

SOGOL –An Experiential Learning (Students Own Gadget for Outstanding Learning)

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Abstract- Children are not machines. They think but machines do not think. Children have interest and machines do not have interest. They work only as programmed. As children think so we should provide interesting and challenging opportunity so that they can think, analyse make rule and learn. Sogol is one of interesting TLM for this. In the NCF -2005, it is emphasized to follow child centered approach with a view that every child can learn Mathematics. But we know that Children learn only when they are interested. Creating interest is a big challenge for teachers. In NCF-2005, it is also expected that teachers should act as facilitators for learning by doing. They should think and give interesting opportunities with appropriate challenge to all children in which they learn through their own experiences. They may be able to think logically and independently and find rules themselves with their own experiences. This experiential learning may be by doing activities with or without using TLM or items of daily life or playing games or puzzles.

SOGOL -An instrument for joyful learning



Innovative TLM SOGOL (Fig.2) creates opportunities.

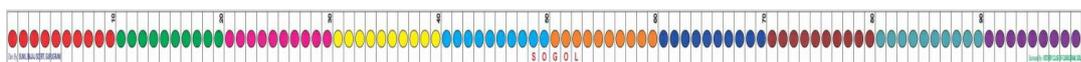


Fig. 2

In this line, measurement is one of the important concepts to be used in daily life and different occupations. However, **research studies** indicate **Measurement** as one of the most challenging areas of mathematics in elementary school (**Clements and Bright, 2003**). Lack

of estimation skills, and formula based approach without any actual experience creates problems in understanding measurement concept. **Innovative TLM SOGOL creates opportunities for** Estimation and measurement of length, Perimeter and area, measuring curve etc.

C. K. Raju-Towards Equity in Mathematics Education 2. The Indian Rope Trick: Rope vs Compass-Box The rope (or string) is flexible in more ways than one and can be used to do everything that can be done with a compass-box. It can further be used to measure the length of a curved line, impossible with the instruments in a compass box. This is helpful for the measurement of angles, and the subsequent transition to trigonometry and calculus. The rope is also inexpensive, locally-constructible, eco-friendly, and suited to conditions prevalent in countries like India. Hence, it is a superior replacement for the compass-box.

Hans Freudenthal (Freudenthal, 1973, pp. 179-194).-Hans Freudenthal from Netherlands inspired by a different approach delays the teaching of place value and focuses on the development of number sense. The activities chosen, such as the counting on the hundred bead long ten-structured bead string and the jumps on the empty number line keep the numbers whole without differentiating them on the basis of their place value. This approach is strongly rooted in the conception of Freudenthal about the teaching of numbers. He approached numbers by recognising that there was more than one concept of number, which included counting number, numerosity number and measuring number. He argued very strongly that the numerosity number was 'mathematically insufficient', 'mathematically unimportant and 'didactically insufficient' for the teaching of natural numbers **Counting in groups** in early years is considered as one of the important concept for developing understanding of structured counting. Grouping of 10 is most basic being used in decimal number system. Needs enough experience of grouping of 10 for better understanding of place value.

Usha Menon -The teaching of Place Value -cognitive considerations A counting based, number line using approach as in RME would differ very much from the approaches prevalent in India. Yet experience in the last four years shows that teachers very warmly welcome a teaching aid such as the structured bead string/ganitmala. 9 This can be understood in terms of the traditional rote practices in which the emphasis is on the chanting of numbers forward and backward as well as on various forms of skip counting. In the traditional practice any form of visual support is given only up to number ten. The development of number sense in the traditional practices can perhaps be understood in terms of the structuring implicit in the number names. Yet these practices can be considered to have the potential to blend with those for developing number sense using the empty number line as a new functional learning system.

Mathematics is known as study of **Patterns**. Patterns are now introduced at Primary level. As we know finding rules while making wonderful patterns creates foundation for Generalization. While making patterns, children start thinking logically with concentration to find rule. They become interested as they find challenge in it. There is a need of creating opportunities which gives scope for making patterns in interesting way (fig.4).

