missing/ - requires a trained/experienced person nearby to demonstrate each step.
- Requires a person/teacher/guide to validate each steps.
- Multi-purposefulness is lacking in most of the products (value)
- The volume of products are sometimes very large and occupies lot of space.
- The products/aids doesn't leads to another level of learning.
- Element of surprise is lacking in most of the products.

Classroom Difficulties

- Understanding/solving custom & new problems- takes time to understand
- Creating new problems/questions
- Slight/minute differences
- Translating activities and actions into mathematical language
- Generalizing-finding similarities in different activities in everyday life.
- Translating 3D into 2D

A look at the existing methods/ways of learning/understanding the concepts of Maths-Geometry

Learning aid

Learning aids enhance one's learning abilities and help to increase one's learning potential. Learning aids help individuals grasp the concept of learning new skills and techniques by seeing, hearing and touching, smelling and tasting but most of all by exploring the environment around them.

Pros

- **Doesn't need much external help to understand/learn.**
- **Interaction between the person and object/aid.**
- **Doesn't need other children/person to enable learning.**
- **Enables self learning**

Cons

- Since the child can learn himself, if he makes some mistakes and no one corrects it, then it will be a problem.
- Less interaction between individuals
- No push/pull factors to learn/understand.
- No/less possibility of learning evolvement.
- No/less validation of learning/understanding. (computers/smartphones/other smart devices are exceptional cases)

Teaching aid

any device, object, or machine used by a teacher to clarify or enliven a subject/concept

Pros

- **The teacher can deliver and alter/modify/develop information according to context.**
- **Varied teacher roles, from information deliverer to architect of educative experiences**
- **Interaction between the child, teacher and object/aid.**
- **The teacher/instructor can validate the learning.**
- **Teacher can push/pull child into learning**

Cons

- Might need an expert/instructor to explain the concepts.(Need an external help)
- The further development of learning happens linked to the instructor.
- Sometimes complex aids/products beyond the grasping capacity of child.
- Depend on the skill/knowledge base of faculty

Games

a physical or mental activity or contest that has rules and that people do for pleasure (one of the definitions)

Pros

Helps With Fast Strategic Thinking & Problem-Solving

Can evolve skills and other learnings with time with push/pull factors

Interaction between aids/products/objects and player/players

Beneficial Specifically For Children With Attention Disorders

Can create interest in child/person to come back for further interaction/learning.

Cons

Creates a series of developmental challenges for the learners.

Game culture and play could be a disadvantage to the learner if not designed correctly.

May loose focus on learning and might directed to other directions.

Might require new reward strategies (other than visual)

Selection of “Method”

“Teaching-Learning Aids for delivering the concepts of
geometry / to make understand/learn/teach the geometrical concepts to visually impaired children.”

Design Brief

To design/develop Teaching-Learning aids for the concepts of Geometry in Mathematics for the blind children.

The cost should be very low as possible and should be a good value-for-money product. The product is aimed at lower middle class and middle class.
There is no constraint for the materials as long as it will be durable, long-lasting, easy to manufacture and low cost.

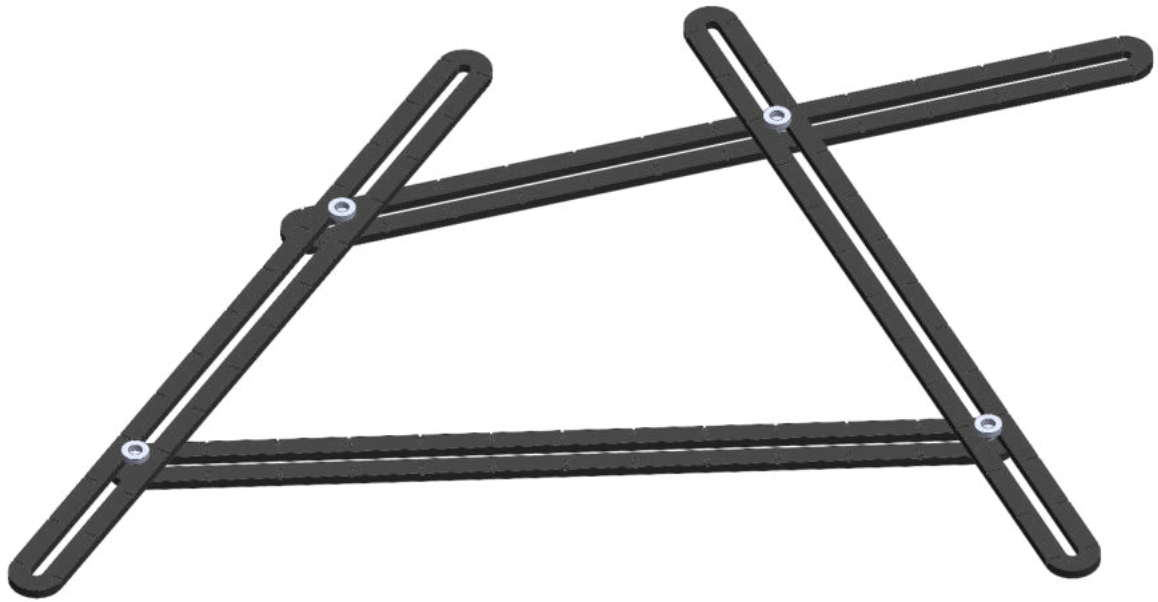
Other considerations

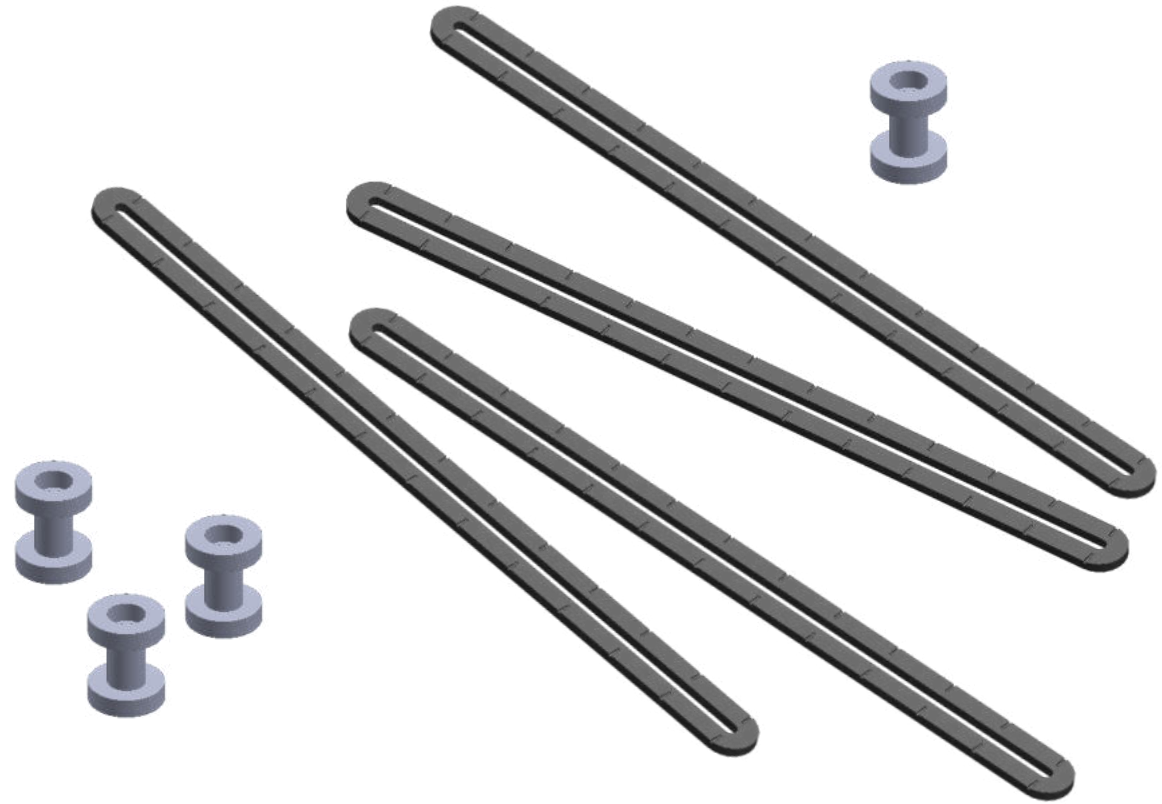
i. It should be strong and sturdy so as to withstand the manipulation of the visually impaired child.
ii. As far as possible, sharp edges should be avoided in three-dimensional aids for visually impaired children. Sharp edges may be made blunt to avoid injuries to the Braille reading fingers.

WORDCLOUD

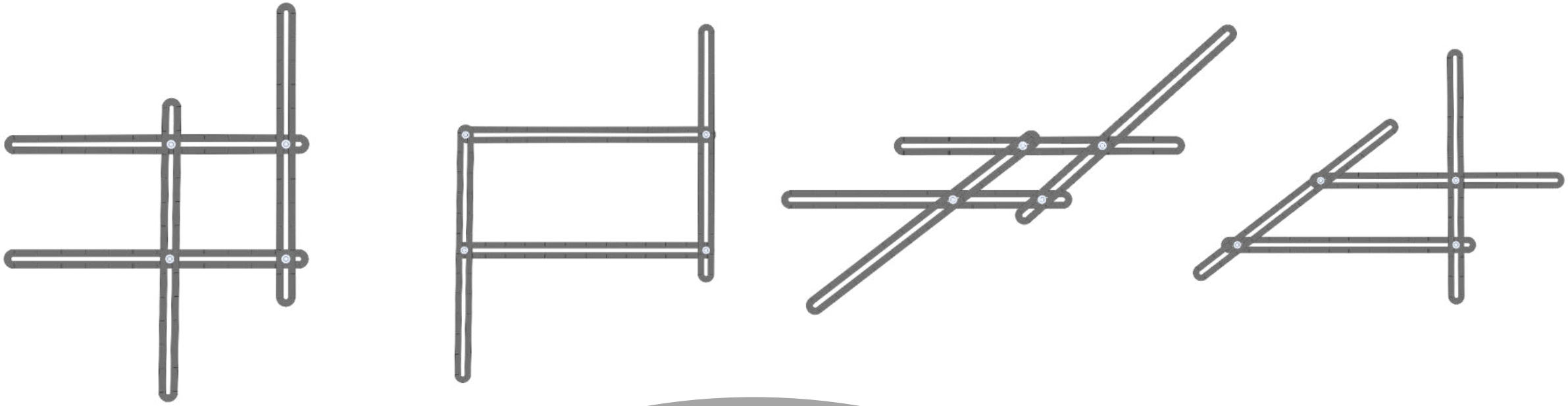

Easy to learn
Point of Interest
Simple
Easy to Teach
Texture
Haptic aesthetics
Easy to understand
Collapsible
Multiple levels of complexity
Modular
Flexible
Transformable
Multi-purpose
Playful
Materials
Long lasting
Compact

ideations





Geometry Flexi-frame



Advantages?

