Chapter IV

METHODOLOGY

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4.4. Tools & Techniques to be Employed for the Study
4.5. Administration of the Tools inventory and scoring
4.6. Procedure of the study
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Chapter IV

METHODOLOGY

Research methods are inevitable part of any type of research. They envisage the different steps to be adopted for solving a chaotic problem behind the research. Thus methodology include the particular approach adopted by the researcher for the formulated problem, rationale behind the selection of objectives and formulated hypotheses, and definition of variables determining the pathfinders of research. The designs proposed by the investigator should be in a clear cut manner with description of tools and techniques with dimensions that are to be executed for the conduct of the study. It also includes a description about the sample and determining factors behind the selection of the sample, different statistical techniques employed for the analysis of data.

This chapter deals with the methodology envisaged by the researcher for the conduct of the present study. The study was oriented to locate the hemispheric preferences of primary school students and thereafter to identify learning styles based on hemispheric preference. The Hemispheric teaching style developed was based on hemispheric preference of thought processing among primary school teachers of Kerala. The study also focused on strengthening of neurological learning style of primary school students and neurological teaching style of primary school teachers based on hemispheric preference strategies. Hence the investigator adopted a Survey cum Experimental method for the successful conduct of the present study. The methodology adopted of the study is presented under the following subtitles:
1. Variables selected for the study

2. Design executed in the study

3. Hypotheses set for the study

4. Objectives opted for the study

5. Sample selected for the study

6. Tools & Techniques employed for the Study

7. Procedure adopted for the study

8. Statistical Techniques used in the study

**Variables selected for the study**

The study targeted to locate the teaching style of primary school teachers and learning styles of primary school students based on their hemispheric preferences. The hemispheric preferences among primary school children were also identified. Thirdly, the scholastic achievement was correlated with the learning styles of students, after implementing left hemispheric preference and right hemispheric preference learning strategies separately and jointly for finding out the effectiveness of hemispheric preference strategy. The scholastic achievements, when they were confronted with right hemispheric teaching strategy and left hemispheric teaching strategy separately and jointly and difference in learning styles of the students were tested. Later the scholastic achievements of the students when they were treated with hemispheric teaching strategy by four different teachers and the learning style difference among their students were correlated with the above test results. For the purpose, the variables were carefully selected. The independent and the dependent variables used in the study are listed below.
Independent Variable:-

Hemispheric preference teaching strategy

The major elements of hemispheric preference learning strategy are,

a) Left hemispheric preference components.

b) Right hemispheric preference components.

Hemispheric preference learning strategy.

The major elements of Hemispheric preference learning strategy

a) Left hemispheric preference components.

b) Right hemispheric preference components.

Dependent Variables:-

Neurological teaching style of primary school teachers

1. Left brain preferred teaching style in right brain dominant primary school teachers.

2. Right brain preferred teaching style in left brain dominant primary school teachers.

3. Whole brain preferred learning style in both right brain dominant primary school teachers & left brain dominant primary school teachers

Neurological learning style of primary school students.

1. Left brain preferred learning style in right brain dominant primary school students.

2. Right brain preferred learning style in left brain dominant primary school students.
3. Hemispheric preference learning style both in right brain dominant primary school students & left brain dominant primary school students. Scholastic Achievement in science

4.1. Design of the study

The investigator selected 400 primary school students and 120 primary school teachers from three revenue districts namely, Thiruvananthapuram, Ernakulam and Kasaragod for survey method. Purposive sampling method was used for selecting the sample to ascertain the representation of right hemispheric preference sections and left hemispheric preference sections among the target population. Survey, Participant observation and experimental method will be the technique for the present study. For the normative survey part of the study, an inventory will be used for locating the hemispheric preferences among primary school students and participant observation will be conducted for locating the hemispheric preferences among the primary school teachers. For the proper execution of experimental method, a sample of 60 students attending VI standard will be selected from primary school. The investigator decided to locate the schools from where she will get the satisfactory distribution of the experimental variables.

The proposed methodology of the study is presented under the following subtitles:

(i) Objectives of the study.
(ii) Sample to be used in the study
(iii) Tools and Technique to be used for the study.
(iv) Procedure of the study.
(v) Statistical techniques proposed for the study.
Methodology

Stage I

Execution of survey

Stage II

Dramatic Representation of the Experimental Study using Hemispheric Preference Learning Strategies.

