CHAPTER– III
METHODOLOGY AND PROCEDURE

The study was titled as “Multivariate analysis of career maturity for academic performance, career decision-making, locus of control and dependence proneness among 10 + 2 level students”. The basic purpose of the study was to see the effect of academic performance, dependence proneness, career decisions making and locus of control on career maturity. To avoid wastage of time, money and efforts the researcher adopted a best-suited research design. Research design is the detailed plan of an investigation. It is a planning stage of research which is usually made logically visualizing its practicability. The selection of research components is done keeping in view the objectives of the research. Research hypotheses also provide the basis for designing a research work.

This chapter discusses the design, method and procedures of the study in regard to the following manners:

1. Research Method
2. Population
3. Sampling
4. Variables involved
5. Procedure of the study
6. Research tools
7. Collection and organization of data
8. Statistical techniques used for analysis of data
RESEARCH METHOD

The method of research is the procedure in which a researcher follows in attempting to achieve the goals of a research study. The choice of research method is generally determined by the objectives of the study, the hypothesis to be tested, the theory, concepts under study and the resources available to the researcher.

In order to make the present study to yield fruitful results, the investigator consulted available relevant literature and felt that the **ex-post facto** method is appropriate.

POPULATION

Before drawing a sample, the population to which it belongs, is defined by the researcher. A population refers to 'all the members of any well defined class of people, events or objects'. It represents a census or complete enumeration method in which all the units are reached or at least theoretically conceived to have been reached. The merit of such a concept is that the obtained results are representative, accurate and reliable. In the present study, the population consists of all XI class students studying in government aided madhyamik schools of Meerut district.

SAMPLING

Sampling is a sin-quo-non of scientific research. A sample is a portion of a population which is selected for the purpose of study.
Since in research it is neither practically expedient nor scientifically desirable to approach the total population, the technique of sampling is employed in which only a part of the population is drawn and studied.

A good sample, however, ensures three things freedom from bias, representativeness of the population characteristics and accuracy in terms of population qualities.

The first step in drawing the sample was to get the list of government aided madhyamik schools of Meerut district. For the purpose, a list of government aided madhyamik schools of U.P. Board was prepared by collecting the names of these schools from the office of the District Inspector of School (D.I.O.S.), Meerut.

The investigator consulted research experts for the size of the sample and decided to include about 8% of the population as sample of the study. There are about 133 government aided Madhyamic Schools of rural and urban area/general and minority institutions, recognised by Board of High School and Intermediate Education, Uttar Pradesh. A list of these schools is placed in Appendix-B. So, out of 133 schools, ten institutions were proposed to include in the sample of the study. These ten institutions were selected with the help of "Simple Random Sampling Technique" using "Lottery Method" as described below:

(i) S.D. Inter College, Sadar, Meerut city
Having selected the institutions the next important step was to establish a rapport with the principals of these institutions. The principals of each of these institutions were first contacted through a personal letter addressed to them and then the researcher personally went to each of the above institutions to have a contact with their principals. They were explained the significance and the purpose of the study and their co-operation were sought for a successful conduct of the study. Each one of the principals was highly co-operative and intended his or her co-operation willingly.

The sample of the study consisted of 600 students studying in class XI in government aided madhyamik schools of Meerut district. The institutions were selected by **Simple Random Technique** using
Lottery Method. Thereafter by using Stratified random sampling method, the total sample of about 600 students was selected.

VARIABLES INVOLVED

The variables are those which vary or change from person to person or from situation to situation. In proceeding to define the problem of the study, the variables are clearly identified and labelled. There are five types of variables usually identified in educational research. These are independent variable, dependent variable, moderate variable, control variable and intervening variables.

In the present study, Academic performance, locus of control, dependence proneness and career decision-making were identified as independent variables and career maturity was identified as dependent variable.

PROCEDURE OF THE STUDY

The research design is the detailed plan of the investigation. In fact, it is the blue print of the detailed procedure of testing the hypotheses and analysing the obtained data. The research design thus may be defined as the sequence of those steps taken ahead of time ensuring that relevant data will be collected in a way that permit objective analysis of the different hypotheses formulate with respect to the research problem.
The selection of the research method is obviously based on purpose of investigation, type of variables and conditions in which the research is to be conducted. The present study was carried out within **ex-post-facto research method** involving **group difference method** and **factorial analysis of variance**.

