Indigenous Learning Cultures
- Basic to Sustainable Total Literacy

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Introduction

It is a common experience with all of us that we "learn" when we experience a sense of joy while involving ourselves in an activity. This kind of learning is thrilling in that it is natural and spontaneous. The social settings in which such natural learning occurs are the learning *cultures.*

Learning cultures facilitate the individuals and the community as a whole in finding a way of life. Functionalism is central to whatever is learnt.

Study and observations of folk-mathematics in rural areas of Tamil Nadu in South India showed clearly process of the natural learning with its core of functionalism. This paper intends to highlight briefly the insights gained from the study regarding the learning strategies inherent in folk-mathematics and their possible applications in planned educational activities such as adult education/literacy programmes.

Study and Observations of Folk-Mathematics

This section includes practices in enumeration of sets of objects, in measurements and in a few forms of recreational mathematics.

1. Practices in Enumeration of Sets of Objects:

Convenient unit-sets of agricultural produce requiring counting vary with produce, considering the ease of handling for counting with speed. The unit-sets vary from naturally occuring bunchs (bananas and of coconuts); counting on fingers - in fives at a stretch Ibanana leaves, cowdung cakes); the volume of produce a hand can hold (betel leaves, paddy seedlings); a load that can be carried on head or shoulders either as bundles (sugarcane, bamboo) or specific-size containers such as nets (fruits), baskets (fruits, tea leaves), sacks (fruits, tea leaves).

These unit-sets may also vary according to the quantum of produce in a specific village. Betel leaves produced in large quantities in a village were counted differently from the other villages.

The multiples of convenient unit-sets are used to reach the counting of large-sets. For example;

1 pidi (handful)=1 mudi (knot)=10 seedlings

10 pidis/mudis=1 Kalasam (cone)= 100 seedlings

100 pidis/mudis=1 kattu (bundle)=1000 seedlings

The names used for unit-sets and their multiples have meanings and can be visualised in concrete forms.

Ingenious ways of counting are found. For example, beedis are counted keeping a bunch of them in the circular space created by bringing together the tip of the thumb and tip of the forefinger and looking at the arrangement of beedis in circles - 3 in the

centre, 8 around the 3 and 14 around the 8 making up to 25 (3 + 8 + 14=25) in a kattu (bundle) and 40 kattus make 1000 and 25 kattus make a packing.

Estimations of quantity of objects are frequently done fairly accurately. It is observed that it is common practice with people. They believe that they have this ability due to their experiences in estimating quantities. The bases for estimations are explained by some as the size of the objects and space occupied by them.

All these indicate the functional nature of the counting process and natural ways of computation in multiples of convenient unit sets which are locally decided. The learning is by participation in the production process with those experienced in agricultural production and marketing through the individual efforts of observation, imitation and practice.

2. Practices in Measurements:

Study of the use of units of measurements for measuring the dimensions of length, volume and time in day-to-day life of people in rural Tamil Nadu showed that:

People used a variety of units, non-specific or specific differing in the types of unit base. Non-specific units in length, for example, include tall-short, shallow deep, long-short, big-small and also slightly more specific ones such as the depth of water in terms of the number of steps immersed, the rope length that gets wet distance in terms of the number of houses, arm-girth and hip-girth in terms of bangles, belt etc., rainfall measures in terms of levels of lakes/tanks, levels of water collected in vessels or grinding stone kept in the rain, the flow of water, duration of the rain, the quantity sufficient for one ploughing or more. Specific units include body units such as finger-length, finger-width, span, cubit etc., British units which are related to body units such as inches, foot yard, furlong, mile; metric units such as millimetre, centimetre, metre and kilometre.

The types of units used are situation-specific and object-specific. Because of this nature of measurement the whole evolution of the units of measurements is practically visible in the villages.

Estimations of measures of length, volume and time are made frequently and fairly accurately also. Bases for estimations can be explained by a few, but the majority have a feel for them but are unable to explain.

*Counting Beads

Women playing ‘Pailanguzhi attam’

Here again, all these point to the highly functional nature of the measurement process. The learning is by observation in totality of life as lived by the family and village community. It is extremely practical to use a variety of units for different objects in different situations. Obviously, in general, there is a kind of consensus as to which type of unit to use for what and when. Learning to inter-relate the various types of units used in different situations will enhance the ability of the people to use variety of units the way they want to.

