CHAPTER - III

METHOD AND PROCEDURE
OF THE STUDY
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METHOD AND PROCEDURE OF THE STUDY

Research methods are of utmost importance in a research process. They describe various steps in solving a research problem. This chapter deals with the research approach, research design, setting, the population, sample, sampling technique, procedure followed, statistical analysis and precautions. So the present chapter would imply sub-heads like.

3.1 Design of the Study
3.2 Selection of the Sample
3.3 Selection of the Tools
3.4 Procedure Followed
3.5 Statistical Analysis
3.6 Precautions observed
3.7 Constraints and Difficulties Faced

3.1 DESIGN OF THE STUDY

Research design is an overall plan for organizing a scientific investigation. An educational research is described as experimental when the research first, specifies a set of researchable hypotheses and then, establishes a systematic programme of data gathering under precisely defined conditions in an effort to test the hypotheses. The hypotheses provide a network of statements relating the impact of independent variables on some outcome variables or dependent variables.

According to Weiner (1977), the experimental method, which is suitable for testing hypotheses, is the strongest method for developing and understanding psychological concepts. Any experimental problem has two interrelated aspects, the design of the experiment and statistical analysis of the data. The later aspect is directly dependent upon the former. Statistical methods can greatly increase the efficiency of an experiment and also
strengthen the conclusions so obtained. A good experimental design should provide some explanation with respect to all the objectives of the experiment and be kept as simple as possible.

In the present study, a pre-test-post-test control group *Quasi experimental design* was employed with a purposive sample in the form of two intact sections of elementary class students of the same school. It involved two groups of sixth grade students (experimental group and control group); the Experimental group was taught through Multimedia package and control group was taught through Traditional method.

**Table 3.1**

<table>
<thead>
<tr>
<th>Design of the Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group ——► Experimental Group</td>
</tr>
<tr>
<td>Method of Teaching Used</td>
</tr>
<tr>
<td>Outcome measure before the treatment</td>
</tr>
<tr>
<td>Outcome measure after the treatment</td>
</tr>
<tr>
<td>Difference in outcomes</td>
</tr>
</tbody>
</table>

E = Gross outcomes measures for experimental group.
C = Gross outcomes measures for control group.
E1 = Measure of outcomes of experimental group before the treatment.
C1 = Measure of outcomes of control group before the treatment.
E2 = Measure of outcomes of experimental group after the treatment.
C2 = Measure of outcomes of control group after the treatment.

The design comprised three stages. The first stage involved pre-testing of all the elementary class (sixth grade) students of two groups on Socio-Economic Status, Intelligence, Achievement in Environmental Science and
Attitude towards Environmental Science. The second stage, involved the experimental treatment, which consisted of teaching five chapters of Environmental science through Multimedia Package to experimental group and through traditional method to control group. In the third stage, the elementary class students were post-tested on Achievement in Environmental Science and Attitude towards Environmental Science. A schematic view of the phases of experiment is presented in Table 3.2

<table>
<thead>
<tr>
<th>Stage</th>
<th>Control Group</th>
<th>Experimental Group</th>
</tr>
</thead>
</table>
2. Measurement of Intelligence of Students.  
2. Measurement of Intelligence of Students.  
| 2. Treatment | Teaching Environmental Science through Traditional method                  | Teaching Environmental Science through Multimedia Package. |
STUDY VARIABLES

In an experimental research, the relationship between two types of variables namely independent and dependent variables is studied, Independent variable are the causes, while dependent ones are effects. Another category of variables, which is equally important, is of the intervening variables. All these three kinds of variables, identified for the study are as discussed below.

Independent Variables

1. Multimedia Package
2. Multimedia Method
3. Traditional Method

As the impact of Multimedia Learning strategy was to be studied, the method of instruction or teaching in Multimedia Package was used as an independent variable. Multimedia package was used to see its effect on the achievement of sixth grade students in Environmental Science. The experimental group was taught through Multimedia package method of learning and the control group was taught through traditional method. Thus, multimedia method and the traditional method were the two independent variables for the study.

Dependent Variables

Achievements in Environmental Science and Attitude towards environmental science were taken as dependent variable. These variable were measured twice during the course of the study-first before beginning the experimental treatment, i.e., at the pre-test stage and then after completing the experimental treatment, i.e., at the post-test stage.

