CHAPTER – III

METHOD OF THE STUDY

3.1 INTRODUCTION

Design of the study is an essential part of a research project, because design provides a picture of what and how to do the work before starting it. It has been determined from time to time that a suitable research design guards against the collection of irrelevant data and gives more economy. So, in any research project, design provides the researcher a blue print of research, dictates the boundaries of project and help in controlling the experimental extraneous error of the problem under investigation. The present chapter includes the method of study which covers the objectives, hypotheses, sample, design of the study, tools and techniques used for the data analysis.

3.2 METHOD OF THE STUDY

A quantitative approach was followed. Burns and Grove (1993:777) define “quantitative research as a formal, objective, systematic process to describe and test relationships and examine cause and effect interactions among variables. Surveys may be used for descriptive, explanatory and exploratory research”. According to Mouton (1996), “A descriptive survey design was used. A survey is used to collect original data for describing a population too large to observe directly”. A survey obtains information from a sample of people by means of self-report, that is, the people respond to a series of questions posed by the investigator. In this study the information was collected through self-administered questionnaires distributed personally to the subjects by the researcher. A descriptive survey was selected because it provides an accurate portrayal or account of the characteristics, for example behaviour, opinions, abilities, beliefs, and knowledge of a particular individual, situation or group. This design was chosen to meet the objectives of the study, namely to determine the knowledge and views of patients and family members with regard to diabetes mellitus and its treatment regimen (Burns & Grove 1993:29).
3.3 PROCEDURE OF THE STUDY

The study was conducted on 400 senior secondary school students studying in government and private school of Gurgaon and Rohtak districts of Haryana. The investigator visited the different senior secondary schools and requested the principals to allow her to collect the data. After seeking approval from the principals and teachers the investigator visited the schools and established a rapport with the students. She told the students about the objectives of administering these tests. It was explained that these tests are for research purpose only and these have nothing to do with their examination. They were informed that no answer is right or wrong. So they may feel free to write the answers. It was made clear that the data so obtained would be kept secret and will be used for research purpose only. Then necessary instructions regarding the tests were read with clarity and loudness. Afterwards, Introversion-Extroversion Inventory by Aziz and Gupta (2005), Intelligence Test by Mehrotra (2012) and Achievement Motivation Scale (n-Ache) by Deo and Mohan (2011) were administered to the subjects. The investigator remained in the classroom to supervise the students while they completed the tests. Their answer sheets were collected and scoring was done strictly according to the procedures mentioned in the manuals. Academic achievement of the students was determined on the basis of marks obtained in XI class conducted by Board of School Education Haryana and CBSE New Delhi.

3.4 POPULATION AND SAMPLE
3.4.1 Population

According to Burns and Grove (1993), “a population is defined as all the elements (individuals, objects and events) that meet the sample criteria for inclusion into a study”. The population consisted of all senior secondary school students who are studying in various schools of districts Gurgaon and Rohtak of Haryana.
3.4.2 Sampling

Measuring the entire population is impracticable though not entirely impossible. Therefore, a sample from the concerned population may be drawn for the purpose of data collection. The state Haryana has four divisions namely Ambala, Gurgaon, Hisar and Rohtak. Out of these four divisions, Gurgaon and Rohtak division was chosen randomly by using lottery method. At the second stage, all the districts of Gurgaona and Rohtak division were written on the separate chits and two districts Gurgaona and Rohtak was randomly picked. From these districts, the list of schools prepared by the Directorate of Education was procured. Thereafter, twenty schools were selected randomly study. In the present study, multi-stage stratified random sampling technique was used to select the sample of 400 sennior secondary school students from government and private schools of Gurgaon and Rohtak districts.

Layout of the Sample:

- 400 Senior Secondary School Students
  - 200 (Male)
    - 100 (Government School Students)
      - Urban 50
      - Rural 50
    - 100 (Private School Students)
      - Urban 50
      - Rural 50
  - 200 (Female)
    - 100 (Government School Students)
      - Urban 50
      - Rural 50
    - 100 (Private School Students)
      - Urban 50
      - Rural 50
3.5 VARIABLES OF THE STUDY:

Independent Variables
- Personality
- Intelligence
- Achievement Motivation

Dependent Variable
- Academic Achievement
3.6 TOOLS USED

The tools used for the present study are related to adolescent students studying at senior secondary level and the current one. The idea behind taking these tools was their availability, language, bi-lingual and related to problems of the study. These tests are culture free and are developed for Indian context and are widely accepted in the field of educational and psychological research.

