CHAPTER III

METHOD

3.0 Introduction

Research is to be the more formal, systematic intensive process of carrying as the scientific method of analysis. It involves more systematic structure of its investigation usually resulting in some sort of formal record of procedures and a report of results or conclusions (John.W.Best, 1996).

Methodology means as the logic of methods but not only in order to justify their use for defined purposes in specified situation and circumstance (Rob Walker, 1985). Selection of appropriate methodology provides clear direction to the researchers with regard to the various steps to be followed in carrying out the research successfully.

The present chapter outlines the Site description, Description of the sample, Sampling technique, Variables of the study, Design of the study, Construction of the tool, Data gathering procedure and Data analysis procedure.

3.1 Site Description

The site selected for the present study was Inclusive Schools and Special Schools situated at Coimbatore, Madurai, and Salem districts in Tamil Nadu, India. The schools selected for the study are:

1. St. Joseph Middle School for the Blind, Paravai, Madurai.
2. Government School for the Blind, Salem.
3. Government School for the Blind, Ulliyampalayam, Coimbatore.
4. Ramakrishna Mission Vidhyalaya High School, PN Palayam, Coimbatore.
5. TAT Kalanilayam Middle School, Coimbatore
6. CSI. Girl's Hir.Sec.School, Townhall, Coimbatore.
7. TELC Middle School, Townhall, Coimbatore
8. Ramalinga Chettiyar Higher Secondary School, Coimbatore.
9. Ramalingam Corporation Primary School, Coimbatore.
10. Avinashilingam Primary School. Coimbatore.

11. Avinashilingam Girl's. Higher Secoundary School. Coimbatore.

3.2 Selection of the Sample

The study was experimental in nature. The sample comprised of 120 students, both boys and girls from the class V to VIII. The sample consisted of two groups of students namely Visually Impaired and Blind-folded Sighted students. The first group of 60 Blindfolded Sighted students with 15 individuals in each gender had been considered as Control Group and the next Group of 60 Visually Impaired Students with almost equal in each gender as Experimental Group.

Table 3.1: Distribution of Sample

Students	Type of School	5th				6th				7th				8th				Total			
		VI		Sighted		VI		Sighted		VI		Sighted		VI		Sighted		VI		Sighted	
		B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G
Visually Impaired (Experimental)	School for the Blind	7	7	-	-	6	6	-	-	8	6	-	-	7	6	-	-	28	25	-	-
	Inclusive School	-	-	-	-	2	2	-	-	-	2	-	-	-	1	-	-	2	5	-	-
Blindfolded Sighted (Control)	Inclusive School	-	-	6	6	-	-	8	8	-	-	8	8	-	-	8	8	-	-	30	30
Total		7	7	12		8	8	16		8	8	16		7	7	16		60		60	
Grand Total = 120																					

The above table presents that there were 25 Visually Impaired students from School for the Blind and 5 from Inclusive School. Among Blind-folded sighted students, all the students were selected from the Inclusive schools.

3.3 Design of the Study

The study was designed on the basis of Pretest and Posttest Control Group Design. The sample of the study consisted of two Groups namely Experimental Group and Control Group. The Experimental Group consisted of Visually Impaired students and the Control Group consisted of Blind-folded Sighted students. Pretest

was administered to both the Groups. Treatment was assigned to only Experimental Group.

The layout of the design carried out in this study is given below.

Experimental Group = $O_1 \times O_2$
(Visually Impaired Students)
Control Group = $O_1 \quad O_2$
(Blind-folded Students)

Here,

O_1 means Pretest
O_2 means Posttest
$\times$ Means Treatment

3.4 Variables

The variables selected for the study and the levels are given below:

Variables	Levels
Independent Variable	
Types of Students	i. Visually Impaired ii. Blind-folded Sighted
Gender	i. Boys ii. Girls
Grade	i. V & VI (group-1) ii. VII & VIII (group-2)
Dependent Variable	
Performance in Spatial Skills	i. Basic Concept Skills ii. Distance Estimation iii. Mental Rotation iv. Delineation v. Assembling vi. Rotational Displacement vii. Braille Reading Skill

Construction of the Tool

1. Personal Data Bank: to collect general information regarding Gender, Types of School programme and Grade Annexure I
2. Assessment Checklist for Basic Concept skills was developed by the investigator Annexure II

