Chapter – II
Methods & Procedure
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METHODS AND PROCEDURE

In this chapter, the methods and procedure employed in the study have been described. It includes the design of the study, sample selection, tools used, instructional procedure, data collection and statistical techniques employed for analysis of data.

2.1 DESIGN OF THE STUDY

The present study aims to study the effectiveness of Multimedia Presentation and Computer Assisted Instruction in acquisition of Biological Concepts in relation to Cognitive Style.

To fulfil this purpose, the experiment carried out was based on pre-test, post-test 3x3x2 factorial design and was conducted on three groups of students, each imparted instruction with different instructional strategy. The two groups, one taught with Multimedia Presentation (MMP) and the other with Computer Assisted Instruction (CAI) formed the experimental groups whereas the third one taught with traditional Lecture Method (LM) was taken as control group. The classifying variables were gender and cognitive style. Witkin’s Group Embedded Figures Test was employed to study the cognitive style thus categorising the students into field dependents (FD) and field independents (FI).

The post-test achievement scores of the three groups were subjected to statistical treatment as per the statistical design drawn for the study. Conclusions were drawn on the basis of descriptive and inferential statistics.

2.2 DIMENSION OF THE FACTORIAL DESIGN

A factorial design consists of two or more factors, each with discrete possible values or "levels", and whose experimental units take on all possible combinations of these levels across all such factors.
In this experimental study, 3x3x2 factorial design was used to study the effects of three factors (independent variables) on the dependent variable as well as the effects of interactions between factors on the dependent variable. The layout of the factorial design is given in figure 2.1

Figure 2.1 Layout of Factorial Design

2.3 SAMPLING

The population represented in this study comprised of all the students of class IX for the academic session 2007-2008 studying in secondary schools situated in the Union Territory of Chandigarh. All students in the study ranged in age 14-15 years. Two schools were chosen by purposive sampling technique where computer facilities were available and the medium of instruction was English.
Table 2.1: List of Schools taken for Study

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of the School</th>
<th>Number of Students taken for study</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shri Guru Harkrishan Model School, Sector 38, Chandigarh</td>
<td>42</td>
</tr>
<tr>
<td>2</td>
<td>Sharda Sarv Hitkari Senior Secondary Model School, Sector 40, Chandigarh</td>
<td>138</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>180</td>
</tr>
</tbody>
</table>

The data were initially obtained from 180 students comprising of boys and girls, 90 each. Witkin’s Group Embedded Figures Test was administered to study their cognitive style and thus classifying them into Field Dependents (FD) and Field Independents (FI). A total of 36 students formed the experimental mortality for not furnishing complete data. The results interpreted here, therefore, are based on a sample of 144 students with 48 students each in three groups exposed to three different teaching strategies. Randomized sampling technique was employed to select students for three experimental groups viz. MMP (A1), CAI (A2) and LM (A3).

The investigator herself imparted instruction to the students of groups A1 and A3 through MMP and LM respectively whereas students of group A2 used CAI software as self instructional material. It was ensured that the teacher selected to facilitate students to utilize CAI software possessed sufficient computer skills.

A sample of ten students studying in different schools of Union Territory of Chandigarh was given MMPs and CAI package on individual basis for validation. Another sample of ten biology teachers/experts was chosen for validating the developed MMPs and CAI package. An additional sample was chosen for validation of Achievement Test (50 students for item analysis and 70 students for test re-test reliability).
2.4 TOOLS USED

The following techniques and tests were used for collecting data during the study.

1. An Achievement test in selected topics of biology was developed and standardized by the investigator to measure the performance of students before and after the treatment.

2. Witkin’s Group Embedded Figures Test (Witkin et al, 1971) was used to study the cognitive style.

3. MMPs in selected topics in biology were developed by the investigator.

4. CAI package in same the topics was developed by the investigator.

5. Lesson plans of the same topics for lecture method teaching strategy were also prepared by the investigator.

6. An opinionnaire to measure the attitude of students towards various instructional strategies was developed by the investigator.

2.5 DESCRIPTION OF TOOLS

2.5.1 Achievement Test

An achievement test consisting of 50 objective based multiple choice questions was constructed by the investigator to measure knowledge, understanding, application and reasoning of the subjects selected for the study. The details of the development of achievement test are discussed in chapter IV. The reliability of the test calculated by test re-test method was found to be 0.928. The validity of the test was determined as content validity. A final copy of the test is appended at the end (Annexure-1).