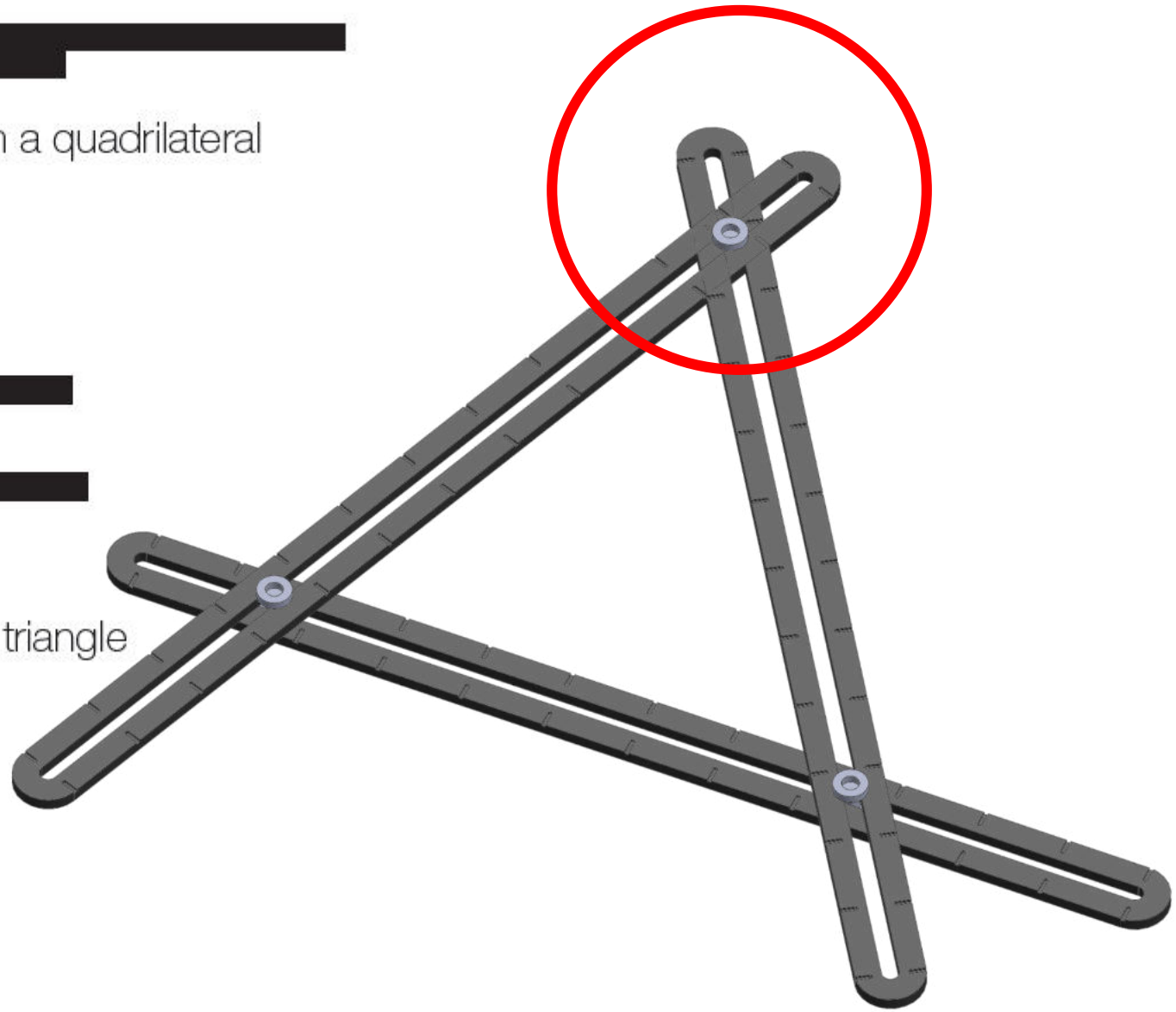
1

Diagram showing the height level of members in a quadrilateral (4 members) **: EVEN members**

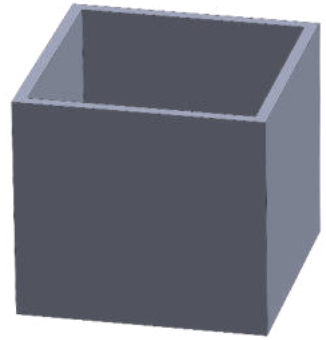
2

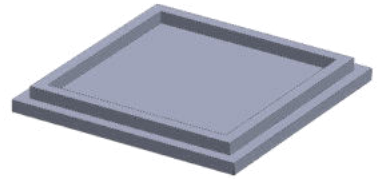
3

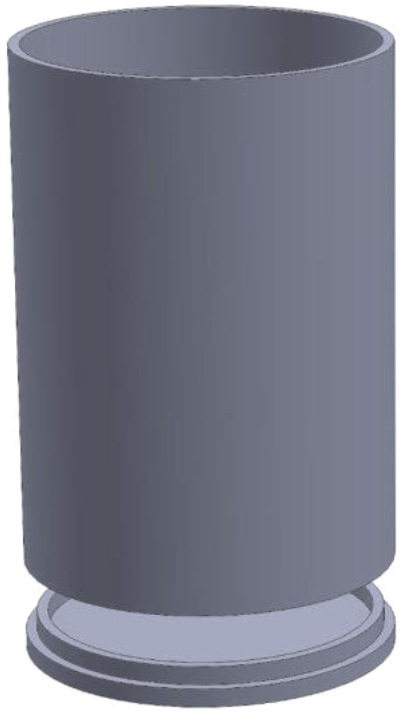
Diagram showing the height level of members in a triangle (3 members) **: ODD members**



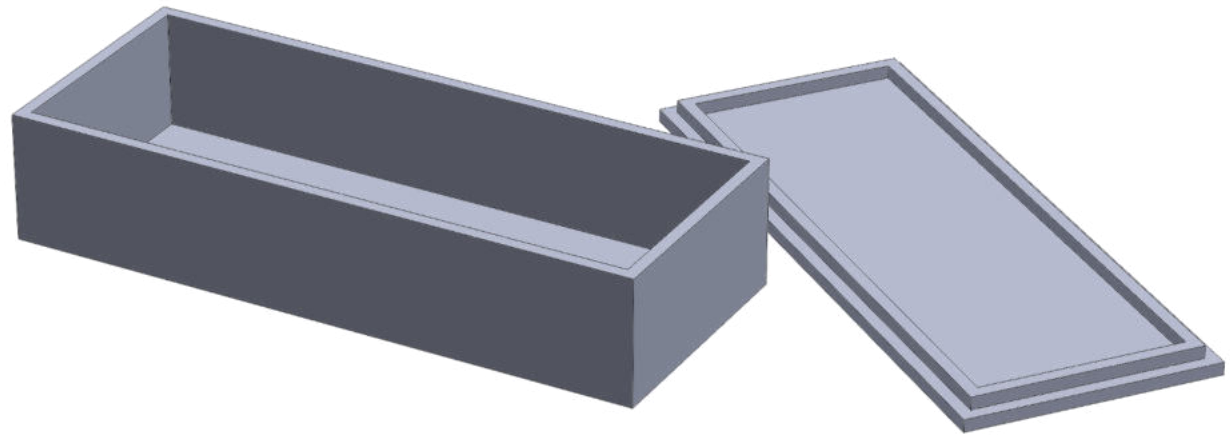
Dis-Advantages?