The Outline of the developed Hemispheric Preference Strategy is given below

**Outline of Hemispheric Preference Strategy**

**1st Step preface:** Here the strategy is introduced to the learners.

**2nd step general instructions:** Here the students are instructed to proceed through the strategy based on the objectives set for the particular content. As the students
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IIIrd step –

themselves going through the study investigator gave carefully arranged stage wise instruction throughout the study.

Curricular objectives:- explain the curricular objectives of different contents separately

It provides through understanding about the objectives regarding the society. It thus help to set curricular aims.

IV th step strategic Objectives

Here, the students get acquainted with the objectives of the strategy. This section is especially helpful to understand their hemispheric preference learning. However the investigator here provides 24 specific dimensions coming under each hemisphere preference separately as Left hemisphere preference and Right hemisphere preference and a combination of these both dimensions as both hemispheric preferences. Thus the students get into their preference track and according to this preference, they can modify their learning styles.

Vth step Before the lesson:-

Here the students themselves are tested for pre-requisites of learning. Going through this the students understand themselves what should be incorporated to new learning. It thus act as an advance organizer.

VI th step Class room activities:-

Here the students gets different activities oriented on specific hemispheric preferences set by the investigator. It is actual learning process on which new contents get incorporated with the existing schema. There
are right, left and whole brain preference for class room activities.

VII th step Testing:- This part enables the learner to test themselves for where they are. As hemispheric preference learning strategy emphasizes pedocentric activities guided by student themselves. It is necessary to develop chances for testing and evaluation. Plenty of procedures, both formative and summative evaluations been presented throughout the study.

VIIIth step Scoring key for evaluation:- Here in this part, students get a chance to remedial learning. They themselves check for the correct answers.

IXth step Check for innovative ideas:- This section deals with chances for existing creative ideas from students.

Xth step Space for extra reading:- this parts provide chances for extra reading.

XIth step Assignments In this section, must select specific assignments from a group of activities given to them.

XIIth step Score Index :- Place for evaluating themselves acts as a motivating factor to proceed further.
Stage III

**Dramatic Representation of the Experimental Study using Hemispheric Preference Teaching Strategies**

The Outline of the developed Hemispheric Preference Strategy is given below.

The investigator selected 120 primary school teachers and 400 primary school students from three revenue districts namely, Thiruvananthapuram, Ernakulam and Kannur for survey method. Random sampling method was used for the selection of the sample and she got due representation for right hemispheric preference sections and left hemispheric preference sections, right hemispheric preference learning style and left hemispheric preference learning style among the target population. Experimental method was adopted for finding out the effect of hemispheric preference teaching style and hemispheric preference learning style in the present study. For the survey part of the study, an inventory was developed and standardised on hemispheric preference teaching style as there was not a standardised tool available for locating the hemispheric preferences among the primary school teachers. A standardised test series was developed and used for locating the hemispheric preferences among primary school students. For the proper execution of experimental method, a sample of 400 students attending VI standard
selected from primary school. The investigator decided to locate the schools from where she would get the satisfactory distribution of the experimental variables.

**Hypotheses set for the Study**

1. There exists significant difference between the left and right hemispheric preferences among primary school teachers for the total sample and relevant sub samples based on:
   a. gender
   b. type of institution
   c. locale
   d. subject of teaching

2. There exists significant difference between the left and right hemispheric preferences among primary school students for the total sample and the sub samples:
   a. gender
   b. type of institution
   c. area

3. The hemispheric preference based teaching strategy has significant effect on neurological teaching styles of primary school teachers.

4. The hemispheric preference based learning strategy has significant effect on neurological learning styles of primary school students.
5. The hemispheric preference learning strategy has significant effect on the scholastic achievement of primary school children.

6. There will be significant difference in the effectiveness of hemispheric preference instructional strategy and hemispheric learning strategy over the prevailing teaching methods.

7. The hemispheric preference teaching strategy is highly effective in transaction of the content.

4.2 Objectives of the Study

The following objectives were formulated for the conduct of the present study:-

1. To find out the hemispheric preference of primary school teachers using Hemispheric Preference Teaching Scale (HPTS) for the total sample and for the relevant sub samples based on
   a) gender
   b) type of institution
   c) locale
   d) subject of teaching
2. To find out the hemispheric preferences of primary school children using Hemispheric Preference Tests (HPT) for the total sample and for sub sample
   a) gender
   b) type of institution
   c) area
3. To examine the effectiveness of hemispheric preference teaching strategy for enhancing neurological teaching styles of primary school teachers for experimental groups and control groups.

4. To examine the effectiveness of hemispheric preference learning strategy for enhancing neurological learning styles of primary school students for experimental groups and control groups.