2.5.2 The Group Embedded Figures Test (GEFT)

The Group Embedded Figures Test (Witkin et al. 1971) was used to determine the participants’ cognitive styles. The test consisted of 3 sections. The first section
was given for practice purposes and included 7 items. Both the second and third sections contained 9 items. The total time for completing the test was 12 minutes. The instrument required each individual to trace a specified simple figure that was embedded within a complex design. A subject’s total score was formed by a number of simple figures correctly traced in section 2 and 3 of the test. The possible score that one could make ranged from 0 to 18. Although Witkin et al. (1971) do not specify a clear cut off score for determining field dependent and independent individuals, the 27% rule created by Cureton (1957) is applied for classification purposes. Thus, based on the raw scores of the subjects on the GEFT, upper 27% are identified as field independent (FI) and the lower 27% as field dependent (FD). During the administration of the GEFT, the exact procedures set out in the technical manual (Witkin, et al., 1971) regarding time limits and directions were closely followed. A copy of the test is appended at the end (Annexure II).

2.5.3 Multimedia Presentations (MMP)

Multimedia presentations in selected Biology topics of class IX were developed by the investigator. Development of MMPs has been discussed in chapter IV and a compact disk (CD) containing MMPs in the form of power point presentations is appended at the end (Annexure IV).

2.5.4 Computer Assisted Instruction (CAI)

CAI package in selected Biology topics of class IX was developed by the investigator. Development of CAI has also been discussed in chapter IV and CAI in the form of power point presentations is included in the CD and is appended at the end (Annexure IV).

2.5.5 Opinionnaire

An opinionnaire to measure the attitude of students towards various instructional strategies viz. Multimedia Presentations and Computer Assisted Instruction was developed by the investigator. Likert method was followed to construct the scales. Five alternatives starting from Strongly Agree to Strongly Disagree were given for
each statement. The opinionnaires for MMPs and CAI are appended at the end (Annexure III).

2.6 PROCEDURE

The present study was conducted in four phases:

In phase I, MMPs, CAI package, lesson plans for lecture presentation, an Achievement test and Opinionnaire were developed.

In phase II, Achievement pre-test based on selected topics in biology of class IX and Wilkin’s Group Embedded Figures Test were administered.

In phase III, all the three groups were given instruction. Group A1 was taught by MMPs, Group A2 was taught by CAI and Group A3 was taught by lecture method. The allocation of instructional strategies was at random. The contact period was one month in each case.

In phase IV, the Achievement post-test (the same one used as pre-test) in selected topics of biology concepts as well as the Opinionnaire was administered to the students of all the three groups.

2.7 COLLECTION OF DATA

The tests were administered and the responses of the students were scored as per the scoring procedures. The raw data comprised of the following sets of scores:

1. Pre-test Achievement test scores
2. Wilkin’s Group Embedded Figures Test scores
3. Post-test Achievement test scores/gain score
4. Opinion Scale percentages

2.8 STATISTICAL ANALYSIS OF DATA

The data was subjected to statistical analysis through descriptive and inferential statistics by using SPSS software. Descriptive statistics such as Mean, Mode, Median, Standard deviation, Kurtosis and Skewness were computed to know the normal distribution. Three-way Analysis of Variance was computed to test the hypotheses by finding out the main effects and interaction between the
independent variables. F-ratios and t-ratios were be computed to find out the significance of difference between means of pre-test scores and post-test scores. Likert scale was used to analyze the attitudes of learners regarding MMP and CAI as instructional strategies.

2.9 OPERATIONAL DEFINITIONS OF THE TERMS USED

1. **Achievement:** Achievement refers to the attainment of the knowledge which students acquire during the course of their study.

2. **Acquisition:** It refers to the attainment of certain abilities and development of certain skills during the learning process.

3. **Cognitive Style:** It refers to the way a learner organizes, filters, transforms and processes information.

4. **Computer Assisted Instruction:** It is an interactive instructional method that uses a computer to present material, track learning and provide appropriate feedback. It was developed by incorporating the essential features to meet the needs of learners.

5. **Multimedia Presentation:** It is the presentation of information by making integrated use of multiple forms of media and technologies involving texts, images (including videos), graphics and sounds.

2.10 LAUOUT OF THESIS

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