

# Expe Bamboo Workshop

*-explorations into designerly ways of teaching and learning in Schools*



Ratika Bakshi had joined as Research Associate during this period. She took the main responsibility of organising and Sachin Datt, a PhD scholar, Rudra Paul and Gangamma our expert craftpersons were helping us. Shubhangi in Bambu Studio rendered secretarial assistance!

Vinay Wamanse working with AGBS rendered a helping hand!

## Background

Bamboo is an excellent material to be used in Schools, to learn craft techniques as well as core subjects like Mathematics and Science. In effect each school ought to have a Bamboo Studio where children can learn bamboo weaves as well as making objects of contemporary interest. Simple hand operated machines, and fixtures with few working tables would suffice!

We started conducting series of workshops from time to time over the years with Bamboo and Maths as core theme!

Once I realised that a whole body of knowledge centred around bamboo for learning in Schools could be created, these workshops became an opportunity to develop '*designerly ways of teaching and learning subjects like Maths with Bamboo.*'

Expe bamboo was one of the workshops which happened at early stages.



# The Challenge



1. Linking Craft and Art with Maths and Science:  
Teachers and Parents don't see craft learning as important compared to learning Maths or Science. Craft and Art activity as an important base for creative development is seldom realized . Linking them with Maths and Science could play a crucial role in enhancing self -motivation in learning. There is an urgent need to convince Teachers, Parents and School authorities inthis direction.
2. Fine Tuning 'skill level' in craft with the subject complexity in the School.
3. Adopting a holistic frame work for 'Education' in which Experiential learning and Creative personality development take a centre space!



## Following programme was announced to people whom we could reach in the KV School!

This workshop “experiential learning with bamboo” aims at introducing children to bamboo craft and initiate basic concepts of math’s and science through it. They will be sensitized to aesthetics and design. The workshop will also inculcate virtues like patience and working in a group.

The workshop will commence every day at 10 A.M and go on till 4 P.M. There will be a one hour lunch break from 12.30 to 1. 30.

### **DAY-1** (24th March, Tuesday)

1. Introduction to bamboo
2. Bamboo tools and machines
3. Width sizing of strips (measurements)
4. Splitting bamboo (geometry, fractions and perimeter)
5. Treatment for bamboo (proportions, measurements and weights)
6. Coloring using natural dyes (proportions, measurements and weights)

### **DAY-2** (25th March, Wednesday)

1. Symmetry through theatre exercises
2. Symmetry in alphabets and geometric shapes
3. Mirror symmetry using words
4. Making symmetric elements
5. Creating symmetric patterns

### **DAY-3** (26th March, Thursday)

1. Understanding symmetry in weaves
2. Weaving bamboo with paper
3. Weaving bamboo mats
4. Making greeting cards from weaves

### **DAY-4** (27th March, Friday)

1. Learning fractions through splitting
2. Making toys from bamboo (learn scientific principles)

### **DAY-5** (28th March, Saturday)

1. Perimeter and area
2. Individual project- (choice of making baskets, lampshades)

### **DAY-6** (30th March, Monday)

1. Individual project continues.



## Introduction to bamboo

Day 1

The day began with an introduction to bamboo. Prof. Rao started with a small talk on how bamboo grows and its available varieties. The children were shown different sizes of bamboo and the various products that can be created for contemporary use with it. Children were also told fascinating stories that are associated with bamboo.



samples of giant bamboo



The difference between Cane(Rattan) and bamboo being explained

## Introduction to tool kit and hand operated machines for bamboo

Day 1

The second session for Day 1 started with distribution of tool kits to everyone. The children were introduced to the various tools in the mini toolkit. This was followed by a demonstration of the various hand operated machines including the slivering machine, width sizer, thickness sizer and IDC sander by Rudra Paul.

Children were excited as they were handling tools and small machines for the first time!



