CHAPTER-III
DESIGN AND PROCEDURE OF THE STUDY

3.0.0 INTRODUCTION

Fate of any activity and its outcome depends essentially upon its design. Fred N. Kerlinger (1974) described "Research design as the plan, structure and strategy of investigation conceived so as to obtain answers to research questions and control variance." Thus, design provides a picture of what and how to do the work. In any research project, design provides the investigator a blue print of research, dictates the boundaries of project and helps in controlling the experimental, extraneous and error variances of the problem under investigation.

This chapter seeks to outline the procedure followed, design employed, sample selected, tools used, sequence of events that occurred, procedure adopted for data collection and statistical analysis conducted to realise the objectives of the study.

3.1.0 DESIGN

In the present study, pre-test post-test control group design was employed. It involved three groups of students, two experimental groups and one control group. The Experimental Group I was taught Hindi through Mastery Learning Model, Experimental Group II was taught Hindi through gaming Model and the Control Group was taught Hindi through Conventional Method. The design comprised three stages. The first stage involved pre-testing of all the students of three groups on
achievement in Hindi, intelligence, socio-economic status and self-concept. The second stage involved treatment of twelve weeks. The experimental treatment consisted of teaching five units of Hindi through mastery learning model to experimental group I, through gaming model to experimental group II and through conventional method to control group.

In the third stage, the students were post tested on achievement in Hindi and self-concept. The design of the study is presented below in Table 3.1.

**Table 3.1**

**DESIGN OF THE STUDY**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Duration</th>
<th>Control Group</th>
<th>Experimental Group I</th>
<th>Experimental Group II</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Pre-testing</td>
<td>One week</td>
<td>Measurement of 1. Intelligence of pupils.</td>
<td>Measurement of 1. Intelligence of pupils.</td>
<td>Measurement of 1. Intelligence of pupils.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Achievement in Hindi</td>
<td>3. Achievement in Hindi</td>
<td>3. Achievement in Hindi</td>
</tr>
<tr>
<td>II Treatment</td>
<td>Twelve weeks</td>
<td>Teaching Hindi through Conventional Method</td>
<td>Teaching Hindi through Mastery Learning Model</td>
<td>Teaching Hindi through gaming model</td>
</tr>
<tr>
<td>III Post-testing</td>
<td>One week</td>
<td>Measurement of 1. Achievement in Hindi</td>
<td>Measurement of 1. Achievement in Hindi</td>
<td>Measurement of 1. Achievement in Hindi</td>
</tr>
</tbody>
</table>
3.2.0 IDENTIFICATION OF VARIABLES

In the experimental researches the relationship between two types of variables namely independent and dependent variables is studied. Independent variables are the causes while dependent ones are the effects. Another category of variables, which is equally important, is of intervening variables. All these three kinds of variables which were identified for the study are discussed below.

3.2.1 Independent Variables

Different models of teaching which were used in the present study to see their effect on the achievement of pupils in Hindi and their self-concept constituted the independent variables. The experimental group I was taught through mastery learning model, the experimental group II was taught through gaming model and the control group was taught through conventional method. Thus, mastery learning model, gaming model and conventional method were the three independent variables for the present study.

3.2.2 Dependent Variables

Achievement in Hindi and self-concept were the dependent variables. These variables were measured twice during the course of the study - first before the experimental treatment which is pre-test stage and then after providing the experimental treatment, i.e., post-test stage.
3.2.3 Intervening Variables

There are certain variables which have their effect on the learning outcome. These variables, known as intervening variables, can influence both the independent and dependent variables. Different intervening variables in a research study can be nature of school, grade level, subject to be taught, intelligence of pupils, socio-economic status of pupils, previous knowledge of pupils etc. These intervening variables were controlled either experimentally or statistically.

3.3.0 CONTROL EMPLOYED

It is necessary to control all those variables that may affect the dependent variables. Hence suitable controls were employed for each such variable.

3.3.1 Nature of School

The sample was selected from a single school in Charkhi-Dadri. It was a aided school situated in an urban area of Charkhi-Dadri.

3.3.2 Grade Level

Sixth class was selected for the present study and grade level was thus kept constant during the study.

3.3.3 Subject

All the three groups were taught same units of Hindi.
3.3.4 Socio-Economic Status

This variable was controlled statistically by employing ANALYSIS OF CO-VARIANCE (ANCOVA) for the scores obtained by administering Socio-Economic Status Scale by Kuppuswamy.

