CHAPTER- IV

METHODOLOGY

"Nothing has such power to boar the mind, as the ability to investigate systematically and truly all that comes under the observation in life"

- Mercus Francis
CHAPTER IV
METHODOLOGY

The Present Chapter- IV deals with the problem under investigation. It also gives a brief outline related to the method, research design, procedure of the study and procedure for collection of data. For research it is necessary to have method and procedure for further proceeding in study without which research is not possible.

4.1 INTRODUCTION

The method and procedure of research study is bound up with its purpose as they provide a frame work with in which the goals of research are to be achieved. Early in the planning stage of research project investigator weighed the merits of various procedures for collecting evidence. After determining which approach yields the form and kind of data necessary to test hypothesis adequately the investigator examined the available tools. Then appropriate tools of experimental research was thus selected and designed for the study and for collection of data.

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Methodology includes the description of the techniques or methods and the tools the researcher has used for collecting, organizing, analyzing and interpreting the data. It gives the detailed description of the research variables and procedures. Here it has been described under following heads:-

- Method adopted/ Nature of the study
- Design selected
- Sample selected for the study
- Tools /instrument used for data collection
- Data collection procedures
- Statistical techniques used for analysis

The present investigation was intended to study the effect of Instructional Strategies at middle level students. It was also intended to test the effectiveness of computer assisted, activity oriented and conventional instructional strategies of teaching in regard to achievement in science, scientific attitudinal changes and creativity in pupils.

METHOD ADOPTED

The main objective of the present study was to compare the effectiveness of computer assisted, activity –oriented and conventional instructional strategies on achievement in science in relation to scientific attitude and creativity. In the present study investigator has
Methodology used the experimental method to find out effectiveness of computer assisted and activity oriented instructional strategies.

4.2. SELECTION OF SAMPLE

A random cluster sampling technique was used to select the secondary school students. The study was conducted on the sample of 300 students of class VIIth studying in Government and Private secondary schools of P.S.E.B from urban locality of Faridkot District of Punjab. List of schools of urban area of Faridkot district was taken from D.E.O office. Schools were selected randomly by lottery system. The selected schools were contacted and programme was explained to Principals before beginning of the new academic session. Previous year of annual exam of the students of class VI (which are now in VII class) were taken and equated in the groups Equating the group was done on the bases of Mean, S.D (Singh, 1998) & (Kothari, 2000). 300 students of the total sample were divided into two groups i.e. 150 students in Government and 150 students in private schools. Each group of 150 students was again randomly furcated into 75 students for the schools. i.e. 75 for two private schools and 75 for two Government schools. Each school contained 25 students in each of three groups.

4.2. Table

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>GROUP I (CAIS)</th>
<th>GROUP II (AOIS)</th>
<th>GROUP III (CIS)</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.G.M sen. Sec. School Faridkot (Private) (A)</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>Little Angel Public School Faridkot (Private) (B)</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>Govt Sen. Sec School Faridkot (Government) (C)</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>Govt. Balbir Sen. Sec School Faridkot (Government) (D)</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>300</td>
</tr>
</tbody>
</table>

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4.3. EXPERIMENTAL DESIGN OF THE STUDY

Design is a definite plan for obtaining a sample from a given population. It refers to the technique or procedure the researcher would adopt in selecting items for the sample. For a study of this type experimental design was found appropriate.

A research design is the arrangement of condition for collection and analysis of data in a manner that aims to combine to relevance to the research purpose with economy in procedure (Selltiz, C. & others 1962). It is the conceptual structure within which research is conducted. It constitutes the blue print for collection, measurement and analysis of data (Kothari, 2009).

The present study is experimental in nature. The experimental design used in the study is as follow:

- Non-randomized control group pre-test and post-test design and two group randomized subject, was selected for the present study. Three groups i.e. two experimental groups and one control group. Group – I (experimental group) was presented instructional unit plan of science prepared by investigator, group - II (experimental group) was presented same unit plan of science prepared by investigator, group – III (Conventional group i.e:-control group) was also presented same unit plan for instruction.