Mini tool kit getting demonstrated



using the width sizer

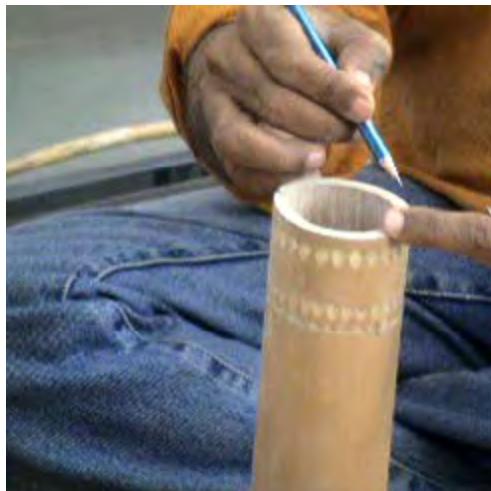


using the splitting machine



Children working on the IDC Sander with Rudrapaul's guidance

# Day 1



The next activity on day 1 was sizing of strips. The children were given three sizes of strips to make using the width sizer. The activity was intended to learn: marking, measuring and sizing to exact dimensions. In general, schools fail to teach these aspects. Children learn maths in a book which objects have exact shapes and dimensions. In practice certain amount of allowance is always required. Children without exposure to such tasks face enormous difficulty in translating abstract, exact dimensions (by definition) to practical situations. Even Math Teachers are not exposed to these aspects. In effect, this input becomes stepping stone to learning Engineering, Design as well as real life practices of doing with hands.



Dividing a circle on paper into half is easy as you just have to draw a diameter. Since circle is drawn with a compass, centre is already available to draw diameter.  
**How does one mark and cut a hallow bamboo into two halves? The centre is missing! You need little more maths, like measuring the perimeter first and marking half of the length on bamboo to get two points to cut across.**

This is what children learnt while cutting bamboo into half. After this, each half was further divided into 3 equal parts by marking equal segments on the cross section and splitting length wise with the splitting knife in the toolkit. These bamboo pieces can be split into thinner strips. This needs the skills of an experienced craft-person. Children were supplied with ready made thin strips for weaving. They were encouraged to try and make thin strips.



Making strips with the width sizer

Children learning from Gangamma how to finish strips



# DAY 2 to 6

Since the workshop was held in Bambu Studio at IDC, we were not constrained by serial class-room type of activities. We had freedom to respond to the interests of children and change the activities freely within the larger framework. Children got fully engrossed and learnt freely as per individual interests. Adherence to Day wise time table was not demanded. Activities flowed from one day to another smoothly *with out the pressure of somehow finishing before 5 O' clock each day!*

## Treatment for borers and fungus

Bamboo has lot of Celulose which is sugar and borers thrive on this food.

It becomes necessary to treat bamboo with borax and boric acid. Both the chemicals are considered safe for human use and also to cause least environmental damage. Children get exposed to Chemistry as well as Environmental Science. Children were surprised to discover boric acid is same as the white powder they have been using on Carrom board!

Their math learning of **Proportions** came into focus when they had to find out weight of the chemical and volume of water to be used for treating bamboo.

Actual weighing and measuring of required water became hands on experiential learning which they miss in the school!



