CHAPTER –III

DESIGN AND PROCEDURE
OF THE STUDY
CHAPTER - III
DESIGN AND PROCEDURE OF THE STUDY

3.0.0 Introduction

Kerlinger (1974) described "Research design as the plan, structure and Model of investigation conceived so as to obtain answers to research questions and control variance". Hence, research design provides a picture of what and how to do the work. In any research project, design provides the researcher a blue print of research, dictates its boundaries and helps in controlling the experimental, extraneous and error variances of the research problem under investigation.

This Chapter describes about the procedure followed, design employed, sample selected, tools used, procedure adopted for data collection and statistical analysis conducted to attain the objectives of the investigation.

3.1.0 Design

In the present investigation, pre-test post-test control group design was employed. It involved three groups of students, two experimental groups and one control group. The Experimental Group I was taught Social Science through Social Inquiry Model. Experimental Group II was taught Social Science through Memory Model and the Control Group was taught through Conventional Method. The design comprised three stages. The first stage involved pre-testing of all the students of three groups on achievement in Social Science, Self-concept, intelligence and socio-economic status. The second stage involved treatment of twenty four weeks. The experimental treatment consisted of teaching 14 chapters of Social Science through Social Inquiry Model to experimental
group I, through Memory Model to experimental group II and through Conventional Method to control group. In the third stage, the students were post-tested on achievement in Social Science and self-concept. The design of the investigation is given below in Table 3.1

Table 3.1

<table>
<thead>
<tr>
<th>STAGE</th>
<th>DURATION</th>
<th>CONTROL</th>
<th>EXPERIMENTAL GROUP I</th>
<th>EXPERIMENTAL GROUP II</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>One week</td>
<td>Measurement of Intelligence of pupils</td>
<td>Measurement of Intelligence of pupils</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre-Testing</td>
<td>2. Socio-economic status of pupils</td>
<td>2. Socio-economic status of pupils</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Achievement in Social Science</td>
<td>3. Achievement in Social Science</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Self Concept of pupils</td>
<td>4. Self Concept of pupils</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Twenty four weeks</td>
<td>Teaching Social Science through Conventional Method</td>
<td>Teaching Social Science through Social Inquiry Model</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Achievement in Social Science</td>
<td>1. Achievement in Social Science</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-Testing</td>
<td>2. Self Concept of pupils</td>
<td>2. Self Concept of pupils</td>
<td></td>
</tr>
</tbody>
</table>

3.2.0 Variables

In the experimental researches the relationship between two types of variables namely independent and dependent variables is studied. Independent variables are the cause while dependent ones are the effects. Another category
of variables, which is equally important, is of intervening variables. All these three kinds of variables which were identified for the present investigation are given below.

3.2.1 Independent Variables

Different methods of teaching constituted the independent variables, which were used in the present study to see their effect on the achievement of pupils in Social Science and Self-Concept. The experimental group I was taught Social Science through Social Inquiry Model, the experimental group II was taught Social Science through Memory Model and the control group was taught Social Science through Conventional Method. Thus Social Inquiry Model, Memory Model and Conventional Method were the three independent variables for the present investigation.

3.2.2 Dependent Variables

Achievement in Social Science and Self-Concept were the dependent variables in the present investigation. These variables were measured twice during the course of the investigation first, before the experimental treatment which is pre-test stage and then after providing the experimental treatment, i.e. post-test stage.

3.2.3 Intervening Variables

There are certain variables which have their effect on the learning outcome and are known as intervening variables, which can influence both the independent and dependent variables. Different intervening variables in a research study can be nature of school, grade level, subject to be taught, intelligence of pupils, socio-economic status of pupils etc. In the present investigation, these intervening variables were controlled either experimentally or statistically.
3.3.0 Control Employed

It is necessary to control all those variables that may effect the dependent variables. Hence suitable controls were employed for each such variable.

3.3.1 Nature of School

i.) The sample was selected from Haryana Public Sr. Secondary School Gohana.

3.3.2 Grade level

Ninth class was selected for the present study and grade level was thus kept constant during the study.

3.3.3 Subject

All the three groups were taught the same 14 chapters of Social Science.

3.3.4 Socio-Economic Status and Intelligence of Pupils

These variable were controlled statistically by employing ANALYSIS OF CO-VARIANCE (ANCOVA) for the scores obtained by administering Socio-Economic Status Scale (S.E.S.S.) by Dr. Rajeev Lochan Bhardwaj, (Km.) Shama Gupta and Dr.N.S.Chauhan and the intelligence test scores which were obtained by employing Cattell's Culture Fair Intelligence Test of mental abilities.