Intervening Variables

There are certain variables known as Intervening variables which have their effect on the learning outcomes and influence both independent and dependent variables. Intervening variables such as type of school, grade level, subject to be taught, socio-economic status of students, intelligence of students, previous knowledge of students etc. were successfully controlled experimentally.
**Control Employed**

It is necessary to control all those variables that may significantly affect the dependent variables. Hence such intervening variables were controlled by employing suitable controls.

1) **Type of School**

The sample was selected from a single school (Gurukul Sr. Sec. School, Matindu), situated in Matindu, Distt. Sonepat.

2) **Grade Level**

Elementary Class students of Sixth grade were selected for the study and grade level was thus kept constant during the study.

3) **Teacher**

Both the experimental group and the control group were taught by the researcher herself to avoid any variation.

4) **Subject**

The two groups were taught same five topics of Environmental Science.

5) **Socio-Economic Status**

The experimental group and control group were given Socio-Economic status test developed by A.K. Kalia and Sudhir Sahu. ANOVA was applied to find out the difference among Socio-Economic status test scores of the two groups. The results are given in Table 3.3

<table>
<thead>
<tr>
<th></th>
<th>Groups</th>
<th>Degree of Freedom</th>
<th>Residuals</th>
<th>F</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SES</td>
<td></td>
<td>Sum of Square</td>
<td>Mean Square Variance</td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>1</td>
<td>1.11</td>
<td>1.11</td>
<td>0.12</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Within Groups</td>
<td>98</td>
<td>847.89</td>
<td>8.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>99</td>
<td>849</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Not Significant at 0.05 level.*
Table 3.3 shows that the f-value between the groups is 0.12 which is not significant at 0.05 level. It means that no significance difference existed between the Socio-Economic status of the two groups, indicating that they belonged to the same kind of a Socio-Economic milieu.

6) Intelligence of students

To eliminate the initial variability of the students statistically in the two groups. They were measured on General Mental ability through cattell’s Culture Fair Intelligence test. General Mental ability is an Index of intelligence which might affect the outcomes of the experiment and consequently influence the results. ANOVA was applied to find out the difference between intelligence test scores of the two groups. The results are given in Table 3.4.

Table 3.4
F-Value of Intelligence test scores of experimental group and control group

<table>
<thead>
<tr>
<th>Groups</th>
<th>Degree of Freedom</th>
<th>Residuals</th>
<th>F</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Sum of Square</td>
<td>Mean Square Variance</td>
<td></td>
</tr>
<tr>
<td>SES Between Groups</td>
<td>1</td>
<td>0.160</td>
<td>0.160</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Within Groups</td>
<td>98</td>
<td>744.79</td>
<td>7.59</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>99</td>
<td>744.95</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.4 shows that the f-value between the groups is 0.021 which is not significant at 0.05 level. It means that no significance difference existed between the Intelligence of the two groups. Initially, general mental ability was thought to be controlled statistically through covariance but since the two groups selected did not differ on general mental ability at the pre-test stage, there was no need to control covariate.
### Table 3.5

**Independent, Dependent and Control Variables**

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Dependent Variables</th>
<th>Control Variables</th>
<th>Control Employed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method of Teaching i.e. Multimedia method and Traditional method</td>
<td>1. Achievement in Environmental Science</td>
<td>1. Type of School</td>
<td>1. Administrative (Single School)</td>
</tr>
<tr>
<td></td>
<td>2. Attitude towards Environmental Science</td>
<td>2. Grade level</td>
<td>2. Administrative (only students of Class VI were taught)</td>
</tr>
<tr>
<td></td>
<td>3. Subject to be taught</td>
<td>3. Administrative (same units of environmental science in the two groups were taught)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Duration of the instructional phase</td>
<td>4. The two groups were taught for 30 days. The duration of the period was 40 minutes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Teacher</td>
<td>5. Both the groups were taught by the same teacher.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. Students Socio-Economic status</td>
<td>6. Belonged to same milieu</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. Students intelligence</td>
<td>7. No need</td>
<td></td>
</tr>
</tbody>
</table>
Specific events and factors like anxiety, home environment, adjustment, social-maturity and the like would have only a marginal effect upon the experiment so these factors were not taken into account.

