CHAPTER-III

METHOD

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METHOD AND PROCEDURE

Research is a purposive, scientific and pointed deliberation, which requires one to proceed in a definite direction along well-defined lines. Method and procedure for study is deemed essential for fruitful research. After the selection and defining of the problem, the investigator has to decide about the method, procedure and techniques that are to be used for collecting, analyzing and interpreting the data.

The present study investigated the effect of web based instruction on achievement of eleventh grade students in relation to learning styles and attitude towards physics. The study was experimental in nature and therefore, the main effects and interaction effects of the independent variables on dependent variables were to be identified. For this, suitable data analysis techniques were decided to be employed by the investigator.

This chapter describes the research methodology employed in the study, including the design of the study, the sample drawn for the study, the data collection instruments and the data analysis techniques. It also outlines and explains the procedure for conducting research.

3.1 DESIGN OF THE STUDY

The present study is an experimental one. The experiment aimed at studying the effect of web based instruction on achievement in relation to learning styles and attitude towards physics. The study is based on the pre test – post test experimental design. The independent variable is the instructional strategy which is employed to teach the students. Two instructional strategies viz. web based instruction and conventional method of instruction were employed for the study. The classifying independent variables are learning styles and attitude towards physics while achievement in physics is the dependent variable. In the present study $2 \times 3$, $2 \times 2$, $3 \times 2$ and $2 \times 3 \times 2$ factorial designs are employed. The reason why factorial design was used is that it permits one to evaluate the combined effect of two or more independent variables simultaneously. The layouts of the factorial designs used in the study are shown below:

A layout of the $2 \times 3$ factorial design used in the study for the variables of instructional strategies and learning styles is given in the figure 3.1.
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Fig. 3.1 Showing layout of 2×3 factorial design on the variables of Instructional Strategy and Learning Styles.

A layout of the 2×2 factorial design used in the study for the variables of instructional strategy and attitude towards physics is given in the figure 3.2.

Fig. 3.2 Showing layout of 2×2 factorial design on the variables of Instructional Strategy and Attitude Towards Physics.

A layout of the 3×2 factorial design used in the study for the variables of Learning Styles and Attitude Towards Physics is given in the figure 3.3.

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Fig. 3.3 Showing layout of 3x2 factorial design on the variables of Learning Styles and Attitude towards Physics.

![Diagram of 3x2 factorial design]

A layout of the 2x3x2 factorial design used in the study for the variables of instructional strategy, learning styles and attitude towards physics is given in figure 3.4.

Fig. 3.4 Showing layout of 2x3x2 factorial design on the variables of Instructional Strategy, Learning Styles and Attitude Towards Physics.

![Diagram of 2x3x2 factorial design]
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The various codes used in the figures above along with their descriptions are as given below:

A — Instructional Strategy
B — Learning Styles
C — Attitude Towards Physics

A_1 — Conventional Method of Instruction
A_2 — Web Based Instruction
B_1 — Visual Learning Style
B_2 — Auditory Learning Style
B_3 — Kinesthetic Learning Style
C_1 — Positive Attitude Towards Physics
C_2 — Negative Attitude Towards Physics

3.2 SAMPLE OF THE STUDY

In research, researchers usually come across unmanageable population. So, representative of the population is drawn for the study as it is often desirable in order to reduce expenditure, time and energy and also to produce greater precision and accuracy. Sampling refers to selecting relatively small number of individuals called subjects, to find out something about the entire population that the subjects represent. Sampling procedures provide generalization on the basis of relatively small proportion of the population.

For the present study, method of random sampling was used. The school sample was drawn from representative senior secondary schools of Ludhiana district, where students have exposure to internet. First of all, four schools were randomly selected from the total population of schools. From each school, two sections were randomly designated as Group I and Group-II. Among the sample of 300 students, Group-I was comprised of 150 students and Group-II was also comprised of 150 students.
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All these students were pursuing the same course/syllabus of study under Central Board of Secondary Education with the same official medium of instruction for Physics. School-wise breakup of sample is as given below in tables 3.1 and 3.2.

