

Dr L S Saraswathi: Practices in linear measurements in rural Tamil Nadu: implications for adult education programmes

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**PRACTICES IN LINEAR MEASUREMENTS
IN RURAL TAMIL - NADU:
IMPLICATIONS FOR
ADULT EDUCATION PROGRAMMES**

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Introduction

Basically linear measurements are useful for comparing two or more objects where measurement is a means and for describing any object where measurement is an end. Lengths of objects can be compared by superimposing one object on the other or by relating these objects to a third object which is movable. The lengths of objects could be described in terms of objects of greater movability and of objects of general acquaintance of a given community. The movable objects used for comparison or description of lengths could be continuous or discrete such as rope, string, body parts and any standard lengths commonly agreed.

Measuring lengths and understanding linear measurements would involve two operations in terms of dividing the length of the object being measured into a series of intervals of equal lengths, the same length as the measuring rod or any movable measuring device the appropriate number of times on the object being measured. This results in building up a system of units.

Describing objects in terms of their linear dimension (observing the linear dimension of the object, superimposing one object over the other or breaking the length of the object into chosen units and expressing the length of the object in terms of the chosen unit), evolving a system of units of linear measurement and applying the system of units to describe and compare objects are all learned through experiences. These are basic skills necessary for understanding and describing objects and beings in the environment and utilising them and relating with them.

A study of modes of describing linear dimensions such as heights and depths, varying lengths, distances, girths, diameters, area, incline and rainfall by the people in rural Tamil Nadu was undertaken as a part of a study of the existing practices of the rural people regarding counting and measurements in day to day life. This was done to study the implications of these practices for an approach to teaching and learning linear measurements in adult education programmes. This is an effort at making the programme participatory and relevant to the life of adult learners.

Methodology

A total of 304 adults belonging to seven villages (Mangadu, Chozhapuram, Theroor, Pavithram, M. Parur, Nelliyalam and Kollimalai) in four regions based on four major dialects of Tamil language (Northern, Southern, Central and Western) were interviewed. Random sampling procedure was followed in selecting the households after a preliminary decision on the criteria of population size of the village and SC/ST population proportion of the districts in each of the four regions. The population range of the villages included was 5,000 to 12,000 and SC/ST population proportion was from 21 to 36 per cent in six villages and one was a tribal village.

Majority of the adults who participated in the study were agricultural labourers, were in the age group of 15-35 years, were married, were in the unitary families of size ranging from 2 to 5 members, were residents of the village since birth/marriage, had limited communication with the outside world as judged from their travel outside the village and receipt of letters from outside. Care was taken to include men and women, SC/STs and other castes, illiterates, semi-literates and literates with a majority having less than VIII Standard education. Majority were Hindus, though there were some Christians and some Muslims.

Data regarding the following were collected from July 1983 to January 1984. General modes of describing linear dimensions of 32 different items generally found in the village/village homes, which have some

importance in terms of linear dimensions of the objects; ability of the people in the villages to recognize and utilise the tools of standard British and Metric units such as scale and tape; ability of the rural people to estimate differing lengths of jute strings and to explain the bases for their estimations.

The questions asked were open ended. The free responses were recorded. The 32 items for which the respondents were asked to describe the units of linear dimension were clustered in terms of their linear dimensions.

They are as follows

- Heights and depths (4 items): Coconut/Palmyrah tree, Tamarind/Banyan tree, persons (men, women, boys, girls), depth of water in wells/lakes/ponds.
- Lengths (medium) (7 items): Rope used for drawing water from the well, rope used for tying the cattle, yoke or the front cross bar in the bullock cart, rope used for putting the bullocks on to the cart, nose rope of bullocks, cloth (sari/dhoti), mat.
- Lengths (short) (6 items): Handle of the ladle, handle of the sickle, blade/handle of knife, central wooden piece of the dry grinder, height of the winnowing, mouth of chula, mouth of pots.
- Distances (4 items): Distance to the next house, to the next street, to the next village, to the market place.
- Girths Perimeters (4 items): Arm girth, Hip girth, perimeter of a ring/chain.
- Diameters (2 items): Hole in the strainer ladle, stones in the ear ring.
- Area (2 items): House/house plot, Land cultivated.
- Incline (2 items): Thatched roof, ladder on the wall.
- Rainfall.