In ex-post-facto design, the changes in independent variables had already taken place and the researcher studied them in retrospect for their possible effects on the observed dependent variable.

In the present study, within the broad framework of ex-post-facto research method, two designs were used:

(i) Group difference method

(ii) Analysis of Variance (ANOVA)

Group difference ('t' test) and ANOVA were used to study the difference of four independent variables (i) academic performance, (ii) career decision-making (iii) locus of control and (iv) dependence proneness and to career maturity in government aided madhyamik schools and to ascertain the contribution of each of the independent variables in predicting the career maturity of 10+2 level students. Mean and Standard Deviation were initially calculated.

The factorial design was adopted to study the main and interaction effects of four independent variables namely academic performance, locus of control, dependence proneness and career
decision-making on career maturity of 10 + 2 level students of government aided madhyamik schools.

In the factorial design, the term factors refer to the independent variables and the level of their variations. The first factor is academic performance which is varied in two ways, high achievers and low achievers.

The second factor is career decision-making, this factor is also varied in two ways, certainty and uncertainty in career decision-making. The third factor is locus of control this factor is likewise varied in two ways internally controllable by their efforts and actions and externally controllable by chance or outside forces and fourth factor dependence proneness is also varied in two ways, high and low. Accordingly the present factorial design has been termed as 2 × 2 × 2 × 2 factorial design.

LAYOUT OF THE FACTORIAL DESIGN

In the 2×2×2×2 factorial design of the study academic performance has been designated as ‘A’ and two levels of it A₁ & A₂. The former corresponds to high achievers and the later corresponds to low achievers. Career decision-making, the second factor, has been designated as ‘B’ and its two levels as B₁ corresponding to its certainty about career and B₂ corresponding to its uncertainty about career. Locus of control, the third factor, has been designated as 'C'
and its two levels as $C_1$ corresponding to internally controllable and $C_2$ corresponding to externally controllable by chance or outside forces. Dependence proneness, the fourth factor, has been designated as ‘D’ and its two levels as $D_1$ corresponding to high level and $D_2$ corresponding to low level. The layout of $2 \times 2 \times 2 \times 2$ factorial design has been schematically presented in below table.

**Table: Schematic Presentation of Four Factors**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>A</th>
<th>B_1</th>
<th>B_2</th>
<th>B_1</th>
<th>B_2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A_1</td>
<td>B_1</td>
<td>B_2</td>
<td>B_1</td>
<td>B_2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_1</td>
<td>A_1B_1C_1D_1</td>
<td>A_1B_2C_1D_1</td>
<td>A_2B_1C_1D_1</td>
<td>A_2B_2C_1D_1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D_2</td>
<td>A_1B_1C_2D_2</td>
<td>A_1B_2C_2D_2</td>
<td>A_2B_1C_2D_2</td>
<td>A_2B_2C_2D_2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_2</td>
<td>A_1B_1C_2D_2</td>
<td>A_1B_2C_2D_2</td>
<td>A_2B_1C_2D_2</td>
<td>A_2B_2C_2D_2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The level of first two factors, 'A' and 'B' have been used in combination of each level of 'C' and 'D'. Accordingly the total numbers of treatment combinations are $2 \times 2 \times 2 \times 2 = 16$ for each type of variables and they are shown in table on next page.
Table: The Sixteen Treatment Combinations for Factorial Design