Children weighing the Chemicals

measuring required water



Boiling for 30 minutes



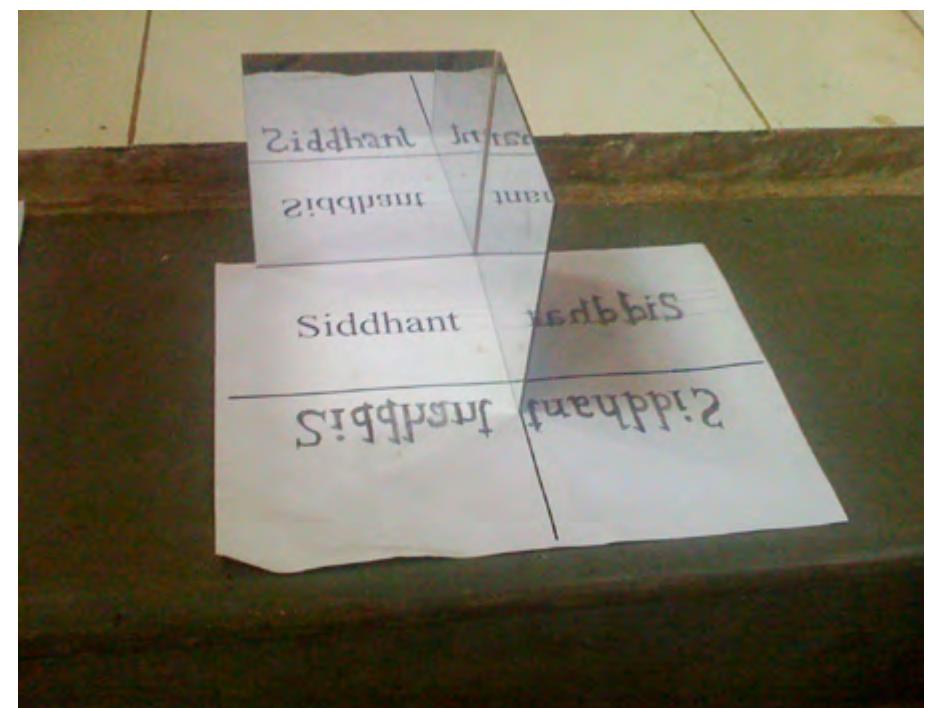
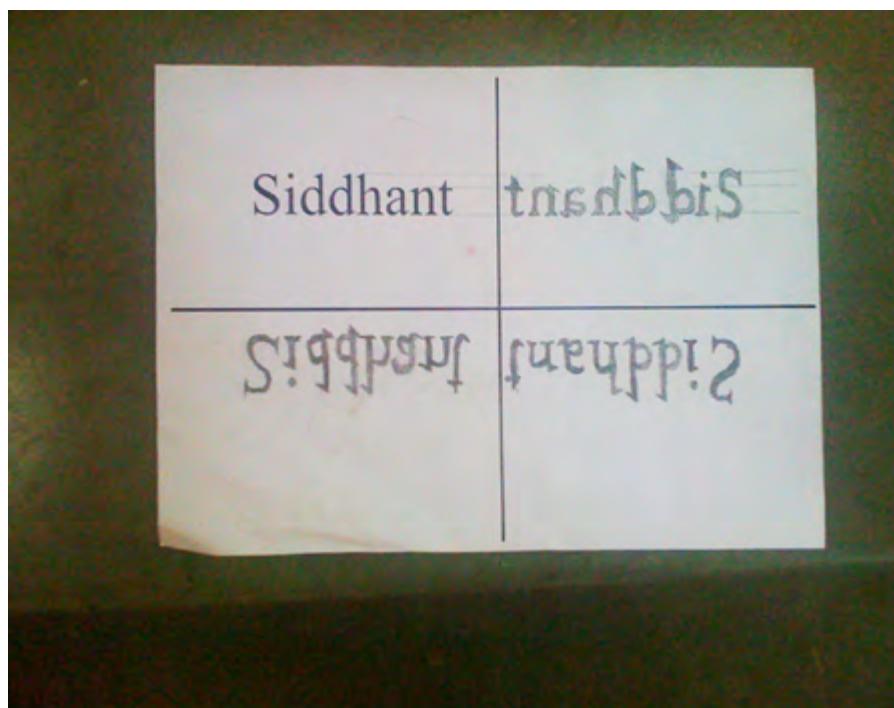
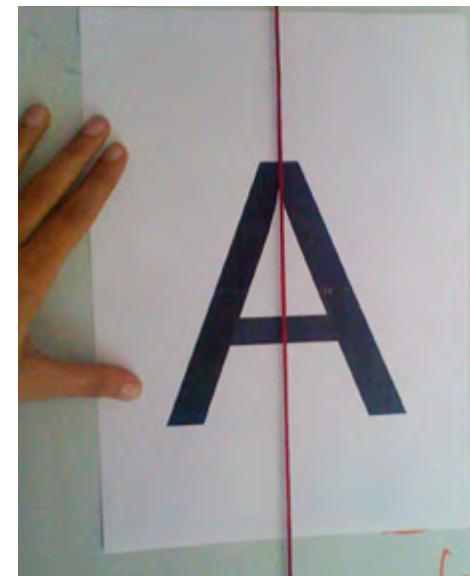
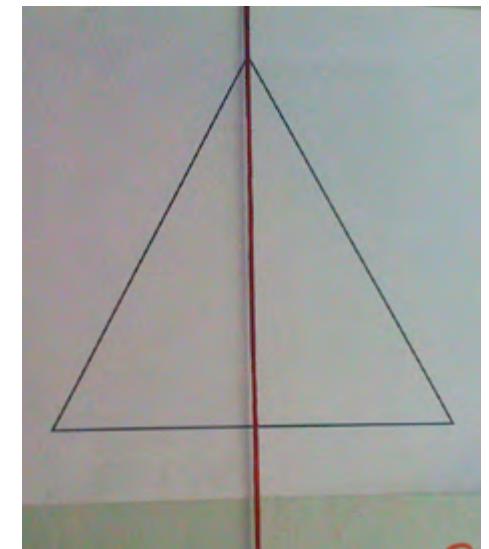
## Symmetry with letters