The collected data were analysed. The analysis consisted of counting frequencies of responses according to the types of units reported to be used by the respondents for each of the items listed above. This was done according to sex and according to castes of the respondents. Percentages were computed for each item. An average of the percentages of responses of the villagers interviewed for each cluster of items mentioned above was computed according to sex and caste groups.

Modes of Describing Linear Dimensions

Free responses to each of the 32 items listed above were analysed in terms of the types of units used by the villagers in measuring the linear dimensions of the objects specified. The results were tabulated. These tables are not presented here due to the space required by such tables in a short article such as the present one. Instead in Table 1 (Appendix) is presented a summary of responses for the clusters of items. The necessary details about the linear measurements of items will be presented following the table as and when required.

The data show that in rural Tamil Nadu

- People used a variety of units to describe the linear dimensions of objects. The units used for any one item or cluster of items varied in their specificity. They were either vague/non-specific or specific but differed in the types of unit base, which was either parts of body or the standard units British (Imperial) or metric system.

Though a variety of units were used to describe the linear dimension of each item or cluster of items, a particular unit seemed to be sore widely used than others.

British (Imperial) units were used more frequently than other units.

In general, the British units, the body units and the non-specific units were in vogue in describing the linear dimensions of objects in day to day life situations. To give an example, in measuring depth of any water source such as well/pond/lake a variety of nonspecific units were used such as shallow-deep, measures in terms of something in the environment such as the number of steps immersed in water, the rope length that gets wet, the time taken for a stone to reach the bottom of the water source and specific units in terms of the body units of

ankle, knee, hip and neck deep and also units of cubits and fathom British units of feet; the metric units of metres and centimetres.

The use of metric units in describing the linear dimensions were minimal. Metric measures were more often used for measuring distances (which require some kind of transport), area and the rainfall. Probably these are mentioned in metric units in mass media such as radio and television. It is to be noted that this is not true in measuring very short distances.

Certain dimensions of length seemed to be more frequently measured than certain other dimensions. Distances, heights and depths were more frequently measured than varying lengths of objects or girths or diameters or area.

- The linear dimensions of certain items were more frequently measured than certain other items.

The most frequently measured items (as shown by over 80 per cent of interviewees reporting some unit of measure) were heights of palmyrah/coconut tree, heights of persons, depths of water sources, rope used for drawing water from the well, sari/dhoti, handle of the ladle, handle/blade of sickle/blade of sickle/knife, distances to the next house, next street, next village and market place. In general, these items seemed to be described in terms of their linear dimensions. In other words, the important identification of these items is their linear dimension. The attention to linear dimension of these items could be spontaneous and measurement of the linear dimension itself seemed to serve the purpose of describing the object.

The items which were measured with moderate frequency (as shown by 60 to 80 per cent of the respondents reporting some unit of measure) were height of banyan/tamarind tree, mat, central wooden piece of dry grinder, mouth of pot, mouth of chula, height of the winnow, arm girth, hip girth, ring (ornament on the finger), house area, land area and rainfall. In these items, except the banyan/tamarind tree, the rest are all either manufactured in varying sizes by different occupation groups (such as mat weavers, potters, stone ware makers, goldsmith) for the people to choose from or the measurements are taken by those on specified jobs on whom the people rely on (examples: arm girth and hip girth by tailor, house area and land area by revenue personnel and rainfall by meteorological personnel). There are variations in linear measurements available and possible in these items requiring the people to choose to serve their own purposes. Here the attention of the people to the linear measures is limited to the choices available with these items, the immediate spontaneous attention is on the function served and the forced attention could be on the measurement of linear dimension. Function and measurement seemed to alternate. Function is important. Measurement could be useful in making a choice of items that are functional.

The least frequently measured items (as shown by less than 60 per cent of those interviewed reporting some unit of measure) were rope used for tying the cattle, yoke or the front cross bar of the bullock cart, rope used for putting the bullock on the cart, nose rope of bullocks, length of chain (ornament around the neck), diameter of the hole in the strainer ladle, diameter of the stone in the ear ring. These items are in general those which were available in standard lengths in the market. There is hardly any variation in their sizes. When there are no choices to be made, probably forcing oneself to measure their linear dimension is superfluous and impractical.

