PROCEDURE OF THE STUDY
CHAPTER III
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The purpose of the present investigation is to study the effects of achievement motivation, self-concept and level of aspiration, independently and collectively in various combinations, on students' achievement and to examine the effectiveness of two designs of instruction, linear programme and mathetical programme. An experimental method is adopted as this method follows a problem solving approach involving the formulation and testing of hypotheses. The present chapter discusses the tools, controls, sample, design of the experiment, layout of the experiment, experimentation, data collection and statistical techniques used.

3.1 Description of Tools

To conduct the present study, the following tools are used.

- Self-Concept List (SCL) by Deo (1985).
- Level of Aspiration by Shah and Bhargava (1971).
3.1.1 Linear and Mathetical Programme Test

Linear and mathetical programmes on the topic 'competitive equilibrium' as related to Economics were developed by Kaur (1983). The particular topic 'competitive equilibrium' has been chosen by the programmer because this is very fundamental and every student studying Economics must be familiar with it. No doubt there are different types of market situations but this is the basic type of market situation which the programmer has selected.

The same content has been presented to the students in information form and in skill form. Thus, two programmes have been prepared, one pertaining to information content and having 295 didules and the other pertaining to skill content containing 118 didules. The first programme pertaining to information content has been selected for the present study.

The entire content of 'competitive equilibrium' was divided into three units. In both the programmes, the first unit pertained to the determination of equilibrium quantity and equilibrium price. The second unit included the effect of increase/decrease in demand on price, whereas the third unit explained the effect of increase/decrease in supply on price.

The validation of the programmes was carried out in three stages - individual testing, small group testing and field testing. The linear programmes were evaluated on the
basis of error rate and density at each stage. The error percentages at the individual testing, small group testing and field testing stages of the linear programme (pertaining to information content) have been 5.00, 2.96 and 1.48 respectively. This showed that the error percentage has decreased with every revision of the programme for revalidation. The error percentage is the maximum at the individual testing stage and minimum at the field testing stage.

Programme density was 0.14, 0.125 and 0.1136 at the individual, small group and field testing stages respectively which indicated that the number of repetitive respules increased as we moved from one stage of the programme validation to the next, thus making the programme less dense comparatively. Sequence progression was found out only at the field testing stage. In the small group testing and field testing stages, the linear programmes were evaluated on the basis of the student performance on the criterion tests which were used as pre and post tests at these stages. In mathetics programme, at each testing stage, the mistakes committed by all the students were taken note of and the programmes were revised to eliminate all the errors of any type. So, at each stage of testing, the programmes were validated against two types of criteria, internal and external. Internal validation was concerned with the frame analysis of the programmes, their error rate
and density. The external validation of the programmes was carried out by analysing the programmes on a '90/90' standard, against the criterion test.

The programmes were used as tools at the experimental stage of the study and have been given in appendices.

3.1.2 Criterion Test

The criterion test measures the terminal behaviour of the learners. This test can be used both as pre-test and post-test to find the changes brought in behaviour through the programme.

Criterion test used in the present study was developed by Kaur (1983) to measure the achievement of the students before and after studying through a linear programme and mathetical programme of instruction. The test was validated by the programmer at two stages - first draft and the second or final draft. The criterion test was validated by relating the objectives of the test with the areas of the content. The distribution of items through the entire range of the content showed that every objective was duly included in the final draft of the criterion test.

The reliability coefficient of the first and the final drafts of the criterion test as calculated by the programmer was 0.8845 and 0.91198 respectively.

The purpose of the test was to measure the terminal behaviour of the students taught through two different programme sets, linear type and mathetical type, based on
the main variable of content in the area of 'competitive equilibrium' in Economics.

3.1.3 Achievement Motivation Test

To measure the achievement motivation of the students, Rao's achievement motivation test is used as a tool.

