Chapter 3

DESIGN AND METHODOLOGY

Research is a systematic effort in the direction of solution of a problem having direct or indirect bearing on human welfare. There may be more than one approach or methodology that determines the dependability of research findings. It is said that success of a researcher lies in his choice of methodology to be followed. Methodology includes all the plans, techniques and strategies followed in carrying out a research study. This study was a descriptive research in which analytical survey method was employed. It involved a clearly defined research problem with definite objectives. It required expert and imaginative planning, careful analysis and interpretation of data gathered and logical and skillful reporting of the findings. This chapter reports the detailed design of the study including technique of selection of the sample, development/selection of research tools and methods followed in data collection and analysis.

3.1 POPULATION AND SAMPLE

A research study is concerned with acquiring knowledge about the characteristics of a population or several populations. Most of the times, it is not necessary and sometimes, not possible to study the entire population in a single research study. Basically, research is a process of drawing inferences about a large aggregate of subjects of certain kind on the basis of the study of a small sample of that aggregate or population. The process of sampling refers to the method of selecting a small part or specimen of a large universe of subjects in order to study some quality or characteristic of the whole population. Sampling is an art of determining how many elements in a population are to be selected and how. The statistical values, which are based on the sample, are called ‘statistics’. On the basis of statistics, corresponding population values can be estimated which are called ‘parameters’. So, a statistical enquiry involves estimating an unknown ‘parameter’ on the basis of ‘statistics’ obtained from a sample. This process is known as statistical inference (Best, 1983).

The present investigation was based on comparison of two populations one of teacher trainees pursuing the Bachelor of Education course under the face to face mode from Dr. Bhim Rao Ambedkar University, Agra, and the other teacher trainees pursuing the
Bachelor of Education course, under the distance education mode from the Uttar Pradesh Rajarishi Tondon Open University (UPRTOU), Allahabad. Thus, the present study compares two populations of teacher trainees on a few relevant variables.

The teacher trainees of face to face mode were selected from colleges located at Aligarh, Mathura and Agra which are affiliated to Dr. Bhim Rao Ambedkar University, Agra. The cluster sampling technique was used. The distance mode teacher trainees were approached at the study centers of UPRTOU located at the cities of Kanpur, Moradabad, Agra and Bulandshahr in the state of Uttar Pradesh. A sample of 252 teacher trainees was selected from the population of trainees pursuing studies under DE mode, and a sample of 259 teacher trainees was selected from the population of those undergoing training under face-to-face mode. Thus, in all 511 teacher trainees were involved in the study. The details regarding the institutions and selected teacher trainees from each city are shown in Table 3.1 and Table 3.2.

**Table 3.1: Details of the sample (Face-to-Face Teacher Trainees)**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>City</th>
<th>Name of Teacher Training Institution/College</th>
<th>No. of Teacher Trainees Selected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Male</td>
</tr>
<tr>
<td>1.</td>
<td>Agra</td>
<td>Raja Balwant Singh (RBS) College</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dharam Samaj College</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tika Ram Girls Degree</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aligarh Teacher Training College</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shivdhan Singh Smriti Mahavidyalaya</td>
<td>15</td>
</tr>
<tr>
<td>2.</td>
<td>Aligarh</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>3.</td>
<td>Mathura</td>
<td>BSA (PG) College</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grand Total</td>
<td>115</td>
</tr>
</tbody>
</table>
### Table 3.2: Details of the sample (Distance Teacher Trainees)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>City</th>
<th>Name of Teacher Training Institution/College</th>
<th>No. of Teacher trainees Selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Agra</td>
<td>Raja Balwant Singh (RBS College)</td>
<td>30 Male 24 Female 54 Total</td>
</tr>
<tr>
<td>2.</td>
<td>Bulandshahar</td>
<td>Shyamlal Saraswati PG College</td>
<td>42 Male 21 Female 63 Total</td>
</tr>
<tr>
<td>3.</td>
<td>Kanpur</td>
<td>Vikramajit Singh Sanatan Dharm (VSSD) College</td>
<td>55 Male 19 Female 74 Total</td>
</tr>
<tr>
<td>4.</td>
<td>Moradabad</td>
<td>Hindu College</td>
<td>29 Male 32 Female 61 Total</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Grand Total</strong> 156 Male 96 Female 252 Total</td>
</tr>
</tbody>
</table>

### 3.2 RESEARCH TOOLS

In carrying out a research study, many considerations have to be kept in mind while selecting research tools that are used to collect information or data. These considerations are objectives of the study, availability of suitable tools and their characteristics as such. Dependability of research findings is not only determined by planning, methodology, data analysis and interpretation, but also by quality of tools used. This study involved the study of teacher trainees’ choice of mode of learning in relation to certain personality factors, general intelligence, professional attitude, socio-economic and academic backgrounds of teacher trainees. So, in order to obtain required information for the study, the following research tools were used by the investigator:

4. Personal Data Sheet seeking information about socio-economic and academic backgrounds (developed by the investigator).