3.3.5 Intelligence of Pupils

This variable can greatly affect the achievement of pupils. It was also controlled statistically by employing ANCOVA to the intelligence test scores which were obtained by employing Cattell's Culture Fair Intelligence Test of mental abilities.

The independent variables, dependent variables and the control variables with the kind of control employed in the study have been summarised in Table 3.2.

**Table 3.2**
Independent, Dependent and Control Variables

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Dependent Variable</th>
<th>Control Variable</th>
<th>Control Employed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method of Teaching (Mastery Learning Model, Gaming Model and Conventional Method)</td>
<td>1. Achievement in Hindi</td>
<td>1. Nature of School</td>
<td>1. Administrative (Single School)</td>
</tr>
<tr>
<td></td>
<td>2. Self-Concept</td>
<td>2. Grade level</td>
<td>2. Administrative (only VI grade to be taught)</td>
</tr>
<tr>
<td></td>
<td>3. Subject to be taught</td>
<td>3. Administrative (same units of Hindi in all the three groups to be taught)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Pupils' intelligence</td>
<td>5. Statistical Analysis of Co-Variance</td>
<td></td>
</tr>
</tbody>
</table>
3.4.0 SAMPLE

The sample for the present study comprised of 105 pupils studying in three sections of the VI class of a private aided school in Charkhi-Dadri. Each section comprised thirty five students. One section formed the control group and the other two sections formed the two experimental groups.

3.5.0 TOOLS USED

For the purpose of collecting data related to different variables covered in this study, following tools were used:

1) Hindi Achievement Test (developed by the investigator herself) to measure the achievement of pupils in Hindi.

2) Swatva Bodh Parikshan (SBP) a test of Self-concept by Sherry, Verma and Goswami to measure self-concept of pupils.

3) Cattell's Culture Fair Intelligence Test by Cattell and Cattell to measure the intelligence of pupils.

4) Socio-Economic Status Scale Form A (Urban) developed by Kuppuswamy to measure the socio-economic status of pupils.

The above said tools used in the present study have been described in detail in the following paragraphs.

3.5.1 Hindi Achievement Test

Achievement test is a systematic procedure for measuring a representative sample of learning tasks (Gronlund, 1988). To achieve the objectives of the present study, a achievement test in Hindi was
constructed by the investigator herself from five units of VI grade Hindi syllabus. It was employed to assess the previous knowledge of the students in the content to be taught and to measure the final achievement of the students after teaching the contents. The different steps followed in developing the test are summarised below.

(a) Planning the test

The planning of achievement test takes into account (a) determining the purpose of the test (b) identification and defining the intended learning outcomes (c) preparing the test specifications (d) constructing relevant test items (N.E. Gronlund, 1988).

For the purpose of constructing achievement test, objectives were defined in behavioural terms. Since the primary concern here was with achievement testing, the focus was mainly on cognitive domain as described in Taxonomy of Educational Objectives by Bloom, et al., 1956. Intellectual outcomes in the cognitive domain covered both the major classes -- knowledge and intellectual abilities and skills. After determining objectives, the learning outcomes were stated as observable terminal performance. Before the writing of any item, test specifications were drawn covering the objectives and decided subject matter to be taught during the experiment.

(b) Item writing

Objective type items (multiple choice) were constructed keeping in view the objectives, course content and the expected behavioural outcomes. Several books of Hindi and literature relating to test
construction were studied before framing the items. A large number of items with wide range of difficulty were constructed from five units of Hindi syllabus prescribed for class VI. Experts in measurement and evaluation, experienced teachers of Hindi and teacher educators were consulted. Items which were found to be ambiguous or structurally flawed were either improved or dropped. Finally, 100 items were selected for preliminary try-out. Each item carried a score of one. The preliminary try-out test was given to 40 students of class VI of Vaish Girls Sr. Sec. School, Charkhi-Dadri. The results of the test revealed a few more points requiring modifications and improvements.

**(c) Test Administration**

After making the required improvements, the test was printed and administered on a sample of 100 students of class VI, who had already studied the contents covered in the test. Detailed instructions were provided to the students. No time limit was fixed for try-out test. It was found that students took on an average 75 minutes to answer all the questions.

The marking was done using scoring key already prepared by the researcher. There was one mark for a correct answer and zero for an incorrect answer.