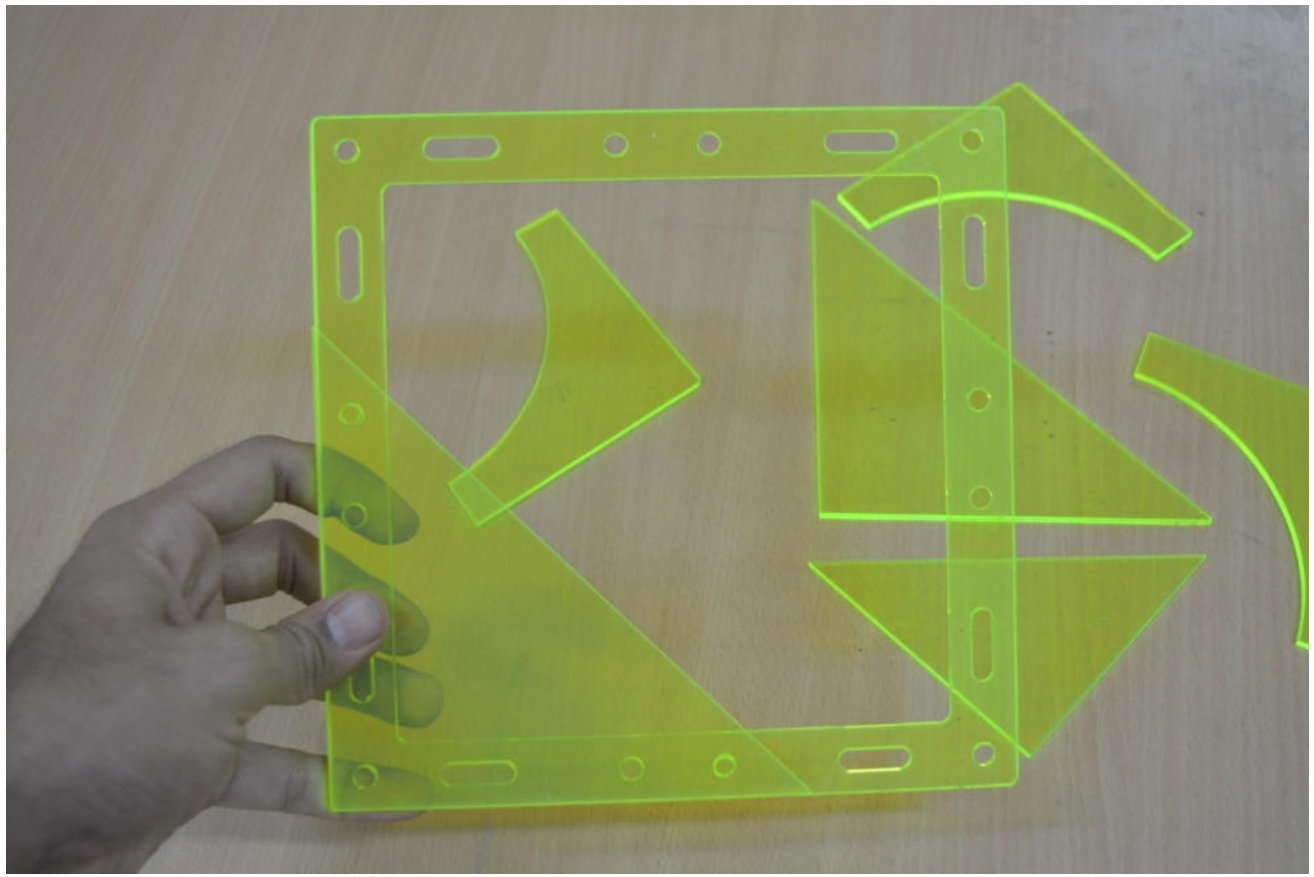
Dabba/container



Concepts

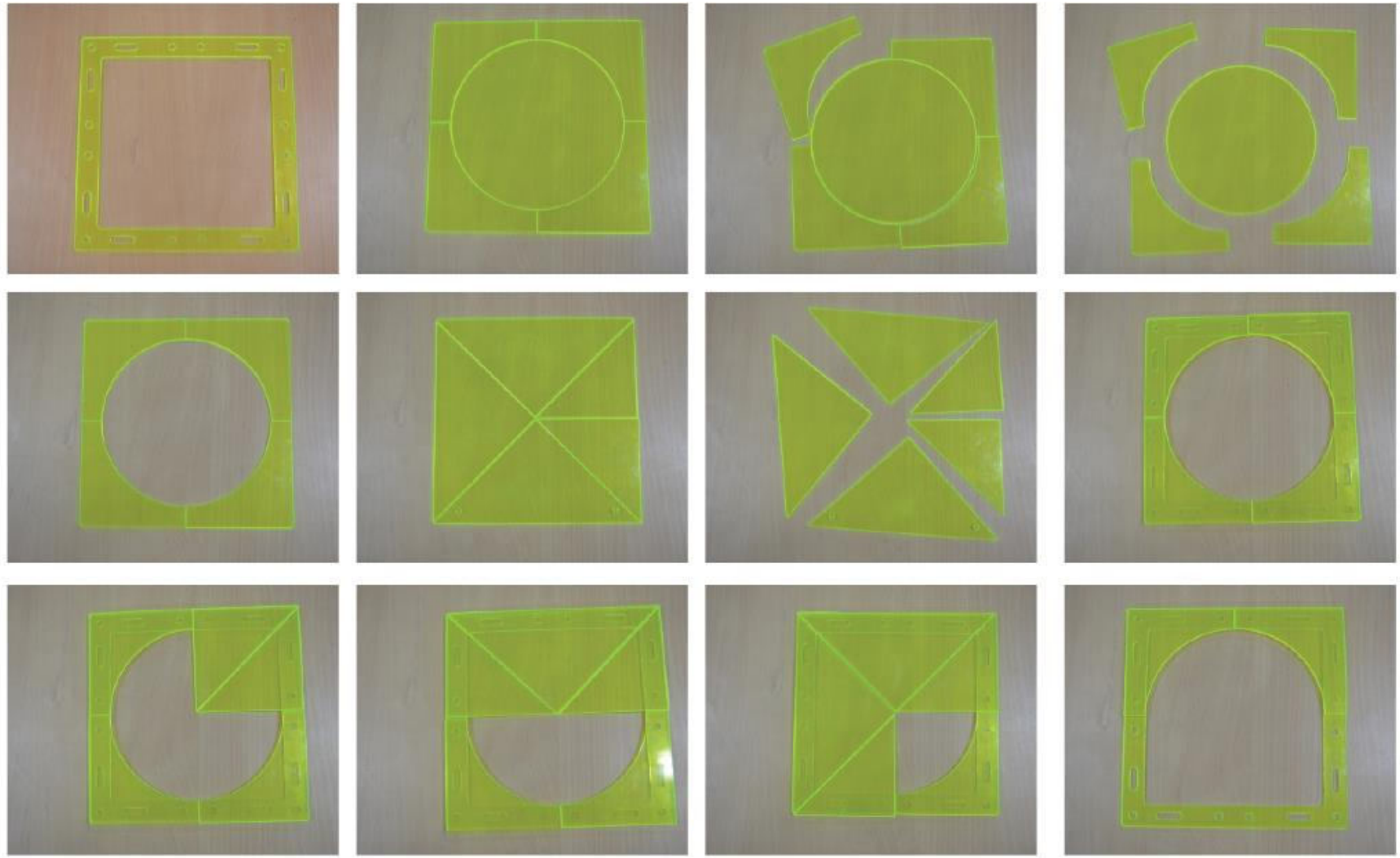
Understanding Elementary Shapes 2-D

Beginners Geo-Frame



What is the product? **Who will teach/show how to use?**

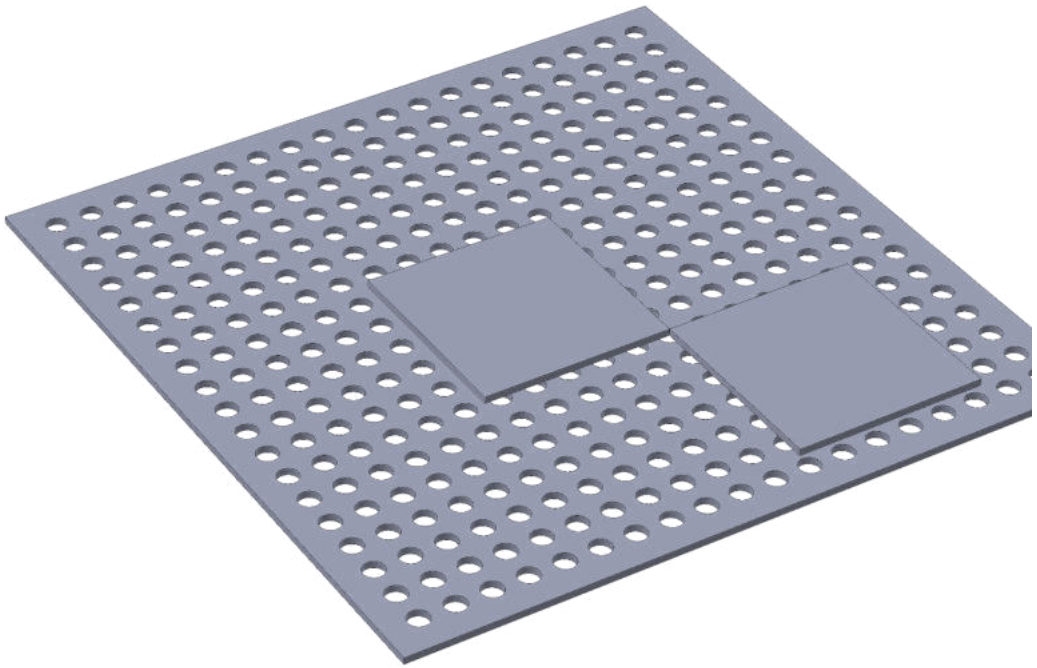
What all content can be taught? **Advantages of Geo-frame?**