3. The dependent variables measure in this study include: Performance in Distance Estimation, Mental Rotation, Delineation, Assembly, and Rotational Displacement. The investigator adapted the tools used by Lederman and Klatzky 1990 and 1995 in their studies in Indian context, They include,
    a. Assessment Checklist for Distance Estimation
    b. Assessment Checklist for Mental Rotation
    c. Score card for Delineation
    d. Time Schedule for Assembly Skill
    e. Time Schedule for Rotational Displacement

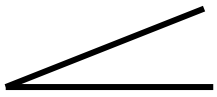
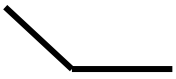
3.4.a Pilot Study

Pilot was study was conducted among 15 Visual Impaired student and 15 Blind-folded Sighted students. The sample was selected from inclusive school and special school in Coimbatore District. Pretesting and posttesting were conducted in a sequence. The tools were found to be reliable to administer to the whole group of samples. This provided a base for the intervention phase of spatial ability in the schools. The reliability of the test Cronbach's Aplha is **0.838** used in the study.

3.5 Preliminary Evaluation

After selecting the sample, the knowledge of the basic spatial concepts of the samples was assessed as Preliminary evaluation. This consisted of nine items.

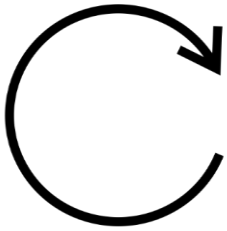
In the first test, the students' knowledge about various angles was tested. The participants were asked to show the following angle using their hand:

Acute angle  Obtuse angle  Right angle 

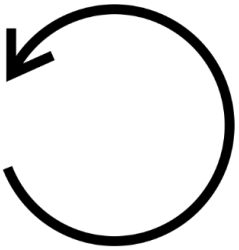
As second item in the Preliminary evaluation, students' knowledge on basic Geometrical shapes was tested. For this purpose the participants were given the following wooden blocks for naming:

 Square  Triangle  Rhombus/ Diamond

In the third item the concept of Rotation was tested by asking the student to rotate the pen in clockwise and anticlockwise rotation.



Clockwise Rotation

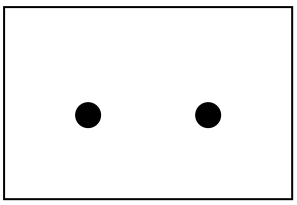


Anti-Clockwise Rotation

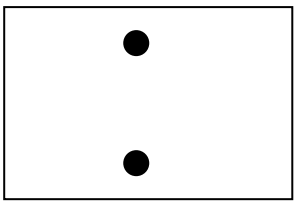
3.6 Distance Estimation

Distance Estimation ability of the samples was tested using a checklist adapted by the investigator. The test consisted of two subtests with 6 items in each. The investigator used a Magnetic Board of 35 × 25cm and three pieces of magnets for testing. In the measurement, there are five items.

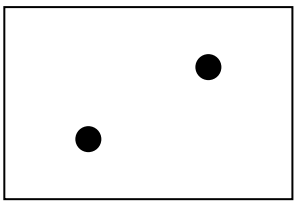
In the first subtest two magnet pieces were fixed on the board with a distance of 10cm, 15cm, 20cm, and 25cm and in the positions Horizontal, Vertical, Diagonal, Near to student and Far from the student as shown in the diagrams below. Each distance was fixed to each position (i.e.) 10cm for Horizontal, 15cm for Vertical and 20cm for Diagonal. Same distance (25cm) was fixed for Far and Near distances. The student had to estimate the distance approximately. If the subject could estimate the distance with 80% accuracy one score was given, if not the score is zero. The maximum score for this subtest is five.



10cm Horizontal
Fig 3.1 (a)



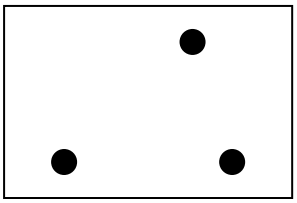
15 cm Vertical
Fig 3.1 (b)



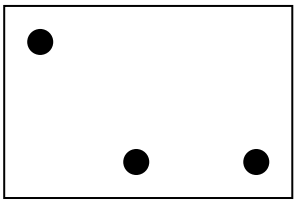
20 cm Diagonal
Fig 3.1 (c)

In the second subtest three magnets were fixed on the board so as to form an angle or triangle. The student had to identify the type of angle (acute, obtuse or right angle) or the type of triangle whether right triangle or equilateral triangle. For every correct response, one score was given and for wrong response zero score was given. Since this subtest had five items the maximum score was five. Hence the maximum

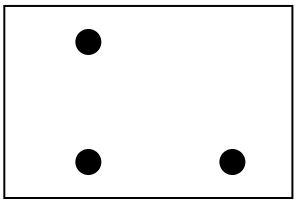
score for the Distance Estimation test for the two components was ten Annexure III.