Symmetry though an exciting subject, is seldom taught in Schools with imagination. Experiential mode of learning is handy to incorporate. Theatric mode is easy to relate and enact.

In this workshop we started a session showing children symmetry in alphabets. Then each one was given a sheet with their own name. Each was to write the mirror symmetry in four quadrants.

Mirror was used to verify the correctness!

We found that when the letters were more children experienced a difficulty . The ability to construct rules became necessary. With a single letter, when the image zone was operating they had no problem. Increased number of letters in a name demanded creation of rules to verify what was done intuitively. A theatric session which they enacted and enjoyed, helped in deveoping a likable memory



## Symmetry with bamboo



A specific task was created in bamboo as an activity to execute symmetry.

They were given Symmetry lines around which they have to stick elements made of bamboo with a quill technique.

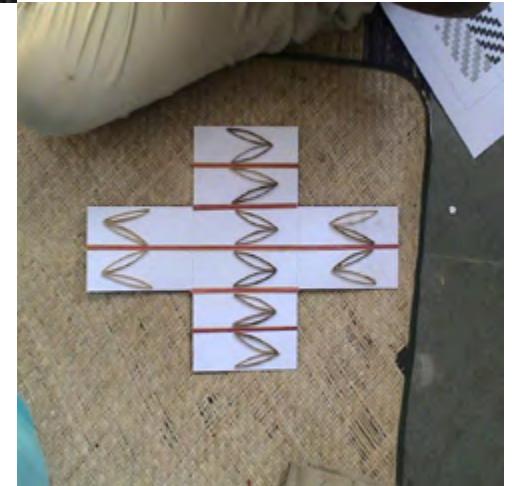
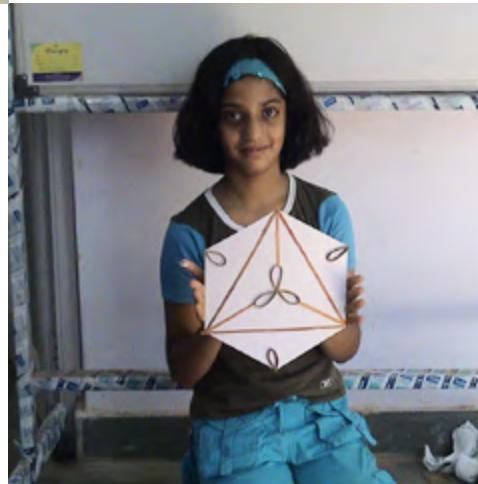
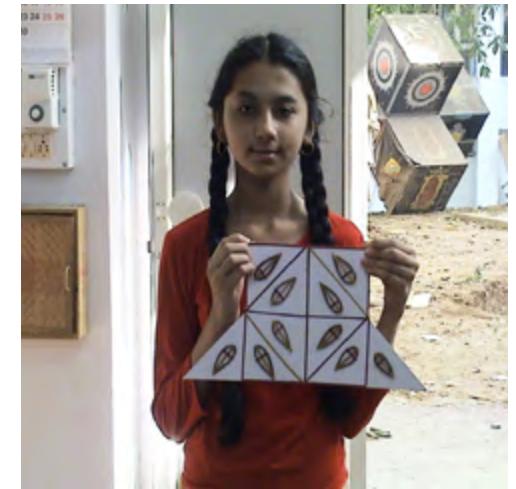
It gave scope for children to express their creativity with in the frame work of symmetry lines given to them.

This task was based on assignments given in their text book.

They were free to make variations in creating and placing

the the elements. The variation in elements reinforces

understanding of generality of principle of symmetry though they are making specific concrete element.