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Treatment</th>
<th>Academic Performance</th>
<th>Career decision-making</th>
<th>Locus of control</th>
<th>Dependence Proneness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A₁B₁C₁D₁</td>
<td>High</td>
<td>Certainty</td>
<td>Internal</td>
<td>High</td>
</tr>
<tr>
<td>2.</td>
<td>A₁B₁C₁D₂</td>
<td>High</td>
<td>Certainty</td>
<td>Internal</td>
<td>Low</td>
</tr>
<tr>
<td>3.</td>
<td>A₁B₁C₂D₁</td>
<td>High</td>
<td>Certainty</td>
<td>External</td>
<td>High</td>
</tr>
<tr>
<td>4.</td>
<td>A₁B₁C₂D₂</td>
<td>High</td>
<td>Certainty</td>
<td>External</td>
<td>Low</td>
</tr>
<tr>
<td>5.</td>
<td>A₁B₂C₁D₁</td>
<td>High</td>
<td>Uncertainty</td>
<td>Internal</td>
<td>High</td>
</tr>
<tr>
<td>6.</td>
<td>A₁B₂C₁D₂</td>
<td>High</td>
<td>Uncertainty</td>
<td>Internal</td>
<td>Low</td>
</tr>
<tr>
<td>7.</td>
<td>A₁B₂C₂D₁</td>
<td>High</td>
<td>Uncertainty</td>
<td>External</td>
<td>High</td>
</tr>
<tr>
<td>8.</td>
<td>A₁B₂C₂D₂</td>
<td>High</td>
<td>Uncertainty</td>
<td>External</td>
<td>Low</td>
</tr>
<tr>
<td>9.</td>
<td>A₂B₁C₁D₁</td>
<td>Low</td>
<td>Certainty</td>
<td>Internal</td>
<td>High</td>
</tr>
<tr>
<td>10.</td>
<td>A₂B₁C₁D₂</td>
<td>Low</td>
<td>Certainty</td>
<td>Internal</td>
<td>Low</td>
</tr>
<tr>
<td>11.</td>
<td>A₂B₁C₂D₁</td>
<td>Low</td>
<td>Certainty</td>
<td>External</td>
<td>High</td>
</tr>
<tr>
<td>12.</td>
<td>A₂B₁C₂D₂</td>
<td>Low</td>
<td>Certainty</td>
<td>External</td>
<td>Low</td>
</tr>
<tr>
<td>13.</td>
<td>A₂B₂C₁D₁</td>
<td>Low</td>
<td>Uncertainty</td>
<td>Internal</td>
<td>High</td>
</tr>
<tr>
<td>14.</td>
<td>A₂B₂C₁D₂</td>
<td>Low</td>
<td>Uncertainty</td>
<td>Internal</td>
<td>Low</td>
</tr>
<tr>
<td>15.</td>
<td>A₂B₂C₂D₁</td>
<td>Low</td>
<td>Uncertainty</td>
<td>External</td>
<td>High</td>
</tr>
<tr>
<td>16.</td>
<td>A₂B₂C₂D₂</td>
<td>Low</td>
<td>Uncertainty</td>
<td>External</td>
<td>Low</td>
</tr>
</tbody>
</table>

**RESEARCH TOOLS**

Tools are essential components of any scientific research endeavour. To provide a concrete frame to an abstract entity is very necessary in scientific researches. In educational and psychological researches, learning objectives can be realized by the achievement of
students and attitude through their knowledge. These psychological traits are abstract in nature and cannot be measured through any scale or meter rather they can be measured and evaluated by tools of research such as tests, rating scales, inventories, questionnaires etc. As per need and requirement of the study following research tools are used.

1. Career Maturity Inventory by Nirmala Gupta.
2. Academic Performance (Board Result)
3. Career Decision-making Scale (Self developed)
4. Locus of Control by Dr. Anand Kumar
5. Dependence Proneness Scale by Jai B.P. Sinha

(1) CAREER MATURITY INVENTORY (CMI)

The career maturity inventory has its origin in the developmental theory of career behaviour which envisages that selection of an occupation is a process spanning a considerable number of years usually from late childhood to early adulthood. The process even continues after the person establishes in an occupation and makes efforts to maintain and advance in it and later in life prepares to retire from it.

The Career Maturity Inventory (CMI) has been conceived and constructed to measure the maturity of attitudes and competencies that are critical in realistic career decision-making. To assess the maturity to these career behaviours, the CMI provides two types of measures:
The attitude scale and the competence test. The researcher used attitude scale in this study.

The Attitude Scale elicits the feelings, the subjective reactions, the dispositions that the individual has toward making a career choice and entering the world of work. Is work seen as a meaningful focus of life or is it viewed as drudgery? How involved and independent is the individual in the choice process? What considerations are made in selecting a career? These and other cognitive aspects of decision-making are stated in the items of the attitude scale as they have actually been verbalized by young people. Five attitudinal variables being surveyed by Attitude Scale are:

(i) Decisiveness in career decision-making
(ii) Involvement in career decision-making
(iii) Independence in career decision-making
(iv) Orientation to career decision-making
(v) Compromise in career decision-making

Reliability: A test-retest reliability with an interval of one month was calculated on Indian samples drawn from classes VIII, X and XII with N = 40. The obtained correlations ranged from 0.78 to 0.82

Validity: The scale has a high content and construct validity as expressed by experts (judges' ratings) in guidance. The items of the attitude scale show developmental scores over classes VIII, Xth and
XIIth (on the standardization sample) which also established the validity of the scale in the Indian sample.