The independent variables, dependent variables and the control variables with the kind of control employed in the present investigation are given below in Table 3.2.
### Table 3.2
**INDEPENDENT, DEPENDENT AND CONTROL VARIABLES**

<table>
<thead>
<tr>
<th>INDEPENDENT VARIABLE</th>
<th>DEPENDENT VARIABLE</th>
<th>CONTROL VARIABLE</th>
<th>CONTROL EMPLOYED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method of Teaching</td>
<td>1. Achievement in Social Science</td>
<td>1. Nature of school</td>
<td>1. Administrative (Single School)</td>
</tr>
<tr>
<td>Social Inquiry Model</td>
<td>2. Self-concept</td>
<td>2. Grade level (only VIII Grade to be taught)</td>
<td>2. Administrative</td>
</tr>
<tr>
<td>Memory Model</td>
<td>3. Subject to be taught</td>
<td>3. Administrative (same units of Social Science in all the three groups to be taught)</td>
<td>3. Administrative (same units of Social Science in all the three groups to be taught)</td>
</tr>
</tbody>
</table>

### 3.4.0 Sample

The sample for the present investigation comprised of one hundred and twenty students studying in three sections of ninth Class of Haryana Public Sr. Secondary School, Gohana. Each section comprised forty students. One section formed the control group and the other two sections formed the two experimental groups for treatment.

### 3.5.0 Tools Used

The following tools were used for the purpose of collecting data related to different variables covered in this investigation.

1. Social Science Achievement Test (developed by the investigator himself) to measure the achievement of pupils in Social Science.
2. Self-concept test by R.K. Saraswat to measure the Self-Concept of students.

3. Cattell's Culture Fair Intelligence Test by Cattell & Cattell to measure the intelligence of students.

4. Socio-Economic Status Scale (S.E.S.S.) by Dr. Rajeev Lochan Bhardwaj, (Km.) Sharna Gupta and Dr.N.S.Chauhan to measure the Socio-Economic status of students.

3.5.1 Achievement Test in Social Science

To achieve the objectives of the present investigation, an achievement test in Social Science was constructed by the investigator himself from 14 chapters of ninth Class Social Science syllabus. It was employed to measure the achievement of students in Social Science. The different steps followed in developing the test are summarized below:

(a) Planning the test

The planning of achievement test takes into account (a) determining the purpose of the test (b) identification and defining the intended learning outcomes (c) preparing the test specifications (d) constructing relevant test items.

(b) Item Writing

Objective type items were constructed keeping in view the objectives, course content and the expected behavioural outcomes. Several books of Social Science and literature relating to test construction were studied before framing the items. A large number of items with wide range of difficulty were constructed from 14 chapters of Social Science syllabus prescribed for class ninth. Experts in measurement and evaluation, experienced teachers of Social Science and teacher educators...
were consulted. Finally 150 items were selected for preliminary try-out. Each item carried a score of one. The preliminary try-out test was given to 90 students of class ninth. The results of the test revealed a few more points requiring modifications and improvements.

(c) Test Administration

After making the required improvements, the test was printed and administered on a sample of 100 class ninth students who had already studied the contents covered in the test. Detailed instructions were provided to the student. No time limit was fixed for try-out test. It was found that students took on an average 60 minutes to answer all the questions.

The marking was done using scoring key already prepared by the researcher. There was one mark for a correct answer and zero for an incorrect answer.

The try-out test and scoring key are given in Appendix-A.

(d) Item Analysis

After scoring the try-out test, the investigator took 90 answer sheets by deleting the rest at random. The following steps were followed for item analysis:

(i) Firstly, all 90 answer sheets were arranged in the descending order from highest score at the top to the lowest score at the bottom.

(ii) Then divided these 90 answer sheets into three groups on the basis of scores. The upper 30 answer sheets with the highest scores formed the upper group, the next 30 answer sheets formed the middle group and the rest 30 answer sheets with the lowest scores formed the lower group.
(iii) After forming the three groups, the next step was to find out and tabulate the number of correct responses of an item in each group. The difficulty of an item is indicated by the total number of pupils who answered it correctly, the larger the number the easier the item. Item difficulty was estimated by determining the percentage of pupils who answered the item correctly. The percentages were converted into proportions. The average of the proportion of correct responses on each item in the three groups was taken to be an estimate of the difficulty value of that particular item.