3. Practices in Recreational Mathematics

Rural Tamil Nadu has a rich folk-lore of mathematical riddles, folk-games and folk-art of kolam incorporating the concepts of number systems. Following are some samples.

Mathematical Riddles

A riddle is a problem or puzzle. It is generally presented as a question or statement or a story with a question. It is formulated in such s way that some ingenuity is required to solve or answer it. The purpose of presentation and resolution of riddles is to develop thinking and imagination through enjoyable experiences. The contents include elements of nature as well as people’s beliefs, customs, thoughts and ideas. The structure is generally simple and limited and also metaphorical in that something is related to the other or compared and contrasted. Feelings, rhythm, the power of words, analogies as they occur to people, find expressions in riddles. Observations in rural areas showed that riddles are always presented in groups. Children and adults alike join together and go on even for several hours presenting and resolving riddles and also creating riddles. An intense sense of wonder pervades the whole atmosphere. The power of orality could be felt in such informal learning situations.

A publication of a book of riddles in Tamil included 2500 riddles. They are of different types which include mathematical riddles. Mathematical riddles are descriptions of life situations or problems involving questions related to quantity and selection of appropriate strategy to deal adequately with problems. Some samples of riddles from rural Tamil Nadu are presented here.

Seen by two, taken by ten, eaten by one, who are they ? (eyes, fingers, mouth)

Two that roam around, two that look at the sides, Two that hear the rising sounds, two that extend to take objects. What are they? (legs, eyes, ears, hands)

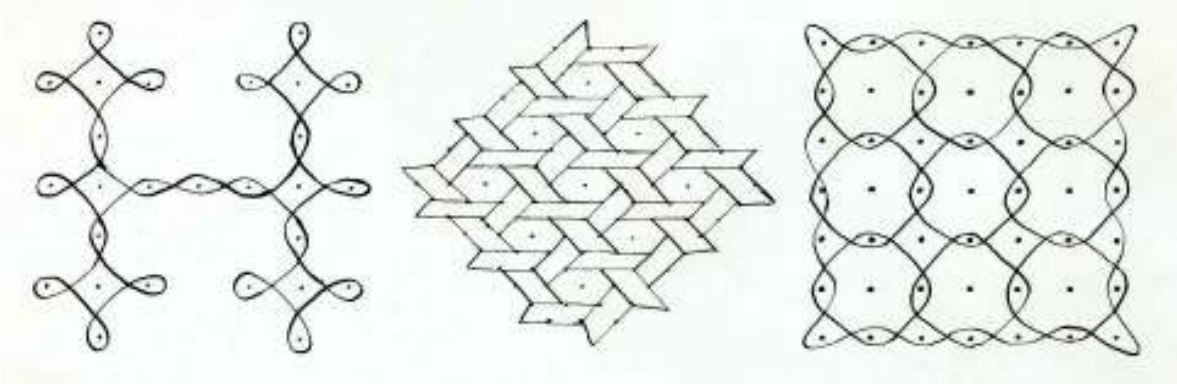
There is one tree. It has twelve branches and each branch has thirty leaves. What are they? (year, month. days)

In a village, there was a lotus pond. In the pond, a few lotus flowers were in bloom. A few bees came humming. Each bee tried to sit on a flower. One bee was left without a flower. Hence bees sat in pairs on each flower. This time a flower was left without any bees. How many flowers were there and how many bees came?
(3 flowers and 4 bees)

Folk-games

Leisure-time activities that are fun and bring delight are games. They are made regular with rules and regulations. They can be indoor or outdoor. Some are seasonal. They are played mostly in groups. Within groups, individuals take their turns, may play in pairs or as a whole group. When some play many watch with much interest. Games are also seen as those played by children (boys, girls, both) adults (men and women) and both adults and children. These games help develop physical and mental skills. A publication in Tamil indicates 126 different kinds of traditional games in Tamil Nadu almost all of which are still being played in rural areas. Songs and conversations are part and parcel of some of the games played. This is true especially with children's games with a view to developing their language ability. The majority of the games have in them the arithmetical and mathematical concepts and also enable the participants to develop some of the basic mathematical skills such as decision-making, predicting, counting, using the four operations, making sets, understanding probability and so on.