Acute Angle
Fig 3.1 (d)



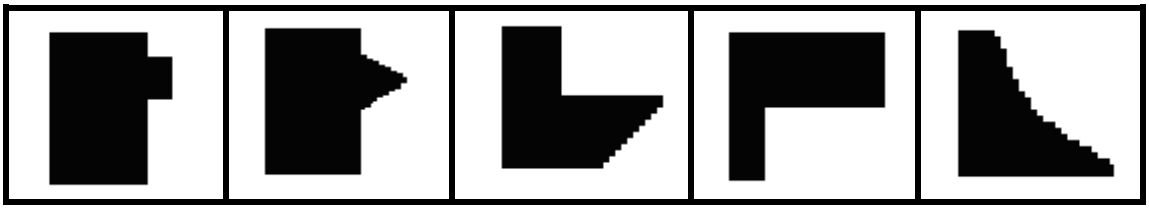
Obtuse Angle
Fig 3.1 (e)



Right Angle
Fig 3.1 (f)

3.7 Mental Rotation

The investigator constructed a test to assess the Mental Rotation Ability of the samples after a thorough study of the related literature. The stimuli used to test the Mental Rotation Ability were based on five shapes shown in Fig.3.2. The investigator used the same stimuli used by Klatzky et al. (1995). Which is a open source available on the Internet. The shapes were approximately 6 × 6 × 0.8cm and were mounted on a board of 35 × 25cm. The following figures are the shapes Mounted on the Board Separately



a b c d e

Fig. 3.2

3.7.1 Assessment of Mental Rotation Skill

In the first subtest, each student was given a stimulus and asked to rotate the shape to any of the angles 45°, 90°, 135°, 180° and 225° about their major axis. An example is given in Fig. 3.2 (a) and 3.2(b). Zero degree was considered as reference point.

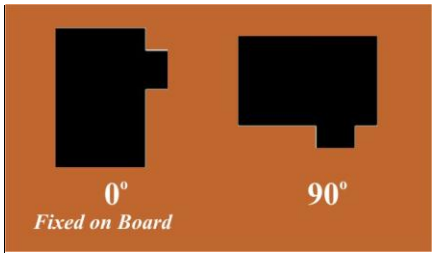


Fig. 3.2. (a)

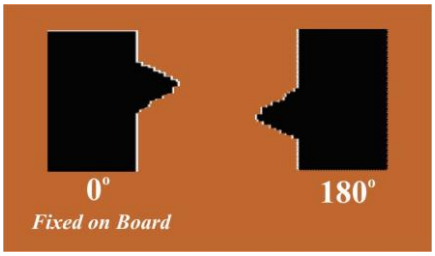


Fig. 3.2. (b)

Among the five stimuli, each stimulus was fixed to each degree. If the student could rotate the stimulus to the given angle correctly, one score was given if not the score was zero. Since this subtest had five items the maximum score for this subtest was five.

3.7.2 Identification of Angle of Rotation

In the second subtest, two copies of the same stimulus were used in each item. Each stimulus (the first) was fixed on the board. The second stimulus would be rotated to a particular degree e.g. 45^{o}, 90^{o}, 135^{o}, 180^{o} and 225^{o}. The student had to identify the angle of rotation. The following figures illustrate the Angle of rotation. An example is given in Fig. 3.2 (c) and 3.2 (d).

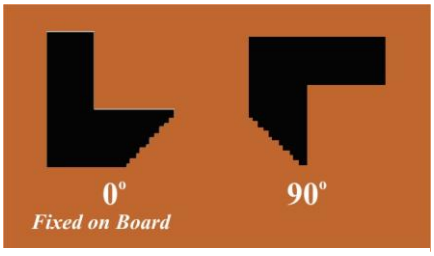


Fig. 3.2. (c)

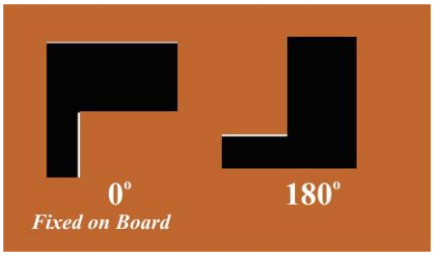


Fig. 3.2. (d)

For this test, the students had to mentally rotate the image. If the student could rotate the stimulus to the given angle correctly, one score was given if not the score was zero. Since this subtest had five items the maximum score for this subtest was five.

