Chapter – III

METHOD AND PROCEDURE
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A theoretical framework of variables, significance of problem, development, related literature and description of the tools have been discussed. The present chapter focuses on the sample, design, tools used, procedure and statistical techniques employed. The method of the study has been discussed under following headings:

3.1 Identification of Variables
3.2 Sample
3.3 Design
3.4 Tools Used
3.5 Procedure
3.6 Statistical Techniques Used

3.1 IDENTIFICATION OF VARIABLES

A variable is the condition that the experimenter manipulates, controls or observes. According to Damato (1970), variable may be defined as those attributes of objects, events, things and beings, which can be measured. Depending upon the problem, a variable may be independent and dependent variables are given below:

(i) Independent Variable: The independent variable is the characteristic that the experimenter manipulates or controls in his attempt to ascertain its relationship to observed phenomena. In the present study, instructional strategy was taken as an independent variable. Two instructional strategies i.e. computer assisted instruction and conventional method of instruction were taken for this purpose. The present study had two classifying independent variables such as problem solving ability and learning style.

(ii) Classifying Independent Variable: The variable which identifies groups within a population based on biological, social, physical, political, economic or other characteristics is called classifying variable. Classifying variable is used for targeting, sub-dividing the population i.e. classifying the data when exploring causality. In the present study as already stated, problem solving ability and learning style were identified as two classifying independent variables.

(a) Problem Solving Ability: The students were divided into three levels on the basis of scores they obtained on the tool of problem solving ability i.e. high, average and low problem
solving ability. Students with average problem solving ability were not involved in the present study.

(b) Learning Styles: Students with four learning styles i.e. diverging, converging, accommodating and assimilating learning styles were identified as proposed by Kolb (2007) in learning style inventory.

(iii) Dependent Variable: The dependent variable is the characteristic that appears, disappears or changes as the experimenter introduces, removes or changes independent variable. In the present investigation achievement in Accountancy was taken as the dependent variable. Besides the independent and dependent variables, the present study had extraneous as well as intervening variables.

(iv) Extraneous Variable: Extraneous variable is an undesirable variable that influences the relationship between the variables that an experimenter is examining. This variable adds error to an experiment. In the present study, school, physical environment of classroom, computer laboratory and content were considered extraneous variables. All the above mentioned variables were either controlled experimentally or were equalized by way of matching.

(v) Controlling Extraneous Variables: In a well designed experiment, the various factors that may influence the outcome of experiment must be controlled if sound conclusions are to be drawn. In the present study the investigator tried to control the following extraneous variables to the maximum extent that they were likely to affect the final achievement of students such as:

- **Prior Knowledge**: Pre-experimental achievements of both the groups were controlled by equating the groups on pre-test scores prior to the experimentation.
- **School Environment**: All the schools selected for the experiment were affiliated to Central Board of Secondary Education, New Delhi and have more or less same physical environment such as ventilation and light arrangement, local area network facility etc.
- **Teacher Behaviour**: The investigator assisted by four M.Ed. students of her college for the conduct of the experiment. Control groups of all the four schools were taught by the investigator herself at different times allotted by the respective. Hence, this eliminated inter-teacher variation.
- **Content**: The same content was taught to both the groups-experimental and control, hence, controlling the content variable.
Method and Procedure

(vi) Intervening Variable: An intervening variable, like extraneous variable, can alter the results of research. This variable, however, is much more difficult to control. In this study, motivation, fatigue, boredom and any other factor that arose during the course of research were the intervening variables.

3.2 SAMPLE

The adequacy of sample depends upon our knowledge of the population as well as the method used in drawing the sample. A population is the theoretical set of all possible observations or a particular experiment (Calfee, 1975). Various techniques have been devised for obtaining sample. In the present study, in order to satisfy the real effort in experimental research, the logical statistical inference of purposive sampling was initially employed to select those schools which have local area network facility and then random sampling technique was used. The sample in the present study was drawn at the two levels such as school sample and the student sample.

