Chapter No 3
METHODOLOGY & PROCEDURE
INTRODUCTION

The present chapter indicates the line of approach of study. The first part deals with the method, population and sample of the study and second part provides the tools and techniques employed in this research. It also presents the procedure of the study.

3.1 RESEARCH METHOD:

In order to collect requisite data for research problem, the investigator selected a suitable research method. The investigator employed Experimental Method due to the nature of the problem.

Experimental research provides a systematic and logical method for answering the question, "if this is done under carefully controlled conditions, what will happen?" Experimenters manipulate controlled stimuli, treatments, or environmental conditions and observe how the condition or behaviour of the subject is affected or changed. Their manipulation is deliberate and systematic. Although the experimental method finds its greater utility in the laboratory, it has been effectively applied within non-laboratory setting such as the classroom, where significant variables can be controlled to some degree. The immediate purpose of experimentation is to predict events in the experimental setting. The ultimate purpose is to generalize the variable relationships so that they may be applied outside the laboratory/non-laboratory to a wider population of interest.
An experiment involves the comparison of the effects of a particular treatment with that of a different treatment or of no treatment. In a simple conventional experiment, reference is usually made to an experimental group and to a control group. These groups are equated as nearly as possible. The experimental group is exposed to experimental treatment.

3.2 SAMPLE AND SAMPLING PROCEDURE:

Sampling, a fundamental technique in methodology of research, is a part of the strategy of research, and has by now acquired the status of a technical job. It is imperative for the scientific minded researcher to take good care of sampling.

This study covered the target population of Senior Secondary Schools of District Ambala and District Yamunanagar. 200 students (100 boys and 100 girls) studying in Senior Secondary School of District Ambala and Yamunanagar were selected randomly.

### TABLE-3.1

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Name of the School</th>
<th>School Code</th>
<th>Boys/Girls/Co-Ed</th>
<th>Rural/Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>GSSS, Ambala Cantt.</td>
<td>4</td>
<td>Co-Ed</td>
<td>Urban</td>
</tr>
<tr>
<td></td>
<td>(BC bazar)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>GSSS, Ambala Cantt.</td>
<td>171</td>
<td>Co-Ed</td>
<td>Urban</td>
</tr>
<tr>
<td></td>
<td>(Main Branch)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>GGSSS, Ambala city</td>
<td>69</td>
<td>Girls</td>
<td>Urban</td>
</tr>
</tbody>
</table>

91
<table>
<thead>
<tr>
<th>No.</th>
<th>School Name</th>
<th>Students</th>
<th>Gender</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.</td>
<td>GSSS, Ambala City (Baldev Nagar)</td>
<td>8</td>
<td>Co-Ed</td>
<td>Urban</td>
</tr>
<tr>
<td>5.</td>
<td>GGSSS, Ambala City (Model Town)</td>
<td>172</td>
<td>Girls</td>
<td>Urban</td>
</tr>
<tr>
<td>6.</td>
<td>GSSS, Ambala City (Prem Nagar)</td>
<td>9</td>
<td>Co-Ed</td>
<td>Urban</td>
</tr>
<tr>
<td>7.</td>
<td>GSSS, Kathemajra, Ambala</td>
<td>47</td>
<td>Co-Ed</td>
<td>Rural</td>
</tr>
<tr>
<td>8.</td>
<td>GSSS, Krasan, Ambala</td>
<td>59</td>
<td>Co-Ed</td>
<td>Rural</td>
</tr>
<tr>
<td>9.</td>
<td>GSSS, Khorwakhurd, Ambala</td>
<td>3990</td>
<td>Co-Ed</td>
<td>Rural</td>
</tr>
<tr>
<td>10.</td>
<td>GSSS, Naggal, Ambala</td>
<td>161</td>
<td>Co-Ed</td>
<td>Rural</td>
</tr>
<tr>
<td>11.</td>
<td>GSSS, Nahuni, Ambala</td>
<td>32</td>
<td>Co-Ed</td>
<td>Rural</td>
</tr>
<tr>
<td>12.</td>
<td>GSSS, Nahra-dera, Ambala</td>
<td>96</td>
<td>Co-Ed</td>
<td>Rural</td>
</tr>
<tr>
<td>13.</td>
<td>GSSS, Nancola, Ambala</td>
<td>95</td>
<td>Co-Ed</td>
<td>Rural</td>
</tr>
<tr>
<td>14.</td>
<td>GSSS, Buria, Yamunanagar</td>
<td>275</td>
<td>Boys</td>
<td>Rural</td>
</tr>
<tr>
<td>15.</td>
<td>GSSS, Jagadhari, Yamunanagar</td>
<td>179</td>
<td>Boys</td>
<td>Urban</td>
</tr>
<tr>
<td>16.</td>
<td>GGSSS, Jagadhari, Yamunanagar</td>
<td>284</td>
<td>Girls</td>
<td>Urban</td>
</tr>
<tr>
<td>17.</td>
<td>GSSS, Khadri, Yamunanagar</td>
<td>279</td>
<td>Boys</td>
<td>Rural</td>
</tr>
</tbody>
</table>
Investigator divides these schools in two groups randomly. The names of groups are:
- Control group
- Experimental group