- Measuring the 'incline' was not very common. When asked about the incline of the roof of the hut or the incline of the ladder on the wall, the responses were generally in terms of the measure of the height of the wall or the length and width of the roof itself or the height of the ladder or the width of the steps of the ladder or the number of steps of the ladder.

- These results indicate that the units of linear measurements used in rural Tamil Nadu appeared to be item specific and situation specific. The question arises, are they also specific to certain groups within the rural community? To answer the question, the data were analysed according to sex and according to caste groups. The results are presented in Tables 2 and 3. (Appendix)

The data reveal the following

- The modes of describing linear dimensions of objects varied with the sex groups. Women seemed to use body measures and non-specific descriptions more often (exceptions medium lengths and rain fall). British/Imperial measures less often than men. This was especially true in the case of heights and depths and short lengths.

- The use of metric units was minimal and the variations in the use of these units were not noticeable.

- There was only slight variation between the responses of men and women in terms of 'non-measuring' of items. In other words, certain items which were reported to be 'not measured' by a majority did not mean that either men or women in large numbers did not measure them. In both sex groups almost equal number reported that they did. not measure.

- The modes of describing of linear dimensions of objects varied with the caste groups. SC/STs (Scheduled castes and scheduled tribes) seemed to use the metric and British/Imperial measures less often and body measures more often than the other castes. The non-specific descriptions were given by SC/STs more often for dimensions of distances, heights and depths and rainfall.

- The use of metric units by SC/STs was less frequent compared to other castes.

- There was some variation between the responses of SC/STs and Other castes in terms of non-measuring of items. This means that more number of SC/STs did not measure the linear dimensions of the items studied.

Thus the linear measurements in rural Tamil Nadu seemed to be group specific meaning, sex specific and caste specific.

Measuring the Linear Dimensions

Descriptions above indicate the general practices in terms of the types of units in vogue in describing the linear dimensions of objects. This means that people are familiar with a variety of units mentioned. Understanding the system of measurement would mean understanding the basics, namely, division of a linear dimension into regular intervals in terms of any chosen unit and counting the number of such intervals. In the present study efforts were made to find out the extent of awareness of the basics involved in linear measurements in the people in rural Tamil Nadu. This was done in terms of:

- Estimation of lengths as an application of basics of linear measurement;

- Identification and utilisation of common standard tools of linear measurement. -

Estimation of Lengths

The interviewees were shown three different lengths of jute threads (3 inch, 6 inch and 3 feet) one by one and they were asked to estimate their lengths. The responses were recorded and analysed according to sex and caste groups. They are presented in Table 4. (Appendix).

The data reveal the following

- The estimations of lengths are not uncommon in rural Tamil Nadu.

- Observations of estimations with three lengths of jute threads showed that majority could estimate the lengths.

- In general, people tended to estimate the lengths less than the actual.

- Considerable percentage of villagers estimated the lengths accurately.

- This was true more for the short and the long ones than the medium one.

- The estimations of lengths were done with fair amount of accuracy more often by men than by women. The difference between the estimated and actual lengths was smaller in the case of men rather than in the case of women.

- The estimations of lengths were done fairly accurately more often by the other castes than by scheduled castes and schedules tribes.

- Majority of those who were interviewed could not specify the basis which helped them estimate the lengths. They said that they knew it because of their experience. A few could say that they mentally measured the jute threads in terms of their own hand measures.

Identification and utilisation of common Standard Tools of Linear Measurement : The common standard tools of linear measurement, namely, the wooden scale (12" or about 30 cms. long) and the tape (60" or about 150 cms. long) were shown to the interviewees for identification and they were also asked to measure something in the environment with them. The results are presented in Table 5. (Appendix).

The data reveal the following:

- The common standard tools of linear measurement of wooden scale and tape were commonly recognised tools of linear measurement in rural Tamil Nadu, though they were not being used frequently.
- A large number of men were able to identify and utilise the common tools of linear measurement of scale and tape. Among women, there was a wide variation between the number who could identify and the number who could utilise. Very small per cent of women could use the tools.
- There were variations between the SC/STs and other castes in identifying and utilising the common tools of linear measurement of scale and tape, with a higher percentage of the other castes showing the ability to identify and utilise the tools mentioned.

Implications for Adult Education

The linear measurement, as explained earlier, involves the process of recognising the linear dimension of any item/object, describing the same in terms of something in the environment, making a choice of any convenient unit which is somewhat common or fairly common to all in the community, making an estimate or measuring the linear dimension of objects with the chosen unit. These processes can be learned.

The process of learning to describe any object/item in terms of its linear dimension is essentially a process of moving from:

Stage 1 (Recognition of linear dimension in the object).

The examples could be

- The tree is tall.
- The person is short.
- The water is deep or shallow.
- The distance is long.
- The rain is sparse/heavy.
- The hole is big or small.

Stage 2 (Recognition of the linear dimension being described in an item as something similar to the linear dimension of some other item in the immediate environment).

The use of all non-specific units of linear measure are examples of this stage. The examples are:

- The depth of water in the water sources in terms of the number of steps immersed in the water, the rope length that gets wet, the time taken for a stone to reach the bottom of the source.
- Distance in terms of number of houses.
- Mouth of chula in terms of the size of the vessels to be placed on it or the number of firewood pieces required to be placed in it.
- Arm girth and hip girth in terms of bangles, belt, petticoat.
- Diameter of a hole in the strainer ladle in terms of objects known such as mustard seed, red grain dhal, a pepper, a black gram, pupil in the eye, a dot and so on or in terms of objects that can pass through the circular hole such as thread, match stick, broom stick, needle, nail.
- Rainfall measure in terms of levels of lakes sod tanks, level of water collected in vessels or grinding stone kept in the rain, the flow of water, time or duration of raining, the quantity sufficient to plough the land known in Tamil as semai, suzhi.

Stage 3 (Choice of any unit of continuous measure)

The recognised linear dimension of any item is measured in terms of stick or string or body parts and described in terms of these.

Stage 4 (Recognition of the need for and use of standard units and tools which could be iterated for a fairly accurate descriptions of objects). The Imperial and Metric units and common tools of linear measure of wooden scale and tape are examples.

The demands for the descriptions of linear measures in life situations are such that any individual or group could be at any of these stages at any time. Better understanding of linear measures results not from merely moving from stage 1 to stage 4 but from an understanding of the interrelatedness of these stages and skill in using them with ease in tune with the demands of the life situations.

The practices in linear measurements in rural Tamil Nadu, being item specific, situation specific and group specific, show that a majority of the people are used to certain stage of measuring with reference to the items, situations and also with reference to their own experiences and exposures. The rural Tamil Nadu people in general were at different stages, depending upon the items being measured or the situation in which the item is measured. The evolution of the process in measurement in the different stages outlined, when understood, could help anyone to be at any stage and yet be aware of the linear dimension and its place in understanding objects and utilising the same.

The educational programmes for adults in rural Tamil Nadu should help the learners understand the process of evolution in linear measurement and thus the interrelatedness of the stages and then introduce them to the tools of measurement and- the standard metric system. This, in practical terms, would mean the following steps:

- Sharing of the experiences of the learners in measuring varying linear dimensions of items (objects) in their own life situations;
- Helping the learners to systematise these experiences in measuring linear dimensions;
- Organising activities to recognise the process of evolution of linear measures or the system of relationship from 'not-measuring' to recognition of linear dimension of objects; to seeing the linear dimension in an item similar to something in the environment or with reference to something else in the environment; to choice of any specific unit which may vary with individuals and groups; to choice of specific unit which is common to all in and out of the village;
- Discussing and recognising that the basis of the diverse measurements found in real life situations is just the mode of functioning of individuals and groups at different levels of measuring according to the demands of the situation;
- Looking at the day to day life situation, problems involving measuring in the light of the understanding or insights gained about underlying pattern of relationships in the existing diverse measuring practices to recognise the need for common units of measure. In short, it is for expanding one's world of activities and gain strength in facing the problems in day to day life.