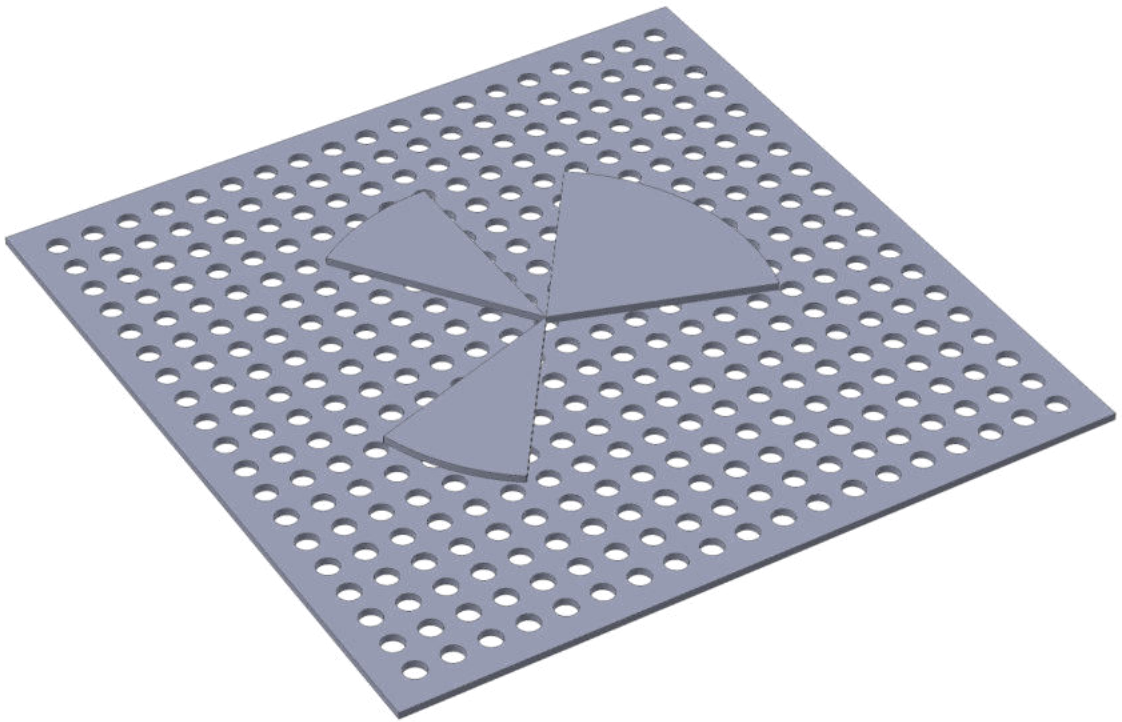


some of the possible configurations of Geo-frame

Dis-advantages of Geo-frame

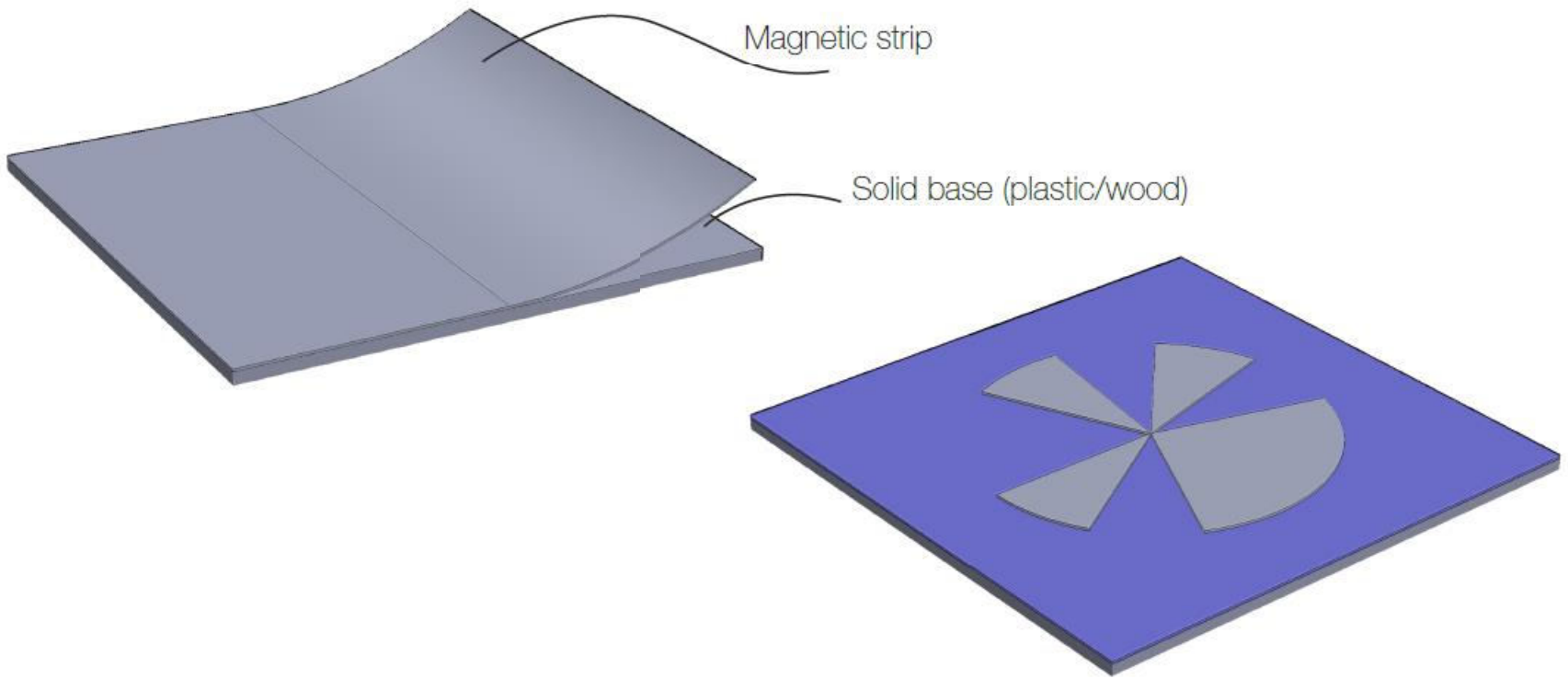
Modified Geoframe

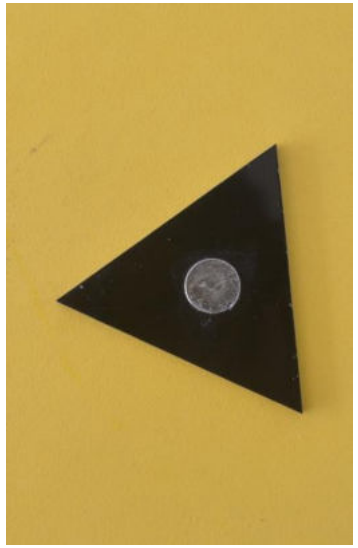


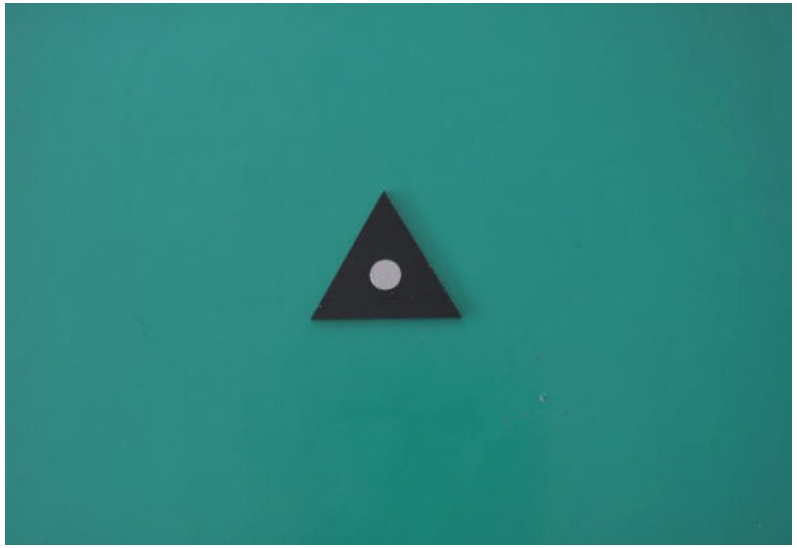


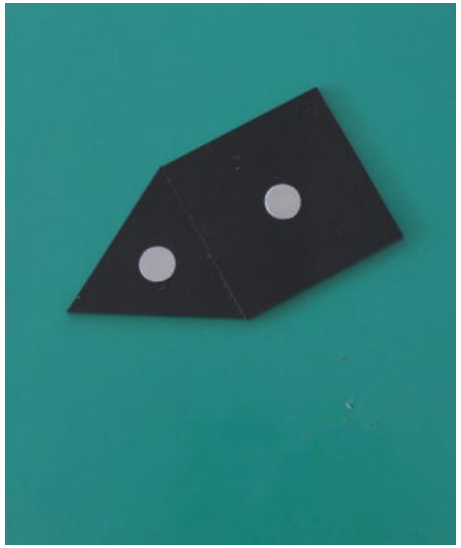
Dis-advantages of Modified Geo-frame

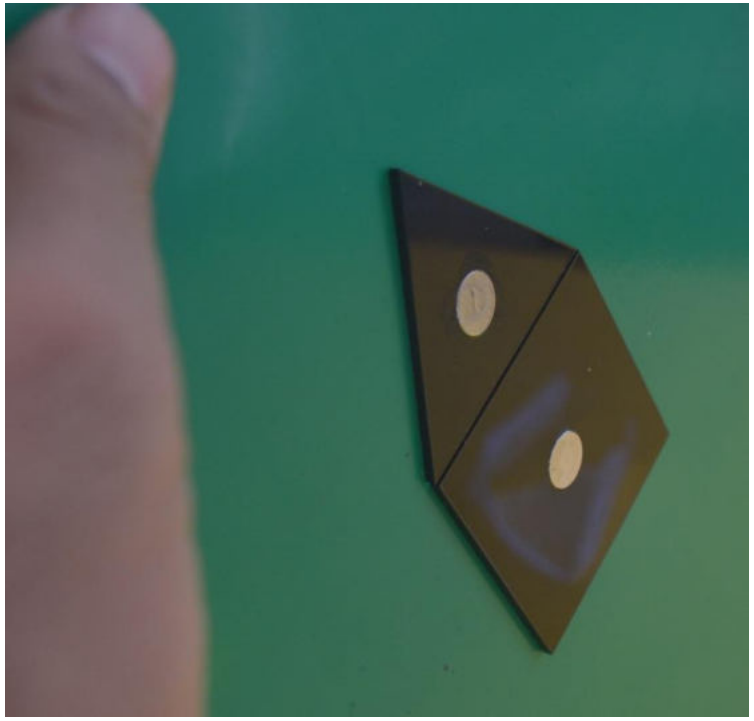
Magnetic Geo-Base

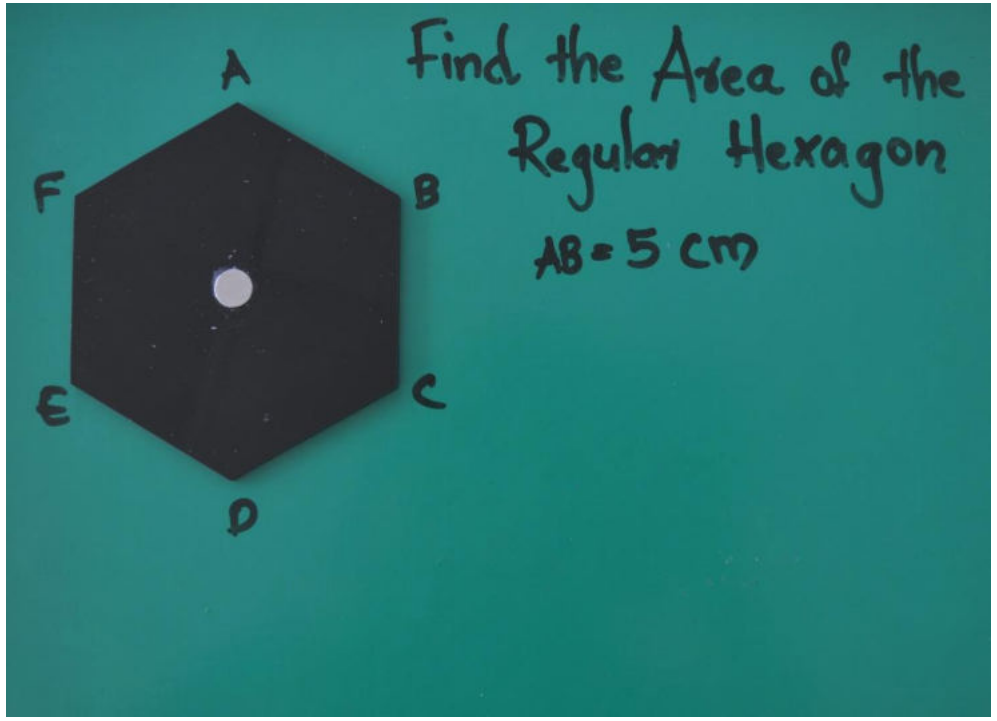


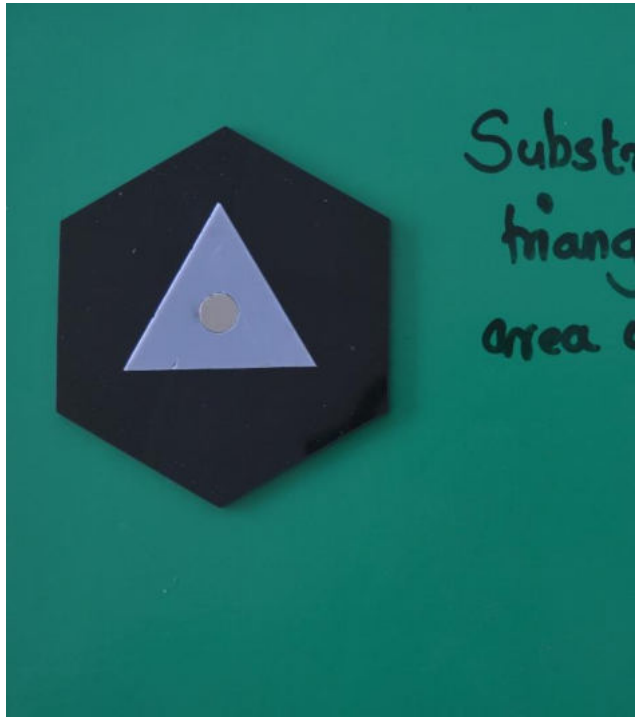


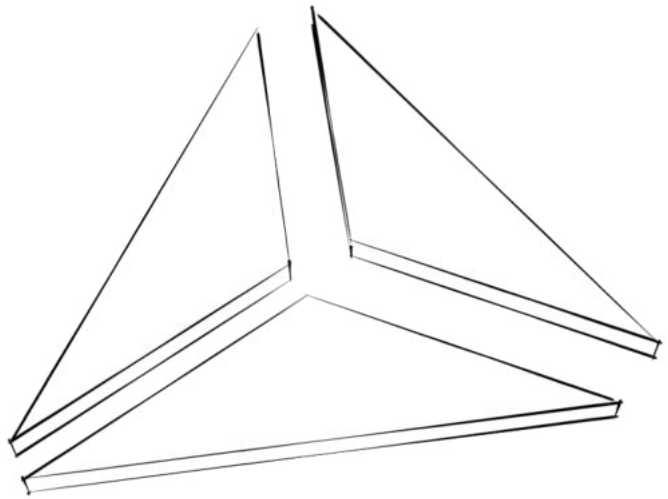


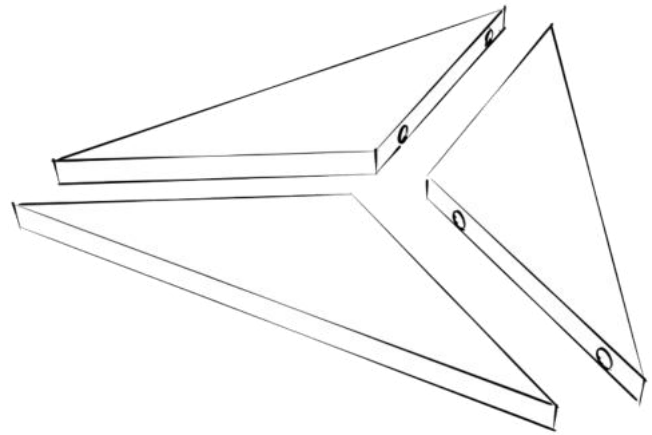


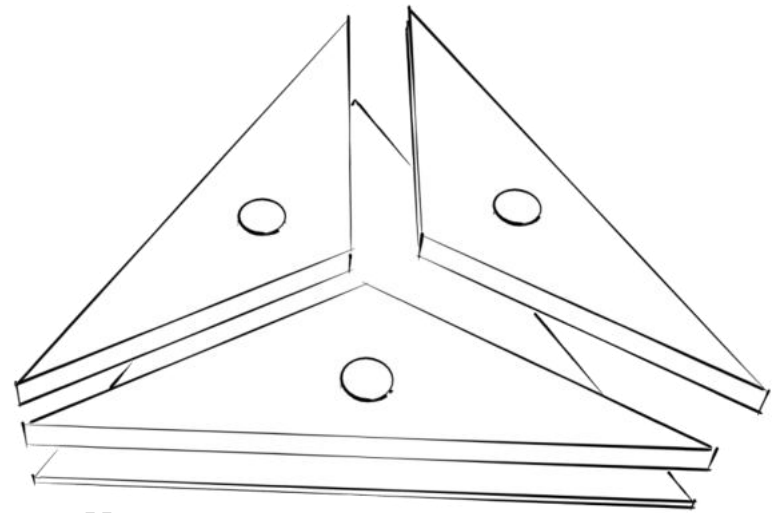



A
B
C
D
E
F
Find the Area of the
Regular Hexagon
AB = 5 cm

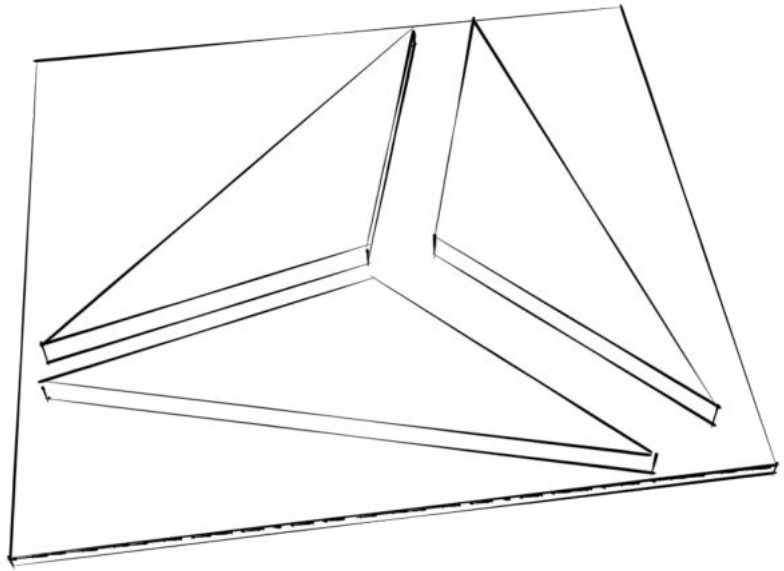


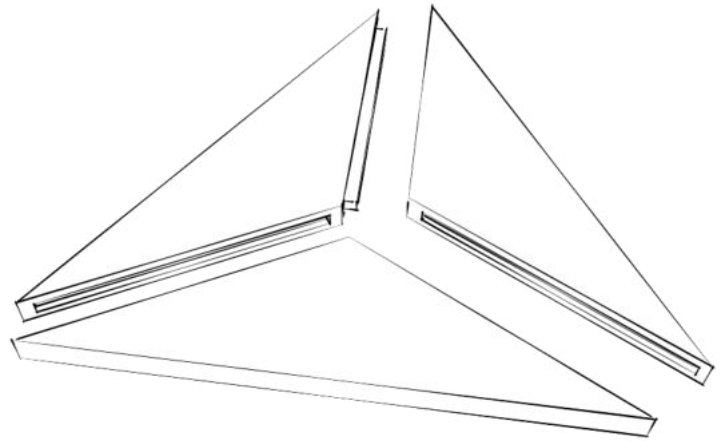


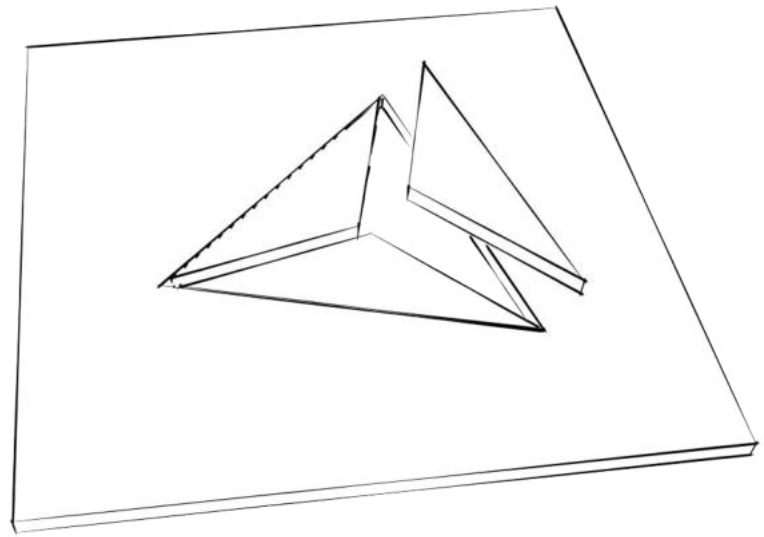




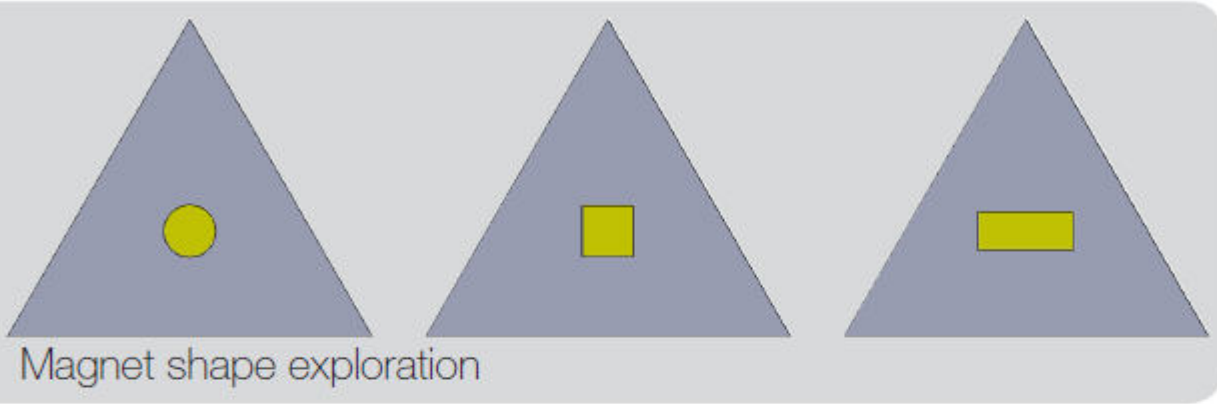
Exploration of joining details