3.2.1 THE SCHOOL SAMPLE

There are 22 districts in Punjab, and each district has rural and urban schools. The rural schools were not taken for the present study as the medium of instruction is Punjabi and there was no facility of local area network. For the purpose of the present study, only urban schools were taken. Urban schools are either privately managed or managed by the government. The sample was drawn from representative secondary schools of Amritsar in Punjab who were affiliated to Central Board of Secondary Education, New Delhi. These schools are affiliated to one of the three examination boards such as (i) Punjab School Education Board, Mohali (ii) Indian Certificate of Secondary Education, New Delhi and (iii) Central Board of Secondary Education, New Delhi. Although schools affiliated to Indian Certificate of Secondary Education were fulfilling the basic requirements for the present study i.e. computer facilities and English as a medium of instruction, yet these schools were not included in the study as their number is insufficient in the state to represent the total population. The science education and computer facilities in schools affiliated to Punjab School Education Board are very pathetic as compared to schools affiliated to Central Board of Secondary Education which are fairly good in terms of science education and computer facilities. Hence, a wide gap in achievement in Accountancy of students from Punjab School Education Board and Central Board of Secondary Education schools would have skewed the data. The investigator therefore, delimited her study to private schools affiliated to Central
Board of Secondary Education in the state of Punjab. The school sample comprising of 10+2 class students (Session 2011-12), was drawn from the representative secondary schools of Amritsar city which have the local area network facility. The average age of students ranged from 16-18 years. A list of the schools having local area network facility under the administration of the Amritsar city was procured.

The names of schools were written down on slips of equal size. The names were folded into six symmetrically equal parts and put in an enclosed container. The lid was then covered and the box was shaken up many times for easy shuffling. The investigator drew out the first four slips one by one bearing the names of each school which represented the population under investigation:

(i) Shri Ram Ashram Public School, Amritsar.
(ii) S.L.Bhawan’s Public School, Amritsar.
(iii) Senior Study Public School, Amritsar.
(iv) Shri Guru Harkrishan Senior Secondary Public School, Amritsar.

### 3.2.2 THE STUDENT SAMPLE

After selecting the four schools of Amritsar district, the students was drawn randomly from the above said four schools. The study was conducted on 500 students of 10+2 senior secondary schools of Amritsar city. The investigator picked up 80 students from one school, 120 from second school, 130 students from the third school and 170 students from fourth school has been presented in table 3.1.

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Name of the School</th>
<th>Experimental Group</th>
<th>Control Group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shri Ram Ashram Public School, Amritsar</td>
<td>40</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>2</td>
<td>S.L.Bhawan’s Public School, Amritsar</td>
<td>60</td>
<td>60</td>
<td>120</td>
</tr>
<tr>
<td>3</td>
<td>Senior Study Public School, Amritsar</td>
<td>65</td>
<td>65</td>
<td>130</td>
</tr>
<tr>
<td>4</td>
<td>Shri Guru Harkrishan Sr. Sec. Public School, Amritsar</td>
<td>85</td>
<td>85</td>
<td>170</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>250</td>
<td>250</td>
<td>500</td>
</tr>
</tbody>
</table>

Table 3.1 shows that 500 students were selected from school of Amritsar city in Punjab. The structure of initial sample has been presented in the following table 3.2 and fig.3.1.
**Method and Procedure**

**Table 3.2: The structure of initial sample for instructional treatment**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Group Allocation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Experimental Group</td>
<td>250</td>
</tr>
<tr>
<td>2</td>
<td>Control Group</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>500</td>
</tr>
</tbody>
</table>

**Fig 3.1: Pie diagram representing the structure of initial sample for instructional treatment**

Table 3.2 and fig 3.1 shows that 250 students were divided each into experimental and control group for the conduct of the experiment. The matching of the groups was done on the basis of pre-test scores. The test of problem solving ability was administered and high and low problem solving ability groups on the variable was formulated according to Kelley (1939) criteria of taking up top 27% and bottom 27% students. Then the test of learning styles was given to classify the students into four learning styles. It was assured that the treatment group and control group had adequate number of different learning styles.

**3.3 DESIGN**

The present study was designed to investigate the effect of computer assisted instruction on achievement in accountancy in relation to problem solving ability and learning
styles. The present study employed an experimental method with $2 \times 2 \times 4$ factorial design for gain scores. The study covered three variables viz. (i) instructional strategies (ii) problem solving ability (iii) learning styles. The variables of instructional strategies studied at two levels such as teaching with computer assisted instruction and conventional method of instruction. The variable of problem solving ability studied at two levels such as high problem solving ability and low problem solving ability. The variables of learning styles studied at four levels i.e. converging, diverging, assimilating and accommodating learning styles. These variables worked as independent variables. The main dependent variable was achievement gain which was calculated as the difference in post-test and pre-test score for each subject. The schematic layout of the factorial design for performance gain has been given below in fig.3.2.