3.7.3 Reflected Images

In the third subtest, one stimulus was fixed on the board and the copy of the same stimulus was given to the student. The student was asked to fix the reflected image of the fixed shape on the board. An example is given in Fig. 3.2 (e) and 3.2 (f).

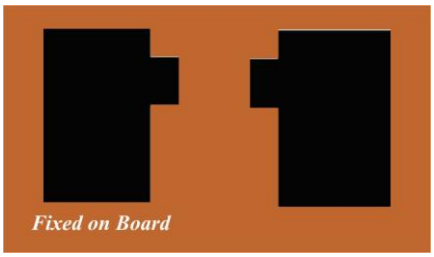


Fig. 3.2. (e)

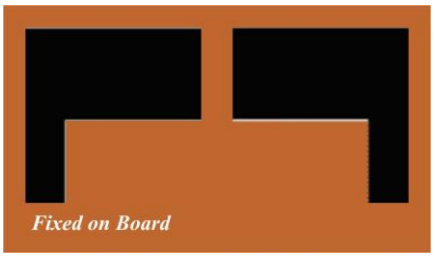


Fig. 3.2. (f)

Reflected Image (Mirror Image)

If he could fix the correct image one score was given, if not the score was zero. Since this subtest had five items the maximum score for this subtest was five. The Checklist for this test is given Annexure IV.

3.8 Delineation

This test is based on the operation by spatial images position. It consisted of four items. The figures shown in Fig. 3.3 were pasted with threads on the board of size 20 x 12 cm. In the first item Fig (3.3a), a maximum of 9 rectangles can be selected and 07, 06 and 13 triangles can be selected in items as shown in Fig (3.3b), Fig (3.3c) and Fig (3.3d) respectively. The student had to select all rectangles and triangles on delineation. For this purpose it was necessary to change the reference point so that the demanded figure became clear visible. One score was given for each selection. Thus this test had a total score of 35.

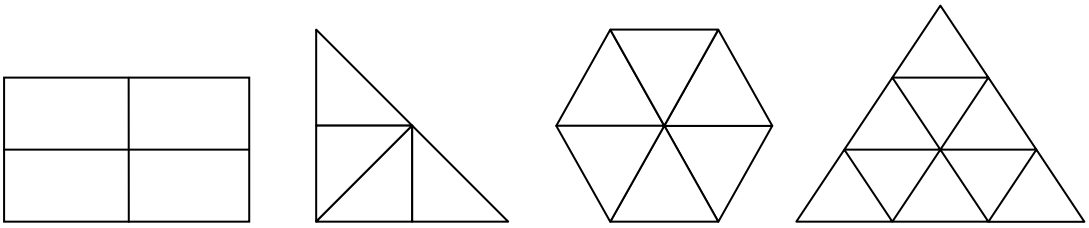


Fig 3.3(a) **Fig 3.3(b)** **Fig 3.3(c)** **Fig 3.3(d)**

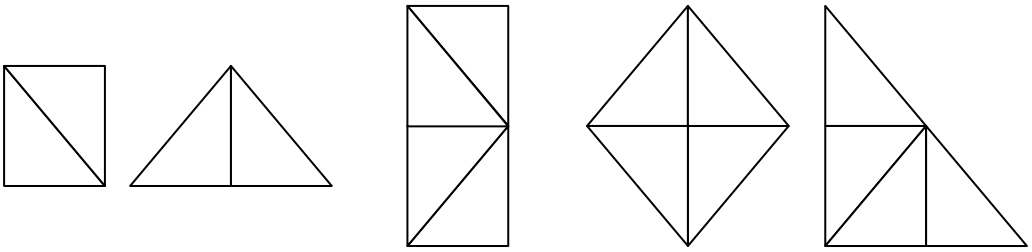
3.9 Assembling

The investigator adapted the test based on the test items given by Klatzky et al. (1995). This was to identify the Assembling ability of the samples. The stimuli were Triangular, Diamond Shaped and wooden shape Square of 5cm on the shortest side. On each trial the student was given three tiles to inspect as long as he or she desired and then was given a completed shape and the same shape could be constructed from two of three separate tiles. The task was to build the completed shape using only two of the tiles. The five shapes and corresponding tiles are shown in Fig.3.4 (a, b, c, d, e, f). Timing for the trial started when the student was handed the completed shape and stopped either when the student indicated completion or at the end of 2 minutes. The time taken by the student for each trial for completing the shape was noted with help of a stop watch.