Table 1

Average of percentages of villagers according to the Units used in measuring the linear dimensions.

Sr. No.	Clusters of objects according to linear dimension	Metric	Percentage of responses in Units				Total
			British Imperial	Body	Non-specific	Not measured	
1.	Distances (4)	15.46	68.09	1.97	9.45	5.03	100.00
2.	Heights and depths (4)	0.91	61.91	16.45	10.78	9.95	100.00
3.	Short lengths (6)	0.33	40.18	27.25	6.20	26.04	100.00
4.	Medium lengths (7)	4.70	16.78	28.57	12.01	37.94	100.00
5.	Girths (4)	2.06	16.09	29.85	18.52	33.48	100.00
6.	Diameters (2)	5.44	5.42	0.83	40.63	47.68	100.00
7.	Area (2)	27.63	31.41	-	7.24	33.72	100.00
8.	Rainfall	20.72	8.88	-	46.73	23.67	100.00
Total		6.52	34.18	18.61	13.65	27.04	100.00

Note :Figures in the brackets ,indicate the number of items in each cluster of a linear dimension

Table 2

Sex-wise presentation of averages of percentages of villagers using varied Units in measuring linear dimensions

Sr. No.	Linear dimension	UNITS USED										
		Metric		Imperial		Body		Non-specific		Not-measured		Total
		M	W	M	W	M	W	M	W	M	W	M/W
1.	Distances (4)	18.52	10.43	69.71	65.43	1.46	02.83	07.01	13.48	03.30	07.83	100.00
2.	Heights and Depths (4)	00.80	01.09	70.10	48.48	12.30	23.26	08.34	14.78	08.46	12.39	100.00
3.	Short-lengths 6)	00.35	00.29	45.86	30.87	20.46	36.40	05.55	07.25	27.78	23.19	100.00
4.	Medium lengths (7)	04.69	04.72	17.46	15.65	26.91	31.30	11.41	09.20	39.53	39.13	100.00
5.	Girths (4)	01.72	02.61	19.05	11.31	28.17	32.60	18.12	19.13	32.95	34.35	100.00
6.	Diameters (2)	06.60	03.48	07.15	02.61	00.80	00.87	33.60	52.18	51.85	40.86	100.00
7.	Area (2)	28.31	26.52	34.93	25.66	-	-	06.08	09.14	30.68	38.68	100.00
8.	Rainfall	23.81	15.65	08.46	09.56	-	-	47.62	45.23	20.11	29.56	100.00
Total		07.09	05.56	37.52	28.72	16.02	22.89	12.46	15.51	26.91	27.34	100.00

Number in the brackets indicates the number of items in each cluster.

M= Men =89, W= Women = 115, Total = 304.

Table 3

Caste-wise presentation of average of percentages of villagers using varied
Units in measuring linear dimensions

Sr. No.	Linear dimensions	UNITS USED										Total SC.ST/O.C.
		Metric		Imperial		Body		Non-specific		Not-measured		
		SC/ST	O.C.	SC/ST	O.C.	SC/ST	O.C.	SC/ST	O.C.	SC/ST	O.C.	
1.	Distances (4)	11.69	19.33	67.21	69.00	02.28	1.67	12.97	5.83	5.85	4.17	100.00
2.	Heights and Depths (4)	00.81	01.99	56.33	67.66	18.50	14.33	12.67	08.84	11.69	08.17	100.00
3.	Short- lengths 6)	00.33	00.34	34.63	45.89	33.44	20.89	05.96	06.44	25.64	26.44	100.00
4.	Medium lengths (7)	02.97	06.48	14.10	19.52	31.26	25.81	08.17	13.05	43.50	35.14	100.00
5.	Girths (4)	01.95	02.17	12.98	19.33	26.14	33.67	16.73	20.33	42.20	24.50	100.00
6.	Diameters (2)	01.63	09.33	02.60	08.33	00.97	00.67	40.58	40.67	54.22	41.00	100.00
7.	Area (2)	23.06	32.31	30.20	32.67	-	-	08.44	06.00	38.30	29.02	100.00
8.	Rainfall	16.23	25.34	12.34	05.33	-	-	39.61	54.00	31.82	15.33	100.00
	Total	04.86	08.20	31.01	37.44	20.30	16.87	13.36	13.91	30.47	23.56	100.00

Number in the brackets indicates the number of items in each cluster.