There are 20 incomplete sentences, each of which is followed by two possible alternatives A and B, out of which one is an achievement related item. Though both the alternatives are achievement oriented and socially acceptable, yet one of them implies a higher sense of achievement and excellence. The student has to indicate the alternative he generally prefers. The test may be administered to a group or an individual. It is suitable for use on both sexes. There is no time limit but the group test takes about 8 to 10 minutes. The reliability of the test was determined by the test-retest method after an interval of one month. The coefficient of reliability was found to be 0.79. The test has been validated in two ways:

(a) The items for the test were selected in terms of the degree to which they differentiated between the upper and lower 27 percent of the individuals in a distribution of scores. Only those items which had a discriminating index of 0.25 and above were retained in the present form of the test.
The teachers of four secondary schools of Bhopal were explained the purpose of the test and the concept of achievement motivation, and they were asked to identify students who had 'very high' and 'very low' achievement motive. The test was administered to these two extreme groups. The means of the total weighted score were compared. The difference between the mean scores of the two groups was found to be significant at 0.01 level, which means that there is agreement between the judgement of the teachers and the scores on the achievement motivation test.

The test is scored with the help of the key. Each item of the test is followed by two responses of which one is high achievement related (HAR) and the other is general achievement related (GAR). The GAR responses get a score of one and the HAR responses get a score of three. The cumulative weighted score of all responses as provided in the key forms the achievement motivation score of the individual. The pupils obtaining a score in the range of 50 to 60 on the test may be considered as 'high' in their achievement motive, and the pupils obtaining the score in the range 33 to 44 as 'average' and the pupils obtaining a score in the range 20 to 32 as 'low' in their achievement motive.

3.1.4 Test of Self-Concept

Deo’s personality world list (PWL) is used to measure
the self-concept of the students. It is based on the self-reporting technique. Observations, projective techniques and self-reporting lists and inventories are some of the main methods used for measuring self-concept. Of these, self-reporting technique maintains its unique and important position because it has the single advantage of knowing exactly what the individual feels about himself. The check list consists of 212 adjectives which can measure all the aspects, perceived, ideal, real and social self of the individual and under each, the scores are obtained for each dimension in positive and negative classes. Later, the check list was shortened to 90 words by eliminating the opposite words and also some other words which did not evoke much of a response from the subjects. This rating scale is on a five point scale: very much like this, much like this, uncertain, not much like this and not at all like this. The rating scale can measure all the four aspects of the self-concept, the perceived, ideal, real and social, on all the dimensions for both positive and negative classes. The main purpose of SCL is to help persons in finding out and assessing what the individual thinks of himself and through the assessment, study many of the underlying problems of perception, motivations, learning and adjustment. The results can be used to assist the individual for better adjustment, better achievement and better successes in life.
Reliability was estimated by test re-test method. For the 15 days' interval, the reliability co-efficient came out to be 0.89 (N=595). Taking different time intervals from 15 days to three and a half months, the coefficients of correlation ranged from 0.62 to 0.86 (N ranging from 65 to 70). The correlations between consistency scores ranged from 0.84 to 0.98. These values indicate a high degree of consistency. It did not reveal any marked difference in the self-concepts of individual over these periods. This indicates that the self-concept list (PWL) gives a stable and reliable measure of self-concept.

The convergent and discriminant validity was found out for this self-concept list (PWL) besides establishing the content validity, because of the other usual methods of finding out validity did not suit the nature of this tool. For obtaining the convergent validity, another tool SCL (self-concept list) which had also been standardised, was utilised. The results show that the convergent correlations between the same dimensions in all cases are higher than the discriminant correlations, thus showing a high degree of the validity of the instrument.

3.1.5 Level of Aspiration Test

To measure the level of aspiration of the pupils, Shah and Bhargava's 'level of aspiration test' is used as a tool.
The test sheet of level of aspiration has 50 circles (each of 1 cm. in diameter) arranged in five rows of 50 circles, having two boxes on the right side. The upper box is for writing the number of completed or actual performance scores whereas lower box is for putting the number of expected performance or aspired scores.

The test can be administered individually as well as in a group. The procedure of scoring is an easy task. It provides three types of scores:

1. Goal Discrepancy Score (GDS).
2. Attainment Discrepancy Score (ADS).
3. The Number of Times the Goals Reach Score (NTGRS).

The difference between immediate past performance and the goal set thereafter reveals something about subject’s level of aspiration and may be called as goal discrepancy score (GDS). For example, the difference between the actual score of first trial and the goal set up for the next in the upper box of expected score, in the second trial, may be called as goal discrepancy score. Thus, in GDS we subtract the immediate past performance (actual score on the first trial) from new level of aspiration (expected score on the first trial).