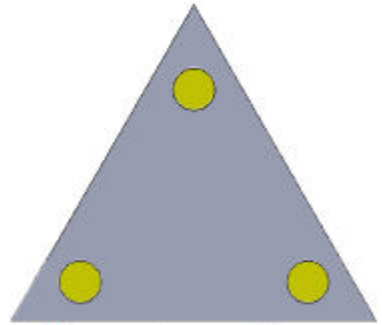




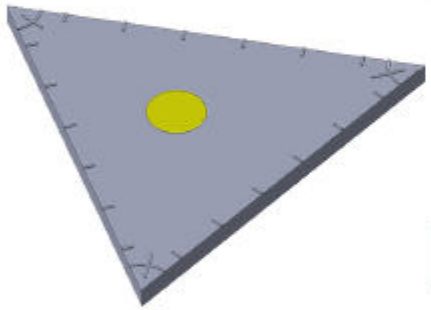
Exploration Details



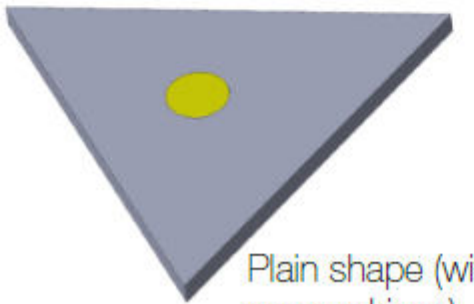
Magnet shape exploration



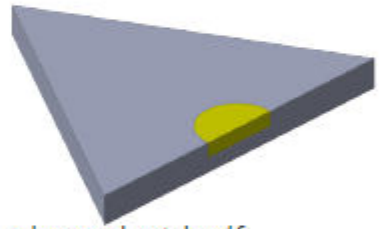
Magnet position



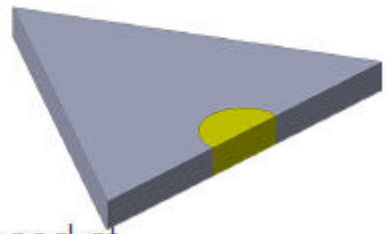
Shape marked with scale, angle and other details



Plain shape (without any markings)



Magnet placed at half depth slot

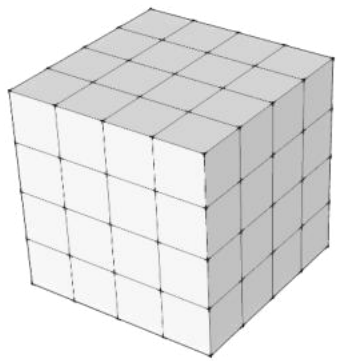
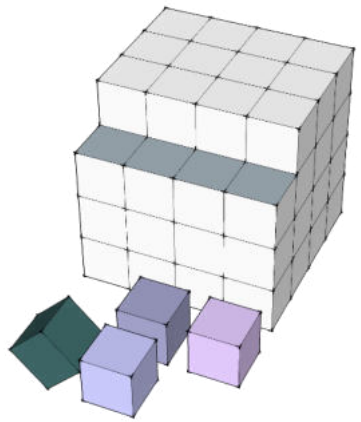
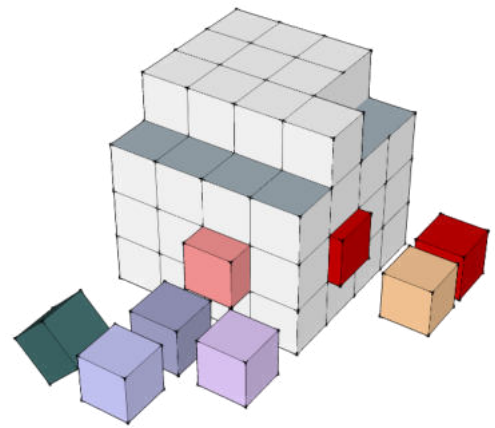
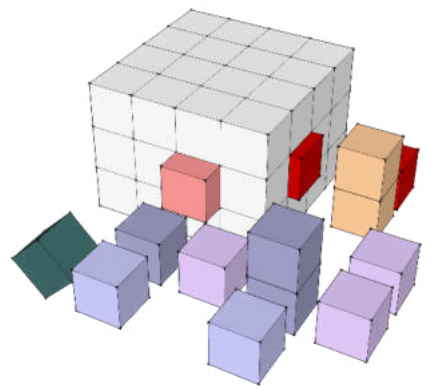


Magnet placed at through hole

Identification of 3-D shapes: Cubes, Cuboid, cylinder, sphere, cone,
Prism (triangular), pyramid (triangular and square) Identification and locating in the surroundings

Elements of 3-D figures. (Faces, Edges and vertices)

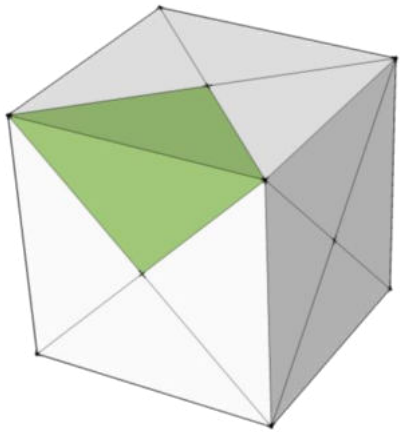
- Nets for cube, cuboid, cylinders, cones and tetrahedrons.