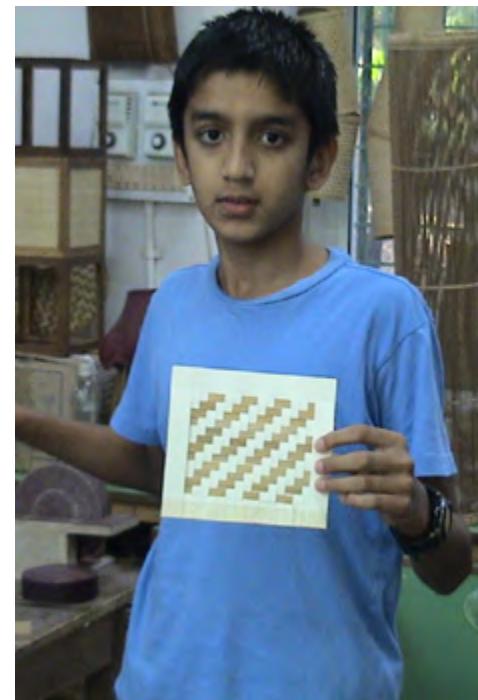
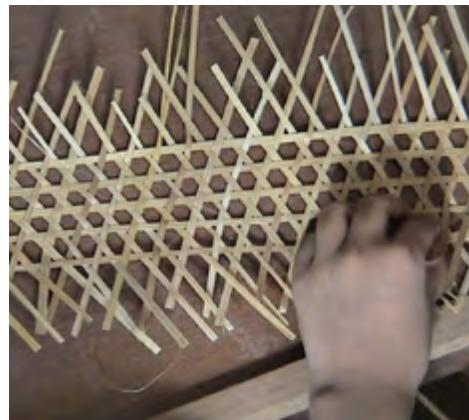
## Mat Weaving

Simple mat weaving gives scope for many learnings starting from skills of making precise strips, understanding the nature of weaves, finding patterns with symmetry, etc. Children made small mats with guidance from Gangamma.

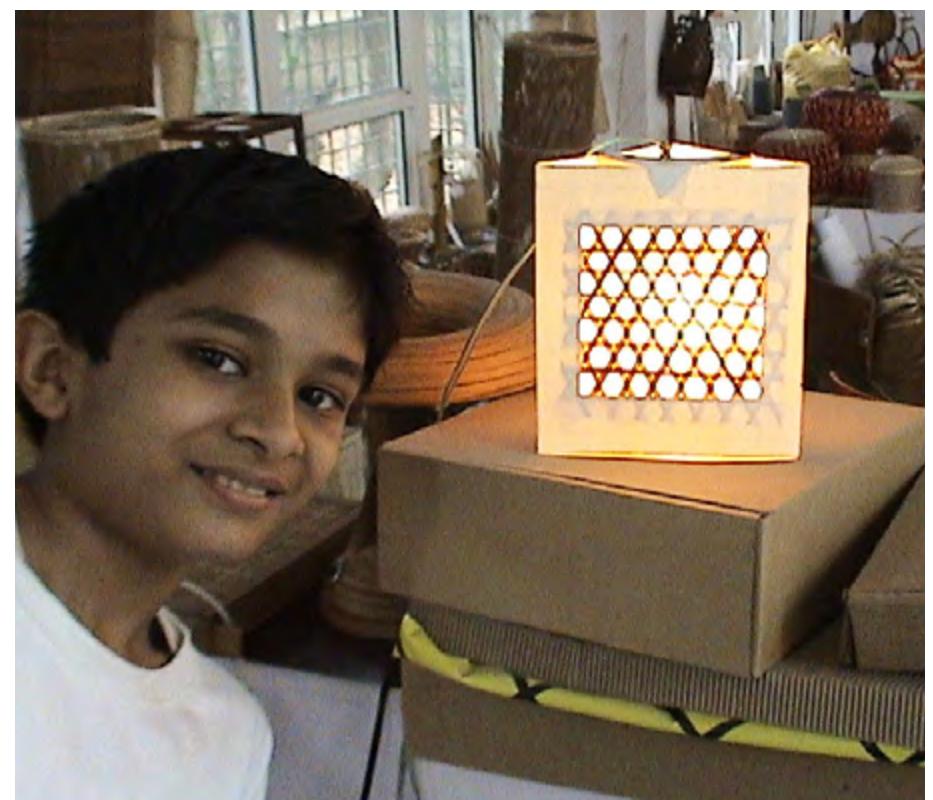
Initially children used paper cut strip frame in which they inserted bamboo strips. This introduced them to the language of mat weaving like 3UP 3DOWN. As a second step Mats were woven with only bamboo strips.