**Administration (Attitude Scale):** The Attitude Scale is applicable to a wide range of groups differing in curricular, demographic and many other characteristics. The Attitude Scale can be administered on an individual as well as a group basis. Persons taking the scale should be told to indicate their feelings about each item rather than attempting to discern a 'correct' answer. Administrators should emphasize that the individual should read and respond to each item solely on the basis of how the item applies to his or her own feelings about the world of work.

The total administration time for the scale should be about 30 minutes including time for collection and distribution of booklets and time for completion of biographical data on the answer sheet.

Steps to be followed in the administration of the scale:

1. Distribute the Attitude Scale booklets after ensuring proper seating arrangements for the students and seeing that everyone has a pencil or pen to mark with.

2. Ask everyone to complete the biographical information on the test booklet itself as they are consumable.

3. Read aloud the instructions given in the test booklet while everyone reads silently.
4. Make sure that method of marking the answers is understood.

5. Take time to answer any questions which may be asked about the inventory.

6. Make sure that only one mark is made against each item and marks are clear and completely fill space.

7. The students should be told to erase or fill completely any answer that needs to be changed. They should not make any stray marks on the booklet.

8. How much time is allowed for those who have trouble finishing is a decision based on the available time and the purpose of testing. The CMI was not designed as a timed test and most complete information on each individual will be obtained if everyone has a chance to finish all the items.

**Scoring:** In order to provide maximum consistency in scoring, the scoring stencils are prepared for easy and accurate scoring.

In test of Attitude Scale, the correct responses of each item is visible in the circle of scoring stencil. If marked responses are visible in the circle or scoring stencil, the responses are treated as correct and for one correct response, one mark in assigned. The total number of correct responses in this test is known as the raw score. For the conveniences, the researcher has divided the group into two broader category of low and high level of career maturity.
(2) ACADEMIC PERFORMANCE

Academic performance refers to the academic achievement of the students in terms of marks obtained by him/her in 10th class examination. The students having below 50% are categorized as low achievers and the students having above 60% are categorized as high achievers.

(3) CAREER DECISION-MAKING SCALE (CDMS)

The CDMS is a 28-item self-report instrument that was developed to understand career decision and the reasons for it. The CDMS evolved from the thinking that a measurable number of distinct problems prevent people from achieving finalization of educational and vocational decision. The CDMS provides an estimate of career decision and uncertainty and basic to its development in the idea that intervention could be used on the different aspects of career indecision measured by the scale.

Specifically, the CDMS presents itself is a two-page booklet which contains all items and ratings. Scoring is tabulated and recorded in the test booklet.

Each of the 28 items on the CDMS is scored on a 5-point scale with responses ranging from absolutely wrong to absolutely right. Preparation of Career Decision-Making Scale: The investigator interviewed few students about their career decision. Thus preliminary
reactions were collected. Some of them were appropriate. These reactions were arranged in systematic order and written on a paper to prepare a schedule. This self-report instrument was administered on students of different schools to seek appropriate decision status about their career.

**Administration:** Career decision-making scale administered individually although it may be administered in a group, if the purpose is to obtain certainty and uncertainty in decision-making. The scale was administered on 10+2 level students of different schools. Each tool was collected by investigator herself after checking that each statement was responded so that chances of rejection of tool may be avoided. Instructions are clear and additional instruction has been given if required.

**Scoring Procedure:** The scoring procedure of the items is very simple. CDMS includes both positive as well as negative items. The maximum score for a (absolutely wrong to absolutely right) positive item is to be awarded 1 to 5. In case of negative items (absolutely wrong to absolutely right) the scoring, procedure is revised i.e. 5 to 1 as given in the table. Item No. 5, 6, 7, 12, 13, 15, 16, 21, 24 are the negative, which are scored as 5 to 1. The score to be awarded for different responses are given in the table. The obtained scores were converted into Z-scores. On the basis of Z-score, the subject were
categorized into groups of certainty, indecisive and uncertainty in decision-making.