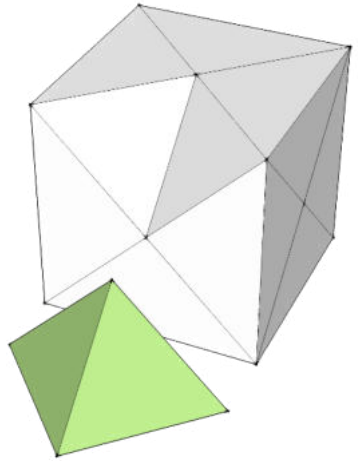





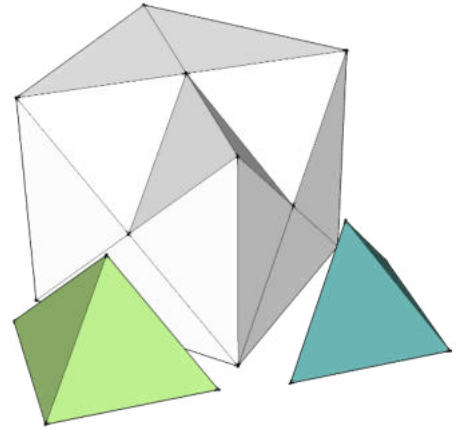
Concept 2

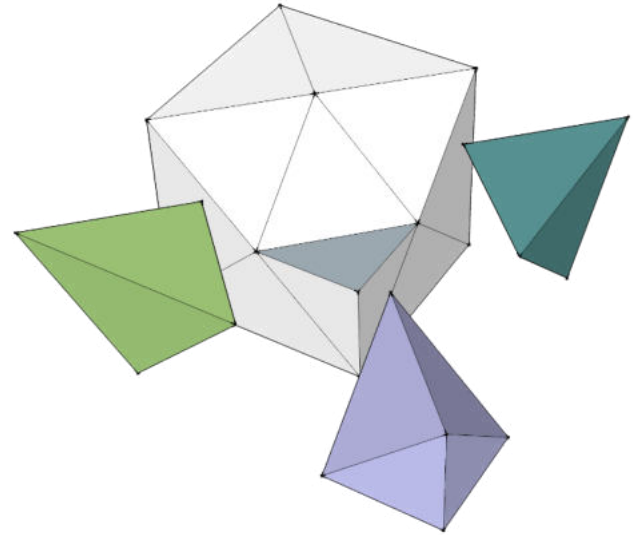
What is the product? **Who will teach/show how to use?**

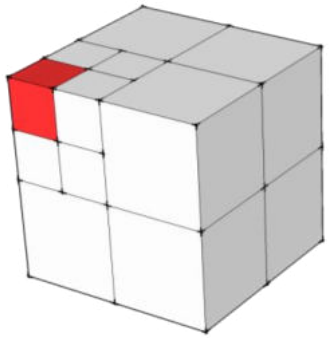
What all content can be taught? **Advantages of Geo-frame?**

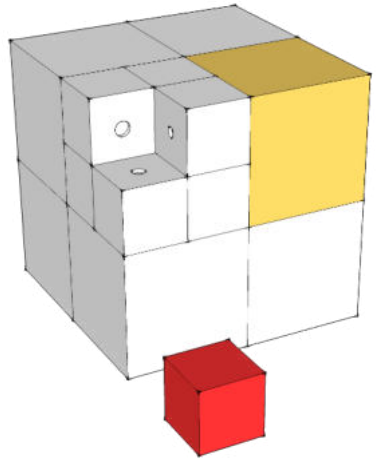


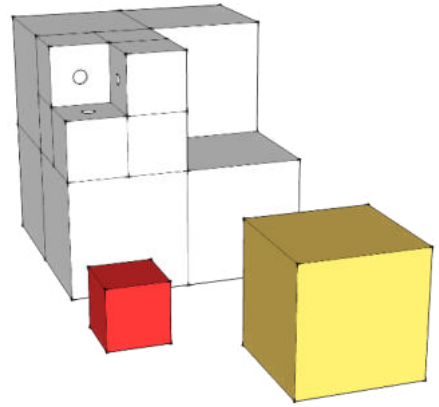


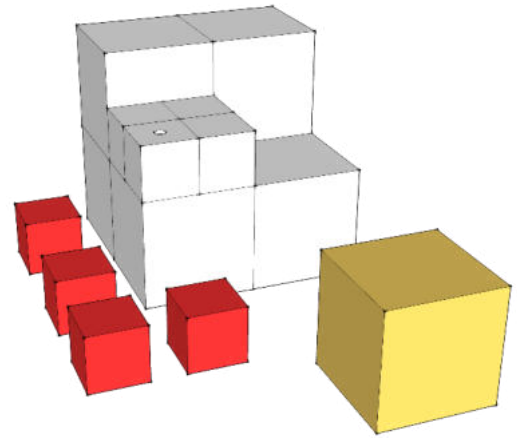


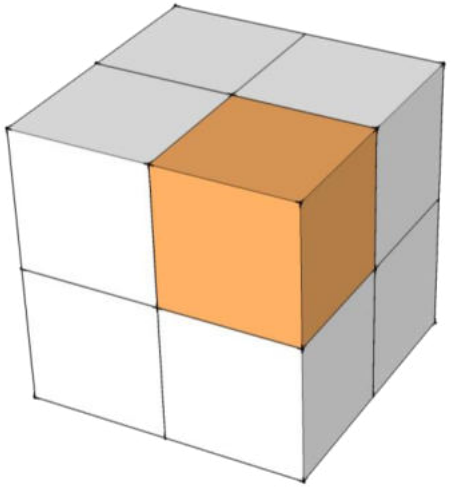


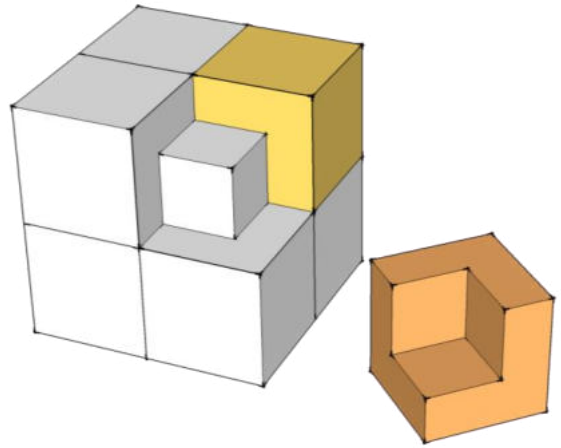


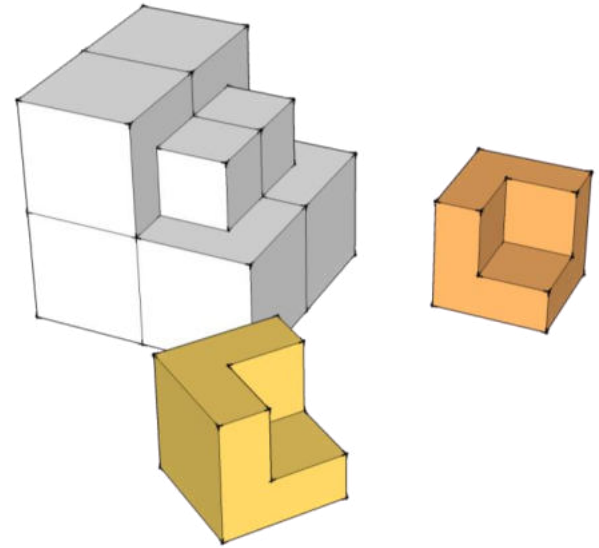


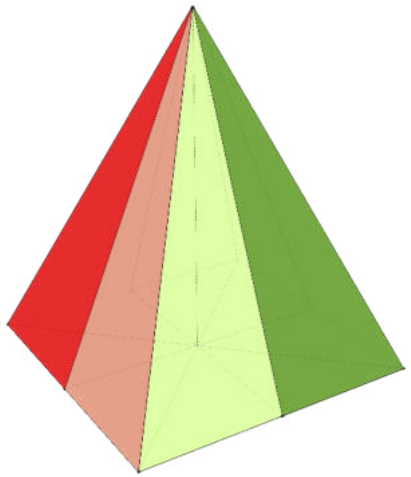


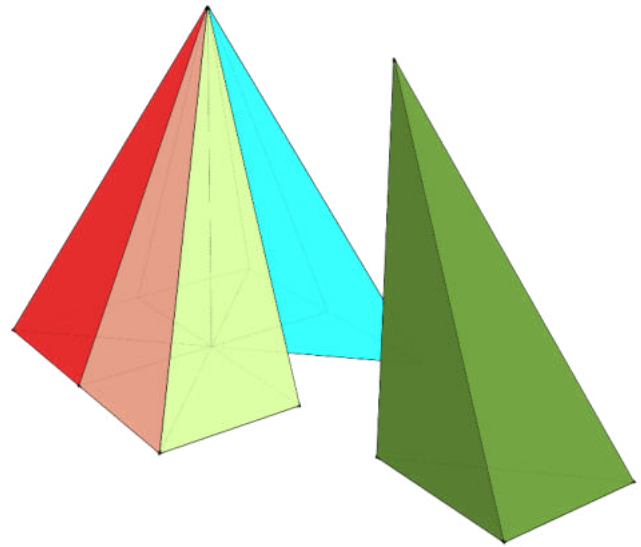


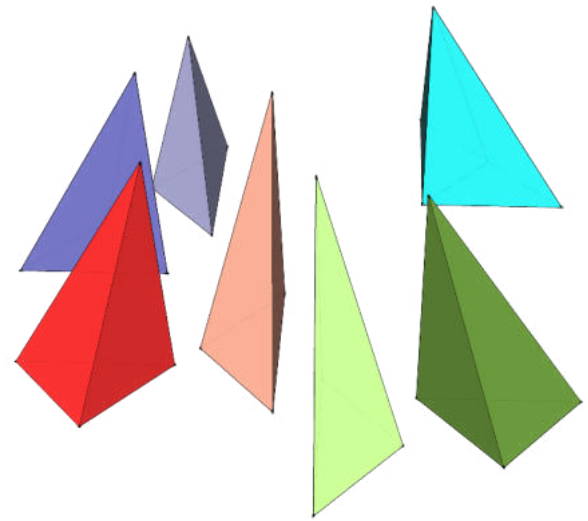




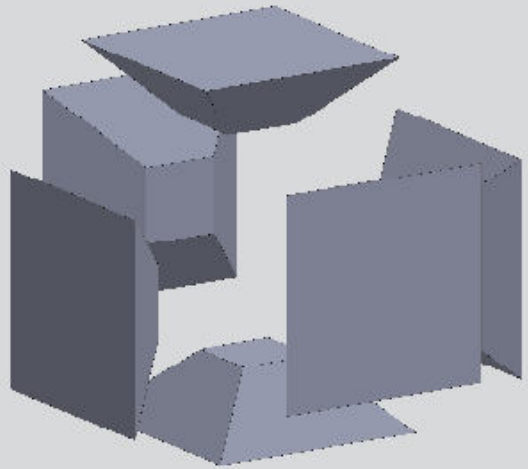




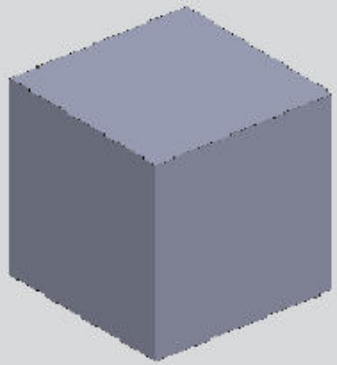




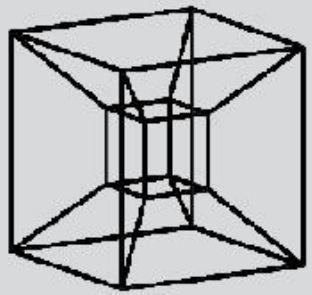
Ideation for modular cube



Half cut pyramid joined to form a cube

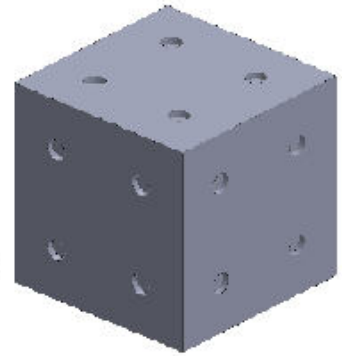


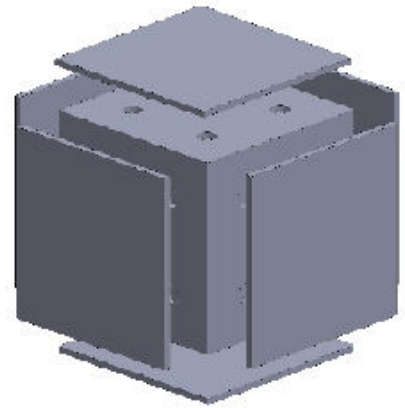
How the cube will look when joined together