The try-out test and scoring key are given in Appendix-A.
(d) *Item Analysis*

After scoring the try-out test, the investigator took 75 answer sheets by deleting the rest at random. The following steps were followed for item analysis:

(i) Firstly, all 75 answer sheets arranged in the descending order from highest score at the top to the lowest score at the bottom.

(ii) Then divided these 75 answer sheets into three groups on the basis of scores. The upper 25 answer sheets with the highest scores formed the upper group, the next 25 answer sheets formed the middle group and the rest 25 answer sheets with the lowest scores formed the lower group.

(iii) After forming the three groups, the next step was to find out and tabulate the number of correct responses of an item in each group. The difficulty of an item is indicated by the total number of pupils who answered it correctly, the larger this number the easier the item. Item difficulty was estimated by determining the percentage of pupils who answered the item correctly. The percentages were converted into proportions. The average of the proportion of correct responses on each item in the three groups was taken to be an estimate of the difficulty value of that particular item.
The formula for computing difficulty value ‘dv’ of each item was:

\[ dv = \frac{Pu + Pm + Pl}{3} \]

where \( dv \) - difficulty value of the item;

\( Pu \) - proportion of correct responses to the item from the upper group;

\( Pm \) - proportion of correct responses to the item from the middle group;

\( Pl \) - proportion of correct responses to the item from the lower group.

(iv) Internal Consistency Discrimination Index (rb)

The relationship between the total scores derived from a test and item scores are referred to as internal consistency discrimination index of an item. It was found out by using the following formula:

\[ rb = Pu - Pl \]

where \( rb \) - internal consistency discrimination index

\( Pu \) - proportion of correct responses to the item from the upper group;

\( Pl \) - proportion of correct responses to the item from the lower group.
(e) Final Selection of the Items

Final selection of the items was made on the basis of difficulty value and discrimination index of each item.

(i) Difficulty Value

Most of the items selected were having medium difficulty value and few items with high and low difficulty values were also taken. Lindeman (1971) emphasised that easy items should be included in a test in order to encourage the pupils of low ability. Some difficult items should also be included to challenge the able pupils. However, in the interest of constructing a measuring instrument of maximum quality and utility, most items included should be in the middle range of difficulty.

(ii) Internal Consistency Discrimination Index

According to Garrett (1967), items with validity indices of 0.20 or more are regarded as satisfactory. Thorndike (1955) considered an item with a validity co-efficient as high as 0.25 as an outstanding 'valid' item. Hence the researcher retained those items for the final draft which were having internal consistency of 0.25 and higher. The items with zero discriminating power and negative discriminating power were discarded while selecting items for final draft.

Gronlund (1988) states, "Zero discrimination power (0.00) is obtained when an equal number of pupils in each group answer correctly."
Negative discrimination power is obtained when more pupils in lower group answer correctly than pupils in the upper group. Both types of items should be removed from norm-referenced tests and then discarded or improved."

A bivariate scatter diagram was prepared for the achievement test, placing each item in the appropriate column and row according to its difficulty value and discrimination index respectively. Thus, 60 items were retained in the final form of the test. The bivariate scatter diagram is given in Appendix-B.

(f) Standardization of Achievement Test

60 items were selected for the final form of the achievement test. This selection sets the stage for the standardization or experimental validation of the test which includes establishing reliability and validity.

(i) Reliability

Reliability refers to the consistency of test scores. The reliability was found by the split half method (odd-even method) and the co-efficient of reliability was 0.85.

(ii) Validity

Validity is the extent to which a test measures what it purports to measure (Gombach, 1970). The validity of the achievement test constructed for the present study was taken for granted because this
achievement test was constructed after preparing the blueprint and ascertaining the weightage of different topics and items. This is in concordance with Guilford (1971) who says, "There are some measures whose validity is taken for granted, for example, achievement test scores."

Content related evidence of validity is especially important in achievement tests. Gronlund (1988) emphasises that we can build a test that has high validity by

(i) identifying the learning outcomes to be measured;

(ii) preparing a test plan that specifies the sample of the items to be used; and

(iii) constructing a test that closely fits the set of test specifications.

Anastasi (1961) had the opinion that content validity when applied to educational achievement test, is often called curricular validity. The preparation of test items is preceded by a thorough and systematic examination of relevant courses syllabi and text books as well as by consultation with subject experts and test construction experts.