Table: Distribution of Items According to Response and their Score at Career Decision-making Scale

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Response Category</th>
<th>Positive Items</th>
<th>Negative Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Absolutely wrong</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>2.</td>
<td>Wrong</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>Doubtful</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>Right</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5.</td>
<td>Absolutely Right</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

**Reliability:** Investigator reported that three-week retest reliability of the CDMS was satisfactory, with scores ranging from .66 to .80. Over longer periods of time test-retest reliability of career in decision instrument is likely to be modest, since the construct of career indecision is inherently unstable (Hartman, Fuqua & Jenkins, 1986).

**Validity:** The investigator measures concurrent validity of the CDMS by comparing the scores obtained on CDMS to scores obtained on similar career decision instruments. The researcher found high correlations of .72 between the criterion measures and the expected CDMS scale.
(4) LOCUS OF CONTROL SCALE (LOC SCALE)

Hindi version of the Rotter’s Locus of Control Scale, developed by Dr. Anand Kumar and Dr. S.N. Srivastava (1985) was used to measure the locus of control of the students. This is a forced-choice instrument which consists of 29 pairs of statements, 23 of which are relevant items and six items are the fillers. Each alternative is keyed as to a belief in either internal or external reinforcing event. High score indicates belief in external control (Luck, chance other etc.) and low score reveals belief in internal control (own efforts).

This scale provides a useful means for measuring individual difference in the extent to which reinforcement is viewed as a consequence of one’s own behaviour or as a consequence of such facts as chance, fate or powerful others. Rotter’s Locus of Control Scale has been used extensively for research purposes in India and abroad and has high level of reliability and validity.

**Reliability:** In order to obtain test-retest reliability of Hindi version of Rotter’s Locus of Control Scale it was administered twice with the interval of four weeks on a randomly selected sample of 345 undergraduate students of both the sexes. The co-efficient of correlation was found to be 0.73. The reliability of the scale was also established by split-half-method on a randomly selected sample of 500 undergraduate students. The coefficient of correlation was noted to be 0.78.
Validity: Rotter (1966) reported good discriminant validity for the scale indicated by low correlation with such variables as intelligence, social desirability and political affiliation. Dr. Anand Kumar and Dr. S.N. Srivastava also determined the validity by administering both versions (Hindi and English) on 60 postgraduate students of both the sexes. The coefficient was found to be 0.89 which was significant at or beyond 0.01 level of confidence.

These results approved the fact that Hindi version of Rotter’s Locus of Control Scale is an adequate parallel form of English version, having sufficient validity.

Administration: Rotter’s Locus of Control Scale is a self-administrating tool and can be administered individually or in-groups. The instructions given on the test form are clear enough. A student is asked to go through the printed instructions attentively and to mark 'a' or 'b' alternatives of the statement which he considered most appropriate. The administration of Rotter’s Locus of Control Scale generally takes 20 to 30 minutes. However, no time limit in prescribed for completion of the scale.

Scoring: Out of 29 pairs of statements only 23 are scored and six filler items (item Nos. 1, 8, 14, 19, 24, 27) are not to be scored. In scoring only external alternatives are endorsed. High scores indicate external locus of control and the low scores indicates internal locus of control. The maximum possible scores of Rotter’s Locus of Control Scale is 23
and minimum being zero. For each item external alternative is to be endorsed as score one. The scoring key of the Rotter’s Locus of Control Scale is given in the table given below. The score were obtained and converted into Z-score. On the basis of Z-score subjectee were categorized into groups of internal, average and external locus of control.

**Table: Scoring Key of Rotter's Locus of Control Scale**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>External Alternative</th>
<th>Item No.</th>
<th>External Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Filler</td>
<td>16.</td>
<td>A</td>
</tr>
<tr>
<td>2.</td>
<td>A</td>
<td>17.</td>
<td>A</td>
</tr>
<tr>
<td>3.</td>
<td>B</td>
<td>18.</td>
<td>A</td>
</tr>
<tr>
<td>5.</td>
<td>B</td>
<td>20.</td>
<td>A</td>
</tr>
<tr>
<td>6.</td>
<td>A</td>
<td>21.</td>
<td>A</td>
</tr>
<tr>
<td>7.</td>
<td>A</td>
<td>22.</td>
<td>B</td>
</tr>
<tr>
<td>8.</td>
<td>Filler</td>
<td>23.</td>
<td>A</td>
</tr>
<tr>
<td>10.</td>
<td>B</td>
<td>25.</td>
<td>A</td>
</tr>
<tr>
<td>12.</td>
<td>B</td>
<td>27.</td>
<td>Filler</td>
</tr>
<tr>
<td>14.</td>
<td>Filler</td>
<td>29.</td>
<td>A</td>
</tr>
<tr>
<td>15.</td>
<td>B</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A copy of the Rotter's Locus of Control Scale (Hindi Version) has been given for perusal as Appendix-A3.