3.3 RESEARCH DESIGN:

When more than one independent variable is included in a study, a factorial design is the first choice of the investigator. The investigator employed 2 X 2 factorial design for the collection of data. The scheme of the research design is as under:

Sex X Socio Economic Status (S.E.S.)

\[
\begin{array}{c}
\text{Sex} \\
\downarrow \\
\text{Male} \\
\downarrow \\
\text{Low SES} \\
(A) \\
\downarrow \\
\text{High SES} \\
(B) \\
\end{array} \\
\begin{array}{c}
\text{Female} \\
\downarrow \\
\text{Low SES} \\
(C) \\
\downarrow \\
\text{High SES} \\
(D) \\
\end{array}
\]
3.4 TOOLS

Following tools were used for the collection data:

1. Multimedia Package developed by the investigator.
2. Socio-Economic Status Inventory (SESI) by Verma R.P., Sexena P.C. and Mishra U.
3. Criterion Referenced Test of Physics developed by the investigator.

(A) S.E.S.I. :

For measuring Socio-Economic Status, a standardized test developed by Prof. R.P. Verma, Prof. P.C. Saxena and Dr. Usha Mishra was used. It has eight areas as given below:
- Caste/ Religion
- Place of Birth
- Length of Residence in the City
- Family
- Education
- Occupation
- Income
- General

Reliability

The test-retest reliability of the SESI using a sample of 50 students was founded to be 0.74 after the interval of three months.

Validity

Validity of SESI lies in its capacity to classify the people in the society in correct classes formed on the basis of their Socio-Economic Status. It was administered on a known group of 50 people from the city of Varanasi and 95% classifications were
found to be true. It shows that the tool is fairly valid to assess socio-economic status.

**Measurement of High and Low Socio-Economic Status:**

The students whose raw score fall between the ranges of 32-43, belong to Low SES and between 68-91, belong to High SES.

**(B) Criterion Referenced Test (CRT):**

For measuring achievement of senior secondary school students in Physics, the researcher developed a Criterion Referenced Test (CRT) on the topic "Light". The sub-topics were "Light, Mirror and Lens, Reflection and Refraction". Researcher included a variety of questions for construction of CRT. The types of Questions were:

1. Fill in the blanks
2. True/ False
3. Multiple Type Questions
4. Short Answer Type Questions
5. Matching Based

The total number of questions in final draft of CRT was 69 and for each right answer one mark was given.

Researcher used two methods for determining the effectiveness of CRT.

1. **Index of Sensitivity (S)**
2. **Index of Criterion Difficulty of the test items (Dc)**

The S and Dc were calculated and details are given in Chapter 4.
3.5 PROCEDURE:

In the beginning of the experiment, the criterion reference test as a measure of pre-test was administered to both the groups i.e. experimental group and control group. Both the groups were seated in separate locations. Students of control group were taught through the traditional lecture method and students of experimental group were presented self-learning multimedia material. The experiment lasted for one month. Experimental group was personally supervised by the investigator so that the students could feel more comfortable.

Factors affecting internal and external validity especially history, motivation, testing, instruments statistically regression, experimental mortality, selection, interaction effect of testing (Campbell and Stanley, 1962) were minimized by:

- Selecting a large sample by random and forming groups at random.
- Keeping procedures, conditions and materials identical in both groups other then the way of presentation.
- Using validated instruments for measuring performance.

3.6 ADMINISTRATION OF TEST

The instructions were printed in the self-learning multimedia package and were easy to read and follow. The instructions / directions contained therein were followed strictly. The criterion referenced test was administered immediately after the completion of schedule to each group.
The booklets of the criterion reference test were scored with the help of key for data collection. Separate tables of scores on pre-test and immediate post-test were prepared for each group.

For administration of the test, the subjects were made to sit comfortably on the desks at sufficient distance apart, so that they may not talk to each other or consult each other about responses. The subjects were provided booklets. The investigator read out loudly all instructions. For the sake of understanding, two examples were also given. Though there was no time limit, the respondents were asked not to waste time.

3.6 STATICAL ANALYSIS OF DATA:

Following statistical tools have been used for analysis of data:

1. Analysis of co-variance followed by t-ratio. Analysis of co-variance was used to ensure equality of groups for better results.