Estimation is an area which is rarely discussed in schools. **Larry P. Leutzinger Edward C. Rathmell Tonya D. Urbatschin** their paper mentioned that Children with experiences of development of **estimation skill** in the primary grades will not only become better at estimating and mental computing but also develop a sense of number. This number sense goes far beyond the ability to compute with paper and pencil. It forms an excellent foundation on which problem-solving and logical-reasoning skills can be based. There is need for providing scope at primary level.

To address these issues, a low cost multipurpose instrument **SOGOL** has been designed which can be used as a TLM. It will help in developing understanding of measurement, place value, number concepts, operations in numbers patterns, fractions, decimal fractions, multiples and factors, LCM and HCF and estimation skills.

BRIEF ABOUT SOGOL

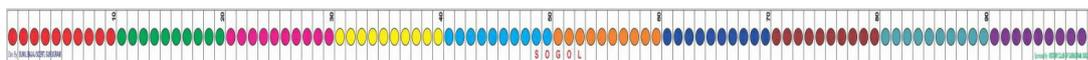


Fig. 3 SOGOL

It is a one meter (approx.) long strip (made of flex sheet) with colored dots in groups of ten and each small partition with one dot is of 1cm (approx.) length. Generally in classroom, One meter measurement tool is rarely available. Children have a vague idea about meter and centimeter actually how much one meter and centimeter is and further $1m = 100$ cm. Now with SOGOL, they can have the idea while using it in the activities on measurement. Their estimation skill will improve as they first estimate any length, e.g., dimensions of Bench, window, Blackboard then verify with SOGOL (fig.5) and will know how much is 1m and 1cm and relation between meter and cm. Also in counting, they have abstract idea of place value. Grouping of 10 in SOGOL will help to understand place value and numberness using tiles.



Fig. 4



Fig. 5

Features of SOG

- It provides the scope of participation of all children as can be easily made available to all children and easy to handle.
- It is a tool for learning by doing. It can be used to measure items of daily life also at home. Helpful in many projects on measurement in and outside class.
- It is used by individual and easy to carry. So can be easily used in classroom to measure length, to find Area and perimeter of notebook, bench etc.



Fig. 6

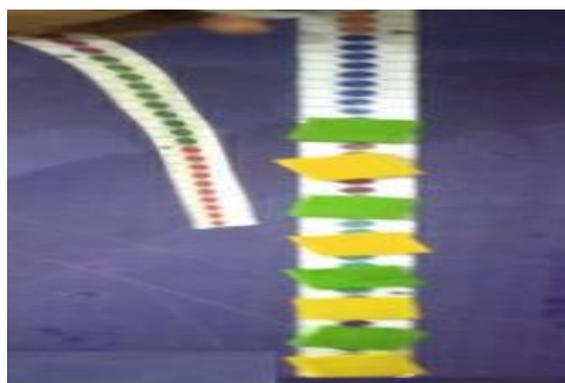


Fig. 7

- It can be a measuring instrument and replacement of Geometric box.
- It is durable and can be used for years with small care.
- It is cheaper and will cost around Rs. 6.
- Work like slate as we write with sketch pen or marker, we can rub and clean it.
- Eva tiles stick on it to make patterns so enough scope for interesting patterns.
- It can be used by teacher to draw an arc or circle and make angle on the black board.

In the case of the rope vs the compass-box.

The SOGOL as a rope or a string can be used to do a number of things. 1. By holding it tight (possibly by fastening one end) one can draw a straight line, so it can perform the function of a straight edge. 2. By choosing any appropriate unit, it can be made into a scale. 3. By keeping one end fastened and moving the other end around, one can draw a circle. So the SOGOL (rope) performs the function of a compass. 4. Most importantly, it can be used to directly measure the length of the arc, hence an angle in radians: simply lay the rope along the curve and note the reading. By measuring circular arcs, it also serves as a protractor which measures angles in radians. 5. By marking two points on it a distance can be picked and carried, so a rope (or string) can perform the function of a divider. 6. It is easy to construct a right angle, and by bisecting or trisecting it, it is easy to construct angles of 45° , 30° , and 60° , so it also performs the function of set squares. 7. By fastening two points, one can also draw an ellipse with the rope. This is impossible with the compass-box. So, string (or a piece of twine) can be used to do everything that can be done with a compass-box, and something

