CHAPTER- III

METHOD AND PROCEDURE OF THE STUDY

Research is an intellectual activity which brings to light new knowledge or corrects previous error and misconception and adds in to the existing corpus of knowledge. It can be viewed as a process of investigating a subject in a very different view so as a new dimension can be added to the already existing knowledge regarding that subject. It also involves a controlled, systematic, valid and rigorous search of what is not known and creation of association and causation that permits the accurate prediction of outcomes under a given set of conditions. For a research to be fruitful and leading to reliable results, it is must that appropriate method should be selected and employed.

According to P. M. Cook, “Research is an honest, exhaustive, intelligent search for facts and their meanings or implications with reference to a given problem. It is the process of arriving at dependable solutions to problems through planned and systemic collection, analysis and interpretation of data. The best search is that which is reliable, verifiable and exhaustive, so that it provides information in which we have confidence.”

According to Kaul (2008), “Educational research refers to a systematic attempt to gain a better understanding of the educational process, generally with a view to improving its efficiency.”

For organizing a scientific investigation or research an overall plan is required, which is known as Research Design. The main function of a research design is how we can find answers of our research questions. The research design sets out the logic.

According to Kerlinger (1986), “A research design is a plan, structure and strategy of investigation so conceived as to obtain answers to research questions or problems. It includes an outline of what the investigator will do from writing the hypotheses and their operational implications to the final analysis of data.”
According to Thyre (1993) “A traditional research design is a blue print or detailed plan for how a research study is to be completed- operationalizing variables so they can be measured, selecting a sample of interest to study, collecting data to be used as a basis for testing hypotheses, and analyzing the results.”

It is said that the fate of an activity and its outcome essentially depends upon its design. Design provides a picture of what and how to do the work before starting it. In any research project design provides the investigator a blue print of the research, dictates the boundaries of the project.

This part of the study outlines the entire research plan. It describes just how data will be collected and analyzed. Data is like raw material, without which production in research is impossible. Data collection is essentially an important part of the research process so that the inference, hypotheses may be tested as valid, verified as correct or rejected as untenable. In order to collect the requisite data for any problem the investigator has to sample the population. Therefore research design is a mapping strategy which is based on sampling techniques.

A research design includes the following components:

- Method of study
- Population and sample
- Tools used
- Procedure of data collection
- Administration of tools
- Statistical techniques applied

3.1 METHOD OF THE STUDY

George J. Mouly has classified research methods into three basic types: Survey method, Historical method and Experimental method. The first task of investigator’s work is to select appropriate research method.
1. **Survey Method:** The word ‘survey’ has been derived from the words ‘sur’ or ‘sor’ and ‘veeir’ or ‘veior’ which means ‘over’ and ‘see’ respectively. In normative survey we are concerned with condition and relationships that exist; practices that prevail; beliefs, points of view or attitudes that are held; processes that are going on; influences that are being felt and trends that are developing. It is concerned with the present and attempts to determine the status of the phenomena under investigation.

2. **Historical Method:** This method is concerned with the past and attempts to trace the past as a means for seeing the present prospective. It involves investigating, recording, analyzing, and interpreting the events of the past for the purpose of discovering generalizations that are helpful in understanding the past and the present, and to a limited extent, in anticipating the future.

3. **Experimental Method:** It is oriented towards the discovery of basic relationship among phenomena as means of predicting and eventually, controlling there occurrences. In experimental method the investigator manipulates independent variable(s) to see its effect on the dependent ones.

The main objective of the present study was to find out the effect of Multimedia Instructional Package on Students’ achievement in Life Science. Therefore to achieve the objectives of present study *Experimental method* has been used by the investigator.

Experimental design is the blue print of the procedures that enables the researcher to test hypotheses by reaching valid conclusions about relationships between independent and dependent variables. Selection of a particular design is based on the purpose of the experiment, the type of variables to be manipulated and the conditions or limiting factors under which it is conducted.

The experimental design can be categorized into following categories based on the degree to which they eliminate or minimize the threats to the experimental validity:

1. **Pre Experimental Design:** It is the least effective, for it provides either no control group or no way of equating the groups that are used.
2. **True Experimental Design:** It employs randomization to provide the control of the equivalence of the groups and exposure to the treatment.

3. **Quasi-experimental Design:** It is used only when randomization is not possible.

According to the nature of the study, the investigator has employed **Quasi-experimental: pre-test post-test Experimental group and Control group design**; as it was difficult to use randomization for the selection of samples for experimentation and thus the researcher took the sample purposively. **Best and Khan (2006)** describes that “this design is used in classroom experiments when experimental and control groups are such naturally assembled groups as intact classes which may be similar.”

The researcher conducted the experiment for the present study, where the experimental design of the study is given in fig. 3.1.

![Fig. 3.1 Experimental design of the study](image)

The experimental and control group consisted two intact sections of class X of a school. The experimental group was taught through Multimedia Instructional Method (MMIM) using Multimedia Instructional Package (MMIP) whereas the control group was taught through Traditional Teaching Method (TTM).

### 3.2 VARIABLES OF THE STUDY

**Creswell (2012)** defined a variable as **“an attribute or characteristics of individuals that researchers study.”**

Following types of variables have been included in the present study:
1. **Independent Variable:** The independent variable is a stimulus variable which operates either within a person or within environment to affect his behaviour. It is that factor which is measured, manipulated or selected by the experimenter to determine its relationship to an observed phenomenon. As per the objective of the study effect of MMIM was to be studied on achievement of students in Life Science. For this experimental group was taught by MMIM and the control group through TTM. So, MMIM and TTM were the independent variables of the present study.

2. **Dependent Variable:** The dependent variable is that factor which is observed and measured to determine the effects of independent variables. In the present study achievement in Life Science and Attitude towards Science were taken as dependent variables, which were measured twice during the course of study; first at pre-test stage and second time at post-test stage.

3. **Intervening Variable:** It is that factor which affects the observed phenomenon but cannot be seen, measured or manipulated; its effects must be inferred from the effects of the independent and moderator variables on the observed phenomenon. So, it can be seen as a variable that explains a relation or provides a causal link between other variables.

4. **Control Variables:** All the variables cannot be studied at the same time. Control variables are extraneous variables that an investigator did not wish to examine in the study. So, it is necessary that these intervening variables must be controlled to guarantee that they will not have a differential or moderating effect on the relationship between the dependent and independent variables.

**Control Employed:**

Hence suitable control was employed to control variables. Control employed for each of this was as follows:

i. **Nature of school:** The sample was taken from a single school; Maharaja Agrasen Model School, Delhi affiliated to C.B.S.E.

ii. **Grade level:** X class was selected for the present study and it was kept constant during the study.
iii. **Teacher:** Both the groups; experimental and control were taught by the same teacher.

iv. **Subject content:** Both the groups were taught the same two units of Science.

v. **Socio-economic Status:** Both groups belonged to same milieu.

vi. **Intelligence level:** Both of the groups belonged to same intelligence level.

The three kinds of variables, identified for the study are given in the fig. 3.2.

![Fig. 3.2 Types of Variables](image)

### 3.3 POPULATION OF THE STUDY

A population is defined as a group of individuals with at least one common characteristic which distinguishes that group from other individuals.

Population for the purpose of the present study has been defined as all students studying in class X CBSE affiliated English medium schools of Delhi.

### 3.4 SAMPLE AND SAMPLING TECHNIQUES
The primary purpose of research is to discover principles that have universal application, but to study the entire population to arrive at generalizations would be impractical, if not impossible. The practical limitations: cost, time and other factors which are usually operative in the situation stand in the way of studying the total population. The concept of sampling has been introduced with a view to make the research findings economical and accurate.

David S. Fox defined the term sampling as “In Social Sciences, it is not possible to collect data from every respondent relevant to our study but only from fractional part of the respondents. The process of selecting the fractional part is called sampling. ”

So, sampling can be viewed as a process of selection of individuals from the population in such a way that every individual has an equal chance of being taken as a sample. In order to serve a useful purpose, sampling should be unbiased or representative. Hence, we select only a few items from the universe for our study purpose. The items thus selected constitute a sample. A good sample must be as nearly representative of the entire population as possible and as ideally it must provide the whole of the information about the population from which the sample has been drawn.

According to Good and Hatt, “Sample, as the name implies is a smaller representation of the larger whole.”