#### 3.2.1 SIXTEEN PERSONALITY FACTOR TEST ‘The 16PF’ Form ‘A’

The 16 PF Form ‘A’ prepared by Raymond B. Cattell and Herbert W. Eber measures sixteen functionally independent traits and psychologically meaningful dimensions of
personality. These sixteen dimensions or scales are essentially independent i.e. the correlations among one another are low. It contains 187 items in all with 10-13 items for each dimension or factor. The questions are arranged in a roughly cyclic order guided by a plan to ensure variety and interest of the examinee. Three alternative responses are provided for each item. The description of sixteen personality factors is as follows:

**Factor A (Cool vs. Warm)**
People who score low on factor A tend to be stiff, cool, skeptical and aloof. They like things rather than people, working alone, and avoiding compromises of viewpoints. They are likely to be precise and rigid in their way of doing things and in their personal standards. People who score high on Factor A tend to be good-natured, easygoing, emotionally expressive, ready to cooperate, attentive to people, softhearted, kindly and adaptable. They like occupations dealing with people and socially impressive situations, and readily form active groups.

**Factor B (Concrete-thinking vs. Abstract-thinking)**
The person scoring low on Factor B tends to be slow to learn and grasp and rated as dull. This dullness may be simply a reflection of low intelligence. The person who scores high on Factor B tends to be quick to grasp ideas, a fast learner and intelligent. This is related to mental capacity of an individual.

**Factor C (Affected by feelings vs. Emotionally stable)**
The person who scores low on Factor C tends to be low in frustration-tolerance under unsatisfactory conditions, easily annoyed and emotional. The person who scores high on Factor C tends to be emotionally mature, stable realistic about life, unruffled, possessing ego strength.

**Factor E (Submissive vs. Dominant)**
Individuals scoring low on Factor E tend to give way to others, to be docile, and to conform. They are often dependent, confessing, and anxious for obsessional correctness. Individuals scoring high on Factor E are assertive, self-assured and independent-minded. They tend to be austere, law unto themselves, hostile or extrapunitive and authoritarian.
Factor F (Sober vs. Enthusiastic)
Low scorers on Factor F tend to be restrained, reticent, and introspective. They are sometimes dour, pessimistic and unduly deliberate. High scorers on this trait tend to be cheerful, active, talkative, frank, expressive, effervescent and carefree.

Factor G (Expedient vs. Conscientious)
People who score low on Factor G tend to be unsteady in purpose. They are often casual and lacking in effort for group undertakings and cultural demands. People who score high on Factor G tend to be exacting in character, dominated by sense of duty, persevering and responsible. They are usually conscientious and moralistic.

Factor H (Shy vs. Bold)
Individuals who score low on this trait tend to be shy, withdrawing, and cautious. They usually have inferiority feelings and tend to be slow and impeded in speech and in expressing themselves. Individuals who score high on Factor H are sociable, bold, ready to try new things, spontaneous and abundant in emotional response.

Factor I (Tough-minded vs. Tender-minded)
People who score low on Factor I tend to be tough, realistic, “down to earth”, independent, responsible but skeptical of subjective, cultural elaborations. People who score high on Factor I tend to be emotionally sensitive, day-dreaming, artistically fastidious and fanciful. They are sometimes demanding of attention and help, impatient, dependent, temperamental and not very realistic.

Factor L (Trusting vs. Suspicious)
The person who scores low on Factor L tends to be free of jealous tendencies, adaptable, cheerful, uncompetitive, concerned about others and a good team worker. They are open and tolerant and usually willing to take a chance with people. People who score high on Factor L tend to be mistrusting and doubtful. They are often involved in their own egos and are self-opinionated and interested in internal life.

Factor M (Practical vs. Imaginative)
Low scorers on Factor M tend to be anxious to do the right things, attentive to practical matters, and subject to the dictation of what is obviously possible. They are concerned over detail, able to keep their heads in emergencies, but are sometimes
unimaginative. High scorers on Factor M tend to be unconventional, unconcerned
over everyday matters, self motivated, imaginatively creative, concerned with
“essentials”, often absorbed in thoughts, and oblivious of particular people and
physical realities.

**Factor N (Forthright vs. Shrewd)**
Individuals who score low on Factor N have a lot of natural warmth and a genuine
liking for people. They are uncomplicated, sentimental and unvarnished in their
approach to people. Individuals who score high on Factor N tend to be polished,
experienced and shrewd. Their approach to people and problems is usually perceptive
and hard headed.

**Factor O (Self-assured vs. Apprehensive)**
Persons with low scores on Factor O tend to be unruffled and to have unshakeable
nerve. They have a mature, unanxious confidence in themselves and their capacity to
deal with things. Persons with high scores on Factor O have a strong sense of
obligation and high expectations of themselves. They tend to worry and feel anxious
and guilt-stricken over difficulties.

**Factor Q1 (Conservative vs. Experimenting)**
Low scorers on Factor Q1 are confident in what they have been taught to believe, and
accept the “tried and true” even when something else might be better. They are
cautious and compromising in regard to new ideas. High scores on Factor Q1 tend to
be interested in intellectual matters and to have doubts on fundamental issues. They
are skeptical and inquiring regarding ideas, either old or new.

**Factor Q2 (Group-oriented vs. Self sufficient)**
Individuals who score low on Factor Q2 prefer to work and make decisions with other
people and like and depend on social approval and admiration. They tend to go along
with the group and may be lacking in individual resolution. Individuals who score
high on Factor Q2 are temperamentally independent, accustomed to going their own
way, making decisions and taking action on their own.
Factor Q3 (Undisciplined Self-conflict vs. