CHAPTER III

DESIGN OF THE STUDY

3.0 Introduction

3.1 Population

3.2 Sample

3.3 Tools Used

3.4 Method of Study

3.5 Data Collection Procedure

3.6 Statistical Techniques Used
3.0 Introduction

The design of the study is concerned with regards to the decision to be taken about the population, sample, tools used, method of study, data collection and a statistical techniques used. Thus the present chapter deals with the above aspects under the following heads:

1. Population
2. Sample
3. Tools used
4. Method of study
5. Data collection procedure
6. Statistical techniques used

3.1 Population

The population of the present study comprises all the students studying in Class X in various Secondary and Senior Secondary Government Schools in East and South districts of Sikkim, affiliated to the Central Board of Secondary Education (CBSE). As per the list obtained from the Human Resource Development Department (HRDD) of Sikkim, Gangtok, there are total 94 Secondary and Senior Secondary schools in both the districts and 2,789 (approx) students enrolled in class X in the year 2009.

The details of these schools and number of students in Class X are given below:

Table: 3.1
Size of the Population (As on 27.9.2009)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Districts</th>
<th>Total No. of Schools</th>
<th>Total</th>
<th>Total No. of Enrolled Students in Class X</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Secondary</td>
<td>Senior Secondary</td>
<td>Total</td>
<td>Boys</td>
</tr>
<tr>
<td>1.</td>
<td>East</td>
<td>32</td>
<td>20</td>
<td>52</td>
<td>860</td>
</tr>
<tr>
<td>2.</td>
<td>South</td>
<td>32</td>
<td>10</td>
<td>42</td>
<td>391</td>
</tr>
<tr>
<td>3.</td>
<td>Total</td>
<td>64</td>
<td>30</td>
<td>94</td>
<td>1,251</td>
</tr>
</tbody>
</table>

Source: Human Resource Development Department, Gangtok, Sikkim, 29/09/09
3.2 Sample

For the present study 15 Secondary and 12 Senior Secondary Schools were randomly selected from East and South districts respectively. The samples of 820 students studying in Class X were randomly selected from these schools. The following table 3.2 shows the distribution of sample under East and South districts of Sikkim.

Table: 3.2

Showing the Size of the Sample of Students Enrolled in
Class X in East and South districts of Sikkim

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Districts</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>East</td>
<td>244</td>
<td>326</td>
<td>570</td>
</tr>
<tr>
<td>2.</td>
<td>South</td>
<td>102</td>
<td>148</td>
<td>250</td>
</tr>
<tr>
<td>3.</td>
<td>Total</td>
<td>346</td>
<td>474</td>
<td>820</td>
</tr>
</tbody>
</table>

Source: Human Resource Development Department, Gangtok, Sikkim

3.3 Tools Used

The following tools were used for the present study.

a) Attitude towards Mathematics Scale constructed by Dr. S. C. Gakhar and Rajani. \(^1\) (Appendix 1)

b) Study Habit Inventory for Secondary School Students (VI to XII i.e. 12 to 18 years) constructed by B. V. Patel. \(^2\) (Appendix 2)

a) Attitude towards Mathematics by Dr. S. C. Gakhar and Rajani

i. Description of the Test

This test is used to measure the mathematical attitude of students studying at 10 + 1 level. This test contain of eight components with 46 statements in total. Component-wise distribution of these 46 statements has been shown in following table 3.3(a):

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Table: 3.3(a)

Components of Attitude towards Mathematics Scale

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the Components</th>
<th>No. of Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Wider Applicability</td>
<td>11</td>
</tr>
<tr>
<td>2.</td>
<td>Development of Skills</td>
<td>05</td>
</tr>
<tr>
<td>3.</td>
<td>Reasoning</td>
<td>03</td>
</tr>
<tr>
<td>4.</td>
<td>Objectivity</td>
<td>06</td>
</tr>
<tr>
<td>5.</td>
<td>Intellectual Development</td>
<td>07</td>
</tr>
<tr>
<td>6.</td>
<td>Non-intellectual Development</td>
<td>05</td>
</tr>
<tr>
<td>7.</td>
<td>Individual Outlook</td>
<td>06</td>
</tr>
<tr>
<td>8.</td>
<td>Universal Outlook</td>
<td>03</td>
</tr>
<tr>
<td></td>
<td><strong>Total number of statements</strong></td>
<td><strong>46</strong></td>
</tr>
</tbody>
</table>