(g) Final Form of the Test

The final form of the Hindi achievement test contains 60 items.

The final test along with the scoring key is given in Appendix-C.
3.5.2 Swatva Bodh Parikshan (SBP) - A test of Self-Concept

A test of self-concept developed by Sherry, Verma and Goswami was used to measure the self-concept of pupils before and after the experimental treatment. Swatva-Bodh Parikshan is a forty-eight item test, yielding scores in eight different dimensions of the self-concept and on the total. These dimensions are: health and physique, temperamental qualities, academic status, intellectual abilities, habits and behaviour, emotional tendencies, mental health and socio-economic status. The statements of the test are simple and declarative about self, seeking responses in "Yes" or "No". Responses are obtained on an answer-sheet. A high score on this test indicates a high self-concept while a low score indicates a low self-concept. The test is given in Appendix D.

The test-retest reliability of the test is 0.733 and rational equivalence reliability using K-R formula 21 is 0.761. This test is reported to have reasonable content validity.

For the administration of the test, booklets containing test items and answer-sheet were distributed to the sample students. An attempt was made to follow all the instructions laid down by Sherry, Verma and Goswami for conducting the test. Though no time-limit was set, the pupils were advised to complete the test as quickly as possible. Generally the pupils took approximately 20 minutes to complete the test. The scoring was done with the help of scoring stencil.
3.5.3 Socio-Economic Status Scale

The urban form of the Socio-Economic Status Scale by Kuppuswamy was used to determine the socio-economic status of students. As the author states, the scale was standardised primarily for use in socio-economic investigations in urban parts of India. The scale consists of three important variables contributing to the socio-economic status in urban areas. These variables are education, occupation and income. For each variable a seven point scale is used.

Form B of the scale, which is meant for the students to provide the required information regarding their parents or guardians, was used to measure socio-economic status of students. This information was summarised in the score-card. (Form B of the scale and score-card are provided in appendix E). The appropriate weightage scores given against the items were encircled for each category. The scores were then entered in the last column. The scores of all the three variables were added in order to get the final score for socio-economic status. On the basis of final scores, the classes were divided as:

<table>
<thead>
<tr>
<th>Total Scores</th>
<th>SESS Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>26-29</td>
<td>I</td>
</tr>
<tr>
<td>16-25</td>
<td>II</td>
</tr>
<tr>
<td>11-15</td>
<td>III</td>
</tr>
<tr>
<td>5-10</td>
<td>IV</td>
</tr>
<tr>
<td>Below 5</td>
<td>V</td>
</tr>
</tbody>
</table>
3.5.4 Cattell's Culture Fair Test

Cattell's Culture Fair Test of mental abilities was used to measure intelligence of pupils. The test measures individual intelligence in a manner designed to reduce, as much as possible, the influence of verbal fluency, cultural climate and educational level. The test which may be administered individually or in a group, is non-verbal and requires only that examinees be able to perceive relationship in shapes and figures.

There are three scales in the Culture Fair Series. For the purpose of the present study, Scale-2 has been used which consists of four subtests. In the first subtest, the individual is presented with an incomplete, progressive series. His task is to select, from among the choices provided, the answer which best continues the series. Second sub-test is related to classification. The individual is presented with five figures. He must select one which is different from the other four. In the third sub-test related to matrices, the individual is asked to correctly complete the design or matrix presented at the left of each row. The fourth subtest, conditions (or Topology) requires the individual to select, from the five choices provided, the one which duplicates the conditions given in the far left box. Before each subtest, examples are given so that the task requirements are clear to the examinee. The test is given in Appendix F.

The reliability of the test (Scale-2, Form-A) by Spearman-Brown formula is 0.79 and K-R Formula 21 is 0.81. Direct concept validity of the test is 0.85.
For conducting the test, test booklets and answer-sheets were distributed to the pupils. The students were asked to fill in the information at the top of the answer-sheet. Then all the necessary instructions were given to the students. Time limits were strictly adhered to. For scoring the answer-sheets scoring key available for scale 2 was used. The stencil key was laid over the left-hand side of the answer-sheet, using the 'Check-star' to adjust it to the proper position. The total number of X’s showing through the holes was counted and this number was recorded in the total score space on the answer-sheet. These raw scores were then converted into normalized IQ scores using Table-2 provided in the manual for scales 2 and 3.