If new level of aspiration is above the immediate past performance, the goal discrepancy score is positive, but if new level of aspiration lies below the level of past performance, the goal discrepancy score is negative.
The difference between the expected score and the actual score on the same trial may be called as attainment discrepancy score. Thus, in ADS we subtract actual performance from the expected performance. If the attainment discrepancy is positive, individual is over aspirant and if negative, he is under aspirant. Attainment discrepancy score may assess the tendency of the subject and adjust his goals in view of his actual performance.

The score pertaining to the number of times the goal is reached may be calculated by the number of trials where his actual score is equal or more than expected score. The subjective probability of success is measured indirectly from goal discrepancy and attainment discrepancy score but it can be measured by (NTGR) number of times the goal is reached. This provides an index of subject’s actual probability of reaching stated goal. There may be a minimum and maximum score with reference to the number of trials and it is expected of a subject with relatively high motivation to avoid failure to approach these two limits, minimum and maximum.

The index of validity of the test is not yet known. It may be stated that no test of the level of aspiration has made any mention of validity coefficient. Perhaps the question of validity is not relevant to study the level of aspiration. In this context, Muthayya (1959) writes that level of aspiration behaviour remains constant regardless of
means used to measure it. Muthayya's argument is understandable because question of validity arises when a real behaviour is inferred from another behaviour indirectly. In this situation, the respondent is involved in actual task proposed by him and the situation is by and large realistic for him. The test was standardised. The test retest reliability with a time gap of a month was found to be +84 (N=50).

3.2 Design of the Study

To find out the effectiveness of four variables viz. instructional design, achievement motivation, self-concept and level of aspiration on the achievement of students, experimental method was adopted. A factorial design was followed for the study which is usually employed to study the effect of two or more independent variables operating simultaneously. There were four independent variables and academic achievement of +2 students was the dependent variable. Effects of independent variables on dependent variable were studied both in terms of variables taken singly as well as taken together in different combinations to find out the interaction effect. According to Tuckman (1972), independent variable is that factor which is measured, manipulated or selected by the experimenter to determine its relationship to an unobserved phenomenon. The dependent variable is that factor which is observed and measured to determine the effect of independent variable.
The first factor i.e. instructional design was varied at two level i.e. linear programme and mathetical programme of instruction. The remaining three factors viz. achievement motivation, self-concept and level of aspiration were varied at two levels each; high and low. Two levels of the instructional design chosen for the present study, linear programme and mathetical programme of instruction, are designated as D₁ and D₂ respectively. Factor of achievement motivation is designated as n-Ach, and its two levels are n-Ach₁ and n-Ach₂ corresponding to high achievement motivated and low achievement motivated groups respectively. The factor of self-concept is designated as S and has two levels viz. S₁ and S₂ representing high and low self-concept groups respectively. The factor of level of aspiration is designated as A and varied at two levels viz. A₁ and A₂ corresponding to high level of aspiration and low level of aspiration groups respectively.

The total number of different combinations came out to be 2x2x2x2 = 16, as is shown in the Table 3.1. A treatment was obtained by selecting one level from each of the four factors viz. D₁, n-Ach₁, S₁ and A₁ representing a treatment consisting of programmed learning for high n-Achievement subjects having high self-concept and high level of aspiration.

The layout of the factorial design followed for the conduct of present experimental study is given below in Table 3.1A.
3.3 Sample

The sample pool for the present study consisted of 1200 students of schools of Chandigarh and its suburbs. It consisted of both boys and girls drawn on the basis of random sampling. The population comprised the students of +2 class of different schools of Chandigarh and its suburbs. Random samples are those which are drawn so that there is no bias at all and that every case in the population has an equal chance of being selected (Rummel, 1958).