The experiment was conducted in four different schools. In each of the schools, three strategies of instructions were compared. Instructional strategies were applied on students belonging to three different equated groups. These groups were equated on the bases of mean and S.D. In this design investigator used pre-assembled groups such as: intact classes. These pre-assembled groups were selected. Pre-academic achievement scores of previous year of VII class were taken from schools and were analyzed. Once groups were obtained three sections of VII class having 25 students in each section from each school were taken to which treatments were randomly assigned. Pre-test was used to test the achievement level, scientific attitude and creativity of equated sample. Post-test was given to all groups after treatments. Pre-test and Post-test scores were than compared. The effect of strategies was measured by differences in pre-test scores and post- test scores of both experimental groups and control group.
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VII Standard Students

Experimental groups I and II

Pre-Test

CAI and AOI treatments

Post-Test

CAI and AOI Treatments

Comparison

Control group III

Pre-Test

CI Treatment

Post-Test

CI Treatment

Figure: 4.3 The Layout of the Design
**Methodology**

### Table 4.3

**EXPERIMENTAL PROCEDURE IN TABULATED FORM**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Experimental Group I (CAIS) (50 Students)</th>
<th>Experimental Group II (AOIS) (50 Students)</th>
<th>Conventional Groups III (CIS) (50 Students)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I</strong></td>
<td><strong>Pre-test</strong></td>
<td><strong>Pre-test</strong></td>
<td><strong>Pre-test</strong></td>
</tr>
<tr>
<td></td>
<td>1. Academic Achievement Test in Science</td>
<td>1. Academic Achievement Test in Science</td>
<td>1. Academic Achievement Test in Science</td>
</tr>
<tr>
<td></td>
<td>by Investigator was used.</td>
<td>prepared by investigator was used.</td>
<td>prepared by investigator was used.</td>
</tr>
<tr>
<td></td>
<td>2. Shailaja Bhagwat Scientific</td>
<td>2. Shailaja Bhagwat Scientific Attitude</td>
<td>2. Shailaja Bhagwat Scientific Attitude</td>
</tr>
<tr>
<td></td>
<td>Attitude scale (SBSAS) by Dr. Bhagwat</td>
<td>Attitude scale (SBSAS) by Dr. Bhagwat</td>
<td>Attitude scale (SBSAS) by Dr. Bhagwat</td>
</tr>
<tr>
<td></td>
<td><strong>II</strong></td>
<td><strong>II</strong></td>
<td><strong>II</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Experimenta</strong></td>
<td><strong>Experimenta</strong></td>
<td><strong>Experimenta</strong></td>
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<td><strong>l Phase</strong></td>
<td><strong>l Phase</strong></td>
<td><strong>l Phase</strong></td>
</tr>
<tr>
<td></td>
<td>1. Students were equated in</td>
<td>1. Students were equated in</td>
<td>1. Students were equated in</td>
</tr>
<tr>
<td></td>
<td>group on the basis of</td>
<td>group on the basis of</td>
<td>group on the basis of</td>
</tr>
<tr>
<td></td>
<td>achievement test</td>
<td>achievement test</td>
<td>achievement test</td>
</tr>
<tr>
<td></td>
<td>performance</td>
<td>performance</td>
<td>performance</td>
</tr>
<tr>
<td></td>
<td>2. Each group was</td>
<td>2. Each group was</td>
<td>2. Each group was</td>
</tr>
<tr>
<td></td>
<td>exposed through CAIS.</td>
<td>exposed through AOIS.</td>
<td>exposed through CIS.</td>
</tr>
<tr>
<td></td>
<td><strong>III</strong></td>
<td><strong>III</strong></td>
<td><strong>III</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Post- Test</strong></td>
<td><strong>Post- Test</strong></td>
<td><strong>Post- Test</strong></td>
</tr>
<tr>
<td></td>
<td>1. Academic Achievement Test in Science</td>
<td>1. Academic Achievement Test in Science</td>
<td>1. Academic Achievement Test in Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Shailaja Bhagwat Scientific</td>
<td>2. Shailaja Bhagwat Scientific Attitude</td>
<td>2. Shailaja Bhagwat Scientific Attitude</td>
</tr>
<tr>
<td></td>
<td>Attitude scale (SBSAS) by Dr. Bhagwat</td>
<td>Attitude scale (SBSAS) by Dr. Bhagwat</td>
<td>Attitude scale (SBSAS) by Dr. Bhagwat</td>
</tr>
</tbody>
</table>