* Folk art of kolam, from left; kolan around dots (single-line kolam. no lifting of hand); kolam joining dots; kolam around dots (double-line kolam, cut and join)



A sample each of a simple and complex game are presented here

Blowing Tamarind Seeds

Two or more can play this game. Children as well as adults play. Those who play bring as many seeds as they can and pile them up in the centre. Each player takes turn to blow the pile three times and pick up the seeds one by one without touching or disturbing the seeds that are closer to the one being picked up. If a neighbouring seed shakes while picking up, the player loses his turn. While blowing the seeds the mouth should not touch the pile.

The force of breath employed in blowing the pile for the seeds to get widely scattered, thus facilitating picking up a large number of seeds by the players, make it an enjoyable and absorbing game. Counting of piles of seeds, comparing with others' catch, getting enthused to scatter more seeds nest turn, are observed while the game is in play.

In seasons when the tamarind seeds are available in plenty every house has a gathering for playing this game. Though children play this game in large numbers, adults do play it too, and enjoy it.

Pallanguzhi Attam or Pondi Attam

(Attam in Tamil means play)

This is one of the very old games, played mostly by women as an indoor game. It is played in the open as well. This game is generally not played at night. Two to four persons play the game. There are several varieties of *Pallanguzhi Attam*. Play continues for several hours. A few play, many observe, assist and enthuse the players.

Two rows of seven pits are dug in the ground. Depending upon the kind of game, the pits are filled with a specific number of seeds. Some use a foldable wooden frame in which the pits are scooped out. Some use such frames made out of metal (brass).

One of the games using the 14 pits is called *Pasu Pondi*. *Pasu* is a small set of four and *Pondi* is a large set. Seven pits on one side are assigned to one player and those on the other side to the other player. Each pit is filled with five stones or seeds. The one who begins empties one of the pits that belongs to her and distributes the seeds one for each pit in clock-wise direction. She continues the process by emptying the pit next to where she ends the first set of seeds. This continues until the end, when, if she finds more than one empty pit she gives up the turn to the other player. If she finds one empty pit next to the pit where she ended, then she captures all the seeds gathered in the pit on the right side of the empty pit. This is called a *sweep* or *Pondi*. After the *sweep* the players change ends and the other one starts. Once the seeds from a pit are opened for distribution, the seeds that get collected subsequently in sets of four (Pasu) could be taken by the player who owns the pit. If all seeds that remain get to one side, the first game is over.

The second game starts with the players filling the pits (five in each) with the seeds they got with the previous game. Both the players may have got enough seeds to fill all the pits or one may have fewer in which case the pits which could not be filled are not part of the nest game. The game goes on until one of the players does not get even five seeds to fill in one pit. Here the game ends, and begins all over again.

Folk-art of Kolam

Kolam is the most popular of the visual folk-arts of Tamil Nadu. This is believed to be 5000 years old. This art is done generally on the floor at the place of worship, main entrance to the house. The designs are made with admirable ease. No tools are used. The ingredients used are rice flour or powdered quartz (kind of white stone). Hence it is generally white in colour. The flour is taken between the thumb and the forefinger and dots are made and lines are drawn. The designs are produced using dots as bases. On special occasions different colour materials are used. They are dry colour powders produced from soils, leaves, charcoal, plant roots, burnt earth, bark of trees, and coloured stones available locally.

These designs are handed down from one generation to the next through the process of socialisation. These designs are generally made by women. Young girls start learning this art through observing older women practising it everyday. Every year during the period from mid-December to mid-January, for a whole month, the whole frontyard of the house is filled with kolam designs everyday. This is done early in the morning after sweeping and cleaning the place with cow-dung water. During the month several women join together and make these designs. Many take this opportunity to study different designs stopping at places with attractive designs, counting dots and looking at the connecting lines. In other words, kolam as an art is focused during this month. On festive occasions, especially those connected with temples, many women jointly undertake the responsibility of filling the vast floor space with kolam designs.