The structure of sample in respect of the schools taken for the experiment is presented in Table 3.2.
Table 3.1A
Treatment Combinations of 2x2x2x2 Experimental Design

<table>
<thead>
<tr>
<th>Instructional Design</th>
<th>n-Achievement</th>
<th>Self-Concept</th>
<th>Level of Aspiration</th>
<th>Treatment Combinations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n-Ach₁</td>
<td>S₁</td>
<td>A₁</td>
<td>D₁n-Ach₁S₁A₁</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S₂</td>
<td>A₂</td>
<td>D₁n-Ach₁S₂A₂</td>
</tr>
<tr>
<td></td>
<td>n-Ach₂</td>
<td>S₁</td>
<td>A₁</td>
<td>D₁n-Ach₂S₁A₁</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S₂</td>
<td>A₂</td>
<td>D₁n-Ach₂S₂A₂</td>
</tr>
<tr>
<td></td>
<td>n-Ach₁</td>
<td>S₂</td>
<td>A₁</td>
<td>D₂n-Ach₁S₂A₁</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S₁</td>
<td>A₂</td>
<td>D₂n-Ach₂S₂A₂</td>
</tr>
<tr>
<td></td>
<td>n-Ach₂</td>
<td>S₂</td>
<td>A₁</td>
<td>D₂n-Ach₃S₂A₂</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S₁</td>
<td>A₂</td>
<td>D₂n-Ach₂S₂A₂</td>
</tr>
</tbody>
</table>

Total Combinations 16

The school-wise distribution of the sample is given in table 3.2.
### Table 3.2

**School-Wise Sample Structure**

<table>
<thead>
<tr>
<th>Sl. Sample No.</th>
<th>Sample Size</th>
<th>Name of the School</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>52</td>
<td>Govt. Model Senior Secondary School, Sec.10, Ch.</td>
</tr>
<tr>
<td>2</td>
<td>52</td>
<td>Dev Samaj Senior Secondary School, Sec.21-D, Ch.</td>
</tr>
<tr>
<td>3</td>
<td>48</td>
<td>Govt. Girls Senior Secondary School, Sec.8, Ch.</td>
</tr>
<tr>
<td>4</td>
<td>51</td>
<td>D.A.V. Senior Secondary School, Sec.8-B, Ch.</td>
</tr>
<tr>
<td>5</td>
<td>45</td>
<td>Moti Ram Arya Senior Secondary School, Sec.27, Ch.</td>
</tr>
<tr>
<td>6</td>
<td>126</td>
<td>Govt. Senior Secondary School, Sec.19, Ch.</td>
</tr>
<tr>
<td>7</td>
<td>47</td>
<td>Govt. Girls Senior Secondary School, Sec.18, Ch.</td>
</tr>
<tr>
<td>8</td>
<td>21</td>
<td>D.A.V. Model School, Sec.15-A, Ch.</td>
</tr>
<tr>
<td>9</td>
<td>47</td>
<td>Govt. Senior Secondary School for Boys, Sec.23, Ch.</td>
</tr>
<tr>
<td>10</td>
<td>147</td>
<td>Govt. Senior Secondary School for Girls, Sec.23, Ch.</td>
</tr>
<tr>
<td>11</td>
<td>70</td>
<td>Govt. Senior Secondary School for Boys, Sec.20, Ch.</td>
</tr>
<tr>
<td>12</td>
<td>63</td>
<td>Govt. Girls Senior Secondary School, Sec.20-B, Ch.</td>
</tr>
<tr>
<td>13</td>
<td>53</td>
<td>Govt. Model Senior Secondary School, Sec.35-B, Ch.</td>
</tr>
<tr>
<td>14</td>
<td>156</td>
<td>Govt. Model Senior Secondary School, Sec.37-B, Ch.</td>
</tr>
<tr>
<td>15</td>
<td>36</td>
<td>Govt. Model Senior Secondary School, Sec.40, Ch.</td>
</tr>
<tr>
<td>16</td>
<td>86</td>
<td>Govt. Senior Secondary School, Sec.38, West, Ch.</td>
</tr>
<tr>
<td>17</td>
<td>47</td>
<td>Govt. Senior Secondary School, Dhanas, Ch.</td>
</tr>
<tr>
<td>18</td>
<td>53</td>
<td>Govt. Senior Secondary School, Sec.16, Ch.</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1200</strong></td>
<td></td>
</tr>
</tbody>
</table>

For the formulation of experimental groups out of the sample pool Kelley's (1939) criterion of taking top 27 percent and bottom 27 percent was used in respect of two
levels of each of the variables of achievement motivation, self-concept and level of aspiration. Thus, eight groups (2x2x2) were formulated on the basis of the three aforesaid variables. Twenty students from each of the eight groups were chosen on the basis of random selection. Thus, 160 (20x8) students were finally selected for the experiment. Two groups of 10 students each within each of these 8 categories were formed again on the basis of random selection. Out of these two groups, one group was taught by D₁ (linear programme) and the other group was taught by D₂ (mathetics programme). Thus, 80 students were taught through D₁ and an equal number through D₂.