5. To compare the effectiveness of hemispheric preference instructional strategy with that of the existing activity based learning strategy.

6. To compare the effectiveness of hemispheric preference instructional strategy with that of hemispheric learning strategy on scholastic achievement in science.

**Development of Tools**

Standardization of hemispheric preference test for primary school students

The draft test was administered to a representative sample of 100 students drawn from standard VI of the primary schools of Kannur and Ernakulam districts. The testing was done during the academic year 2008-2009. First part of the test was Activity oriented items Second part was for Spot test, third part for paper pencil method and fourth part was for verbal questions Separate score was given to the correct response of each test item. The sum of the scores for the ninety items was taken as the total score for the test. After rejecting incomplete entries, only 108 answer sheets were available for item analysis. Further eight answer sheets were rejected at random in order to bring down the number to 100, to follow the psychometric procedures for item analysis.
The 100 answer scripts were arranged in the descending order of the total score. The highest 27% and the lowest 27%, with respect to the total scores were separated. There were 27 response sheets each from upper and lower levels.

For each response sheet in the upper and lower level was examined. The number of respondents in the upper and lower groups answered each item correctly was found out. The indices of item discrimination and difficulty were estimated by using the procedure given by Ebel (1965).

The difficulty level and discriminating power of each item were estimated using the following formulae

$$D_v = \frac{U + L}{2N} \times 100$$

$$D_i = \frac{U - L}{N}$$

Where

U = the number of correct responses for any item in the upper group.

L = the number of correct responses for any item in the lower group.

2N = total number of answer scripts in the upper and lower levels.

N = 100, since the upper and lower groups stands for 27% of the total group of 370 which is equal to 100 for both upper and lower groups.

The item analysis data is given as Appendix I

On the basis of the indices of difficulty and discrimination, items were rated. Items with difficulty index between 65 and 35 (on the assumption that the items of difficulty level of 50 have the highest discriminating power) were identified. From
among these items, items with highest discriminating power were selected. Only items of discriminating power of 0.30 and above were selected for the final test. Thus 10 items from each subtest were selected and they were arranged in the increasing order of difficulty.

The final hemispheric preference test (HPT) included First part of the test was Activity oriented items (16 questions), Second part was for Spot test (4 questions), third part for paper pencil method (8 questions) and fourth part was for verbal questions (38 questions)

The draft and final hemispheric preference test are given as Appendices II & III. The English translation of final test is given as Appendix VII.

Validity and Reliability of HPT test

Content validity of the test, which requires the determination of the adequacy of each item to be a sample of the hemispheric preference which are supposed to be measured, was ensured through careful planning of the test, satisfying the adequacy of sampling of test items by following the standard theoretical models of the construct to be measured and meticulous analysis of the test items by experts. In the final HPT, all the 4 subtests were given equal weightage.

The construct validity of the test was estimated using average marks obtained in science for the first terminal examination, of standard VIth students treated as the external criteria. The average marks in science of 100 pupils of standard VI was used for this purpose. The average scores

Obtained in HPT were correlated with that of average science scores. The coefficient of correlation is found to be .77
The split half reliability was estimated for the whole tests as well as for components. The co-efficient of correlation

Corrected for shortening using Spearman Brown formula are presented in table 4.1

**Table 4.1**  
**Reliability coefficients corrected using Spearman Brown formula for the HOP**

<table>
<thead>
<tr>
<th>Tests</th>
<th>Reliability coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub test A</td>
<td>.94</td>
</tr>
<tr>
<td>Sub test B</td>
<td>.96</td>
</tr>
<tr>
<td>Sub test C</td>
<td>.92</td>
</tr>
<tr>
<td>Sub test D</td>
<td>.92</td>
</tr>
</tbody>
</table>

Reliability using Kuder-Richardson formula was estimated. The reliability by using this method was .94. The validity and reliability reported here showed that HPT used in the study is reasonably valid and reliable tool for measuring hemispheric preference.

Descriptive explanation of some of the questions in the hemispheric preference test

The first question in Part B, Spot analysis section was the handedness response question. The subject was asked to show his right hand. If he could show the right hand he is definitely a left handed person because right side of the body is controlled by left hemispheric of the body and vice versa. Thus if a person make confusions it shows his right brain made an attempt to perceive the stimuli than left..