3.6.0 DEVELOPMENT OF EXPERIMENTAL MATERIAL FOR EXPERIMENTAL GROUP-I

Five units of VI class Hindi syllabus prescribed by Haryana Board of School Education constituted the course content covered in the experiment.

Keeping in mind all the concepts in each lesson to be covered in the experiment, outlines of all the lessons were constructed. The list of questions provided in the text-book was supplemented by developing additional questions from each lesson.

Three forms of mastery tests for each of the five units were constructed. These tests are an integral part of mastery learning model as they enable the teacher to find out whether the learner has attained the mastery level at the completion of each unit. It helps in identifying the
students' difficulties and thus in providing remedial measures appropriate to the needs of the student during the course of experiment. The procedural steps followed in constructing the formative/mastery tests were:

(1) Deciding the Subject and Units

Subject field identified for the purpose of experiment was Hindi. Five units selected were:

(i) Noun and Pronoun
(ii) Adjective
(iii) Verb and Adverb
(iv) Compound and Joining
(v) Idioms and Proverbs, Antonyms and Synonyms.

(2) Content Analysis

An analysis of learning units into its components was made. New content was defined in terms, facts, rules, principles, skills, procedures covered in the new material which had not been introduced to the students in prior learning units. Then a list of identified elements of new content was prepared.

(3) Formulation of Specific Objectives

Specific objectives in terms of behavioural outcomes of students were formulated. While formulating these objectives, all the contents to be covered in the experiment were kept in mind.
(4) Construction of tests

Three parallel forms of the test were developed keeping in mind the contents and the specific objectives. List of correct answers was also prepared for each of the three tests.

(5) External review

The three forms of test were subjected to review by experienced teachers teaching Hindi to Class VI. This was done in order to detect and eliminate flaws, if any.

(6) Internal review

Internal review was conducted to ensure that all the questions in the three forms of the test formative were in consonance with the specific objectives besides checking out deficiencies in the tests.

(7) Field trial

The three forms of the test formative were tried out on a small number of students ranging from 10-15. The tests were administered by the researcher herself so that any quarry or difficulty arising during the test could be treated.

(8) Final Internal review

After field trial the tests were subjected to the final review and final form was given to the testees.
3.6.1 DEVELOPMENT OF EXPERIMENTAL MATERIAL FOR EXPERIMENTAL GROUP-II

The experimental group-II was taught through gaming model. For teaching this group, the investigator took training in the use of gaming model from the supervisor. The investigator prepared lesson plans in Hindi. On the basis of lesson plan format (Appendix-G) for the gaming model. These lesson plans were discussed with the supervisor and were practised by the investigator under simulated conditions using gaming model. Gaming exercise were prepared in the same way used for teaching Hindi to the experimental group II by following the four phases of gaming model.

3.7.0 EXPERIMENTAL PROCEDURE

It consisted of three stages:

(i) Pre-testing (ii) Experimental Treatment and (iii) Post-testing

3.7.1 Pre-testing

Before the commencement of experiment, pre-tests were conducted. They were administered in all the three groups by the researcher herself. Co-operation of the class teacher was sought for conducting the tests properly. All the instructions were explained in clear terms to the students before administering the test. The pre-testing programme is given in Table 3.3.
Table 3.3
Programme of Pre-testing

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Date</th>
<th>Test administered in Control Group</th>
<th>Test administered in Experimental Group I</th>
<th>Test administered in Experimental Group II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.8.97</td>
<td>Intelligence test</td>
<td>Intelligence test</td>
<td>Intelligence test</td>
</tr>
<tr>
<td>2</td>
<td>5.8.97</td>
<td>Socio-economic Status Scale</td>
<td>Socio-economic Status Scale</td>
<td>Socio-economic Status Scale</td>
</tr>
<tr>
<td>3</td>
<td>6.8.97</td>
<td>Achievement test</td>
<td>Achievement test</td>
<td>Achievement test</td>
</tr>
<tr>
<td>4</td>
<td>7.8.97</td>
<td>Self-concept test</td>
<td>Self-concept test</td>
<td>Self-concept test</td>
</tr>
</tbody>
</table>

3.7.2 Experimental treatment

After pre-testing, the experimental treatment of teaching Hindi to class VI students was started. All the three groups control group, experimental group I and experimental group II were taught by the investigator herself. The control group was taught through conventional method of teaching, while the experimental group I was taught using Mastery Learning Model and the experimental group II was taught through gaming model.