SC/ST = Scheduled Castes and Scheduled Tribes; N = 154; O.C. = Other Castes; N = 150; Total N = 304.

Table 4

Estimates of Length

Sex-wise, Castewise distribution of respondents according to differences in the estimated and actual measurements of lengths of jute threads

Items	Difference in Estimated and Actual lengths	Men N=189	Women 115	Total 304	SC/STs 154	O.C. 150
3" length (7.6cm)	No difference	87 (46.03)	25 (21.75)	112 (36.84)	45 (29.22)	67 (44.67)
	Less than the actual	73 (38.63)	64 (55.65)	137 (45.06)	76 (49.35)	61 (40.67)
	More than the actual	18 (9.52)	10 (8.70)	28 (9.22)	20 (12.98)	8 (5.33)
	No response	11 (5.82)	16 (13.90)	27 (8.88)	13 (8.45)	14 (9.33)
	Total	189 (100.00)	115 (100.00)	304 (100.00)	154 (100.00)	150 (100.00)
6" Length (15.2cm)	No difference	27 (14.29)	3 (2.60)	30 (9.86)	19 (12.33)	11 (7.33)
	Less than the actual	130 (68.78)	77 (66.96)	207 (68.10)	98 (63.64)	109 (72.67)
	More than the actual	15 (7.94)	18 (15.66)	33 (10.86)	23 (14.93)	10 (6.67)
	No response	17 (8.99)	17 (14.78)	34 (11.18)	14 (9.10)	20 (13.33)
	Total	189 (100.00)	115 (100.00)	304 (100.00)	154 (100.00)	150 (100.00)
3 feet (91.5cm)	No difference	67 (35.45)	24 (20.88)	91 (29.93)	34 (22.07)	37 (38.00)
	Less than the actual	89 (47.10)	49 (42.60)	138 (45.40)	69 (44.80)	69 (46.00)
	More than the actual	21 (11.10)	29 (25.22)	50 (16.45)	38 (24.68)	12 (8.00)
	No response	12 (6.35)	13 (11.30)	25 (8.23)	13 (8.45)	12 (8.00)
	Total	189 (100.00)	115 (100.00)	304 (100.00)	154 (100.00)	150 (100.00)

Table 5

Estimates of Length

Sex-wise, Castewise distribution of respondents according to their ability to identify and utilise the common standard tools of measurement

Items	Ability to Identify / Utilise	Men	Women	Total	SC/STs	O.C.
Wooden Scale	Can Identify	175 (92.59)	86 (74.80)	261 (85.85)	126 (81.82)	135 (90.00)
	Can't Identify	14 (7.41)	29 (25.20)	43 (14.15)	28 (18.18)	15 (10.00)
	Total	189 (100.00)	115 (100.00)	304 (100.00)	154 (100.00)	150 (100.00)
Wooden Scale	Can Utilise	145 (76.72)	44 (33.26)	189 (62.18)	89 (57.80)	100 (66.67)
	Can't Utilise	44 (23.28)	71 (61.74)	115 (37.82)	65 (42.00)	50 (33.33)
	Total	189 (100.00)	115 (100.00)	304 (100.00)	154 (100.00)	150 (100.00)
Tape	Can Identify	165 (87.30)	84 (73.03)	249 (81.90)	123 (79.87)	126 (84.00)
	Can't Identify	24 (12.70)	31 (26.97)	55 (18.10)	31 (20.13)	24 (16.00)
	Total	189 (100.00)	115 (100.00)	304 (100.00)	154 (100.00)	150 (100.00)
Tape	Can Utilise	133 (70.37)	44 (38.26)	177 (58.23)	83 (53.90)	94 (62.27)
	Can't Utilise	56 (29.63)	71 (61.74)	127 (41.77)	71 (46.10)	56 (37.33)
	Total	189 (100.00)	115 (100.00)	304 (100.00)	154 (100.00)	150 (100.00)