The formula for computing difficulty value \( dv \) of each item was

\[
\frac{p_u + p_m + p_l}{3}
\]

Where \( dv \) - difficulty value of the item;

\( p_u \) - proportion of correct responses to the item from the upper group;

\( p_m \) - proportion of correct responses to the item from the middle group.

\( p_l \) - proportion of correct responses to the item from the lower group.

(iv) Internal Consistency Discrimination Index \( (rb) \).

The relationship between the total scores derived from a test and item scores are referred to as internal consistency discrimination index of an item. It was found out by using the following formula:

\[
r_b = p_u - p_l \text{ Where } r_b \text{ - internal consistency discrimination index.}
\]

\( p_u \) - proportion of correct responses to the item from the upper group;
Pi - proportion of correct responses to the item from the lower group;

(e) Final Selection of the items

Final selection of the items was made on the basis of difficulty value and discrimination index of each item.

(i) Difficulty Value

Most of the items selected were having medium difficulty value and few items with high and low difficulty values were also taken. However, in the interest of constructing a measuring instrument of maximum quality and utility, most items included in the test should fall in the middle range of difficulty.

(ii) Internal Consistency Discrimination Index

Garrett (1967), items with validity indices of 0.20 or more are regarded as satisfactory and Thorndike (1955) considered an item with a validity co-efficient as high as 0.25 as an outstanding 'valid' item. Hence the researcher retained those items for the final draft which were having internal consistency of 0.25 and higher. The items with zero discriminating power and negative discriminating power were discarded while selecting items for final draft of the test.

A bivariate scatter diagram was prepared for the achievement test, placing each item in the appropriate column and row according to its difficulty value and discrimination index respectively. Thus, 100 items were retained in the final form of the test and their difficulty value and discrimination value are given in (Appendix-B).
(f) Standardization of Achievement Test

100 items were selected for the final form of the achievement test.

(i) Reliability

The reliability was found by the split-half method (odd-even method) and the co-efficient of reliability was 0.89.

(ii) Validity

The validity of the achievement test constructed for the present study was taken for granted because this achievement test was constructed after preparing the blue print and ascertaining the weightage of different topics and items. This is in concordance with Guilford (1971) who says, "There are some measures whose validity is taken for granted, for example, achievement test scores".

Anastasi (1961) had the opinion that content validity when applied to educational achievement test, is often called curricular validity. The preparation of test items is preceded by a thorough and systematic examination of relevant course syllabi and text books as well as by consultation with subject experts and experts in test construction.

(g) Final form of the Test

The final form of the Social Science achievement test contains 100 items.

The final test is given in Appendix-C.

3.5.2 Self-concept Questionnaire

The self-concept inventory by Saraswat was used to collect the data related to self-concept in the present study. It provides six separate dimensions of self-concept, viz., physical, social, intellectual, moral, education
and temperamental self-concept. It also gives a total self-concept score. The inventory contains forty-eight items. Each item is provided with five alternatives. Responses are obtained on the test booklet itself. There is no time limit but generally 20 minutes have been found sufficient for responding to all the items.

**Instructions to the students**

This is a self-concept inventory. These are 48 items in it. Against each item, there are five responses. Every student is to read each item carefully and respond to it by marking a tick (✓) on any one of the five responses given against that item which they think proper.

There is no right or wrong answer. The right answer is only what you feel about yourself. A student is required to respond according to what he/she feels about himself/herself with reference to that statement. His/her answers will be kept confidential.

**Scoring**

The respondent is provided with five alternatives to give his responses ranging from most acceptable to least. The alternatives or responses are arranged in such a way that the scoring system for all the items will remain the same i.e. 5, 4, 3, 2, 1 whether the items are positive or negative. If the respondent puts (✓) mark for first alternative, the score is 5, for second alternative the score is 4, for third alternative the score is 3, for the fourth it is 2 and for the fifth and last alternative the score is one. The summated score of all the forty eight items provides the total self-concept score of an individual. A high score on this inventory indicates a high self-concept, while a low score shows low self-concept.
Reliability

Reliability of the inventory was found by test-retest method and it was found to be .91 for the total self-concept measure. Reliability coefficients of its various dimensions varies from .67 to .88.

Validity

Experts opinions were obtained to establish the validity of the inventory. 100 items were given to 25 psychologists to classify the items to the category to which it belongs. Items of highest agreement and not less than 80% of agreement were selected. Thus the content and construct validity were established.