(a) Teaching to Experimental Group I

This group was taught through mastery learning model. The criteria decided for mastery was 75% mastery by 75% of the students. The procedure consisted of the following mastery learning steps:
(i) **Informing the pupils about the Instructional Objectives**

Students were told about the units to be covered. They were also told about the sequence in which the units selected were to be taught. The concepts rules and processes involved were specifically made explicit to the students. Instructional objectives were made clear to the students. They were told about the mastery level decided.

(ii) **Assessment for pre-requisites**

The test was conducted to assess the pre-requisites for the first unit. The students found deficient in necessary pre-requisites were given the help they needed. It was done to ensure that all the students were equipped with the necessary pre-requisites before starting the teaching of first unit.

(iii) **Teaching the learning task to the class as a whole**

First unit was taught to the class as a whole employing the usual techniques of teaching with a view to bringing the maximum member of students to the level of maximum learning.

(iv) **Unit Formative Test-I**

The presentation of learning task was followed by assessment of the mastery level of the pupils by administering the formative test I. It helped the investigator in classifying the pupils in groups according to their levels of learning. Pupils who scored 75 percent mastery or above of the content taught were placed in one group called the mastery group. Rest
of the pupils were placed in another group called the non-mastery group.

(v) Differential Teaching Sessions

Non mastery group was further divided into subgroups. Students approximating the mastery level getting 60% or above but less than 75% required a little more practice which they were made to do themselves with additional materials related to the learning task to achieve mastery level. Students scoring 40% or above but below 60% were divided into smaller groups. They were assisted by small group peer instruction by the pupils of mastery group. Students getting 20% or above but less than 40% were taught individually by peers. The remaining group of students consisting of those who scored less than 20% were intensively taught by the teacher herself. In the light of the formative test-I, the teacher provided guidelines to the peers about how to assist pupils under their care. The teacher also told the students about their respective strength and weakness as shown by their performance in the test. They were also told about the necessary corrective measures.

(vi) Formative Test-II

The pupils were then administered formative test-II. On the basis of the results, the students were again divided into mastery and non-mastery groups. It was found that the number of students achieving mastery level had increased. Formative test results were utilised to plan further strategies in order to improve the non-mastery group of students to the mastery level.
(vii) **Intensive Teaching Session**

The number of students in non-mastery group was smaller than before. These students were assisted using both peer-tutoring and teacher-tutoring techniques. Additional instructional material was also used in the process. The students in the lowest range of scores were attended to personally by the teacher. They were helped through practice and drill.

(viii) **Formative test-III**

Formative test-III was then administered to the students. Results revealed that a considerable majority of students had been able to acquire the decided mastery level. The students who were unable to make to the mastery level were helped outside the class by the teacher. A few of them were also helped by the parents following the guidelines provided by the teacher.

(ix) **Teaching the next unit**

The teaching of second unit was started and the procedure and steps followed in teaching unit-I were repeated. All the five units selected for teaching during the experiment were taught in a similar manner.

(b) **Teaching to Experimental Group II**

Gaming model was used to teach the experimental group II. The games were prepared on the same content which was taught to the control group and experimental group I. For teaching the experimental group II
through gaming model, a lesson plan for each game was prepared according to the guidelines of Planning Guide provided by Weil Marsha and Bruce Joyce (1992). The syntax of the gaming model consists of four phases which were followed, are given below in Table 3.4.

Table 3.4
Syntax of Gaming Model

<table>
<thead>
<tr>
<th>Phase One: Orientation</th>
<th>Phase Two: Participant Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present the broad topic of the simulation and the concepts to be incorporated into the simulation activity at hand.</td>
<td>Set up the scenario (rules, roles, procedures scoring types of decision and to be made goals).</td>
</tr>
<tr>
<td>Explain simulation and gaming.</td>
<td>Assign roles.</td>
</tr>
<tr>
<td>Give overview of the simulation.</td>
<td>Hold abbreviated practice session.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase Three: Simulation Operations</th>
<th>Phase Four: Participant Debriefing (Any or all of the Following Activities)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct game activity and game administration.</td>
<td>Summarize events and perceptions.</td>
</tr>
<tr>
<td>Obtain feedback and evaluation (of performance and effects of decisions).</td>
<td>Summarize difficulties and insights.</td>
</tr>
<tr>
<td>Clarify misconceptions.</td>
<td>Analyze process.</td>
</tr>
<tr>
<td>Continue simulation.</td>
<td>Compare simulation activity to the real world.</td>
</tr>
<tr>
<td></td>
<td>Relate simulation activity to course content.</td>
</tr>
<tr>
<td></td>
<td>Appraise and redesign the simulation.</td>
</tr>
</tbody>
</table>

(i) Orientation Phase:

In the orientation phase, the teacher present the topic to be explored, the concepts that are embedded in the actual gaming, an explanation of the game if this is the student’s first experience with it, and on overview of the game itself. This part should not be lengthy but can be
an important context for the reminder of learning activity.