**4.4 THE VARIABLES SELECTED IN THE STUDY**

The study as indicated was intended mainly to determine the effectiveness of instructional strategies of teaching science with conventional instructional strategy of teaching. As such, the independent variables happened to be strategies of teaching: computer assisted instructional strategy (CAIS), activity-oriented instructional strategy (AOIS), conventional instructional strategy (CIS). Dependent variable taken to as achievement in science, scientific attitude and creativity.
4.5. PROCEDURE OF THE STUDY

PHASE -I

1. Preparation of Unit Plan
Investigator designed the units for computer-assisted instructional strategy (CAIS), activity-oriented instructional strategy (AOIS) by taking the subject matter of science subject of 7th standard of P.S.E.B. Subject matter from physical science, chemical science, biological science, environmental science and general science etc were taken to plan the units. Units were planned as per requirements of all the treatments i.e. two instructional strategies viz CAIS, AOIS. The subject matter was uniform for all the three treatments but the unit plan was differ, based on assumption and requirements of CAIS and AOIS. After preparing the unit plan investigator herself taught students in the class through CAIS, AOIS & CIS treatments. CAIS included use of CD-ROM, internet, video-clip & e-learning material etc. AOIS included making and using toys, working models, improvised apparatus, experiments, games, quizzes, out of class learning activities, nature trail etc. Hands-on activities help in observation, exploration, experimentation, analysis and synthesis etc. For conventional instructional strategies only the teaching points were arranged to maintain the uniformity of subject.

PHASE –II

2. Pre-test introduction
Pre-test was given to the students including: - achievement test in science, scientific attitude scale and creativity test. The tests were given one after another. Before giving tests instructions were given to the students regarding performance of tests. After applying pre-test, experimental variables were introduced. Students were taught through Instructional strategies using unit-plan designed by investigator.

PHASE –III

3. Final level of attainment
It was seen by applying post-test using achievement test in science, scientific attitude scale & creativity test. The experimental and control groups were taught five units of VII class science through three instructional strategies i.e. Computer assisted Activity- oriented and conventional instructional strategies. In this phase students were tested on achievement in science, scientific attitude and creativity.

4.6 TOOLS USED
In this study, two types of tools were used. One was Instructional tool and other was measuring tools. Instructional tools were used to impart instructions to the students in
science through three strategies. These consisted of unit plan in which subject matter is presented through different strategies. Measuring tools are standardized tools; these are achievement test in science, scientific attitude and creativity.

Following tools were used:

1. Achievement Test in Science was used and developed by investigator herself.
3. A New Test of Creativity by Pal. (1991)
4. Unit plant of science content to be used for Instructional strategies was prepared by investigator.

4.7. DESIGNING OF UNIT PLAN

➢ UNIT PLAN FOR CAIS

Subject matter with illustrations was presented on the CDs. Contents of unit plan were same as for AOIS. Difference was only of presentation.

CDs: - These were used to present material on computer. LCDs or computer can also be used. Use of internet was also for practice and classification. CDs contained pictures some contained videos slides to show the students about reality of life.

Power Point Projectors: These were used to teach the whole class. Subject matter in the form of points or summary was also represented. Pictures can also be shown.

➢ UNIT PLAN FOR AOIS: These were instructional booklets. The subject matter for preparing these booklets was taken from the text-book of science of VII class P.S.E.B. Unit design consist of five units. Booklets contained instructions in the first part. At the end practice exercise was given. These also include the use of:

- Models: Models were used for Activity Oriented Instructional strategy. The replicas of real objects in the form of models were also used. Models were of different types. Some were ready-made, some were to construct by the students for the purpose of activity. They simplify the reality of complex objects. They concretize the abstract concepts.

- Concrete Material: This is used to represent and clear the concepts of lessons. For example: magnet, stop watch, Balloons etc.

- Charts: Charts, pictures and maps were used to show those objects which were out of sight.

- Original Specimens: These were used to classify the different concept.
MEASURING TOOLS

These were employed to measure changes in student's behaviour concerning achievement, attitudes and reaction toward different instructional design: Scientific attitude and Creativity.

4.8. DESCRIPTION OF TOOLS OF THE STUDY

4.8.1. ACADEMIC ACHIEVEMENT TEST IN SCIENCE

In the present study investigator was to find Achievement level of students in science before and after introducing the external variables. It was decided to prepare the achievement test in science herself for target group of VII grade students. It was also decided to prepare multiple choice type question or item to reduce the subjectivity and to increase the objectivity and reliability of the test. Firstly, for the preparation of the test investigator prepared a plan of content. Test is developed to measure the objectives such as knowledge, application and understanding. It is prepared as per syllabus of P.S.E.B. It contained total 32 items. Each item has four options. One of the important steps in the study was the preparation of Unit Plan and tools to collect the data; description has been given in Chapter- V (Development of Tool and Learning material).

4.8.2 SHAILAJA BHAGWAT SCIENTIFIC ATTITUDE SCALE (SBSAS)

This scale is prepared by Dr. (Smt) Shailaja Bhagwat in 2005, (Head (Retd) Department of Psychology, Maharishi Ved Vigyan Mahila Mahavidyalaya Jabalpur) to know whether or not the students have developed favourable attitudes toward science as discipline. Scientific attitude helps to approach different problems objectively without any bias and it promotes logical thinking. It develop favourable attitudes toward science as a discipline. It helps to inculcate scientific attitude among pupils. It helps in developing positive attitude toward subject. It has 24 items (12 favourable and 12 unfavourable to the issue) selected on the criterion of the discriminative value.

4.8.3 A NEW TEST OF CREATIVITY

This test was constructed by Dr. Roma Pal University of Agra. They are of the view that man is creative in his ability to create new forms. Concepts of creativity are actually based on the needs of man and realities of his nature. Present test has been standardized on a sample of VIII to XII class students but can be administered on all age groups. Three components of creativity have been taken in the present test, with scores of fluency, flexibility and Originality.

Scoring of each part is done separately.
4.9. EXPERIMENTATION
Investigator took a list of urban schools from the D.E.O office and schools were selected randomly which were with in the reach of the investigator and in the urban area. Then investigator took the permission of the Principals of the schools for experimentation. After permission investigator made schedule of teaching in four schools on April 3, 2011. After equating different groups actual teaching started on April 4, 2011 by preparing the Time-Table. As schools started at 8.00 am accordingly time schedule was made. Different groups in four schools (School A i.e:- M.G.M Sen Sec School, School B i.e:- Little Angel Public school, School C i.e:- Govt sen sec school Faridkot, School D i.e :- Govt. Balbir Sen. Sec. School) were taken on the bases of previous performance of the students in academic achievement in their exams and their mean and S.D were taken which comes about nearly equal. Then in each school, three groups were taught, two experimental and one controlled of 7th grade. Whole teaching process was carried out for a month excluding Sunday and Holidays.

(i) Administration of the Pre-tests
Achievement test in science, scientific attitude test and creativity test was administered to the students to have pre-test scores. Each test was administered one by one on each alternate day on a sample. There were 25 students in each of the three groups in one school. The test was given alternatively to the each group. First, response sheets were given to each student. Than investigator explained how the students will have to fill up the details required in the response sheets. Test booklets were distributed and the time limit was noted down. After stipulated period the response sheets were collected along with the test booklets. Same way the other tests were administered to the whole sample. The scores of response sheets were collected and used for statistical analysis.

(ii) Treatment Phase
After taking the pre-tests of achievement in science, scientific attitude and creativity, scoring was done and then investigator started the teaching instruction with the three instructional strategies.i.e:- computer assisted, activity –oriented and conventional instructional strategy. Three experimental groups were taught through instructional strategies (CAIS, AOIS and CIS) with pre-prepared unit design. Time –table was made and three periods per day were taken in each school. Each period was of 35 minutes of duration. All topics were taught in same sequence to all groups, whether experimental groups or controlled groups. But the only difference was that students of experimental
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group, Group –I taught with computer assisted, experimental group- II was taught with activity oriented instructional strategy and controlled group III was taught with conventional strategy. Investigator herself took the responsibility to teach each experimental group (CAIS, AOIS & CIS).