1. Introversion-Extroversion Inventory by Aziz and Gupta (2005);
2. Intelligence Test by Dr. P.N. Mehrotra (2012);
3. Achievement Motivation Scale (n-Ache) by Deo and Mohan (2011); and
4. Academic achievement scores was taken from the performance in 11th class of the subjects.

3.6.1 Description of Tools Used

(i) Introversion-Extroversion Inventory by Aziz and Gupta

The present inventory aims at studying whether an individual is predominantly extroverted or predominantly introverted or falls somewhere in the middle of the continuum. The inventory has been designed for application to Hindi knowing adults.

Item Analysis

The preliminary form of the inventory was administered on a sample of 200 individuals (100 males and 100 females). Item analysis was done by analysing the scores of the top '27%' and the bottom 27% with the help of J. C. Flanagan’s table of normalized biserial coefficients. Out of the 70 items 60 implying good discriminative power, were selected for the final form of the inventory. Thus the final form of the inventory has 60 items - 30 pertaining to an introvert's characteristics and 30 to an extrovert's characteristics.

Standardization Sample

The inventory was then administered in five far-flung cities of the U. P. state- Dehradun and Meerut in the Western U. P., Allahabad in the Central U.P., and Basti and Rai Bareli in the Eastern U.P. on a sample of 792 individuals consisting of students, teachers, doctors, lawyers, engineers, businessmen, housewives etc.
Reliability

The reliability was determined on a sample of 361 male and female subjects by the test-retest method after an interval of 15 to 20 days. Table 1 gives the retest reliability coefficient, index of reliability and standard error of measurement. Standard error of measurement was found to be 4.50, indicating that the true scores did not deviate too greatly from their true values.

**TABLE**

*Reliability of the Inventory*

<table>
<thead>
<tr>
<th>Method</th>
<th>N</th>
<th>r</th>
<th>Index of Reliability</th>
<th>SE means.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test-retest</td>
<td>391</td>
<td>.91</td>
<td>.95</td>
<td>4.50</td>
</tr>
</tbody>
</table>

Validity

Cross validation was carried out on a sample of 288 individuals. The criterion related validity was determined by correlating the scores obtained on the inventory with the scores obtained by the subject on the Neymann Kohlstedt Introversion-Extroversion Test. The validity coefficient obtained is 0.95, which is significant beyond 0.01 level.

Scoring

Scoring system is very easy. Extrovert responses are considered to be correct. One mark is awarded for each correct response. Score obtained = No. of correct responses - No. of incorrect responses. The subject obtains a plus score when the No. of correct responses exceeds that of the incorrect ones; he gets a minus score when the No. of incorrect responses exceeds that of the correct ones. If the subject's score ranges between - 15 and + 15 he is said to be an ambivert. If the score is above + 15 he is said to be an extrovert; and if the score is below -15 he is said to be an introvert.

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below-15</td>
<td>Introvert</td>
</tr>
<tr>
<td>-15 and +15</td>
<td>Ambivert</td>
</tr>
<tr>
<td>Above +15</td>
<td>Extrovert</td>
</tr>
</tbody>
</table>
(ii) Description of P.N. Mehrotra’s Intelligence Test

The present test has been prepared in a spiral—omnibus form providing selective form of items for both parts of the test, which may be conveniently used in a group form. The test can be used on school-going pupils between 11 to 17 years. This test has been constructed on the lines of Wechsler—Bellevue Scale of Intelligence. The author has included ten sub-tests, five each in verbal and nonverbal tests, in this test. They are as follows:

<table>
<thead>
<tr>
<th>A</th>
<th>Verbal Tests</th>
<th>B</th>
<th>Non-Verbal Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Analogy test</td>
<td>1</td>
<td>Analogy test</td>
</tr>
<tr>
<td>2</td>
<td>Number-series test</td>
<td>2</td>
<td>Arrangement test</td>
</tr>
<tr>
<td>3</td>
<td>Classification test</td>
<td>3</td>
<td>Classification test</td>
</tr>
<tr>
<td>4</td>
<td>Vocabulary test</td>
<td>4</td>
<td>Digit-symbol test</td>
</tr>
<tr>
<td>5</td>
<td>Reasoning test</td>
<td>5</td>
<td>Part-fitting test</td>
</tr>
</tbody>
</table>

All these sub-tests are mostly saturated with ‘g’ factor.