(ii) Participant Training:

In phase two, the students get into simulation. At this point the teacher sets up the stage by introducing the students, the rules, procedures, scoring, type of decisions to be made and goals of the game. Abbreviated practice session is organised to ensure that the students have become well conversant with all the rules and directions that are to be followed while carrying out the gaming.

(iii) Simulation:

At this stage of administration the actual game starts. Students take part in the game and teacher's role as a referee or coach also start. Whenever teacher requires that there are certain points or occasion where the students require feedback or clarifying it is done and their doubts are cleared.

(iv) Debriefing:

Phase four consist of summarising events. The teacher note perceptions and reaction of the students. The simulation is compared with the real world and activity to course content. The experiment took 12 weeks time.

Special care was taken to control time period for teaching all three groups. Courses in all the three groups were completed in time.
3.7.3 Post-testing

The completion of the teaching of contents to both the groups was followed by post-testing. The following tests were administered in both the groups. The programme of post-testing is summarised in Table 3.5.

**Table 3.5**

**Programme of Post-testing**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Date</th>
<th>Test administered in Control Group</th>
<th>Test administered in Experimental Group I</th>
<th>Test administered in Experimental Group II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>17.11.97</td>
<td>Achievement test</td>
<td>Achievement test</td>
<td>Achievement test</td>
</tr>
<tr>
<td>2.</td>
<td>18.11.97</td>
<td>Self-concept test</td>
<td>Self-concept test</td>
<td>Self-concept test</td>
</tr>
</tbody>
</table>

3.8.0 SCORING

Responses of each pupil to Intelligence Test, Socio-Economic Status Scale, Achievement Test and Self-Concept Test were measured using the prescribed scoring key or the key prepared for the purpose. These scores were then tabulated and statistical analysis done.

3.9.0 STATISTICAL ANALYSIS

Statistics has become an indispensable tool for research. It is fundamental to the proper analysis of data. In order to achieve the objectives of the study, the data collected was statistically analysed using the following techniques:
1. Analysis of Co-variance (ANCOVA) was used in order to adjust pupils’ achievement in Hindi on intelligence and socio-economic status. ANCOVA was used on pre-test, post-test and gain scores of achievement test in Hindi.

ANCOVA was also used in order to adjust pupils’ self-concept on intelligence and socio-economic status. ANCOVA was used on pre-test, post-test and gain scores of self-concept.

2. Mean and Standard Deviations were computed in respect of intelligence, socio-economic status, achievement and self-concept.

3. As the hypotheses of this study are directional, one tailed ‘t’ test was employed for testing the significance of difference between the means of pupils’ achievement in Hindi and their self-concept scores. This test was used on post-test and gain scores. The value of ‘t’ is computed with the help of the formula:

\[ t = \frac{M_1 - M_2}{\sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}} \]

where \( M_1 \) = Mean of first group;
\( M_2 \) = Mean of second group;
\( \sigma_1^2 \) = Variance of first group;
\( \sigma_2^2 \) = Variance of second group;
\( N_1 \) = Number of cases in first group
\( N_2 \) = Number of cases in second group
The value of ‘t’ was checked for its significance from the table of ‘t’ with degrees of freedom equal to \((N_1-1)+(N_2-1)\) at the 0.05 level under column \(P=0.10\) and at the 0.01 level under column \(P=0.02\).

Mean scores in respect of achievement in Hindi and self-concept were visually presented in histograms. Histograms were developed in respect of pre-test, post-test and gain scores of experimental group I, experimental group II and control group.

Thus, the procedure and design outlined in the foregoing pages was employed to pursue the objectives of the study. The methodology, tools and techniques described above were used during the course of this attempt. This provided the investigator with the data which is presented in the next chapter. The analysis and interpretation of this data will also follow in the chapter to come.