A sample is a small proportion of a population selected, for observation and analysis. By observing the characteristics of the sample, one can make certain inferences about the characteristics of the population from which it is drawn. Samples are not selected haphazardly; they are chosen in systematically random way so that the chance of the operation of probability can be utilized.

Purposive sampling technique was used for the selection of the sample considering the experimental nature of the present study and bearing in mind the feasibility aspect of the experimentation, data collection and with the objective of getting all the required facilities. 80 students of X standard belonging to two sections (40 students in each section) of Maharaja Agrasen Model School, Pitampura Delhi were
selected as a sample for the present study. These sections were assigned randomly as Experimental group and Control group.

**Table: 3.1**

**Sample of the Study**

<table>
<thead>
<tr>
<th>Group</th>
<th>Class</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group</td>
<td>X</td>
<td>40</td>
</tr>
<tr>
<td>Control Group</td>
<td>X</td>
<td>40</td>
</tr>
</tbody>
</table>

### 3.5 TOOLS USED

Findings of any research study are dependent on the planning, methodology, data analysis and interpretation. Apart from these it also depends on the collected information or data which is the basis of conclusions. The collected information or data is dependent on the types of tools used for data collection. A good research tool is foundation of a quality research as it is a very important factor in determining the accuracy of data, which in turn ensures the findings of the study in arriving at right conclusions. In a research study, while selecting research tools various considerations should be kept in mind like, objectives of the study, the amount of time to be devoted for the study, availability of suitable tools, age group of the sample etc.

For the selection of the suitable tools the investigator reviewed related testing material and discovered that tools for the assessment of Intelligence, Attitude towards Science and Socioeconomic Status were readily available. Hence it was decided to use; G.C. Ahuja Group Test of Intelligence (GGTI) by Dr. G.C. Ahuja, Science Attitude Scale (SAS) by Avinash Grewal and Socio-Economic Status Scale- Urban and Rural (SESS-UR) by Prof. A. K. Kalia and Sudhir Sahu.

Whereas following tools were developed and standardized by the investigator herself:

- A Multimedia Instructional Package (MMIP) on two units (Life Processes and Control & Coordination) of class X standard, prescribed by CBSE.
- An Achievement Test for the assessment of knowledge gain in Life Science; i.e. Life Science Achievement Test (LSAT) for two units (Life Processes and Control & Coordination) of class X standard, prescribed by CBSE.
• Multimedia Instructional Package Opinionnaire for Teachers (MMIPOT) for the validation of MMIP.
• Multimedia Instructional Package Opinionnaire for Students (MMIPOS) to elicit opinion of students regarding MMIP.

So, for the present study following tools were selected and developed:

1. **Standardized Tests**
   1. G.C. Ahuja Group Test of Intelligence (GGTI) by Dr. G.C. Ahuja (2005)

2. **Self-Developed Tools**
   1. Life Science Achievement Test (LSAT)
   2. Multimedia Instructional Package Opinionnaire for Teachers (MMIPOT)
   3. Multimedia Instructional Package Opinionnaire for Students (MMIPOS)
   4. Multimedia Instructional Package (MMIP)

3.6 **EXPERIMENTAL PROCEDURE**

As already discussed that it is a quasi-experimental research so the procedure followed for the conduction of research consisted of following three stages:

1. Stage I: Pre testing Stage
2. Stage II : Treatment Stage
3. Stage III: Post-testing Stage

**1. Stage I: Pre-testing Stage**

This is the very first stage of the experimental procedure. At this stage following activities were executed:

i. Two intact sections of the class X of the experimental school were chosen as sample and one section was assigned as Experimental Group and another as a Control Group by tossing the coin.
ii. After establishing rapport with the students of experimental and control group an orientation of the selected tools was given regarding the nature and importance of the study. Before administering the tests the instructions pertaining to each test were given to the students of both the groups and the tests were administered according to the schedule given in table-3.2.