Picture showing x-ray image of joined cube

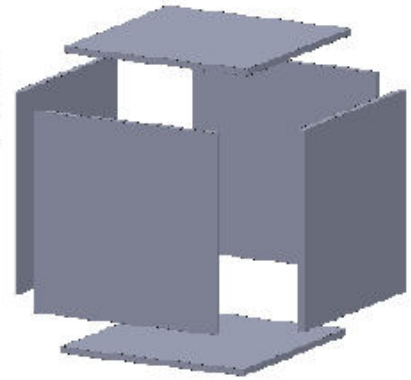
A solid cube





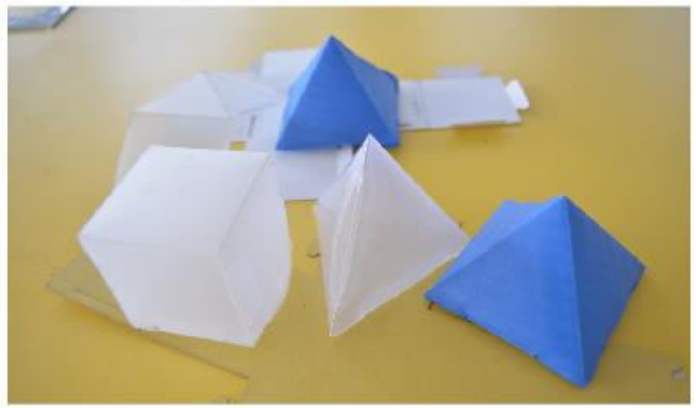
Square faces attached to solid cube

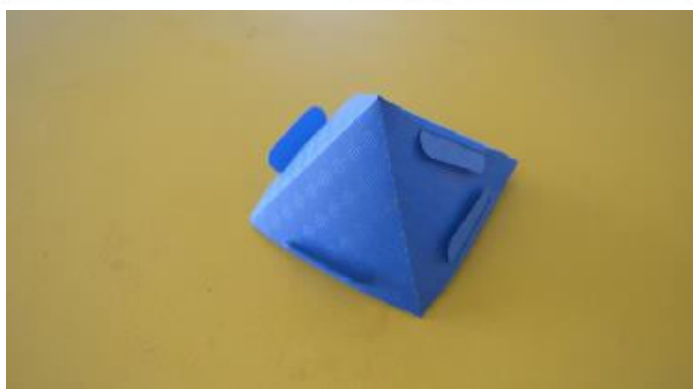
The faces can be joined by using, magnets or can also be joined with velcro .

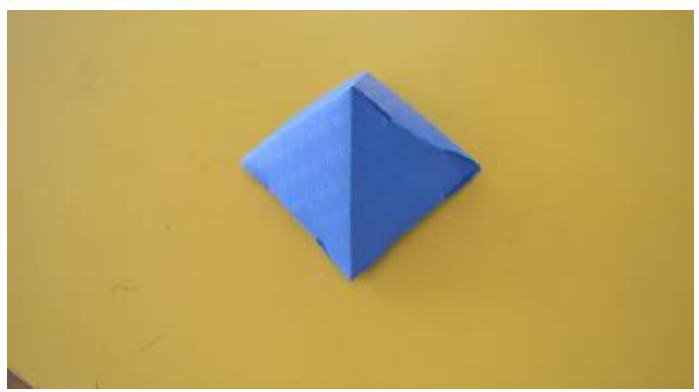


Concept 3

Nets for constructing solids



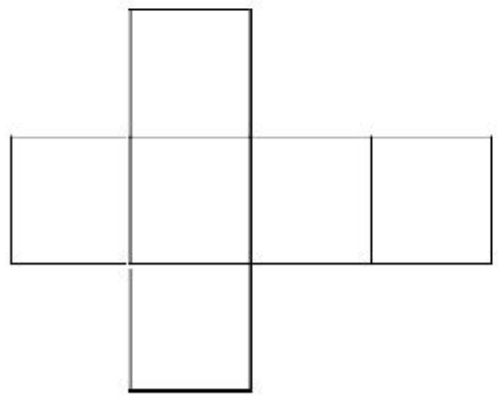




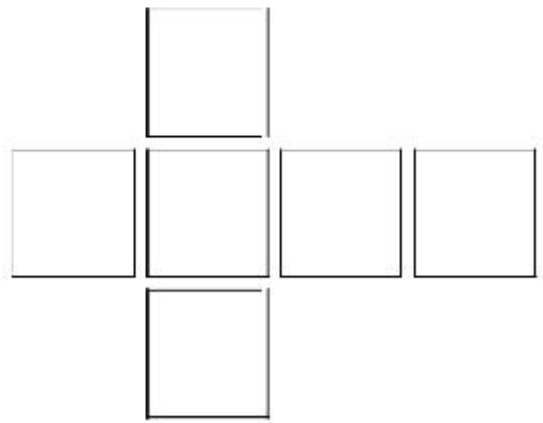
What is the product? **Who will teach/show how to use?**

What all content can be taught? **Advantages of Geo-frame?**

Net – joining detail exploration



Net of cube single piece

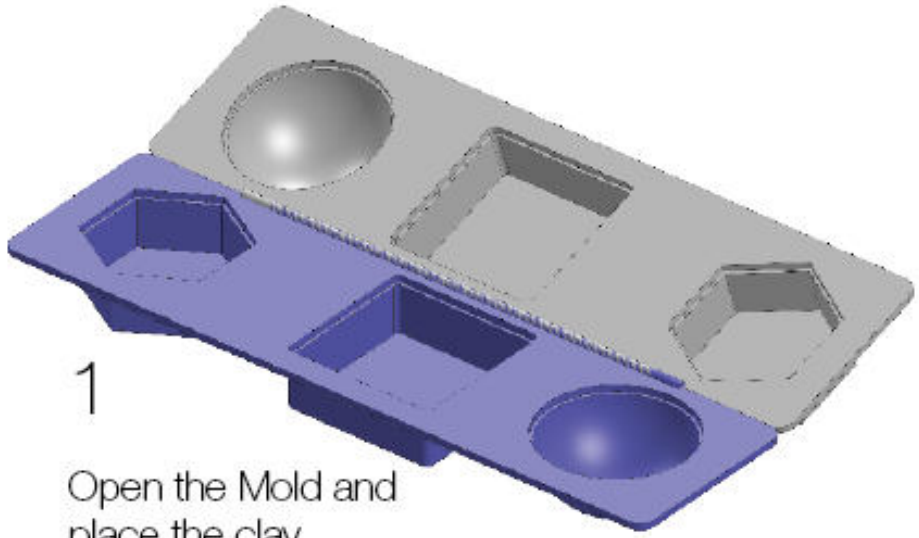


Net of cube, each face as separate pieces

Concept 4

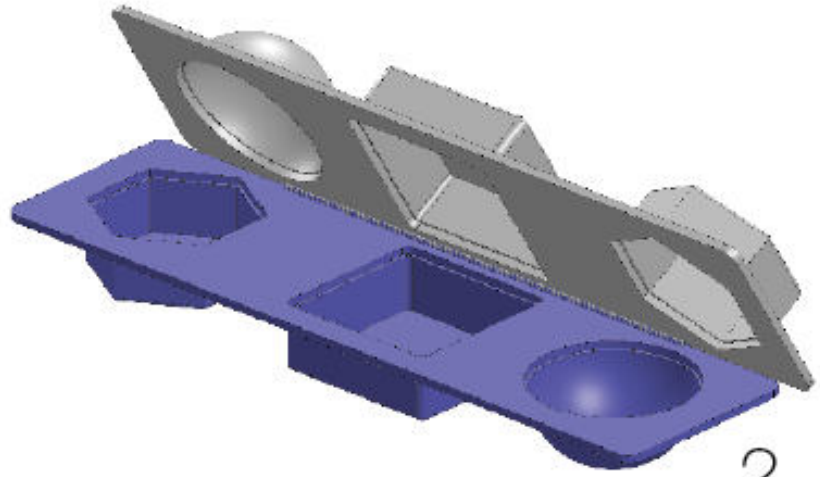
What is the product? **Who will teach/show how to use?**

What all content can be taught? **Advantages of Geo-frame?**



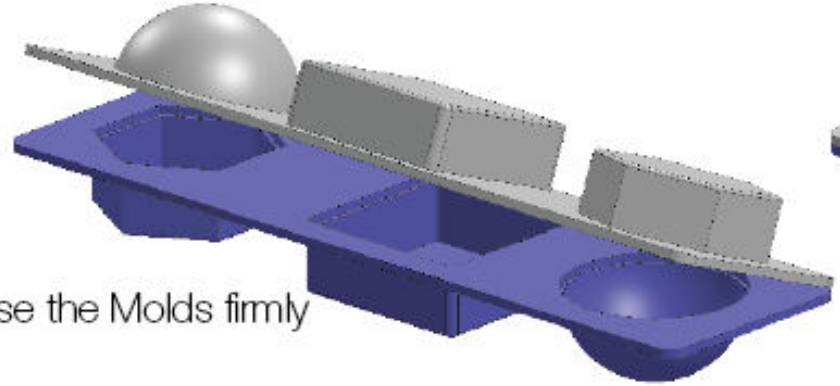
1

Open the Mold and
place the clay



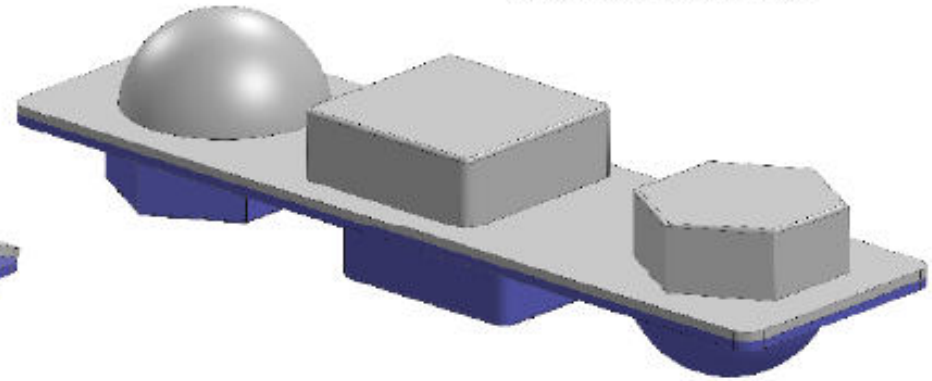
2

Make sure all the clay
is in the slot area.