**Fig. 3.2: The schematic layout of the factorial design ($2 \times 2 \times 4$)**

Where:
- $A_1$ stands for computer assisted instruction
- $A_2$ stands for conventional method of instruction
- $B_1$ stands for high problem solving ability
- $B_2$ stands for low problem solving ability
- $C_1$ stands for converging learning style
- $C_2$ stands for diverging learning style
- $C_3$ stands for accommodating learning style
- $C_4$ stands for assimilating learning style
3.4 TOOLS USED

Tools are the techniques which are appropriate for the collection of certain types of evidence or information for conducting the research. The following tools were used for the present study are given below:

1. Revised Problem Solving Ability Test by Dubey (2011) was used.
2. Learning Style Inventory by Kolb (2007) was used.
3. A Criterion Referenced Test in Accountancy was developed by investigator herself.
4. An Achievement Test in Accountancy was developed and standardized by the investigator herself to measure the performance of students before and after the treatment.
5. Computer Assisted Instruction Package in Accountancy was developed and validated by investigator herself with the help of software engineer.
6. Instructional Material on Conventional Method of Teaching in Accountancy was also prepared by the investigator herself.

3.5 PROCEDURE

After the selection of the sample and allocation of students in two groups for instructional strategies, the experiment was conducted in four phases as following:

Firstly, the investigator made necessary arrangements with the principals of schools selected for the experiment. An achievement test as a pre-test measure was administered on the total sample. The students were assigned to two groups such as experimental and control group on the basis of pre-test scores to make equivalent groups. Before implementing the computer assisted instructional package, the two groups i.e. experimental and control groups were randomly decided and matched on the basis of pre-test scores so that equivalent groups could be formed. The answer-sheets were scored to obtain the information regarding the previous knowledge of the students.

Secondly, the problem solving ability test and learning style inventory was administered in each school of the experiment and control groups. The answer-sheets were scored as per the answer key to obtain knowledge about threshold values of learners on the variables.

Thirdly, treatment was given to the experimental group. The experimental group was taught through computer assisted instruction package and the control group was taught by conventional method of instruction by the investigator herself. The same content was taught to both the groups for the same duration of time. The duration of instructional treatment was
Method and Procedure

twenty sessions in each case with each session of 45 minutes. Regarding the experimental period, the investigator had already contacted with the heads of the schools taken for study and informed them that Accountancy portion of 10+2 class syllabus would be taken by her. The investigator personally requested the concerned subject teachers of the schools for leaving accountancy portion of class 10+2 syllabus prescribed by Central Board of Secondary Education, New Delhi. The investigator had taken the time for experimental phase as per their suitability without disturbing their schedules. In experimental group, each student worked independently with the help of Compact disc.

Fourthly, after the completion of the instructional program, the same achievement test in Accountancy was administered as post-test to the students of both the groups. The students were given one hour to complete the test. The answer sheets were scored with the help of scoring key. After the completion of test students were thanked for their full cooperation. Experiment and control group scores were compared according to their pre-test and post-test scores and difference was called as gain achievement scores of the experiment and control group. The schedule of experiment has been presented in table 3.3.

Table 3.3: School-wise schedule for the conduct of the experiment

<table>
<thead>
<tr>
<th>Activities</th>
<th>Shri Ram Ashram Public School, Amritsar</th>
<th>S.L.Bhawan’s Public School, Amritsar</th>
<th>Senior Study Public School, Amritsar</th>
<th>Shri Guru Harkrishan Sr. Sec. Public School, Amritsar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contacted Principal and Teachers</td>
<td>July 17, 2012</td>
<td>July 17, 2012</td>
<td>July 17, 2012</td>
<td>July 17, 2012</td>
</tr>
</tbody>
</table>

(Source: Field Survey, 2012)
3.6 STATISTICAL TECHNIQUES USED
The following statistical techniques were employed to analyze the data obtained from the experiment in order to test the hypotheses:

(i) Descriptive statistics such as mean, standard deviation, skewness and kurtosis were computed on the total sample to determine the nature of the distribution of the scores.

(ii) Analysis of Variance (2×2×4) was employed for mean gain achievement scores on problem solving ability and learning styles.

(iii) For the significant F-ratio, the t-test was employed so as to find out the significance of difference between means related to different groups and different variables.

(iv) Graphical techniques were used for descriptive analysis and visual perception of the data.