The present test, thus, consists of two tests, i.e., verbal and non-verbal, these tests contain five sub-tests each. Both verbal and non-verbal tests have fifty items each organized in an omnibus selective form. Since the test consists of two types, i.e., verbal and non-verbal, it is conveniently called a mixed test of intelligence.

Preliminary try-out and item analysis

In order to select suitable items to be retained in the final form of the test, a preliminary try-out was conducted on a sample of 200 pupils of ages ranging from 11 to 17 years reading in VII to XII classes. For this purpose of the test, 200 items—20 items in each sub-test preceded by two problems for exercise in each—have been constructed. In evaluating items three major aspects, viz., difficulty level, discrimination power and internal consistency, were calculated. After a study of difficulty level of each item, items of 10 to 92 percent difficulty level were finally selected. For the study of discrimination power of the items, the 27 percent top and the 27 percent bottom groups were taken. In order to test internal consistency of an item, point biserial correlation was calculated. In this way, in the
final form of the test, item of varying difficulty levels, high discrimination power
and with positive and high correlation with the total test scores, were selected.

Sample

The sample for the purpose of constructing this test consists of 2101 school
going pupils drawn from various schools selected from thirteen districts of U.P.
stratified into three regions. These districts are Moradabad, Bijor, Meerut,
Rampur, Bareilly, Nainital, Shahjahanpur, Lucknow, Kanpur, Agra, Gorakhpur,
Allahabad and Varanasi.

Administration of the Test

The present test of intelligence is primarily a group test although it can be
used for individual testing as well. The instruction for each part of the test, i.e.,
verbal and non-verbal, are printed on the test form. The answers of questions are
to be given by the testee on answer sheet supplied to them. To minimize the work
of writing on the part of a testee, the answers were framed in such a manner that
the testee has to give an answer to a question in a digit form. The full test consists
of a work of 20 minutes only, i.e., 10 minutes each for verbal and non-verbal test.
The test can be administered even by an ordinary man as no special training for
the administration of the test is required. The test can be administered
conveniently within a period of one and an half hour in a classroom consisting of
not more than 40 pupils.

When the pupils are properly seated in appropriate position, the tester
should start with preliminary talk to them regarding the test. Thereafter, the test-
booklets alongwith answer sheets of verbal test should be distributed among pupils
with the assistance of two helpers who may be the senior students of the school.
After that the tester should request the pupils that they should fill in the required
columns given on the above side of the answer-sheet. When the pupils say that
they have filled in the required columns, the test should read out the instructions
given on the test and should write the examples on the black-board. Then the
pupils should solve those problems given in the beginning of the test under the
head ‘examples’. After solving the problems, the tester should enquire from the
pupils if there was any difficulty in filling the answers in the appropriate columns
of the answer-sheets given to them? When the tester himself is satisfied, he should announce, “Do not start the work until you are asked.”

When these preliminaries are completed, he should order the pupils to start the work. The time must be noted. After ten minutes, testee is asked to stop his responses on verbal test. The same procedure may also be adopted for non-verbal test. No extra time should be given to any pupil.

**Scoring**

An easy method of scoring in the present test has been followed. In each test, only one correct answer is to be selected by a pupil for one question from the different alternatives given under each question. In scoring, credit of one point should be given for each correct answer and zero for each incorrect answer. No marks should be deducted for wrong answers. For scoring, scoring keys have been prepared for verbal and non-verbal test separately. After setting the scoring key on the answer-sheet, the wrong and left out questions should be crossed.

The number of correct questions should be counted in each test, i.e., verbal and non-verbal, which becomes the raw score of a pupil. This raw score can be interpreted in any manner according to different types of norms given.

**Reliability of the Test**

The reliability of this test has been calculated by three methods. The reliability co-efficient thus obtained by these methods are given as below.

<table>
<thead>
<tr>
<th>Methods of reliability</th>
<th>Verbal test</th>
<th>Non-Verbal test</th>
<th>Full test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Split half</td>
<td>.91</td>
<td>.81</td>
<td>.88</td>
</tr>
<tr>
<td>Test-retest</td>
<td>.89</td>
<td>.82</td>
<td>.86</td>
</tr>
<tr>
<td>Kuder Richardson</td>
<td>.90</td>
<td>.80</td>
<td>.85</td>
</tr>
</tbody>
</table>

These figures suggest that the test is confidently reliable.