	3 Separate Tiles	Shapes from two Tiles	
Fig 3.4a			Pentagon
Fig 3.4b			Triangle
Fig 3.4c			Parallelogram
Fig 3.4d			Quadrilateral
Fig 3.4e			Trapezoid
Fig 3.4f			Parallelogram into Triangle

3.10 Rotational Displacement

This test consisted of five items. These series of tasks required operation of spatial image structure. It was necessary to construct new figures (Square, Triangle, Rectangle & Rhombus) from four Equilateral Triangles. The subjects should mentally constitute new figures and assemble them using the blocks. Timing for the trial started when the subject was handed the triangles and stopped either when the students indicated completion or at the end of 2 minutes. The time taken by the student for each trial for completing the shape was noted with help of a stop watch.



Square Fig 3.5(a) **Triangle Fig 3.5(b)** **Rectangle Fig 3.5(c)** **Rhombus Fig 3.5(d)** **Right Triangle Fig 3.5(e)**

3.11 Data Collection Procedure

The study was conducted in three phases.

In the first phase, Basic Concept Skill Assessment was done and the Personal information regarding Gender, Grade, Type of Students, Types of School, and Braille Reading of Visually Impairment Students were collected using Personal Data Bank.

In the second phase, Pretest on Distance Estimation, Mental Rotation, Delineation, Assembling and Rotational Displacement were administered both the Group of students. Training was given only to the Experimental Group. Thirty days training was given to each student. A maximum time of 45minuts was given for each student for each training session.

In the third phase, Posttest on Distance Estimation, Mental Rotation, Delineation, Assembling and Rotational Displacement was administered to both the Groups. The Same tool used in the Pretest was used in the Posttest.

3.12 Intervention Strategies

After pretesting using the tools developed/adapted, intervention was given. The following are the intervention strategies adopted in the study.

3.12.1 The Intervention Strategies for the Teaching Basic Concepts

- Training in the identification of Geometrical shapes, Basic concept and Clock wise and anti-clock wise Direction.
- Training was given both individually and as group depending on need. The time taken for each individual ranged from 10mts to 30mts.

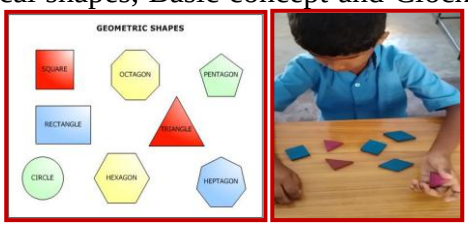


Plate 1: Teaching Geometrical Shape

3.12.2 Intervention for the Concept of Distance

To teach concept of distance, various activities have been provided which include.

- Directional concepts such as East, West, North, South and Diagonal sides were taught.
- Measurement of centimeter (2cm, 5cm, 7cm, and 10cm etc...) using embossed scale and tactile inch/cm tape (Embossed tape.)

- Measuring distance using meter tape and train to measure table, bench, block board, and wall.

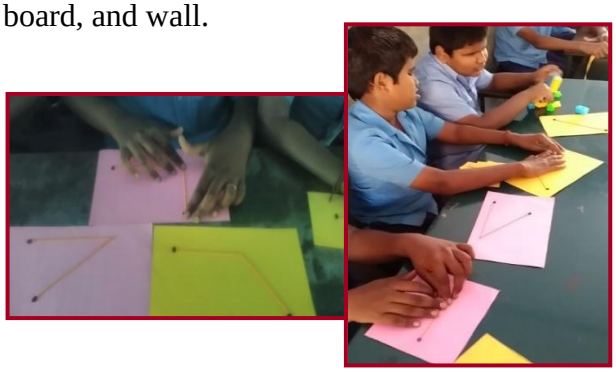


Plate 2: Distance Estimation Activities

Plate 3: Measuring Table Using Tactile Tape

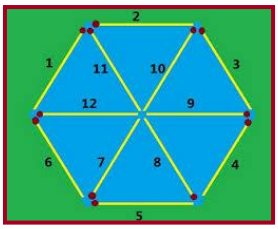
- Making noise standing at a particular distance say 3meter and ask the visually impaired students to identify the approximate distance from where the noise has come.
- Measurement of room size. Time taken for the activities ranged from 30-45mts for each child.