3.5.3 Cattell's Culture Fair Intelligence Test

Cattell's Culture Fair Test of mental abilities was used to measure intelligence of pupils. The test measures individual intelligence in a manner designed to reduce, as much as possible, the influence of verbal fluency, cultural climate and educational level. The test which may be administered individually or in a group, is non-verbal and requires only that examinees be able to perceive relationship in shapes and figures.

There are three scales in the Culture Fair Series. For the purpose of the study, Scale - 2, Form A was used which consists of four subtests. In the first subtest, the examine is presented with an incomplete, progressive series. His task is to select, from among the choices provided, the answer which best continues the series. Second subtest is related to classification. The examine is presented with five figures. He must select one which is different from the other four. In the third subtest related to matrices, the examine is asked to correctly complete the design or matrix presented at the left of each row. The fourth subtest provides a condition
Before each subtest, examples are given so that the task requirements are clear to the examinee.

The reliability of the test (scale - 2, Form - A) by Spearman-Brown formula is 0.79 and by K - R formula 21 is 0.81. Direct concept validity of the test is 0.85.

For conducting the test, test booklets and answer-sheets were distributed to the pupils. The students were asked to fill in the information at the top of the answer sheet. Then all the necessary instructions were given to the students. Time limits were strictly adhered to. For scoring the answer sheets, scoring key available for scale 2 was used. The number of correct responses of each answer sheet gave the total score. These raw scores were then converted into normalized I.Q. scores using Table - 2 provided in the manual for scales 2 & 3. The test is given in *Appendix - E.*

3.5.4 SOCIO-ECONOMIC STATUS SCALE (S.E.S.S.)

For measurement of socio-economic status of students SESS by Dr. Rajeev Lochan Bhardwaj, (Km.) Shama Gupta and Dr. N.S. Chauhan was used the present Socio-economic status scale has been constructed with a view to seek clarity of distinct aspects of social and economic statuses of an individual separately and integrally.

Keeping this dilemma in view, it has been considered appropriate to determine social and economic statuses separately in the two areas of social and economic aspects, and then the two scores of different areas switched
to one continuum or in standard scores, which can give the socio-economic status of an individual.

**ADMINISTRATION OF SESS:**

It was a self-administering scale. The SESS was distributed to the students of the sample. The investigator explained to the all participants the instructions and way of answering the questions. There was no time limit for answering the SESS but they were asked to complete the scale as early as possible. The students took 10-15 minutes to complete the test.

The investigator assured the students that their answers and scores would be treated with strict confidence. The SESS also ended with thanks by the investigator.

**SCORING OF SESS**

Scoring of the test was very easy and of a quantitative type. Scoring was done with the help of scoring stencil. *Appendix-F.*

**3.6.0 Development of Experimental material**

For experimental purpose, 14 chapters were developed from the syllabus of ninth class Social Science subject. Keeping in mind all concepts in each lesson to be covered in the experiment, outlines of all the lessons were developed. The list of questions provided in the text book was supplemented by developing additional questions from each lesson. This list of questions is to check the validity and compatibility with previous devised generalizations and the experiences of the students.
3.6.1 Deciding the subject and units

The subject identified for the purpose of experiment was social science comprising of three streams: five chapters of History, five chapters of Geography and four chapters of Civics were selected.

3.6.2 Development of Experimental Material for Experimental Group I

The Experimental Group - I was taught through Social Inquiry Model. For teaching this group, the investigator took training in the use of this Model. The investigator prepared a lesson in Social Science on the basis of lesson plan format for Social Inquiry Model. This lesson plan was discussed with the supervisor and was practised by the investigator under simulated conditions using Social Inquiry Model. After getting the training in Social Inquiry Model, the investigator taught lessons of Social Science to Experimental Group - I with the help of this model.

3.6.3 Development of Experimental Material for Experimental Group-II

The Experimental Group - II was taught through Memory Model. For teaching this group, the investigator took training in the use of this Model. The investigator prepared a lesson in Social Science on the basis of lesson plan format for Memory Model. This lesson plan was discussed with the supervisor and was practised by the investigator under simulated conditions using Memory Model. After getting the training in Memory Model, the investigator taught lessons of Social Science to Experimental Group - II with the help of this model.