(5) DEPENDENCE PRONENESS SCALE (DPS)

Dependence Proneness Scale developed by Jai B.P. Sinha (1968) was used to measure the dependence proneness in classroom situations. Items were written after through review of literature, case studies and general observation. 50 items thus developed were behavioural descriptions or inclinations such as (a) to seek support, advice, and/or order from others, (b) to confide in other’s uncritically, (c) desire to be encouraged, helped, and or protected by others. Negatively, they included (d) lacking initiative and independent judgment, and (e) displacing responsibility for unfavourable outcomes.

The scale was put in a Likert format in which the respondents were asked to indicate the applicability to each item on a 5-point scale ranging from quite true (5) to not at all true (1) with undecided (3) in the middle.

The 50 item scale was administered to 40 students of Ranchi University. The item discrimination test was employed to select discriminating items with the cutting point at 0.18. 20 items were selected to constitute the final scale. Seven out of 20 items (1, 2, 8, 9, 10, 13 and 14) were negatively keyed. The 20-item scale was
administered to 185 students of Patna University. The items were inter-correlated and were subjected to the similarity Analysis Reciprocal Pairs (Mc. Quatty, 1967). Dependence Proneness Scale has been used extensively for research purposes in India and abroad and has high level of reliability and validity.

**Reliability:** The split-half reliability co-efficient of the DP scale have ranged from poor to excellent depending on how the scale is used. If it is used in a group or a classroom situation, the co-efficient has generally been around 0.67 (Sinha, 1968 a). If administered individually, the co-efficient in one study (Pandey, 1971) has been reported to be 0.94, Therefore, it is advisable to use the scale individually.

**Validity:** The validity of the scale has been tested in a number of ways. Asha Lakshmi (1970) examined the verbal interactions of high and low DP subjects in 2- person groups. Using Bales Interaction Pattern Analysis, she found that high DP subjects indeed more often asked for orientation, suggestion and advice than to the low DP subjects ($F = 5.28, df 5 : 10$ p. 01).

The low DP subjects gave more often orientation, suggestion and advice than do the high DPs ($F = 3.06$ df 5, 108, p. 01). Sinha (1968, b) obtained a validity score by correlating the scores on the DP scale with the degree of dependency expressed in sentence completion test administered on a sample of 26 college students. A- 50 items
sentence completion test was devised with items likely to elicit responses expressing dependency. Each completed sentence was rated by an independent judge for the degree of dependency on a 5-point scale ranging from Very Dependent (5) to very independent (1) with Doubtful (3) in the middle. A subject’s scores were added to get his total dependency score. The product moment correlation between DP and the dependency score was 0.55. T.N. Sinha (Sinha 1971) examined the behavioural basis of dependence proneness. An independent measure of dependency was obtained through subjects' over reliance on a source of information at a higher cost. 160 college students took DP scale. After around three months, they were individually put in an experimental situation where they were asked to distinguish the delinquent persons from the normal ones on the basis of their pictures when all the pictures were of normal people. For each randomly determined correct recognition a score of +2 and for the incorrect recognition –2 was given. A subject can, however, minimize his chances of getting –2 by consulting a pile of 3× 5 inch cards containing the (allegedly) correct answers. The number of times a subject consulted the pile constituted his dependency score. The coefficient of correlation between DP & dependency score was 0.26 which was significant at 0.05 level.
Administration: Dependence Proneness Scale administers individually although it may be administered in a group if the purpose is to obtain high and low scoring groups.

Instructions are clear and no additional instruction is required. Once the response to the scale are obtained, a subject’s DP score may be computed in the following fashion:

(a) Reverse the response score of the negative items (1, 2, 8, 9, 10, 13 and 14) by subtracting the response score from 6 (because is a 5-point scale). For example, if a subject rates the item no. 2 as quite true and thus gets response score of 5, his DP score on item no. 2 will be 6–5 = 1; or if he rates the items no. 10 as Not true and gets the response score of 2, his DP score on item no. 10 would be 6–2 = 4.