Table 3.1 Showing distribution of the students in schools for Experimental Group.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of School</th>
<th>Class</th>
<th>Boys</th>
<th>Girls</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>C.F.C. Public Sen. Sec. School, Ludhiana</td>
<td>XI</td>
<td>21</td>
<td>17</td>
<td>38</td>
</tr>
<tr>
<td>3.</td>
<td>Alpine International School, Ludhiana</td>
<td>XI</td>
<td>20</td>
<td>16</td>
<td>36</td>
</tr>
<tr>
<td>4.</td>
<td>Sacred Heart Convent School, Ludhiana</td>
<td>XI</td>
<td>19</td>
<td>14</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>83</td>
<td>67</td>
<td>150</td>
</tr>
</tbody>
</table>

Table 3.2 Showing distribution of the students in schools for the Control Group.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of School</th>
<th>Class</th>
<th>Boys</th>
<th>Girls</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>C.F.C. Public Sen. Sec. School, Ludhiana</td>
<td>XI</td>
<td>21</td>
<td>18</td>
<td>39</td>
</tr>
<tr>
<td>2.</td>
<td>G.H.G. Public Sen. Sec. School, Sidhwan Khurd, Ludhiana</td>
<td>XI</td>
<td>22</td>
<td>19</td>
<td>41</td>
</tr>
<tr>
<td>3.</td>
<td>Alpine International School, Ludhiana</td>
<td>XI</td>
<td>20</td>
<td>16</td>
<td>36</td>
</tr>
<tr>
<td>4.</td>
<td>Sacred Heart Convent School, Ludhiana</td>
<td>XI</td>
<td>19</td>
<td>15</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>82</td>
<td>68</td>
<td>150</td>
</tr>
</tbody>
</table>
3.3 TOOLS USED

For the present study, the researcher required various data gathering tools which varied in their design, complexity, administration and interpretation. Each tool was appropriate for the collection of certain type of information. For this study, the following tools were used to collect the data:

1. Web Based Instruction on selected units of Physics of eleventh grade was developed by the Investigator.

2. Achievement Test on selected units of Physics of eleventh grade was developed by the investigator to measure the performance of students before and after the treatment.

3. Learning Styles Test was developed by the Investigator.

4. A Scale to measure Attitude Towards Physics was also developed by the Investigator.

3.4 DESCRIPTION OF TOOLS

3.4.1 Web Based Instruction

The investigator developed a website (http://www.jaspreetkaur.me/) to provide web based instruction in the subject of physics to the students of XI grade. The content is based on the syllabus prescribed for XI grade physics by C.B.S.E. New Delhi. The investigator selected eight units of physics to be taught to the students. The website is a blend of text, video and audio files. The content is presented in a well-organized, ready to use and dynamic form as animated demonstration are more efficiently processed by learners. The links are also provided to visit some related websites.

It is essential to register oneself before taking the instruction through the website. After registration, a login id and password are generated. The users have to login to view the lessons which are presented in an interesting way. After going through each unit, the students are required to take formative assessment test given for each unit in the website. After finishing all the units, a summative assessment test is supposed to be given by the students. In this way, all the necessary components and instructions are included in the website.
**Validation**

After the preparation and development of web based instruction, the validation process was carried out. WBI was subjected to two types of evaluation—self evaluation and expert appraisal. In the self evaluation, the content portion of the learning material was examined to verify its factual correctness and relevancy with objectives. In the expert appraisal, comments and suggestions were taken from six physics teachers about the presentation of material and existence of the essential characteristics needed for an instructional material. All the experts had a close agreement that the content and presentation of the material of the web based instruction is according to the objectives of the study. Some suggestions were also given by them to help the investigator to improve the website.

**Final Form of the Website**

After making necessary modifications as suggested by the experts the website was finalized and uploaded on the internet. The hard copy of web based instructional material is appended as Appendix (IV).

**3.4.2 Achievement Test in Physics**

Achievement tests are constructed to measure present performance in relation to a skill or knowledge which has been acquired as a result of learning. They are designed to measure an individual’s quality of learning in a particular subject or course of study at the end of the instruction. Achievement tests are not designed to provide an indication of future success, but Beggs and Lewis (1975) have indicated that such tests are found to be as good for predicting success as aptitude tests because of the considerable overlap in the content of the two.