**Validity of the Test**

In order to find out the validity of the test, given criteria have been adopted. The following validity co-efficient are thus obtained by these criteria.
**Correlation with Teacher’s Ratings**

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Verbal Test</td>
<td>.86</td>
</tr>
<tr>
<td>B. Non-verbal test</td>
<td>.72</td>
</tr>
<tr>
<td>C. Full test</td>
<td>.87</td>
</tr>
</tbody>
</table>

**Correlation with Examination Marks**

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Verbal Test</td>
<td>.36</td>
</tr>
<tr>
<td>B. Non-verbal test</td>
<td>.30</td>
</tr>
<tr>
<td>C. Full test</td>
<td>.39</td>
</tr>
</tbody>
</table>

**Correlation with other Tests Scores**

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Verbal Test and Jalota’s test scores</td>
<td>.54</td>
</tr>
<tr>
<td>B. Non-Verbal Test and Jalota’s test scores</td>
<td>.37</td>
</tr>
<tr>
<td>C. Verbal test and Bhatia’s test scores</td>
<td>.53</td>
</tr>
<tr>
<td>D. Non-verbal test and Bhatia’s test scores</td>
<td>.61</td>
</tr>
<tr>
<td>E. Full test and Jalota’s test scores</td>
<td>.47</td>
</tr>
<tr>
<td>F. Full test and Bhatia’s test scores</td>
<td>.56</td>
</tr>
</tbody>
</table>

**Sub-tests validity in terms of ‘g’ saturation**

All sub-tests, except analogy test of non-verbal test, are highly saturated with ‘g’ factor loadings which range from .2478 to .8269.

**Factorial Validity**

Factorial validity in the present test has been ascertained by Hotelling’s principal components method. The author has followed the procedure of extracting actors as has been given by Kendall. In all, ‘ten factors have been extracted.

An analysis of the factor loadings clearly reveals that the present test is heavily loaded with ‘g’ factor.

**Norms**

To provide basis for interpreting raw scores rendered by pupils, various types of norms have been prepared. These norms are age and grade-wise standard scores, T-Scores, Deviation I.Q. and Centile norms. Besides, tentative norms in
terms of mean scores and standard deviations according to the age and grades have
been prepared to present a quantitative analysis of data.

(iii) **Achievement Motivation Scale**

The term motivation refers to an organismic state that mobilizes activity
which is in some sense selective or directive as suggested by Deo and Mohan
(2011). It is one of the most important personality variable, that manifests social
needs; their needs to be measured on a relevant scale

**Development of the Scale**

The Deo Mohan scale was developed to measure the achievement
motivation, as a variable used in many studies in education either as a main
variable or as a secondary variable; or as a moderator variable. This standard
verbal scale has been found to be a very useful instrument for research in
achievement motivation. This scale covers three areas, i.e., academic factors;
factors of general field; and social interests. It contains 50 items.

**Academic factors**

**Academic factors include**, “academic motivation, need achievement, academic
challenge, achievement anxiety, importance of grades or marks, meaningfulness of
school/college tasks, relevance of school/college to student’s future, attitude
towards education, work methods, attitude towards peers, warmth of interpersonal
relations, college concern for the individual, and implementation of educational
objectives”.

**Factors of general field of interest** include “competition in co-curricular and
curricular activities like sports and athletics, fine arts and dancing, music,
painting, debates and orations, mountaineering or hill climbing or hiking, cross-
country races, sports, domestic crafts for girls : cooking, embroidery etc., reading
and writing, and experimentation or any act of creation”.

**Social interests include** “activities such as organizing and participating in social
activities, arranging exhibitions, social functions etc”.

**Criteria for the Choice of Items in the Scale**

Items in the scale involved achievement imagery related to known
achievement experiences of the respondents in a comprehensive and accessible
language. Final form of the scale comprised 50 items having five options for rating, that is, always, frequently, sometimes, rarely and never; out of which 13 items are negative with numerical values 0 to 4 and 37 items are positive with numerical values 4 to 0 respectively, as shown in the table given below.