Children also learnt concept of fixture as they used the specially made board with bar clamp in wood. The bar has sand paper stuck at the bottom to ensure enough friction to hold the bamboo strips.

Hexagonal weaves with gaps were also made which were used for making lamps with paper and bamboo mat! Paper lamps were designed with geometrical shapes which children had already done in the school, like prism.



A strategy of incorporating appropriate math complexity for that standard children becomes an important pedagogic skill. It was also necessary to make a finished product in that short period with the skills available.



**Design plays a crucial Role  
in this context!**

## Making Toys

Toy making became a concrete, meaningful activity for Children. It is a good strategy to blend toys which can be made with their skills. Many learnings are dormant in making each of these toys.



[Click to see the video for listening to the whistle >>](#)



### 1.Bamboo whistle

Bamboo whistle is a common toy even I made when I was a kid.

It involves

- making two strips of bamboo,
- placing a rubber band in between and tying the ends with a twine. One learns marking, splitting bamboo to size, keeping the rubber band in place and tying with a right gap.
- Learning of ‘Physics’ of producing sound experientially is important. At later stage children can link to concepts like ‘frequency’ in physics to these vibrations .
- Joy of making the whistle to make a sound and tacit learning acquired with trial and error stays in their memory as they grow up!

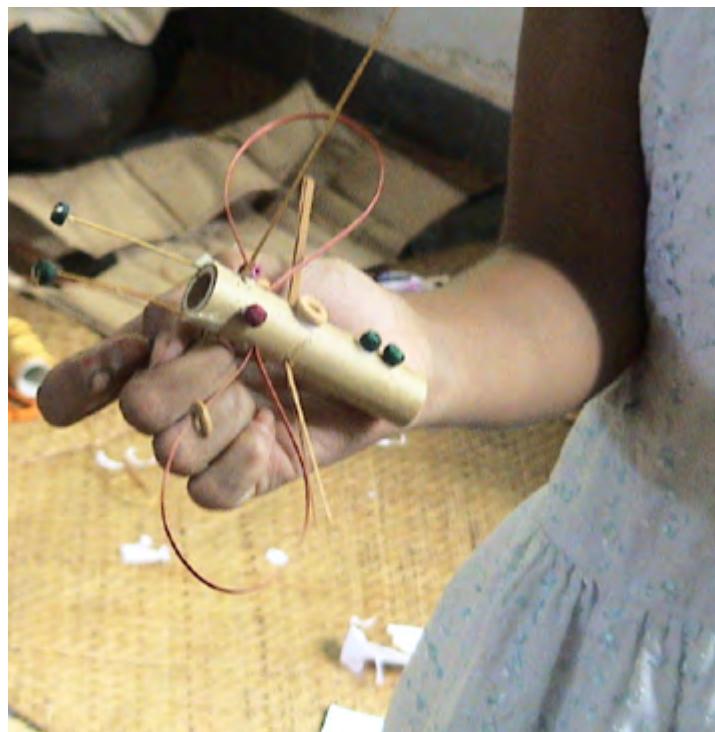
## 2. Jitter bug in Bamboo

This is folk toy from Sudarshan Khanna's book on 'Folk Toys'. Jumping monkey is a standard version. We adopted a strategy to use these folk toys as resource material.

With little design efforts we came out with a 'jitter butter fly' in bamboo.

Making involved cutting a small diameter bamboo to size and drilling a hole to pass the thread. adding small elements like wings in bamboo makes the toy interesting. We encouraged children to come up with their own variations. They were quite imaginative in this 'art-craft' activity!

Physics principles like 'gravity and balance' involved in producing the interesting movement were explained.