The kolams are mainly of two types: single-unending line kolams and multiple-line kolams in which cutting and connecting of lines are done. There are kolams in which lines are drawn around the dots and others in which dots are joined. With increasing the dots a simple design can be enlarged.

The movements made at the time of designing kolam are considered to be natural movements. Arithmetical operations of enumeration and computation of addition, subtraction, division and multiplication are possible while counting dots, rows of dots—equal number and unequal number. Besides, mathematical abilities of enlarging designs sustaining proportions, adjusting to uniformity and symmetry, maintaining proportions, perception of visual imagery and widening the visual field could be developed using this art. Cognitive skill of understanding spatial relations is in-built into this art. It is amazing that with a set of five dots in a row and five rows of five dots, one can produce one *lakh* or one hundred thousand different designs. There is immense potential for creative expression. Each kolam design has a name that is meaningful to the people and hence easily identifiable.

Folk-ways of learning include several other forms. In this paper only a few forms are introduced to indicate, understand and discuss indigenous learning cultures.

Learning Strategies in Folk-Mathematics: The Study Pointers

The learning situation is the social setting of home ,and neighbourhood, wider community of extended family and village as a whole. This social setting has some important features that facilitate the natural learning process. They are: 1) Both ‘age-sets’ and ‘multi-age-group’ are there enabling collaborative learning which is also kind of non-competitive;

2) Team work becomes possible as the setting affords the collective wisdom of its members. There is diversity in that the members have different strengths, styles and attitudes: 3) The congenial environment to learn through fun-filled activities.

The individual learning strategies are observation, imitation and practice in real life activities rather than following verbal instructions.

The learning process involves immersion of learners (children and adults) in an environment where mathematical challenge comes naturally.

Learning takes place through metaphors and symbols which are psycho-emotionally related, unlike the condensed symbols used in school mathematics.

Learning is context-specific and hence highly functional.
It brings in the question to the learner: "how does this work in this situation and how does this fit my world-view?" In this, mathematics is a system of codification that allows describing, dealing, understanding and managing reality.

There is inherent potential in the indigenous natural learning process for the learner to acquire higher order cognitive skills as indicated in the recreational mathematics section. These skills include the ability to use language actively as in riddle presentation, resolution and creation.

In the light of the study pointers it could be said that there are two basic problems in adult education/literacy programmes. They are: 1) Ignoring and debasing what people have, how they learn what they learn: and 2) Assuming a great division between orality and literacy and hence suppressing orality in order to promote literacy.

Both are attitudinal problems of the programme planners and organisers. They are reflected in the methods and materials and in the results showing high drop-out rate and frequent atrophy of skills.

General Suggestion for Planning a Sustainable Literacy Programme

The indigenous learning cultures are basic on which the planned literacy programme is to be built. This would mean facilitating a process of Freire's "Cultural Synthesis" in that the learners should be enabled to systematise the context specific learnings to see their inter-relatedness, This process can help in widening their life perspectives still preserving the context- specific use of their learnings. At some point they see the written form of literacy as a part of their learning continuum and hence a part of their culture. This is how and when the programmes become sustainable,

This implies actions in terms of

The planned educational programme should be location-specific o that it is in tune with the cultural context of the people in the programme.

The materials are to include 1) materials that help in the creation of an environment for literacy: a) oral cultural context b) process of reflection on its efficacy and limitations, c) discussing the literacy need, and 2) materials for literacy learning suited to a particular environment. These materials could be prepared with the people in the programme

The methodology of teaching and learning is to be participatory as it is in the indigenous learning cultures - with emphasis on the informal nature of the learning activities facilitating involvement in the activities.

The training of programme organisers is to underline the indigenous learning cultures and their application in literacy programmes. The training becomes crucial as the change in the attitude towards the indigenous learning cultures ix the key factor.

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She has had experience over two decades of working with the people in the rural areas of Tamil Nadu in South India, especially in the field of non-formal education for children as well as adults. Special field of interest has been evolving methodologies integrating the people's present practices with whatever the field of study has to offer. She has spent a lot of her time and energy focusing on the approach to children and adults (women) in involving them in the learning process. She has several publications to her credit.