3.7.0 Experimental Procedure

It consisted of three stages: (i) Pre-testing, (ii) Experimental treatment, and (iii) Post-testing.
3.7.1 Pre-testing

Before the commencement of experiment, pre-tests were conducted. They were administered in all the three groups by the investigator himself. Co-operation of the class teacher was sought for conducting the tests properly. All the instructions were explained clearly to the students before administering the test. The pre-testing programme is given in Table 3.3

Table 3.3
PROGRAMME OF PRE-TESTING

<table>
<thead>
<tr>
<th>S. Date No.</th>
<th>Test administered in control group</th>
<th>Test administered in experimental Group I</th>
<th>Test administered in experimental Group II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Intelligence Test</td>
<td>Intelligence Test</td>
<td>Intelligence Test</td>
</tr>
<tr>
<td>2.</td>
<td>Socio-economic Status Scale</td>
<td>Socio-economic Status Scale</td>
<td>Socio-economic Status Scale</td>
</tr>
<tr>
<td>3.</td>
<td>Achievement Test</td>
<td>Achievement Test</td>
<td>Achievement Test</td>
</tr>
<tr>
<td>4.</td>
<td>Self-Concept Test</td>
<td>Self-concept Test</td>
<td>Self-concept Test</td>
</tr>
</tbody>
</table>

3.7.2 Experimental Treatment

After pre-testing, the experimental treatment of teaching Social Science to class ninth students was started. All the three groups (Control group, Experimental Group I and Experimental Group II) were taught by the investigator himself. The control group was taught through conventional method of teaching, the experimental group I was taught through Social
Inquiry Model and the experimental group II was taught through Memory Model.

a) Teaching through Social Inquiry Model of Experimental Group - I

The experimental group I was taught through Social Inquiry Model. For teaching this group, the investigator took training in the use of Social Inquiry Model. The investigator prepared a lesson in Social Science on the basis of lesson plan format for Social Inquiry Model. This lesson plan was discussed with the supervisor and was practised by the investigator under simulated conditions using phases of Social Inquiry Model. After getting the training in Social Inquiry Model, the investigator taught lessons of Social Science to Experimental Group - I with the help of this model.

(b) Teaching through Memory Model of Experimental Group - II

The Experimental Group - II was taught through Memory Model. For teaching this group, the investigator took training in the use of Memory Model. The investigator prepared a lesson in Social Science on the basis of lesson plan format for Memory Model. This lesson plan was discussed with the supervisor and was practised by the investigator under simulated conditions using Memory Model. After getting the training in Memory Model, the investigator taught lessons of Social Science to Experimental Group - II with the help of this model.

(c) Teaching through Conventional Method

The control group was taught through Conventional method of teaching for a period of 24 weeks. The 14 chapters of Social Science to Control Group were taught by the investigator with the help of Conventional Method of teaching.
### 3.7.3 Post-Testing

After teaching the contents to all the three groups, the post test was administered to the students of Control Group, Experimental Group-I and Experimental Group-II. The programme of post-test is summarised in Table 3.4

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Test Administered in control</th>
<th>Test administered in Experimental Group</th>
<th>Test Administered in Experimental Group I</th>
<th>Test Administered in Experimental Group II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Achievement Test</td>
<td>Achievement Test</td>
<td>Achievement Test</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Self-Concept Test</td>
<td>Self-Concept Test</td>
<td>Self-Concept Test</td>
<td></td>
</tr>
</tbody>
</table>

### 3.8.0 Scoring

Responses of each student to Achievement Test and Self-Concept Test were measured using the prescribed scoring key or the key prepared for the purpose. These scores were then tabulated for statistical analysis.

### 3.9.0 Statistical Analysis

Statistics has become an indispensable tool for research. It is fundamental to the proper analysis of data. In order to achieve the objectives of the study, the data collected was statistically analyzed using the following techniques:

1. Analysis of Co-variance (ANCOVA) was used in order to adjust pupils' achievement in Social Science, on intelligence and socio-economic status. ANCOVA was used on pre-test, post-test and gain scores of pupils' achievement test in Social Science.
ANCOVA was also used in order to adjust pupils' Self-Concept on intelligence and socio-economic status. ANCOVA was used on pre-test, post-test and gain scores of pupils' self-concept.

2. Mean and Standard Deviations were computed in respect of intelligence, socio-economic status, achievement and self-concept.

3. As the hypotheses of this study were null, two tailed 't'-test was employed for testing the significance of difference between the means of pupils' achievement in Social Science and their self-concept scores. This test was also used on post-test and gain scores.