3

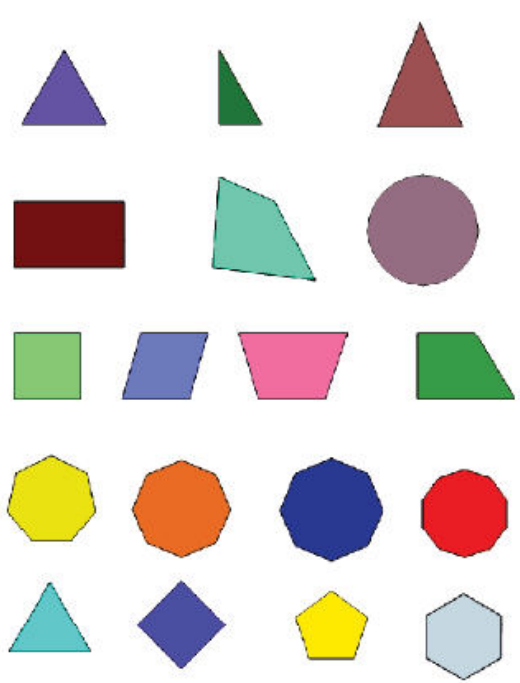
Close the Molds firmly



4 Press completely and open the
mold and get the specific shape

	Concept 1 Geo-base	Concept 2 Modular	Concept 3 NETS	Concept 4 Mold and clay
Most resembles the theoretical Model	9	8	9	8
Easy to use	9	9	9	9
Easy to understand	9	8	9	9
Cost effective (Manufacturability, Easy to make, fast to make, Material and technology)	8	6	9	7
Compact (easy to carry, Easy to store.)	8	7	9	7
Long lasting	8	8	8	8
Other possibilities	playful activities	playful activities	playful activities	playful activities
Syllabus covered	Most 2D shapes	3D solids	Most 3D solids and surfaces	Most 3D solids and surfaces
Appropriateness to the context	9	8	9	8
Total	60	54	62	56

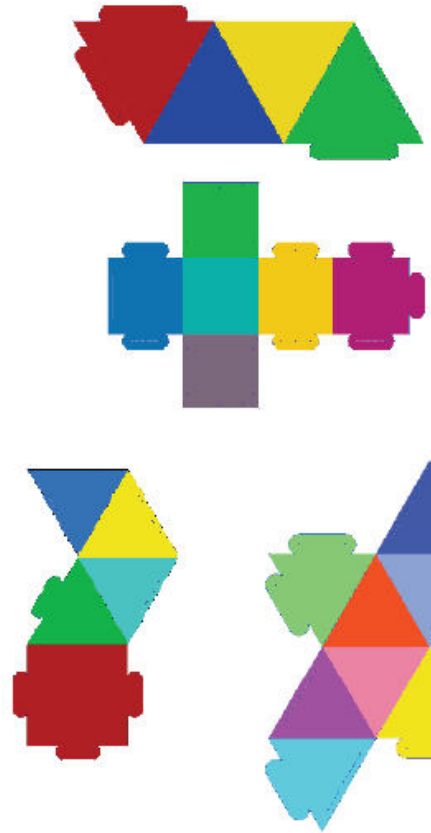
Concept Evaluation



Mag Geo-Base & 2D shapes

Concept 1

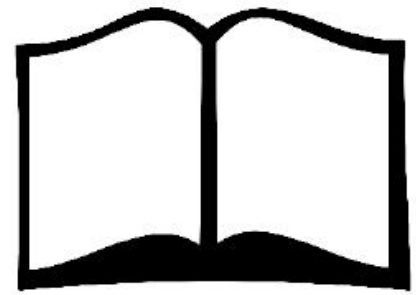
+



NETs of 3D objects

Concept 3

+



A workbook
(which have instructions and the method of learning/teaching)

Concept evaluation & review

Designing/structuring the Teaching Method,

(The way information is meant to be delivered)

Development of Teaching-Learning materials for
the blind children (to teach/learn basics of geometry) and
Designing the means and method of Teaching-learning,

for effective information delivery

Relevance

The tasks are to understand and learn the concepts through activity based learnings and bring in a different approach to teach/learning.
The process and steps are designed to deliver maximum information with minimum effort to teach.
The learning is which was based on books, now is designed to be experiential, to the children.

Objectives

To introduce the visually impaired students to the actual shapes and forms of Basic geometry

To equip the students with concepts of basic/geometry and understand its properties

To enable learning through experiential methods.

To enable and enhance the interaction between students, faculty, parents/elders.

Contents

(i) Basic geometrical ideas (2 -D):
Introduction to geometry. Its linkage with and reflection in everyday experience.
Quadrilateral — Sides, vertices, angles, diagonals, adjacent sides and opposite sides (only convex quadrilateral are to be discussed), interior and exterior of a quadrilateral.
• Circle — Centre, radius, diameter, arc, sector, chord, segment, semicircle, circumference, interior and exterior.

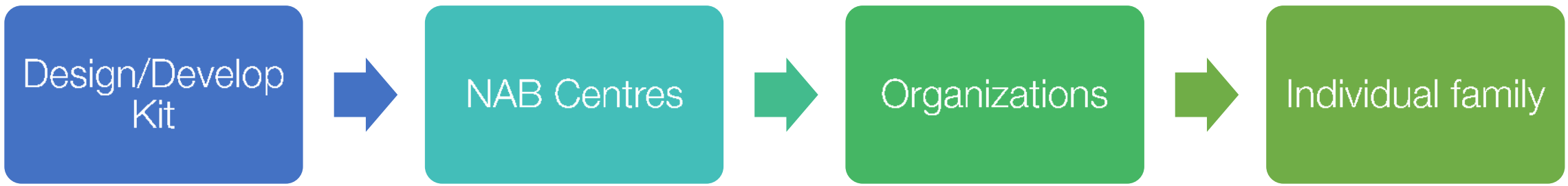
(ii) Understanding Elementary Shapes (2-D and 3-D):
• Classification of triangles (on the basis of sides, and of angles)
• Types of quadrilaterals – Trapezium, parallelogram, rectangle, square, rhombus.
• Simple polygons (introduction) (Up-to octagons regulars as well as non regular).
• Identification of 3-D shapes: Cubes, Cuboid, cylinder, sphere, cone,
Prism (triangular), pyramid (triangular and square) Identification and locating in the surroundings
• Elements of 3-D figures. (Faces, Edges and vertices)
• Nets for cube, cuboid, cylinders, cones and tetrahedrons.

(iii) Symmetry: (reflection)
• Observation and identification of 2-D symmetrical objects for reflection symmetry
• Operation of reflection (taking mirror images) of simple 2-D objects
• Recognising reflection symmetry (identifying axes)

Methodology

Observation, identification, verification and articulation of basic shapes, forms and other elements of Geometry using (hands/fingers) tactile sensation for blind children.
Discussions and activities with other children, teachers and parents.
Solving problems and finding solutions
Reading, writing and other activities based learnings.

Product planning



FEEL ‘n’ LEARN

I cant come up with a entire new and efficient pedagogy. Over the time, with the experience , using my products the teachers can refine and come up with new teaching models and structure.

Finally making the Teaching-learning inclusive

Possibilities?

Tangram and other puzzles, Activities, Games & many more

References

Visual impairment - Wikipedia, the free encyclopedia. 2016. Visual impairment - Wikipedia, the free encyclopedia. [ONLINE] Available at: https://en.wikipedia.org/wiki/Visual_impairment. [Accessed 12 March 2016].

Blindness: Types, Causes, and Symptoms. 2016. Blindness: Types, Causes, and Symptoms. [ONLINE] Available at: http://www.healthline.com/symptom/blindness. [Accessed 12 March 2016].

Blindness Symptoms, Causes, Treatment - What are the different types of blindness? - MedicineNet. 2016. Blindness Symptoms, Causes, Treatment - What are the different types of blindness? - MedicineNet. [ONLINE] Available at: http://www.medicinenet.com/blindness/page2.htm. [Accessed 12 March 2016].

Numbers & Counting Adaptations for Students with Visual Impairments - Teaching Students with Visual Impairments. 2016. Numbers & Counting Adaptations for Students with Visual Impairments - Teaching Students with Visual Impairments. [ONLINE] Available at: http://www.teachingvisuallyimpaired.com/numbers--counting.html. [Accessed 04 March 2016].

Teaching Strategies. 2016. Teaching Strategies. [ONLINE] Available at: http://www.tsbvi.edu/resources-math/3237-teaching-strategies.html. [Accessed 04 March 2016].

M.N.G. Mani; Aree Plernchaivanich; G.R., 2005. Mathematics Made Easy For Children with Visual Impairment. Edition. On-Net. . 2016. . [ONLINE] Available at: http://icevi.org/pdf/Mathematics_%20Made_%20Easy%20for%20Children_%20with%20_Visual%20Impairment.pdf. [Accessed 04 March 2016].

The ways of teaching mathematics to visually impaired students
Iveta Kohanová
Faculty of Mathematics, Physics and Informatics, Comenius University
Bratislava, Slovakia . 2016. . [ONLINE] Available at: http://tsg.icme11.org/document/get/716. [Accessed 04 March 2016].

Access to Mathematics by Blind Students:. 2016. Access to Mathematics by Blind Students:. [ONLINE] Available at: http://www.snv.jussieu.fr/inova/villette2002/act5b.htm. [Accessed 06 March 2016].

IDC Reports

Title - “HAPTIC ANIMATION FOR BLIND”, Name of student - HASHIM K.BASHEER. Guide - Prof : ANIRUDHA JOSHI. year -2007

Title - “Learning Aid For Visually Impaired Children”,
Name of student - Priyanka Chavan. Guide - Prof : Mandar Rane.

Title - “Playing kit for Visually Impaired children”,
Name of student - Sanjay B Nair. Guide - Prof : R. Sandesh. year -2010

Title - “Vocational/Educational Aids for the visually handicapped”,
Name of student - Sanjay T Koli. Guide - Prof : Mohan Bhandari. year -1991

Title - “2D SPACE UNDERSTANDING FOR BLIND BY APPLYING 3D CONCEPTS”, Name of student - Shweta Kamble.
Guide - Prof : Prof. G G Ray. year -Design Research Seminar 2014

Title - “Computer for blind”, Name of student - Sudhakar S Lahade.
Guide - Prof : Mohan Bhandari , co-guide- N.Sadhu . year -1992

Title - “Design for the Blind : Redesign of LPG stove for the Blind”,
Name of student - Anirban Ghosh. Guide - Prof : G G Ray & Prof. year -1996

Title - “Product Information Deciphering Device for the blind”,
Name of student - Sachin Patil. Guide - Prof : G G Ray &
co-guide- Prof.K Munshi. year -1999

Thank you