ii. **Item Analysis**

For selecting statements for final scale, Q-value \(\frac{Q_3 - Q_1}{2}\) and median (or scale value) for each statement were computed and compared. The statements for the final scale were selected on the bases of Q and median (or scale values) so that the statements should be fairly and evenly spread on the scale continuum and Q-value of the selected statements were ranging between 0.5 to 2.00 as per Vernon (1962). In this way median or scale values were indicative of the spread statements on the scale continuum and Q or inter-quartile range was the measure of the spread of the middle 50% of the judgements.

iii. **Administration of the Test**

The test may be administered in a regular classroom. The instructions are given on the first page on the consumable booklet. The students were asked to read each statement carefully and give their response on a five point scale on a continuum according to degree of favourableness or unfavourableness of each statement.
iv. **Reliability of the Scale**

The reliability of the scale was obtained by split-half method. In order to make the two forms truly parallel, all the statements of the scale were arranged in rank order according to the scale values. Successive pairs were then marked off. Reliability of the scale was found to be 0.78.

v. **Validity of the Scale**

For finding the validity of the scale the scores of the attitude scale were comparable with the actual behaviour of the students which were nearly comparable.

b) **Study Habit Inventory by Dr. B. V. Patel**

i. **Description of the Test**

This inventory was constructed and standardised to find out types of study habits of secondary school students. The responses were recorded and used to frame statements depicting good as well as bad study habits. This test contains seven categories with 45 statements in total as shown in table 3.3(b)(i):

<table>
<thead>
<tr>
<th>Table 3.3(b)(i)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Categories of statements of Study Habits Inventory</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Area</th>
<th>Statements’ Nos.</th>
<th>Total No. of Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Home environment and planning</td>
<td>1 to 7</td>
<td>7</td>
</tr>
<tr>
<td>2.</td>
<td>Reading and note taking</td>
<td>8 to 16</td>
<td>9</td>
</tr>
<tr>
<td>3.</td>
<td>Planning of subjects</td>
<td>17 to 21</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>Habits of concentration</td>
<td>22 to 25</td>
<td>4</td>
</tr>
<tr>
<td>5.</td>
<td>Preparation for examination</td>
<td>26 to 31</td>
<td>6</td>
</tr>
<tr>
<td>6.</td>
<td>General habits and attitudes</td>
<td>32 to 39</td>
<td>8</td>
</tr>
<tr>
<td>7.</td>
<td>School environment</td>
<td>40 to 45</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td><strong>Total number of statements</strong></td>
<td></td>
<td><strong>45</strong></td>
</tr>
</tbody>
</table>
ii. **Scoring Key**

   The present study-habits inventory consists of 45 statements out of which some of the statements depict good study habits and some of them depict poor study habits. The detail of scoring is given in the manual.

iii. **Administration of the Test**

   The standardised inventory may be administered in a regular classroom. All the students were provided with one set of test paper each. The instructions are given on the first page on the consumable booklet. They were asked to read each statement carefully answer it after properly weighing it with the existing habits. There is no time limit.

iv. **Reliability and Validity**

   The reliability established by test-retest method and split-half methods were found to be 0.79 and 0.82 respectively. The validity was established by using external criteria. Here scores on the study habits inventory were correlated with the teachers’ opinion and examination marks. The coefficient of examination mark was 0.50, which is sufficiently high. With teachers’ opinion, the coefficient of correlation was 0.40.

v. **Interpretation**

   The following table 3.3 (b)(ii) shows the interpretation of the score obtained by a student on the inventory.