Second Question in Part B is a chimera figure. Left side represent a median which divides the picture bilaterally into two equal halves. Right side of the picture represents a male and left side of the picture depicts to that of a female. The person is asked to identify the picture for a male or female. A person who is stronger in the
right eye is assumed to point out the right part of the picture and one who is stronger in the left visual field is assumed to visualize it for left side of the picture. Hence the one who answers the picture as man is considered as left brain dominant and the person who identifies the chimera for women comes under right brain dominant. The picture is adopted from Gazzaniga.

Third question in part B comprised of a picture with a purpose to recognize the complexity. Recognition of complex figures comes under the Right hemispheric. The picture is composed of the creatures inhabiting in sea. By sequential ordering which is the function assumed to be performed left brain of the creatures the appearance of a tribal man is purposefully created. The case is asked to observe the picture and recognizes his view. If one could holistically perceive the picture, the answer is definitely of a tribal man. If so he perceived the picture from the left brain mode of thinking, it definitely points out answer is as sea creatures. He analyzed the picture sequentially and intellectually rather than intuitively or creatively. The picture has been adopted from the Gazzaniga

Forth question in Part B was to locate the feminine nature of the picture by pointing the black spot of the forehead. This picture is also a chimera. The left picture in the exact mirror image of the right picture generally facial recognition in the mental function preferred lay right hemispheric. If the person observes the stimuli in the picture A. it shows his active occipital sensory area is of right brain. If one answers as picture B, it is assumed that his left visual field is active and hence right brain orientation of sensory switching. The picture has been adopted from Gazzaniga
3. Hemispheric preference paper pencil method for primary school students
   (Dr. K.P. Suresh & Chaithannya R. 2008)

4. Hemispheric preference learning style inventory for primary school Students
   (Dr. K.P. Suresh & Chaithannya R. 2008)

**Significant Theories and Models Behind the Development of the Hemispheric
Teaching Style Inventory and Learning Style Inventory.**

The tool Hemispheric Preference Teaching Style for Primary School Teachers was developed with a view to find out the hemispheric preference teaching style of primary school teachers with respect to the appositional and propositional thinking style dimensions. The researcher developed this test with the help of her supervising teacher Dr. K.P. Suresh (2008). The tool anchors mainly on the neurological theories put forward by Sperry (1976) in collaboration with Ornstein, Herrman’s (1980) quadrant metaphorical model of thought process and Benziger’s ‘frontal-basal mode’ model of brain functioning and system thinking model of functioning of brain by Russel (1993) need a special mention. The developed test was standardized with expert criteria held with expert in the field of teacher education and psychology. The following persons were available for expert criticism. Late Dr. Vedamani Manuel, Dr. P.S. Sukumaran, Dr. A Sudharma, Dr. Sumangala V were the experts consulted for external criticism. Description of the tool hemispheric preference teaching style for primary school teachers

The tool as entitled wanted to detect the teaching style of primary school teachers and hence is divided into two main categories as Part A to specify left hemispheric preferences of teaching style and as Part B to specify right hemispheric preference of teaching style. The preferred dimensions were again divided into 12
Methodology

categories to denote the behavioural outcomes of brain function based on appositional and propositional thinking styles. Based on these functional differences, 24 items complimentary to both the right and left hemispheric preferences were selected under each category and is rated with 3 point scale of scoring. The maximum mark given to most rating category is 3, 2 to the next rating category and 1 to the score denoted for no occurrence of such style while teaching. The samples were asked to fill the data sheet based on their natural style of teaching after creating a rapport with each of them.

The developed inventory was administrated directly to the primary school teachers of government and private sectors. For the purpose of execution of the tool around 150 primary teachers from rural -urban, government priate sectors at primary level of northern, central and southern part of Kerala were approached. Of them 120 successfully completed sample were selected.

The dimensions given as categories in the hemispheric preference teaching style tool were scheduled below.
### Table 4.2
Dimensions of Left Hemispheric Preference inventory

