CHAPTER – 3

METHODS AND PROCEDURE

This chapter describes the methods and procedures employed in the present study. It includes design of the study, sample selection, tools used, instructional procedures, data collection and statistical techniques employed for analysis of data.

3.1 DESIGN OF THE STUDY

The present study aims at finding the effectiveness of computer Assisted Instructions (CAI), Video Assisted Instruction (VAI) and Self Learning Modules (SLM) on achievement in Mathematics in relation to gender and Cognitive Style. For this purpose, pre–test, post-test three way (3 x 2 x 2) factorial design was employed. Teaching strategies, viz. CAI, VAI and SLM. Gender and cognitive style as classifying variables were studied at two levels each. The criterion was the scores of achievement test. The gain achievement scores of the three groups were subjected to statistical treatment as per the statistical design drawn for the study of description.

3.2 DIMENSION OF THE FACTORICAL DESIGN

The factorial design (fixed model) was used as it permits to evaluate the combined effect of two or more independent variables simultaneously. The dimensions of a factorial design refer to the number of levels of each factor. The experimental method followed was based on 3 x 2 x 2 into factorial
design. The lay out of the factorial design used in the present study is given in figure 3.1

TEACHING STRATEGIES

- Computer Assisted Instructions (A1)
- Video Assisted Instructions (A2)
- Self Learning Modules (A3)

Fig. 3.1 Layout Of Factorial Design

Fig 3.1 depicts teaching strategies designated as A and its three strategies viz. CAI, VAI, SLM as A1, A2, and A3 respectively. Gender is designated as B and its two types as B1 and B2 representing male and female respectively. Third variable is Cognitive Style and designated as C1 and C2
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representing field dependent and field independent respectively. The total number of combinations came out to be $3 \times 2 \times 2 = 12$ as shown in Fig 3.1.

3.3 SAMPLE SELECTION

The population of the study comprised of all the 10th class students for the academic session 2005-2006 studying in high schools of Chandigarh. Out of these schools, only four Government schools were selected to conduct the experiment. The samples were chosen, one for validation of achievement test and the other for conducting the experiment. For validation of achievement test and for small group testing of CAI and SLM developed, a sample of 100 students was raised from one government school of Chandigarh. Another sample of 25 teachers teaching subject of mathematics was raised for validation of achievement test and the CAI and SLM developed.

The experiment of the study was conducted on a sample of 153 students selected from four government high schools of Chandigarh. Purposive sampling technique was employed to select four schools. Randomized sampling technique was employed to select 153 students from these four schools. Further, students were randomly assigned to three treatment groups. The break of the sample selected for the present study is given in Table 3.2.
Table 3.2 the Break of the sample selected for the study

<table>
<thead>
<tr>
<th>SR. No.</th>
<th>NAME OF THE SCHOOL</th>
<th>NUMBER OF STUDENTS WHO ADMINISTERED TREATMENT</th>
<th>NUMBER OF STUDENTS WHO WERE FOR THE STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A1</td>
<td>A2</td>
</tr>
<tr>
<td>1.</td>
<td>G.M.H.S-28</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>2.</td>
<td>G.M.H.S-36</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>3.</td>
<td>G.M.H.S-42</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>4.</td>
<td>G.M.H.S-34</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>53</td>
<td>50</td>
</tr>
</tbody>
</table>

During the experiment 53 students dropped out at one stage or the other stage of the study, thus leading to experimental mortality of 53 students. Results of the present study are based on the raw data of 120 students. Out of 120 students, 40 students each were taught through CAI (group A1), VAI (group A2) and SLM (group A3) respectively.

3.4 TOOLS USED

Investigator requires many data gathering tools which vary in their complexity, design, administration and interpretation. Each tool is appropriate for the collection of particular type of information. After familiarizing herself with the nature, merits and limitations of the existing research tools and developing skill in the construction and use of these research tools, the following tools were employed to collect the relevant data for the present study:
Methods and procedure…..

1. An Achievement Test developed and standardized for local use by the investigator, was used to test the performance of the students before and after treatment.

2. Group Embedded Figure Test developed by Witkin et al (1971) was used to measure the Cognitive Style of the learners.

3. Twelve Video Assisted Instructional packages developed by NCERT in selected topics of mathematics for class 10th were procured to provide treatment to one of the experimental groups.

4. Computer Assisted Instruction (CAI) and Self Learning Modules (SLM) in mathematics on the same twelve topics of class 10th developed by the investigator were used to give the treatment to the two other experimental groups.

3.4.1 Description Of Tools

3.4.1.1 ACHIEVEMENT TEST:

To measure knowledge, understanding and application in mathematics, an achievement test was constructed by the investigator. The test consisted of three major types of items. Section (A) consisted of 25 multiple choice questions. Section (B) consisted of 25 fill in the blanks and Section (C) consisted of 25 true or false type. The detail of the development of achievement test is discussed in chapter 4. Each right answer carries 1 mark. The reliability of the test was calculated by test- retest method and was found to be 0.87. The validity of the test was determined as content validity. A final copy of the test is appended as Annexure-1.
3.4.1.2 COGNITIVE STYLE

Cognitive styles are terms used to describe different ways that people process information when perceiving and various strategies they use when responding to tasks. e.g. Quick, impulsive vs. slow, painstaking, problem solving behaviour, intuitive, inductive vs. logical, deductive thinking. These are styles and not abilities. They refer to how people process information and solve problems.