   **Table 3.3(b)(ii)**

<table>
<thead>
<tr>
<th>No.</th>
<th>Limits of Scores</th>
<th>Grade</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Score 199 and above</td>
<td>A</td>
<td>Very good study habits</td>
</tr>
<tr>
<td>2.</td>
<td>Score between 180 and 198</td>
<td>B</td>
<td>Good study habits</td>
</tr>
<tr>
<td>3.</td>
<td>Score between 160 and 179</td>
<td>C</td>
<td>Normal or satisfactory study habits</td>
</tr>
<tr>
<td>4.</td>
<td>Score between 140 and 159</td>
<td>D</td>
<td>Below normal or poor study habits</td>
</tr>
<tr>
<td>5.</td>
<td>Score 139 and below</td>
<td>E</td>
<td>Very poor study habits</td>
</tr>
</tbody>
</table>
3.4 Method of Study:

For the present study, descriptive method of research has been used. Descriptive research studies are designed to obtain pertinent and precise information concerning the current status of phenomena and, whatever possible, to draw valid general conclusions from the fact discovered. They are restricted not only the fact finding but may often result in the formulation of important principles of knowledge and solution of significant problems. Descriptive studies involve events that have already taken place and are related to a present condition.³

In the present study, the facts regarding the students’ attitude towards mathematics and their study habits were obtained by administering the concerned test/scale as mentioned earlier. For academic achievement in mathematics, marks in mathematics subject scored by the students in their Secondary School Examination 2012, conducted by Central Board of Secondary Education (CBSE), were collected and administered.

3.5 Data Collection Procedure:

The investigator first of all took formal permission from the Human Resource Development Department (HRDD) from both of the districts i.e., East and South districts of the State of Sikkim to administer the tests on students studying in class X in various Senior/Senior Secondary schools both the districts. Furthermore, permission was taken from Principals/ Headmasters/ Headmistress of the concerned Secondary /Senior Secondary Schools. The data were collected from the sample using above mentioned tools.

Both of the tests, i.e., Attitude towards Mathematics Scale (ATMS) and Study Habit Inventory (SHI) were administered on the same day one after the other with a brief break in between. Before administering these tests motive of conducting the same was explained to the students. Instructions were also read

out by the investigator. Only after being sure that students have understood the tests properly, booklets were distributed. Every statement in both the tests was also explained to make students understand them properly. A constant vigil was kept over the class while the test administration was made. The time consumed by students to complete both of the tests was 40 to 50 minutes per school.

For academic achievement in mathematics, marks in mathematics subject scored by the students in their Secondary School Examination 2012, conducted by Central Board of Secondary Education (CBSE), were collected by the investigator from school record and were administered.

The collected data were analyzed on the Statistical Package for Social Science (SPSS). Data was analyzed using descriptive statistics which involved the use of frequencies, mean scores and standard deviation. SPSS was used to aid in data analysis and also to calculate $z$-value.

### 3.6 Statistical Techniques Used:

The following statistical techniques were used for analyzing the data:

i. **Pearson’s Coefficient of Correlation**

The following formula of calculating Pearson’s $r$ is used

$$ r = \frac{N \sum x^' y^' - \sum f x^' \cdot \sum f y^'}{\sqrt{[N \cdot \sum x^2 - (\sum f x^' )^2][N \cdot \sum y^2 - (\sum f y^' )^2]}} $$

Where:

$x^'$ = The deviation of variable $x$ from the assumed mean

$y^'$ = The deviation of variable $y$ from the assumed mean

$f$ = Frequency of the score

$f x^2$ = The sums of the square $x$ value
\( f y^2 \) = The sums of the square y value

\( N \) = Size of the sample

\( \sum \) = Summation

ii. **Testing Significance**

For testing the significance of various statistics the following formulae were used.\(^4\)

**Significance of the Difference between two Means**

To test the significance of the difference between two Means, the following formulas were used:

\[
\sigma_D = \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}
\]

\[
Z = \frac{D}{\sigma_D}
\]

Where:

\( \sigma_D \) = Standard Error of the difference of the Means

\( \sigma_1 \) and \( \sigma_2 \) = Standard Deviation of the two Scores

\( N_1 \) and \( N_2 \) = Number of each independent sample