An achievement test in physics for XI grade was developed by the investigator to measure knowledge, understanding and application objectives of cognitive domain of learning. It was used to ascertain what and how much was learnt. The test items have been selected from eight units of XI grade physics. The test consists of 50 multiple choice type items having four options. The scoring was to be done with the help of scoring key. The details of the development of the Achievement test in physics are given in chapter IV. The final copy of the test is appended as Appendix (I).
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3.4.3 Learning Styles Test

Learning styles are various approaches or ways of learning. They involve methods, particular to an individual that are presumed to allow the individual to learn best. A learning style is the way in which an individual learner tries to learn. It includes how they approach learning, experience learning and utilize information. The unique interaction between individual and its environmental circumstances give way to form a unique preference for learning that is the particular learning style of the learner. Everyone has a different learning style and learns better through different means. Understanding one’s particular learning style and how to best meet the needs of that learning style is essential to performing better in the classroom.

In order to determine learning styles of students, the investigator developed learning styles test that was based on three types of learning styles, viz. visual, auditory and kinesthetic. The test consisted of 40 items. Each item was in the form of a statement having three options viz. (A), (B) and (C). The individual is required to choose any one option that best describes him. If the individual chooses mostly (A)’s he will have visual learning style, if one chooses mostly (B)’s he will have auditory learning style and if one chooses mostly (C)’s he will have kinesthetic learning style. The details of the development of the Learning Styles test are given in chapter IV. The final copy of the test is appended as Appendix (II).

3.4.4 A Scale to Measure Attitude Towards Physics

An attitude is a hypothetical construct that represents an individual’s degree of like or dislike for something. Attitudes are generally positive or negative views about a person, place, thing, or event— this is often referred to as the attitude object. An attitude is a manner, disposition, feeling, position, etc., with regard to a person or thing. It is a tendency or orientation, especially of the mind. An attitude is the way a person views something or tends to behave towards it, often in an evaluative way.

Physics subject is measured as the most problematic area within the field of science. Teaching of physics in senior secondary schools traditionally magnetizes fewer learners than other field of science subjects. Attitude towards Physics denotes interests or feelings towards studying physics. It is the students’ disposition towards ‘like’ or ‘dislike’ of physics. Students’ beliefs and attitudes have the potential to either facilitate or inhibit learning.
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As the investigator could not find an appropriate scale to measure XI grade students’ attitude towards physics, a new scale was constructed. The scale consists of 32 items. The response is taken on a five point continuum viz. strongly agree, agree, undecided, disagree and strongly disagree. The positive and negative attitude of students can be determined on the basis of 27% criteria. The upper 27% on the variable was considered as the group having positive attitude towards physics and lower 27% was considered as the group having negative attitude towards physics. The details of the development of the Attitude towards Physics Scale are given in Chapter IV. The final copy of the scale is appended as Appendix (III).

3.5 PROCEDURE OF DATA COLLECTION

After the selection of the sample the experiment was conducted in the following phases:

Phase- I: Development Phase:

In this phase, Web Based Instruction, achievement test in Physics, learning styles test & the scale to measure attitude towards Physics were developed.

Phase- II (a): Administration of Tools:

The students were randomly divided into two groups, viz., experimental group and control group. The learning styles test and the scale to measure attitude towards Physics were administered to the students of both the experimental and the control group.

Phase-II (b): Pre-Test Phase

The achievement test in Physics was administered as pre-test to both the experimental and the control group. Before starting the test, necessary instructions were given to the students. The students were told that the purpose of the test was not to evaluate them but to get useful information for some research work.

Phase- III: Implementing the Instructional Strategies:

The investigator employed two instructional strategies for the present investigation. The experimental group was taught through Web Based Instruction and the control group was taught through conventional method. Same content was taught to both the groups for the same duration of time.
Phase- IV: Post-Test Phase

After completion of the treatment, the same achievement test in Physics was administered as post-test to the students of both the experimental and the control group.

3.6 STATISTICAL TECHNIQUES USED

Statistical techniques were employed to give the concise picture to the data so that it can be easily comprehended. The following statistical techniques were used to test the hypotheses:

1. Descriptive statistics like Mean, Median, Mode, Standard Deviation, Skewness, and Kurtosis were employed to understand the general nature of data.

2. Two way (2×3, 2×2, 3×2) and three way (2×3×2) analysis of variance was employed to find out the main and interaction effects.

3. 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.