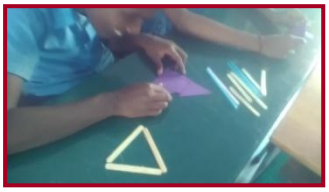
3.12.3 Intervention for Mental Rotation Skill

- Angles were taught using hand and also protractor and relief sheet which embosses the diagram.
- Also taught mirror image using hand, shapes and letter ‘P’, ‘R’, number ‘7’ and comb.
- Positional concept such as Horizontal, Vertical, Diagonal, Near and far have been taught using 3 dimensional items and 2 dimensional tactile diagrams.
- Time taken for all the activities ranged from 30-45mts.

3.12.4 Intervention for Delineation Skill

- Different sizes and shapes have been taught
- Activities for delineation were given
- Counting sides of the shapes
- Time taken for this intervention ranged from 30 to 45 minutes





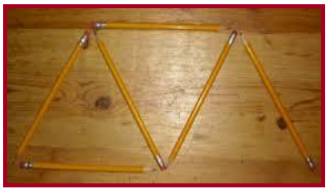


Plate 4: Activities for Delineation Skill

3.12.5 Intervention for Assembling Ability

- Developing assembling skills to visually impaired students.
- Exposure to different types of shapes and model (e.g. different geometrical shapes).
- Activities to arrange blocks.
- Activities to assemble different types of pen, torch light, bottles and lids. Activities to fit lid to different boxes as per shapes.
- Puzzle activities (e.g.) birds and animals. Arranging the train track.
- Arranging the shapes as per form and Size. Time taken for all the activities ranged 30-45mts for each child.

Plate 5: Activities for Assembling

3.12.6 Intervention for Rotational Displacement

- Forming shapes with the help of ice stick and straw (e.g.) square, circle, and rectangle.
- Arranging shapes with the help of paper cuttings.

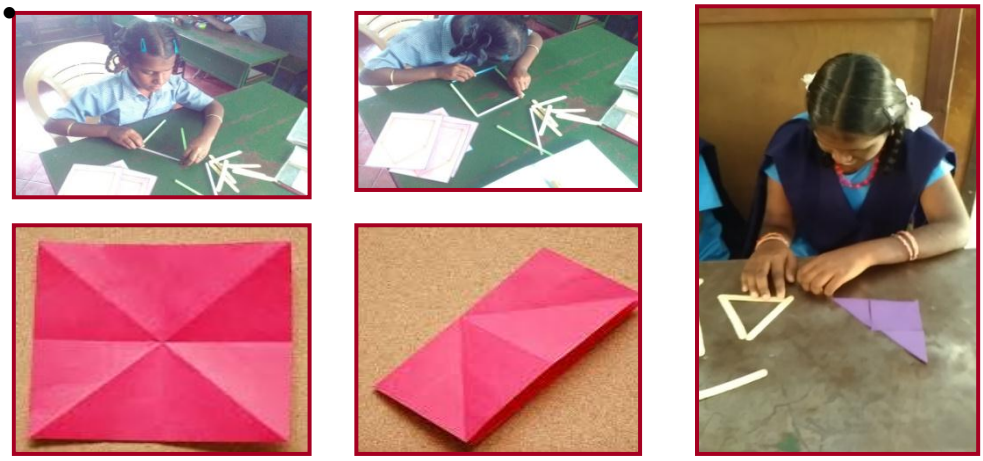


Plate 6: Students involved in activities fostering Rotational Displacement

3.12.7 Duration of Intervention

For each child, the time taken ranged from 3 hours to 5 hours. Each student was given 30mts to 45mts. every day for five days in a week. The entire intervention period included 5 months duration. In addition the pre and posttest consumed one month each. The items, material and activity used for intervention and pre &post testing activity were different.

3.13 Data Analysis Procedure

For analyzing the data, following statistical techniques were used.

1. For comparison of Spatial Ability with respect to Experimental and Control group t-test was used
2. For studying the effectiveness intervention for spatial ability in terms of Basic Concept Skills, Distance Estimation, Mental Rotation and Delineation, t-test, was used.
3. Influence of Gender/Grade and Type of Students and their resultant interaction, ANCOVA was used
4. To find out the Association between Type of Students and Time taken for completing the task, Chi-Square test was used.
5. To find out the relationship between Braille Reading skill on spatial skill development, One Way ANOVA was used.

The next chapter deals with Results and Interpretation of the study.