### Description of the items of Achievement Motivation Scale

<table>
<thead>
<tr>
<th>S.No.</th>
<th>FACTORS</th>
<th>No. of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>ACADEMIC MOTIVATION</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>NEED FOR ACHIEVEMENT</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>ACADEMIC CHALLENGE</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>ACHIEVEMENT ANXIETY</td>
<td>1</td>
</tr>
<tr>
<td>5.</td>
<td>IMPORTANCE OF GRADES/MARKS</td>
<td>2</td>
</tr>
<tr>
<td>6.</td>
<td>MEANINGFULNESS OF TASK</td>
<td>4</td>
</tr>
<tr>
<td>7.</td>
<td>RELEVANCE OF SCHOOL/COLLAGE TO FUTURE GOALS</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>ATTITUDE TOWARDS EDUCATION</td>
<td>4</td>
</tr>
<tr>
<td>9.</td>
<td>WORK METHODS</td>
<td>5</td>
</tr>
<tr>
<td>10.</td>
<td>ATTITUDE TOWARDS TEACHERS</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>INTERPERSONAL RELATIONS</td>
<td>4</td>
</tr>
<tr>
<td>12.</td>
<td>INDIVIDUAL CONCERN</td>
<td>2</td>
</tr>
<tr>
<td>13.</td>
<td>GENERAL INTERESTS</td>
<td>4</td>
</tr>
<tr>
<td>14.</td>
<td>DRAMATICS</td>
<td>2</td>
</tr>
<tr>
<td>15.</td>
<td>SPORTS ETC.</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>

### Final Form of the Scale

After item analysis, some changes were made in the scale. Firstly, the questions were changed to statements form to avoid the feeling of irritation and monotony to the respondents. Secondly, Hindi version of the scale was also prepared for convenience of the respondents. In the final scale, out of 50 items, 13 are negative and 37 are positive items.

### Reliability

Test-retest method was applied to obtain the reliability coefficient of the scale. Taking different sets of the sample; the administration of the scale created
on several occasions, the results are given in table given below:

<table>
<thead>
<tr>
<th>Sample</th>
<th>N</th>
<th>Interval</th>
<th>R</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Group</td>
<td>51</td>
<td>4 weeks</td>
<td>0.69</td>
<td>0.01</td>
</tr>
<tr>
<td>Male</td>
<td>33</td>
<td>5-6 weeks</td>
<td>0.67</td>
<td>0.01</td>
</tr>
<tr>
<td>Female</td>
<td>50</td>
<td>5-6 weeks</td>
<td>0.78</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Validity

As far as the validity of the scale is concerned, in the first instance the item validity established by the high-low discrimination method was accepted as the validity of the whole measure. Besides, this scale was also used for validating the projective test of achievement motivation. The coefficient of correlation between the scale and the projective test was observed to be 0.54 which speaks for the validity of the scale also, the validity being of the concurrent nature. Finally, the scale scores were also correlated with the scores obtained by administering the Aberdeen academic motivation Inventory of Entwistle (1968) yielding a coefficient of correlation as .75 for a mixed sample of .93.

Scoring

Two keys are to be used for scoring, one for positive items that carries the weights of 4,3,2,1 and 0 and the other for negative items to be scored 0,1,2,3 and 4 for the categories Always, Frequently, Sometimes, Rarely and Never respectively. The minimum score obtained can be ‘0’ (zero) and the maximum can be 200, other scores ranging between these limits.

Norms and Interpretation of the obtained Raw Scores

The Scores theoretically range between 0 to 200 and an obtained score for any person will be in between these two limits. This obtained score shall be the Raw Score, and for interpretation of the Raw Scores, z-Score Norms are presented age-wise, viz., 13,14,15,16,17 and 18 and for 19 years and more. Z-Score Norms on the basis of Mean and Standard Deviation of the Total Sample of 635 have
been prepared and presented for interpretation in terms of the level of Achievement Motivation.

3.7 **STATISTICAL TECHNIQUES USED**

Completion of any scientific analysis is possible only with the use of some of statistical processing. The acceptance or rejection of hypothesis will ultimately determine the contribution of the investigation in the scientific development of a particular area. This is especially true for statistical techniques in the analysis for interpretation of data.

The following statistical techniques were used for analysis of data:

- Descriptive Statistics such as Mean, Standard Deviation were calculated to describe the nature of data.
- ‘t’ test was used to compare the different groups under consideration.
- Karl Pearson’s Product Moment Correlation was used to see the relationships between variables under study.
- Analysis of Variance (ANOVA) was used to see the interaction effect.
- The following levels were established for comparison.
  - A. 0.05 level
  - B. 0.01 level