Table: 3.2
Schedule of pre-test (Intelligence and SESS)

<table>
<thead>
<tr>
<th>Group</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group and Control Group</td>
<td>Administration of GGTI- G C Ahuja Group Test of Intelligence</td>
</tr>
<tr>
<td></td>
<td>Administration of SESS- Socio Economic Status Scale</td>
</tr>
</tbody>
</table>

iii. The scores of both the groups obtained in Socio Economic Status Scale (SESS) were analyzed through t-test and found that there was no significant mean difference between the two groups. So, it was concluded that both the two groups were socio-economically equivalent.

iv. The scores of both the groups obtained in G C Ahuja Group Test of Intelligence (GGTI) were analyzed through t-test and found that there was no significant mean difference between the two groups. So, it was concluded that both the two groups were equivalent in terms of intelligence.

For a quasi-experimental research it is necessary that the control and experimental groups should be equated on basis of some characteristics. So, here we have two statistically equivalent groups on the basis of socio-economic status and intelligence. After ensuring the equivalence of the groups following tests were administered:
Table: 3.3
Schedule of pre-test (LSAT and SAS)

<table>
<thead>
<tr>
<th>Group</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group and</td>
<td>Administration of Life Science Achievement Test</td>
</tr>
<tr>
<td>Control Group</td>
<td>(LSAT)</td>
</tr>
<tr>
<td></td>
<td>Administration of Science Attitude Scale (SAS)</td>
</tr>
</tbody>
</table>

2. **Stage II: Treatment Stage**

After conducting pre-test at the first stage of experiment, treatment was given to the experiment group i.e. the experimental group was taught two units of Life Science through Multimedia Instructional Method (MMIM) using Multimedia Instructional Package (MMIP) developed by the investigator herself. The control group was taught the same units through Traditional Teaching Method (TTM). Duration of the treatment stage was eight weeks.

3. **Stage III: Post-test Stage**

As soon as the instructional treatment was over the students of both the groups were assessed to know the effect of treatment and overall effectiveness of the package was also assessed. For this tests were administered to both the groups according to the schedule given in table-3.4.

Table: 3.4
Schedule of post-test (LSAT and SAS)

<table>
<thead>
<tr>
<th>Group</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group and</td>
<td>Administration of Life Science Achievement Test (LSAT)</td>
</tr>
<tr>
<td>Control Group</td>
<td>Administration of Science Attitude Scale (SAS)</td>
</tr>
<tr>
<td>Experimental Group</td>
<td>Administration of Multimedia Instructional Package Opinionnaire for Students (MMIPOS)</td>
</tr>
</tbody>
</table>
### 3.7 STATISTICAL TECHNIQUES EMPLOYED

Various statistical techniques employed for the analysis of data are given in the table-3.5. *(All the analysis was made by using SPSS version 20.0)*

**Table: 3.5**

<table>
<thead>
<tr>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>-</td>
<td>% analysis</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>Mean, SD, Skewness, Kurtosis</td>
</tr>
<tr>
<td>4</td>
<td>$H_0$ 1(a), $H_0$ 1(b), $H_0$ 1(b), $H_0$ 1(c), $H_0$ 1(c)</td>
<td>t-test</td>
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<td></td>
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<td>ANOVA</td>
</tr>
<tr>
<td></td>
<td>$H_0$ 1(c), $H_0$ 2(c)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>$H_0$ 3 and $H_0$ 4</td>
<td>t-test</td>
</tr>
<tr>
<td>6</td>
<td>$H_0$ 5(a)</td>
<td>t-test</td>
</tr>
<tr>
<td>7</td>
<td>$H_0$ 5(b), $H_0$ 5(b)</td>
<td>t-test</td>
</tr>
<tr>
<td>8</td>
<td>$H_0$ 5(c), $H_0$ 5(c)</td>
<td>t-test</td>
</tr>
<tr>
<td></td>
<td>$H_0$ 5(c)</td>
<td>ANOVA</td>
</tr>
<tr>
<td>9</td>
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<td>t-test</td>
</tr>
<tr>
<td>10</td>
<td>$H_0$ 6(b), $H_0$ 6(b)</td>
<td>t-test</td>
</tr>
<tr>
<td>11</td>
<td>$H_0$ 6(c), $H_0$ 6(c)</td>
<td>t-test</td>
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<tr>
<td></td>
<td>$H_0$ 6(c)</td>
<td>ANOVA</td>
</tr>
<tr>
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</tr>
<tr>
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<td>ANCOVA</td>
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<tr>
<td>15</td>
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<td>% analysis</td>
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<td>17</td>
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