Group –I was taught through Computer assister instructional strategy by the use of P.P.T, inter-net and CDs through computer. These CD and P.P.T. contained the unit design which was prepared for teaching. Inter-net was used to explore the things wherever needed.

Group – II was taught through Activity –oriented instructional strategy with unit design having activities, experimentation and field trips.

Group –III was taught simply same topics through conventional strategy without using any aid on the basis of prescribed text-book. Unit Plan consists of five units having different topics of VII class science syllabus of Punjab School Education Board. In each unit there were objectives, contents to be taught and practice exercise. Units are provided with sufficient pictures and explanations.

After teaching each unit there was a session for discussion. Students raised their doubts and investigator clarified their doubts. The investigator noticed that students were very eager and curious to learn through unit designs. They observed the pictures very carefully and did the activities. The knowledge obtained from learning through unit design motivated them to learn.

(iii) Administration of the post-test

Post-test of 7th grade was administered to find out effectiveness of instructional strategies on experimental and controlled groups. Post –test was the achievement test in science, scientific attitude scale and creativity test which were applied to check the effectiveness of three instructional strategies.

After administering post-test, it was found that all the students were appeared in post-test. Post- test scores of achievement in science, scientific attitude and creativity test were scored, tabulated and used for statistical analysis. Distribution of students in different groups in final sample was shown in Table.
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Table: 4.9

DISTRIBUTION OF STUDENTS IN FINAL SAMPLE

<table>
<thead>
<tr>
<th>Schools</th>
<th>Experimental Group I</th>
<th>Experimental Group II</th>
<th>Controlled Group III</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>B</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>A+B</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>C</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>D</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>C+D</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>Grand Total</td>
<td>50+ 50 =</td>
<td>50+50 =</td>
<td>50+50 =</td>
<td>150+ 150=</td>
</tr>
<tr>
<td>A+B and C+D</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>300</td>
</tr>
</tbody>
</table>

4.10. COLLECTION OF DATA

Procedure adopted for collection of data was through experimentation. It is an experimental study in which pre-test and post-test administration’s result is analyzed.

After finalizing the sample and tool used, investigator met the Principals of the school and fixed the time for collection of the data, most of the teachers allotted the whole afternoon periods for administration of the tools. Uniform procedure was followed in all schools in collection of data. The steps followed by investigator during collection of data:

- Distribution of answer sheets to the subjects with instructions for filling them up.
- Distribution of test booklets together with printed instructions regarding the test.
- Explaining the general instructions in the booklet.
- Familiarizing the subjects with answer sheets, method of entering responses etc.
- Clearing the doubt of the subjects, giving instructions regarding time-limit.
- Strict adherence to the time limit prescribed in the test booklet.
- Giving instructions not to disfigure the test booklets.
- Giving interval between tests.
- Collecting back the test booklets and answer sheets.
- After collection, data was analyzed.

4.11. SCORING OF ANSWER SHEETS

General guidelines were framed for the scoring of the answer sheets. It included consideration of important points like students were given full marks. Scores for right
answers were given in the booklets. Investigator done the scoring of all three answer sheets of tests i.e. Academic achievement of science test, scientific attitude scale, creativity test that were tabulated for statistical analysis.

4.12. CONSOLIDATION OF THE DATA
All the data relating to each pupil (sex, locality, schools and test scores in each test) were entered separately in corresponding rows and columns of specially designed papers. The data was entered in such a way that they could be used for computer data processing.

Mean, standard deviation s, ANOVA, Regression, t-test of the distribution of the scores of the achievement test in science, scientific attitude and creativity for whole sample was determined.

4.13. STATISTICAL TECHNIQUES USED FOR ANALYSIS
The responses given by the different categories of the respondents viz. boys and girls were treated separately. Analysis of variance (ANOVA) (Garret, 1981) was used to find out the effectiveness of instructional strategies.

To arrive at certain conclusions regarding the hypotheses in the present investigation the following statistical techniques were employed to analyze the data obtained from experiment.

- Mean
- Standard deviation
- t-test.
- ANOVA
- Regression