[Click to see videos for toy in action >>](#)



### 3.Joker

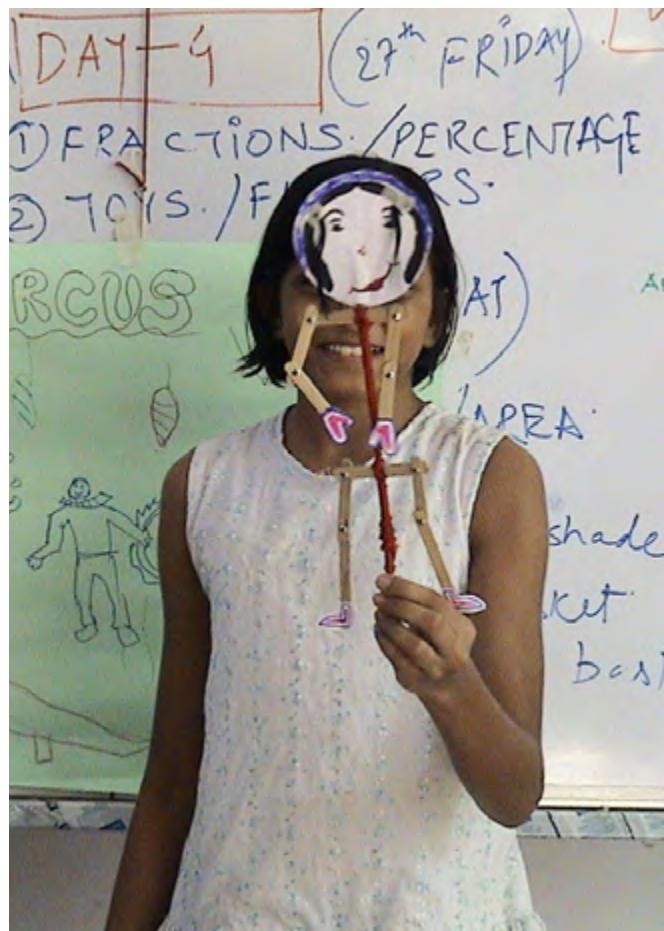
Joker is a simple toy to make in bamboo!

Skills involved are

- making strips to given thickness, width and length
- drilling holes for rivets
- riveting the links keeping free movement
- drawing head in card board and fixing it
- drawing feet, palms and fixing them

Children invariably created characters of their own.

They were asked to create a narrative to make a puppet show with these characters.



## Making Constant Perimeter Link

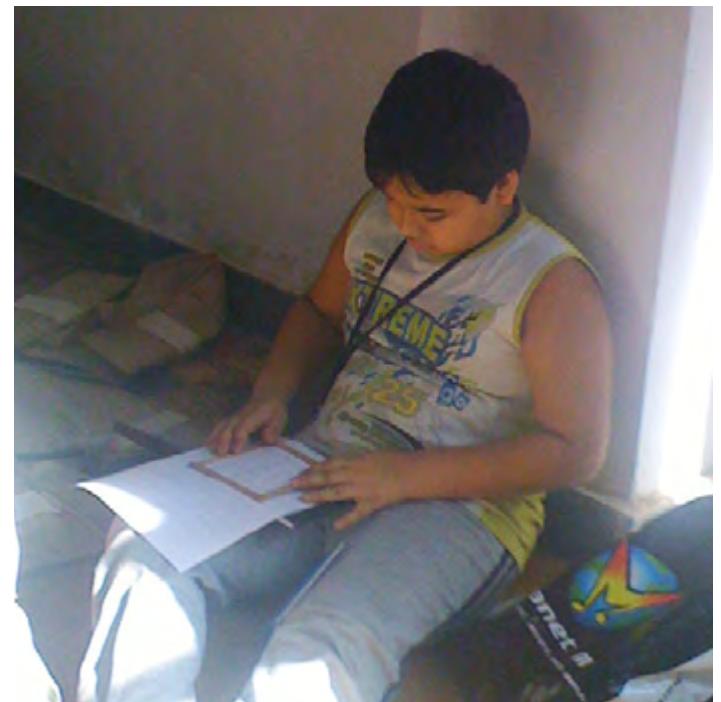
There is well known misconception in Maths, that if perimeter of a figure is same, area also will be same even if it acquires different shapes.