<table>
<thead>
<tr>
<th>Preferred Hemispheric</th>
<th>Sl.No.</th>
<th>Behavioural Outcome of Brain functions</th>
<th>Sl.No.</th>
<th>Characteristics of teaching style</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEFT</td>
<td>1</td>
<td>Organised and systematic</td>
<td>1</td>
<td>Following Directions &amp; Rules</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>Systematic black board work</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Verbal</td>
<td>3</td>
<td>Reciting or quoting a plenty</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>Using word to name describe and define</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Analytic</td>
<td>5</td>
<td>Careful observation of the parts</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>Step-by step logical presentation of tasks</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Linear and controlled</td>
<td>7</td>
<td>Teaching in terms of linked ideas</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td>Strictly Time bound</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Mathematical Skill</td>
<td>9</td>
<td>Collecting and presenting data</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td>Preparation of schedules</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Logical Thinking</td>
<td>11</td>
<td>Presentation of practical and sensible ideas</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td>Objective thinking</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Detailed</td>
<td>13</td>
<td>Collection of all the possible facts</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>14</td>
<td>In depth knowledge and Imparting content in detail</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Rational</td>
<td>15</td>
<td>Realistic in approach</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16</td>
<td>Scientific approach</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Intra Personal</td>
<td>17</td>
<td>Introvert in nature</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>18</td>
<td>Less focusing on students</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Sequential Thinking</td>
<td>19</td>
<td>Giving detailed Home Work.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20</td>
<td>Timely correction of Home Work</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>Temporal</td>
<td>21</td>
<td>Sticking on contemporary methods</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>22</td>
<td>Relating things in present</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>Critical Thinking</td>
<td>23</td>
<td>Accuracy in teaching</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>24</td>
<td>Assigning specific criteria</td>
</tr>
</tbody>
</table>
### Table 4.3
Dimensions of Right Hemispheric Preference inventory

<table>
<thead>
<tr>
<th>Preferred Hemispheric</th>
<th>Sl.No.</th>
<th>Brain functions</th>
<th>Sl.No.</th>
<th>Behavioural Outcome of teaching style</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIGHT</td>
<td>1</td>
<td>Creative and imaginative</td>
<td>1</td>
<td>Innovative and curious</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Kinesthetic</td>
<td>3</td>
<td>Harmonious jesters</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Holistic</td>
<td>5</td>
<td>Flexible and Dynamic</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Concrete</td>
<td>2</td>
<td>Harmonious jesters</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Concrete</td>
<td>4</td>
<td>Flexible and Dynamic</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Concrete</td>
<td>6</td>
<td>Flexible and Dynamic</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Concrete</td>
<td>8</td>
<td>Flexible and Dynamic</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Concrete</td>
<td>10</td>
<td>Flexible and Dynamic</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>Concrete</td>
<td>12</td>
<td>Flexible and Dynamic</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>Concrete</td>
<td>14</td>
<td>Flexible and Dynamic</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>Concrete</td>
<td>16</td>
<td>Flexible and Dynamic</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>Concrete</td>
<td>18</td>
<td>Flexible and Dynamic</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>Concrete</td>
<td>20</td>
<td>Flexible and Dynamic</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>Concrete</td>
<td>21</td>
<td>Flexible and Dynamic</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>Concrete</td>
<td>22</td>
<td>Flexible and Dynamic</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>Concrete</td>
<td>23</td>
<td>Flexible and Dynamic</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>Concrete</td>
<td>24</td>
<td>Flexible and Dynamic</td>
</tr>
</tbody>
</table>
1. Hemispheric preference learning strategy

2. Left hemispheric preference learning strategy

3. Right hemispheric preference learning strategy

4. Hemisphric preference teaching strategy

5. Left Hemispheric preference teaching strategy

6. Right Hemispheric preference teaching strategy

7. Achievement test on Science for VI th grade students

4.3. Sample used for the study

For the selection of the sample, the investigator will consider the following conditions.

(i) The sample should be a real representative of right hemispheric preference individuals. i.e., it is generally estimated that left handed population represents nearly 10% of the general population.

(ii) The size of population should be optimal for different methods adopted and that coverage of very large numbers is not practicable

(iii) The sample selected for observation technique should be small enough to get reliable data.

(iv) It must be a true representation of primary school teachers and students of Kerala State.

Thus, for the effective execution of the study, the investigator intends to select the sample spread over southern, central and northern regions of Kerala.
Since the study anchored on the hemispheric functions in teaching style and learning style of primary school teachers and students respectively, there arised the need to locate them based on their preferred mode of hemispheric style preferences. As mentioned above, the left handed population represents nearly 10% of the total population, the investigator assumed to adopt random sampling for survey and purposive sampling for experimental design.

The study was restricted to primary level schools under various strata of locale, management and gender. The rationale behind the selection of the study was students at this stage, just started their formal operational stage (11-15 years) and are almost passed their concrete operational stage. At this stage, they might not start to focus on any formal style, and hence it was easy to explore real response of them. Plasticity of the brain at this stage might be helpful in the better absorption of the developed strategy for establishing a better natural learning style in them. Piaget believed that the knowledge acquisition is a process of continuous self construction. Therefore children possess logical ability and thinking style which are entirely different from those of adults. Naturally, the teachers who were teaching them should also possess such plasticity compatible with their student’s progressive construction of logically embedded structures and receptive to adopt with a new strategy. All these logics naturally determined the selection of primary level for the study.

Thus, 120 primary school teachers and 400 primary school students from both sexes and various locale spread over government and private schools of Thiruvananthapuram, Ernakulam and Kannur Districts selected for the study. Pre-
test post-test non equivalent group design will be adopted for the study and ANCOVA as statistical technique for data analysis.

For effective execution of Hemispheric preference learning strategies for primary school children, the investigator decided to restrict the sample into VI standard students and are coming under the age group 11-13 years.

Table 4.4

Break up of the sample of primary school students selected for the study

<table>
<thead>
<tr>
<th>No</th>
<th>Total</th>
<th>Extraneous variables</th>
<th>category</th>
<th>No.of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>400</td>
<td>Gender</td>
<td>Boys</td>
<td>175</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Girls</td>
<td>225</td>
</tr>
<tr>
<td>2</td>
<td>400</td>
<td>Type of Institutions</td>
<td>Government</td>
<td>298</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Private</td>
<td>102</td>
</tr>
<tr>
<td>3</td>
<td>400</td>
<td>Locale</td>
<td>Rural</td>
<td>108</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Urban</td>
<td>122</td>
</tr>
</tbody>
</table>

Sample for experimental part was selected from among the 400 students selected for the hemispheric preference test. Those student group who showed minimal sore on the test were taken for the experimental study. Thus a total of 360 students were chosen for the experimental study.
Table 4.5
Break up of the sample of primary school teachers selected for the study

<table>
<thead>
<tr>
<th>No</th>
<th>Total</th>
<th>Extraneous variables</th>
<th>Category</th>
<th>No of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>360</td>
<td>gender</td>
<td>Male</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Female</td>
<td>156</td>
</tr>
<tr>
<td>2</td>
<td>360</td>
<td>Type of institutions</td>
<td>Government</td>
<td>186</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Private</td>
<td>54</td>
</tr>
<tr>
<td>3</td>
<td>360</td>
<td>Locale</td>
<td>Rural</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Urban</td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td>360</td>
<td>Subjects of teaching</td>
<td>Language</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mathematics</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Science</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Social Science</td>
<td>19</td>
</tr>
</tbody>
</table>

Sample for experimental part was selected from among the 120 selected for the hemispheric preference test. Thus a total of 360 students were chosen for the experimental study.

**Tools & Techniques employed for the Study**

Researcher reviewed available tools came to exist related to the topic hemispheric preference, leaning style, teaching styles, cognitive teaching and learning styles and thinking styles and about various components styles, models and strategies associated with hemispheric preference. The challenge on before of the researcher was to produce tools which are relevant to measure the hemispheric preference overt behaviour through teaching style, learning style, teaching strategies and learning strategies. For the study, it was also necessary to correlate the
hemispheric preference of the children with their learning style based on the assumption that primary school students are too small children and they might not developed any particular learning style at their elementary stage. Hart (1983), observed hand compactable tools and machines in prevailing educational system which favour the right are not dare to devise instruments according to the nature of hand preference. Yet, we forced our students into schools that have never seriously studied the hemispheric nature of brain. Here, respecting the vast intricacy of brain, within the available knowledge of brain functioning theories an attempt of its applications was made to design the tools for emphasizing the exploration of real hemispheric preference. The developed and standardised tools executed in the present study were, listed in the appendix XI of this.

1. **HEMISPHERIC PREFERENCE TEACHING STYLE INVENTORY FOR PRIMARY SCHOOL TEACHERS**

   (Dr. K.P. Suresh and Chaithannya R, 2008)

   The standardized hemispheric preference teaching inventory consisted of two parts namely Part A and Part B. The main objective behind the construction of the inventory was to locate and rate the extent of right hemispheric, left hemispheric and as whole hemispheric group (the convergent group in between +sigma and −sigma of the total gain score). The inventory was first envisaged as an observation schedule but the chances for the bias from the investigator who herself developed the inventory was noted down by the panel of experts and later on it was developed as an inventory maintaining all the dimensions persisted in the observation schedule. There were also some minute level corrections made on the suggestions followed by the review of experts from the Psychology and Neuroscience. Suggestions from the
primary school teachers were also increased the reliability of the tool. The inventory was standardized in a group of 50 primary school teachers at Kannur educational district and Ernakulam district.

2. **HEMISPHERIC PREFERENCE LEARNING STYLE INVENTORY FOR PRIMARY SCHOOL STUDENTS**
   (Dr. K.P. Suresh and Chaithannya R, 2008)

3. **HEMISPHERIC PREFERENCE TEST FOR PRIMARY SCHOOL STUDENTS**
   (Dr. K.P. Suresh and Chaithannya R, 2008)

4. **HEMISPHERIC PREFERENCE LEARNING STRATEGY FOR PRIMARY SCHOOL STUDENTS**
   (Dr. K.P. Suresh and Chaithannya R, 2008)

5. **LEFT HEMISPHERIC PREFERENCE LEARNING STRATEGY FOR PRIMARY SCHOOL STUDENTS**
   (Dr. K.P. Suresh and Chaithannya R, 2008)

6. **RIGHT HEMISPHERIC PREFERENCE LEARNING STRATEGY FOR PRIMARY SCHOOL STUDENTS**
   (Dr. K.P. Suresh and Chaithannya R, 2008)

7. **HEMISPHERIC PREFERENCE TEACHING STRATEGY FOR PRIMARY SCHOOL TEACHERS**
   (Dr. K.P. Suresh and Chaithannya R, 2008)

8. **LEFT HEMISPHERIC PREFERENCE TEACHING STRATEGY FOR PRIMARY SCHOOL TEACHERS**
   (Dr. K.P. Suresh and Chaithannya R, 2008)
9. RIGHT HEMISPHERIC PREFERENCE TEACHING STRATEGY FOR PRIMARY SCHOOL TEACHERS

(Dr. K.P. Suresh and Chaithannya R, 2008)

10. ACHIEVEMENT TEST IN SCIENCE FOR PRIMARY SCHOOL STUDENTS

(Dr. K.P. Suresh and Chaithannya R, 2010)

4.4. Tools & Techniques to be Employed for the Study

As there was no readymade tool for collecting data from the sample, the investigator decided to prepare the tools necessary for the study. The following are the tools to be employed in the present study.

(i) Hemispheric preference inventory for primary school teachers and students.
   (Suresh and Chaithannya, 2007).

(ii) Observation schedule for Hemispheric preference teaching style (Suresh & Chaithannya, 2008)

(iii) Teaching strategies based on Hemispheric preferences of primary school teachers (Suresh & Chaithannya, 2008)

(iv) Learning strategies based on hemispheric preference of primary school children (Suresh & Chaithannya, 2008) – under development

(v) Achievement test (Suresh & Chaithannya, 2008).

The major features of the tools are described below:
4.4.1 Hemispheric preference inventory for teachers and students

(Suresh and Chaithannya, 2008)

The inventory consists of both verbal and non-verbal items for providing and opportunity for free expression.

As per the objectives of the study, the inventory is prepared with a view to gather adequate and reliable data for the study. Before preparing the inventory the investigator studies most of the reference materials related to the present study and discussions were made with the supervising guide and other experts in the field of neuroscience. Through reviewing the related literature and adequate discussion about the topic, she prepared a draft inventory. The draft inventory was presented before the supervising guide and experts and necessary changes were made according to their suggestions.

The areas covered by the inventory are discussed herewith.

Various components of the inventory are classified under two categories based on right hemispheric preference style and left hemispheric preference style. Later, subcomponents for each categories were prepared based, on the characteristics of hemispheric specialization of brain functions.

Items of the inventory represents non-verbal and verbal parts. First there pictorial representations were adopted from Bragdon and Gamon. These chimera diagrams are aimed to locate the hemispheric preferences of the individual. If one focus eyes upon the nose and express stronger impression of a woman, the person is said to be right hemispheric dominating while express stronger impression of a man, the person is said to be left hemispheric dominating.
Second question is a painting by 16\textsuperscript{th} century Milanese artist Giusepe Acrimboldo. If a person is asked what he seen for, gives an answer as face, he is supposed to be holistic in attitude. Hence comes under right brain dominant and answer given in fished he is analytical in approach hence can be considered for left brain preference style.

Item three also is a chimera representation. If individuals are asked to focus on the dot and judge for more feminine part by comparison of two pictures reveal their preference of brain function. If one find it on left part, his/her right brain is dominant one if one find it on right part his/her left brain is dominant.

The verbal part of the questionnaire is divided into two sections meant to locate right brain preferred individuals and left brain preferred individuals. The components of the right hemispheric preferences are

(i) Discrimination of shape
(ii) Understanding geometric properties
(iii) Reading faces
(iv) Copying designs
(v) Negative emotions
(vi) Global holistic processing
(vii) Reading emotions
(viii) Innovative and intuitive
(ix) Imaginative thinking
(x) Interpersonal Thinking
(xi) Unorganised

(xii) Creative

(xiii) Spatial sense

(xiv) Non-verbal

(xv) Spiritual

(xvi) Emotional

(xvii) Analogic

Components of left hemispheric preference brain activities.

(i) Sequential thinking.

(ii) Planned and organised

(iii) Detailed

(iv) Verbal

(v) Systematic

(vi) Time management

(vii) Symbolic

(viii) Linear

(ix) Logical

(x) Analytical

(xi) Independent

(xii) Rational
(xiii) Abstract Thinking

(xiv) Digital

The investigator intends to conduct a pilot study for the tool before going to the field for data collection. Changes in the inventory will be made, if necessary, after the pilot study. The inventory is attached as the Appendix I. Malayalam version of the same is attached as Appendix II.

4.4.2 Observation schedule for Hemispheric preference teaching style for primary school teachers. (Suresh & Chaithannya, 2008)

Participant observation will be conducted for identifying the hemispheric preference style of primary school teachers. The observation schedule is divided into two parts based on the hemispheric preference mode of functioning. Thus the first part of the schedule include categories related to right brain preference teaching style and the second part of the schedule includes categories related to that of left hemispheric preference teaching style. The investigator will observer the classes of the primary school teachers and indicate the frequency of occurrences of each categories in the space provided. The observation schedule is attached as Appendix III.

4.4.3 Teaching strategies based on Hemispheric preferences of primary school teachers (Suresh & Chaithannya, 2008)

The strategy is oriented upon the hemispheric preference style of primary school teachers. There are 28 different strategies for strengthening the right hemispheric preference style of teaching and left hemispheric preference style of teaching among the primary school teachers. The strategy narrates the hemispheric preference functions based on left or right specilisation and related classroom
activities to be conducted by the teacher. The classroom activities will be followed by the hemispheric preference activities of students. The strategies have been presented at the end of this chapter.

4.4.4 Learning strategies based on hemispheric preference of primary school children (Suresh & Chaithannya, 2008)

Learning strategies based on hemispheric preferences of primary school students orient on strengthening the right/left hemispheric specialization based learning style among the primary school students of standard VI.

He strategy is focussing on the strengthening of preferred hemispheric learning style and acquaint them into practice the other hemispheric preference learning styles too. Thus, the strategy prefer a holistic approach/whole brain approach to learning.

4.4.5 Achievement Test (Suresh & Chaithannya, 2008).

An achievement test has been prepared for primary school students studying on VIth standard. The subject for achievement test is Basic Science. It is attached as Appendix IV. Malayalam version of the achievement test is attached as Appendix V.

4.5 Administration of the Tools inventory and scoring

The investigator will approach 300 primary school students for identifying the hemispheric preference style of them. Around 45 minutes will be spend for the successful execution of Hemispheric preference inventory for teachers and students (Suresh and Chaithannya, 2008). There are 50 items in the inventory and each item in the inventory carries one mark. The item covering under different hemispherics will be scored separately.
The investigator will approach 60 primary school teachers for identifying hemispheric preference style of teaching. For this purpose an observation schedule containing number of items representing each hemispheric will be executed. Each item in the observation schedule will be scored separately based on the preference of their functional specialisation of the hemispheric. Each observation will provide with one mark.

4.6. Procedure of the study

The present study is coming under the preview of survey cum experimental method. The sample decided for the study is 300 primary school students and 60 primary school teachers from three different revenue districts representing the southern central and northern parts of Kerala. The investigator prepared an inventory for understanding the hemispheric preference style of primary school students and an observation schedule for understanding the hemispheric preference style of primary school teachers. The investigator prepared hemispheric preferred teaching strategies for strengthening the teaching styles of primary school teachers. After executing the teaching-learning strategies which meant to strengthen the hemispheric preferences, achievement test will be conducted among selected sample of primary school implementing hemispheric preferred strategies. Thus, the successfulness of the study will be analyzed after treating the data by suitable statistical method.

4.7. Statistical Techniques to be used

Since the study is an experimental cum survey method. The following statistical techniques will be used for the study based on the postulated objectives.

(i) Percentage Analysis.
(ii) Mean, Standard Deviation, Graphical representation and bar diagram.

(iii) Arithmetic mean

(iv) Carl Pearson’s coefficient of correlation.

(v) Critical Ratio

(vi) ANCOVA