(b) Add the score across the twenty items in order to get the DP score of a subject.

The subject’s scores will have the possible range of 20–100, the higher the score the greater is the degree of dependence proneness. The scores were obtained and converted into Z-scores. On the basis of Z-score, the subjectee were categorized into groups of high, average and low dependence proneness.
Table: Distribution of Items According to Response and their Score on Dependence Proneness Scale

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Response Category</th>
<th>Positive Items</th>
<th>Negative Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Absolutely Right</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Right</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>Doubtful</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>Wrong</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>5.</td>
<td>Absolutely wrong</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

COLLECTION AND ORGANIZATION OF DATA

The investigator made her best efforts to gather most reliable and valid data. For this purpose the investigator visited all the selected institutions personally and contacted the principal of each institution. The tests were administered personally by the investigator in the natural classroom setting with the permission of the principals of the institutions. The data collection was done in two sessions, each of approximately 1½ hour's duration. The following tools were administered in two sessions.

Ist Session: 1. Career Maturity Inventory

2. Dependence Proneness Scale

IInd Session: 1. Internal-External Locus of Control Scale

2. Career Decision-making Scale
The standard instructions for recording the responses to the items given in the respective manuals were carefully read out by the investigator and explained to the students. The tests were administered after ensuring that student understood properly as to how to record their responses to the items. On completion, tests were collected and later on scored with the help of standard keys.

For knowing their academic performance, the marks obtained by them in the secondary school examinations (Xth class) conducted by U.P. Board from the respective institutions were taken into consideration. The score of academic performance and four variables for 600 students have been given in Appendix-C.

**STATISTICAL TECHNIQUES USED FOR ANALYSIS OF DATA**

The obtained scores on a test are meaningless, to interpret or draw any conclusion unless these are treated statistically. On the nature of test and scores obtained, the statistical techniques are selected and then data are treated with to draw conclusions. In the present study, parametric statistics was applied.

(i) Mean
(ii) S.D.
(iii) 't' test
(iv) Analysis of Variance (ANOVA)

The description of each of the above mentioned techniques is presented below:
(i) MEAN

Simpson and Kafka described mean as a quotient that results when the sum of the items in the series is divided by the number of items. It is one of the most widely employed measures of central tendency. It is least affected by the fluctuations of sampling and therefore, considered to be the most stable average.

Mean was calculated using the given formula:

\[
\text{Mean or } X = \text{AM} + \frac{\sum fx}{N} \times i
\]

Where,

\begin{align*}
\text{AM} & = \text{Assumed mean} \\
\sum fx & = \text{Sum of the product of frequency and deviation from AM} \\
N & = \text{Size of the sample} \\
i & = \text{Size of class interval}
\end{align*}

(ii) STANDARD DEVIATION

Standard Deviation was first suggested by Karl Person in 1893 as a measure of variability. It is defined as a positive square root of the arithmetic mean of the squares of the deviation of the given scores from their arithmetic mean. Typically it is used to describe variability when mean is used to describe central tendency.

The formula for the computations of standard deviation from the grouped data is
\[ \sigma = \sqrt{\frac{\Sigma fx^2}{N} - \frac{\Sigma fx}{N}} \]

Where,

\( \Sigma fx^2 \) = Sum of the products of frequencies and deviation square

\( \Sigma fx \) = Sum of the product of frequencies and deviation keep in the views the algebraic signs

\( N \) = Number of sample

(iii) 't' TEST

The 't' test allows us to determine whether or not the means of two samples differ so much that the samples are unlikely to have been drawn from the same population. The parametric 't' test is the one most commonly used by researchers who wish to test the significance of the difference between the means of two independent samples.

There are various formulae for 't' test depending upon the particular circumstances governing the data. In the present study the following formula of 't' test given by Cohen and Holiday, (1979, p. 178) was applied to find out the differences of male and female students and two groups different madhyamik schools of Meerut district.

\[ t = \frac{M_1 - M_2}{\sqrt{\frac{SD_1^2}{N_1} + \frac{SD_2^2}{N_2}}} \]
Where

\( M_1 \) = Mean of sample 1
\( M_2 \) = Mean for sample 2
\( SD_1 \) = Standard deviation of sample 1
\( SD_2 \) = Standard deviation of sample 2
\( N_1 \) = Numbers of sample 1
\( N_2 \) = Numbers of sample 2

In the use of above mentioned formula of ‘t’ test the following assumptions were made.