3.4 Experimental Controls

Various controls were exercised at the experimental stage. The following controls given by Tuckman (1962) were kept in mind.

- The factor of instrumentation was taken care of as same criterion test was used as pretest and post-test, thus, decreasing the likelihood of any change in the criterion test at two administrations of the same at the experimental stage.

- The sample selected for experimentation was random both in view of the selection of the various sections from different institutions as well as the assigning of treatment variables to them.
Experimental mortality was controlled by keeping the duration of each cycle of experiment of a very small duration of three days each.

3.5 Experimental Procedure

Before conducting the experiment, the subjects were made to understand that the aim of the experiment was to examine some research work and not to evaluate their performance. They were asked to be honest and free while answering in the tests. Sympathetic and friendly attitude was adopted to establish a rapport with them.

The experiment was conducted with a definite schedule which was followed in different schools. The first phase of the experiment was to administer the tests of achievement motivation, self-concept and level of aspiration. It took about two months in all, three days being spent in each school. First of all, achievement motivation test was given to the students on one day and on the following days the tests for self-concept and level of aspiration were given.

The following directions were given for administering the achievement motivation test:

"This is an attempt to understand you and help you to do well, whatever you want to do in life. Below are given 42 incomplete sentences with two possible alternatives, A & B which complete the sense. There is nothing like a right or wrong answer. Both the statements are correct. Put a tick mark against only one of the alternatives which you prefer."
This has nothing to do with your examination. Feel free to answer all the questions frankly. There is no time limit, but work rapidly. The students of your age generally takes 8 to 10 minutes.

On the second day self-concept test (PWL) was given to the students. Instructions printed on the list were explained by the tester so that the subjects do not hesitate to give their honest and frank response in the correct manner. After the directions were fully explained, the subjects were given a chance to ask any questions for the clarification of their doubts and queries. There is no time limit for SCL (PWL) but usually subjects take about 15 to 20 minutes for filling up the list.

Similarly, on the third day, following instructions were provided for the level of aspiration test to the subjects before a actual work began:

"You are going to do a simple task. You have a set of 50 circles in front of you, the purpose is to draw four lines in these circles so that it appears like a face. You must draw a line in a sequence working from left to right across the rows and then pass on to the next line. For each test there are thirty seconds for work and at the end of thirty seconds, I will ask you to stop. You count the number of completed faces and enter this number into the appropriate upper box. In the box below, you enter the number of faces, you intend to complete in the next thirty
seconds' period. This number should represent your immediate goal for the next trial. The faces should be constructed in the order right eye, left eye, nose and mouth. In the same way, you have to complete 17 trials, 15 for actual work and the first and the last trial will be ignored." The same schedule and procedure was adopted in different schools.

Before exposing the subjects to the learning materials in the second phase of the experiment i.e. learning through the linear programme and mathetical programme of instruction, criterion test was administered as a pretest to assess their initial knowledge about the subject matter. The same phase of the experiment i.e. learning though linear programme and mathetics programme took about two month's duration. Same criterion test was given to them again as the post test. The difference between pre criterion test and post criterion test was found out by the experimenter. The gain scores, thus worked out, were organised for statistical analysis.

3.6 Analysis of Variance

Analysis of variance gives a global picture about the nature of variance.

It is a method for dividing the variations observed in experimental data into different parts, each part assignable to a known source, cause or a factor. It is mostly used for important and oft-encountered problem of determining the significance of the difference among several
means. In this technique the important factor is that variance can be simultaneously analysed into two components: the mean of the variance within the group and the variance of the group means. Non chance variations among means, somewhere in the sets, are indicated by 'F' value while 't' value signifies which and how many means are significantly different.