We developed a linkage called 'Costant Perimeter Link' (CPL). CPL can form different simple geometric shapes like rectangle, square and triangle.

Children are told a story which demands choosing and finding out the area of each shape.

Area being a square unit compared to length which is a length unit creates a problem of learning. Once the area is measured with a square grid this misconception can be got rid off.

Children made the constant perimeter link in bamboo as they were already familiar with making of the strips for the link as they had made the puppet with similar strips.





Children made a bamboo strip to represent the golden bamboo. It was easy to solve the problem physically. In 60 cm length half was 30 cm. When divided into further half boys got 15 cm length each. Girls got one third of 30, i.e. 10 cm each.

Some students divided all the pieces into 5 parts. So they got 30 pieces of 3cm, from boys share and 30 pieces of 2cm length form girls' share. Each child got 2 pieces of 3 cm, and 3 pieces of 2 cm, with a total length of  $3+3+2+2+2 = 12$  cm which is equal to one fifth of 60 cm.

How many other ways you can cut?

How can you cut to get the same length of 12cm in 3pieces for each?

## Solving Fraction problem in bamboo

A story with a puzzle/riddle was created for children to make the fractions in bamboo and solve the puzzle/riddle .

The Story:

Golden bamboo & Fractions : - a math story

a g rao

Mahavir is a businessman selling bamboo! He had become 90 years old. He had two sons and three daughters. One day he called all of them. He took out a 'golden bamboo piece', from his old treasure chest! It was looking like bamboo but was made of gold, 60cm long. He said, "See, children! This is our family heritage! This piece came to me as my share! I want you to share this equally! Sons will get half of this piece and daughters the other half!"

So the children took the Golden bamboo bar and cut into half. Sons made their half into 2 pieces and daughters made their half into 3 pieces. When they just finished, Mahavir's wife Lakshmi came she saw how the golden bamboo bar was cut and said, 'Boys are only two, but girls are three, this way boys will get  $\frac{1}{2}$  of  $\frac{1}{2}$  , which is  $\frac{1}{4}$  , where as girls will get  $\frac{1}{3}$  of  $\frac{1}{2}$  which is  $\frac{1}{6}$  only.  $\frac{1}{6}$  is less than  $\frac{1}{4}$  why should girls get less ! All should get equal".

Mahavir realised the mistake he has made. He called all the children and "Cut all the pieces and redistribute so that each will get one fifth even if it is in two or three pieces".

How should the children cut the pieces, so that all get equal gold!

Note for : Teachers / Facilitators

1. This story was used in a 'Bamboo Craft workshop. A bamboo bar of 60cms length was given to cut.
2. You can use card board strip or thick paper as substitute 'Golden Bamboo bar!



## Children who participated

The workshop was organized for children in the age group of 10 to 13 yrs. The group of 15 children had a mix of boys and girls and all of them belonged to Kendriya Vidyalaya School in the IIT campus. The parents were informed about the workshop via e-mail and that's how the first nine children joined. These children told their friends about the various activities and that is how the remaining six children joined later.

Most children attended the workshop regularly inspite of other activities like swimming, tennis, French, dance etc. which they do in vacation. They were keen on trying their hands on all the tools and machines.



RAJITA DUBEY



APOORVA P. PHALE



RUJUTA NAIK



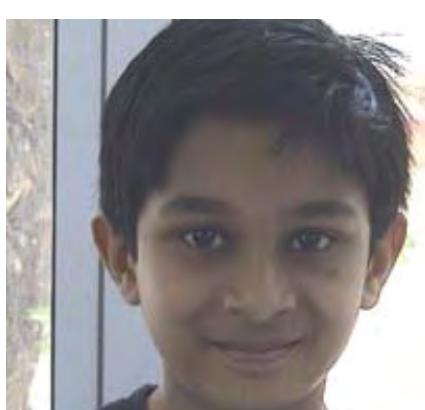
BIBHAVARI BANTOPADHYAY



ANOUSHKA BANAVAR



CHHANDITA CHAVAN



SANDESH MANIK



NEHA PATWARDHAN



AMRUTHA MANJUNATH



CHINMAY PATWARDHAN



ADITYA PETETY



NAMASHYA SAHOO



SIDDHARTH



SIDDHANT REDDY



SNEHA RAUT

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