3.2 POPULATION AND SAMPLE

A population is usually defined as “all the members of any well defined class of people, events or objects.” It represents a complete enumeration in which all the units are listed or at least theoretically conceived to have been reached. The population needs to be defined clearly by indentifying the nature and form of units that it consists of. Thus, for the present study all the students of Grade Sixth in government schools and self-financing schools in Sonepat district constitute the population.

The primary purpose of research is to discover principles that have universal application, but to study the whole population in order to arrive at generalizations would be impractical, if not possible. Sampling is a technique by which a relatively small number of individuals or measures of individuals, objects or events is selected and analysed in order to find out something about the entire population from which it is selected. Sampling technique reduces the expenditure, saves time and energy permits measurement of greater scope or produces greater precision and accuracy. In all types of researches, there are some inferences regarding a well specified and identifiable group known as population and the selected number of persons known as sample. Sample is the representative proportion of the population. Educational Researchers, because of administrative limitations in randomly selecting and assigning individuals to experimental and control groups, often use available classes as samples (Best & Kahn 1995).

The sample of the study comprised of 100 students studying in grade sixth of Gurukul Sr. Sec. School, Matindu (Sonepat). One section formed the control group and the other section formed the experimental group.

The institution chosen and the number of each student in each of experiment and control group are given in the Table 3.6.
### Table 3.6
**Sample of the Study**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of the School</th>
<th>Groups</th>
<th>Total No. of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Gurukul Sr. Sec. School, Matindu</td>
<td>Experimental Group</td>
<td>50</td>
</tr>
<tr>
<td>2.</td>
<td>Gurukul Sr. Sec. School, Matindu</td>
<td>Control Group</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

3.3 **SELECTION OF TOOLS:-**

Tools of educational research are the basic documents employed by the researcher to elicit facts or data in order to substantiate the hypotheses. The selection of tools is of Prime importance which is carried out keeping in view the subjects’ age and the objective of the study for the present investigation. Out of the six tools, four major tools have been developed by the Investigator herself. In this study, the following tools were used.

1. Socio-Economic Status Scale (Developed by A.K. Kalia and Sudhir Shahu)
2. Cattell’s Culture Fair Intelligence test (Developed by R.B Cattell and A.K.S Catted)
3. Achievement Test (Developed by the investigator)
4. Opinionnaire for teachers. (Developed by the investigator)
5. Multimedia Learning Package (Developed by the investigator)
6. Attitude Scale towards environmental science. (Developed by the investigator)

3.4 **PROCEDURE FOLLOWED**

The experiment was conducted in three phases as given below:

<table>
<thead>
<tr>
<th>PHASES OF EXPERIMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>➔ Phase 1 : Administration of Pre-test</td>
</tr>
<tr>
<td>➔ Phase 2 : Conducting the Instructional Programme ; and</td>
</tr>
<tr>
<td>➔ Phase 3 : Administration of Post-test</td>
</tr>
</tbody>
</table>

*Fig. : 3.1 Phases of Experiment*
Phase-1  Administration of Pre-test

Before the start of the experiment, the sample subjects were contacted and rapport was established with them. They were oriented to the tests to be used with them and also with the methodology of the treatment to be followed e.g. Multimedia Package method and Traditional method. Pre-test, i.e., Achievement Test and Attitude scale were administered to the Sixth grade students of two groups by the researcher herself. The instructions pertaining to the tests were explained verbally in clear terms to the elementary students before administering test. The administration of these test was carried out as per norms and instructions contained in their manuals.

Phase-2  Conducting the Instructional Programme

The instructional treatment was given for 30 days which included 5 Multimedia package lessons to the experimental group, whereas the control group was taught by the traditional method. Same content was taught to both the groups. Elementary class students were motivated to learn through the novel method of instruction and were encouraged to participate in the experiment by explaining the objectives.

Phase-3 Administration of Post-Test

Immediately after the instructional treatment was over, the subjects were assessed on criterion measures to know the effect of the treatment. The Achievement and Attitude Scale on Environmental Science were administered to both the experimental and control groups.