3.4.1.3 VIDEO ASSISTED INSTRUCTION.

In addition to the above mentioned two tools, videos programmes in mathematics developed by NCERT, were procured. The programmes include the following twelve topics of mathematics of class 10th:

1. Concept of linear Equations in two variables and methods of solving Linear Equation.
2. Solution of Linear Equations in two variables by algebraic methods.
3. System of Linear Equations and their graphical type of solution.
4. Solving word problems of Linear Equations in two variables.
5. Types of Ratio and properties of Proportion.
6. Polynomials and Rational Expression.
7. Symmetric, Homogeneous and Cyclic Expressions and Factorization of Cyclic Expressions.
8. Need and importance of Quadratic Equations and methods of solving Quadratic Equations.
9. Quadratic Equations –Constructions and solutions.
10. Sum and Product of roots of a Quadratic Equation.

11. Application of Quadratic Equations.

12. Trigonometric Ratios and Identities.

A Compact Disc containing all twelve video programmes are appended at the end. In order to make it Video Assisted Instruction, students were first informed about the instructional objectives of the topic followed by testing of their pre-requisite knowledge. This was followed by screening video programmes. During the screening of video programmes, students were given exercises for practice followed by feedback. At the end of the each Programme, they were given post-test.

3.4.1.4 COMPUTER ASSISTED INSTRUCTION (CAI)

CAI packages in mathematics on the same twelve topics of mathematics of 10th class as mentioned above in VAI were developed. Development of CAI has been discussed in chapter 4 and, a compact disc (CD) containing twelve CAI is appended. (Annexure-4).

3.4.1.5 SELF LEARNING MODULES (SLM)

Self Learning Module on the same twelve topics of mathematics of 10th class as mentioned above in VAI were developed. All SLM’s are also appended at the end (Annexure-3).

The details of the development of VAI, CAI, and SLM are discussed in chapter-4.
3.5 PROCEDURE

The present study was conducted in four phases.

Phase I - During this phase, development of Achievement test and Learning material viz CAI and SLM were carried out.

Phase II- During this phase, achievement test as pre-test and Witkin; GEFT for measuring Cognitive Style were administered to all the students.

Phase III- Students were taught through different teaching strategies viz CAI, VAI and SLM. Group A1 was taught through CAI, Group A2 through VAI and Group A3 through SLM. The treatments were assigned to three groups randomly.

Phase IV – During this phase, achievement test as post-test was administered to all the students of all the three groups.

3.6 COLLECTION OF DATA

The Achievement Test and Cognitive Style tool were scored in strictly according to the instructions to yield the following set of scores:

1. Pre-test (Achievement Test) scores.
2. Cognitive Style test scores.
3. Post -test scores.
3.7 STATISCAL ANALYSIS OF DATA

Descriptive statistics like mean, median, mode, skewness and kurtosis were computed to study the nature of the distribution of data. ANOVA standard deviation and t-tests were computed to test the hypotheses.

3.8 OPERATIONAL DEFINITIONS OF THE TERMS USED

1. Achievement- Achievement as measured by the achievement test developed and standardized by the investigator in the form of scores.

3. Cognitive Style- Field dependent and field independent as measured by Witkin et al (1971)

3. Gender- Categorizing the sample into male and female students.

3.9 LAY OUT OF THESIS

Chapter -1 Introduction

Chapter -2 Review of Literature.

Chapter -3 Methods and Procedure.

Chapter -4 Development of CAI, SLM and Achievement test.

Chapter -5 Analysis and Interpretation of Data.

Chapter -6 Summary and Conclusions

BIBLIOGRAPHY

Appendix 1- Achievement Test.

Appendix 2- Cognitive Style test.
Appendix 3-12 Self learning Modules on

1. Concept of linear Equations in two variables and methods of solving Linear Equation.

2. Solution of Linear Equations in two variables by algebraic methods.

3. System of Linear Equations and their graphical type of solution.

4. Solving word problems of Linear Equations in two variables.

5. Types of Ratios and properties of Proportion.

6. Polynomials and Rational Expression.

7. Symmetric, Homogeneous and Cyclic Expressions and Factorization of Cyclic expressions.

8. Need and Importance of Quadratic Equations and methods of solving Quadratic Equations.

9. Quadratic Equations – Constructions and solutions.

10. Sum and Product of roots of a Quadratic Equation.

11. Application of Quadratic Equations.

13. Trigonometric Ratios and Identities.

Appendix – 4: - CAI CD’s on same topics as in Self Learning Module (SLM).

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