In India, a string with 100 beads popular as Ganit Mala (Usha Menon–Jodogyan) is expensive and is very difficult to handle. SOGOL is very cheap and is easy to handle. Ganit Mala is mostly used for demonstration as is of big size and smaller is also difficult to handle. It is durable and handy may be kept in pocket. Many games can be played for each Counting, grouping, place value, operations, tables, even odd numbers Patterns, fractions, decimal fractions, Multiples and factors, LCM and HCF, developing estimation and measurement skill, perimeter and area.

Play and Find the Rule to Win

Divide whole class in to two groups. One who will reach 20 (or any other target may be 30 ,40 ,50,60 ,70 ,100...) will be the winner. One group will start by speaking any number up to 4 (this may change every time 2 or 3 or 5 or 6, ...) let they say 3. In the beginning, children can mark on Sogol by keeping finger, then other group will add any number up to 4 say 2 now $3+2$, i.e., 5. Now turn of first group, they spoke 4 so now total comes $5+4 = 9$, continue in this manner and one who will reach 20 first will be winner. Let children play this any number of times and discover the rule to win. This is very important activity for children to find rule and win.

This can be played by subtracting numbers starting from 20 or any other and one who will reach 0 first, will be the winner.

Multiples and factors, LCM

Also play game of Micky mouse and Pucy cat as in NCERT book class-5. mouse is on 9 and cat is on 4. Cat can jump 4 steps or four dots here and rat can jump 3 steps or dots. Rat can hide in a whole at 27. Whether rat will reach the hole safely or cat will catch the mouse. Take two tiles one as Micky mouse and other as Pucy cat and children jump them simultaneously 3 and 4 steps and see what happens? See the numbers where cat and rat jumped and observe.

Be My Multiple, I'll be Your Factor

The Mouse and the Cat

The hungry cat is trying to catch Kunjan the mouse. Kunjan is now on the 14th step and it can jump 2 steps at a time. The cat is on the third step. She can jump 3 steps at a time. If the mouse reaches 28 it can hide in the hole. Find out whether the mouse can get away safely!

a) The steps on which the mouse jumps — _____

b) The steps on which the cat jumps — _____

c) The steps on which both the cat and the mouse jump — _____

d) Can the mouse get away? _____

Length estimation, Area and perimeter

Ask children to estimate length of their arm, width of blackboard and copy etc. verify with SOGOL etc. measure perimeter of notebook, copy, table etc. find area of notebook, copy, table etc. circumference of different circular objects (use it finding value of pie).

Integer

Take vertical strip as multi story building (or thermometer) by keeping it vertical and taking zero in the middle that is five colours up (Istfloor, IInd Floor...) and five colours down (-1 as basement Ist, -2 as basement IInd...) or fifty dots up and fifty dots down.

Also in vertical strip take five colours up or fifty dots up as positive integer 1234...50 and five colours down or fifty dots down as negative integers -1, -2, -3...-50.

Play game by throwing two dice one with number and other +, -sign for example + and 5 comes move 5 steps up or if -and 4 comes then 4 move steps down (game given NCERT 7th class book).

Algebra

Introduction to variable -Hide some part from one end and show dots e.g., five and ask how will you write it (hide by rolling other end so that child will not know the total).

Fraction

In how many ways you can use two colours to show fraction $\frac{5}{7}$. Similarly many other fractions. Compare $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$... by making 2 parts, 3 parts, 4 parts etc. by size of the strip SOGOL. Use one colour as $\frac{1}{10}$ equal to 0.1 and use 10 dots (in that colour) out of 100 dots as 0.10 and see both are equal.

Concepts-Counting, grouping, place value, operations, tables, even odd numbers Patterns, fractions, decimal fractions, Multiples and factors, LCM and HCF, developing estimation and measurement skill, perimeter and area. Due to its Low cost, durability and easy to handle property, it is going to be a game changer. To make it available to all, it is suggested that it may be made a part of geometry box/replacement.

References

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