(i) The groups are independent and have been randomly sampled.
(ii) That population variances are unequal or heterogeneous.
(iii) The population distribution are normal.

The 0.05 and 0.01 conventional levels of significance were used for evaluating the obtained 't' values.

(iv) **ANALYSIS OF VARIANCE (ANOVA)**

Analysis of Variance (ANOVA) is a broad set of technique used for the most part, to compare means in studies involving more than two groups. It may be considered as an extension of the 't' test, between independent groups and like the 't' test, this is suited to samples of any size.

One-way analysis of variance is used when the different treatments are the variations of a single treatment variable. On
contrary four-way analysis of variance involves the procedures which permit simultaneous study of the effects for four treatment variables.

The four factor variables are called factors and the various conditions were referred to as levels. In the present study four factors were academic performance (A), career decision-making (B), Locus of control (C), and dependence proneness (D), and their levels were A₁ and A₂, B₁ and B₂, C₁ and C₂ and D₁ and D₂. The four-way analysis of variance allows the researcher to test, four null hypothesis concerning the main effects, six null hypothesis pertaining to two factor interaction; four null hypothesis related to three factor interaction and one null hypothesis concerning the four factor interaction effect.

**Meaning of Main effect:** The main effect of a factor is an 'average' effect, it is the differential effect of that factor averaged over the levels of other factors, for example, in a factorial experiment of four factors (A×B×C×D), each involving two levels, the significant A mean square tells us that the means for A₁ and A₂, averaged over the levels of B, C and D, differ significantly. Examination of the means for A₁ and A₂ shows that which group is superior to another one. Similarly the significant B mean square tells us that means for B₁ and B₂ averaged over the levels of A, C and D differ significantly. Again examination of the two means shows that which group is superior to another one with regard to dependent variable. The significant C mean square tells us that mean for C₁ and C₂ averaged over the levels of A, B and D
differ significantly. Examination of the two means shows that which group is superior to another on criterion variable. Similarly the significant D mean square tells us that mean for D₁ and D₂ averaged over the levels of A, B and C differ significantly. Again, the examination of the two means indicate which group is better than other on dependent variable.

**Meaning of Interaction effect:** Interaction is present if the differential effect of one factor differs from level of the second factor or vice-versa. If interaction is present, the main effect of a factor can be quite misleading for whatever the difference it will not apply at all levels of the other factor. In the presence of interaction effect of a factor of interest is examined to each levels of the other factor. Graphs of cell means can be of a great help here. In a 2×2 factorial design where in each factor has two levels, the significant A×B interaction that the A effect, that is the difference between A₁ and A₂ is dependent on the particular level of B. Alternatively it may be stated that the difference between B₁ and B₂ is dependent on A.

The interpretation of significant A×C, A×D, B×C, B×D and C×D interaction is made in the similar fashion. The significant three factor interaction (A × B × C) implies that two factor interactions is not the same for different levels of the third factor. For instance A × B interactions form; separate level of 'C' are not of the same that A × C interactions for the separate levels of 'B' are not of the same; and that
B × C interactions for the separate levels of 'A' are not of the same form. The nature of significant A × B × C interaction can be examined by the graphic methods clearly that is to say that we may examine the nature of A × B × C interaction by graphing A × B interaction separately for the levels of 'A'.

The significant four-factor interaction implies that the three factors interactions are different for the level of the fourth factor. For instance the interaction of A × B × C for the first level of D is not the similar that of the second level of 'D' or the interactions of A×C×D are different for different levels of 'B' or interactions of B×C×D are different for different levels of A. We may draw graph of any of the three factor interaction separately for the levels of the forth factor.

**The Rejection of Null Hypothesis:** The null hypothesis (Ho) is rejected if the F-ratio is so large as to fall beyond the critical value for the appropriate degrees of freedom and alpha level (0.01 and 0.05).

**Assumptions of Analysis of Variance:** The assumptions under lying the four-factor model of analysis of variance are same as for the one way analysis of variance. These are concerned with random sampling, independent groups, homogeneity of variance and normality.

In addition to the above described statistical techniques, the graphical techniques were also employed for showing the main and interaction effects of the variables of the study.
By adopting the methodology outlines in this chapter, the data were collected and subsequently interpreted. The account of analysis and interpretation of the data has been given in the next chapter.