Date Schedule of the Instructional Phase for both the Groups

Phase 1: Pre-test Stage

02\textsuperscript{nd} Sept. 2013 - Administration of Achievement Test in Environmental Science for both groups

03\textsuperscript{rd} Sept. 2013 - Administration of Attitude Scale towards Environmental Science for both groups
Phase 2: Instructional Programme

Table 3.7
Date Schedule of the Instructional phase for both the groups

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topic</th>
<th>Date schedule of Instructional phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Understanding Our Environment</td>
<td>04 Sept. 2013 to 07 Sept. 2013</td>
</tr>
<tr>
<td>2</td>
<td>Living and Non-living Things</td>
<td>09 Sept. 2013 to 14 Sept. 2013</td>
</tr>
<tr>
<td>3</td>
<td>Natural Resources</td>
<td>16 Sept. 2013 to 21 Sept. 2013</td>
</tr>
<tr>
<td>4</td>
<td>Water</td>
<td>23 Sept. 2013 to 28 Sept. 2013</td>
</tr>
<tr>
<td>5</td>
<td>Pollution</td>
<td>30 Sept. 2013 to 08 Oct. 2013</td>
</tr>
</tbody>
</table>

Control Group
The above chapters were taught by traditional method to the control group on the same dates.

Phase 3: Administration of Post-Test

09th Oct. 2013 - Administration of Achievement Test in Environmental Science for both groups

10th Oct. 2013 - Administration of Attitude Scale towards Environmental Science for both groups

3.5 STATISTICAL ANALYSIS
To achieve objectives of the study, the data collected was statically analyzed using the following techniques:
1. Descriptive statistics such as means and S.Ds were worked out on the score of achievement in Environmental science and Attitude towards Environmental science.
2. Analysis of variance (ANOVA) was used in order to find out the significance of difference between means of SES and intelligence among control and experimental group.
3. ‘t’ test was employed for testing the significance of difference between the means of students Achievement in environmental science and their
Attitude towards environmental science on pre test, post test and gain scores. The value of ‘t’ was computed with the help of the following formula:

\[ t = \frac{D}{\sigma D} \]

Where \( D = M_1 - M_2 \)

Where \( M_1 = \text{Mean of first group} \)
\( M_2 = \text{Mean of second group} \)

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

\( \sigma = \text{standard deviation} \)
\( \sigma_1 = \text{standard deviation of first group} \)
\( \sigma_2 = \text{standard deviation of second group} \)
\( N_1 = \text{Number of frequency of first group} \)
\( N_2 = \text{Number of frequency of second group} \)

\( t = \text{Testing the level of significance} \)

3.6 PRECAUTIONS OBSERVED

Following precautions were observed during the course of experiment (Pre-test \( \rightarrow \) Treatment \( \rightarrow \) Post-test) for ensuring effectiveness and high precision in experimental condition which may have contributed to the results.

- No undue stress or control of any kind was imposed on the subjects at any time during the study and the experiment was conducted in a relaxed natural setting.
- Both the experimental and control groups were taught by the researcher herself to avoid any variation.
- The effectiveness of the experimental treatment was ensured by establishing rapport with elementary students, maintaining natural setting, harmonious atmosphere, providing sufficient time for various activities in the experimentation.
• It was ensured that the topics chosen as contents of treatment had not been previously taught to the elementary students in both the experimental and control groups.
• During instructional treatment, attempt was made to stick to limits of the specific teacher directed instructions in both groups.
• Separate material for achievement tests was provided to every student during experimentation so as to avoid any indiscipline or chances of unfair observations.
• Teaching periods of 40 minutes duration were utilized fully for treatment and time was not wasted during treatment.

3.7 CONSTRAINTS AND DIFFICULTIES FACED DURING EXPERIMENT

It may not be improper to mention some of the difficulties faced or constraints of the experiment that need to be taken note of. These were sorted out by the researcher:

• Power failure
• Time-table related difficulties

Efforts were needed to convince other teachers and the principal about importance of the experiment to make them agree to cooperate in the experiment. The researcher contacted the authorities and briefed about the programme and its usefulness. It is an essential requisite for every experiment that the treatment should be fully provided to every student. It was ensured that the sample groups regularly attended the school. The experiment had to be adjusted as per the time-table. Even the time-table incharge was contacted for making some changes in the regular time-table. Despite these constraints and difficulties, the researcher carried out the experiment very smoothly.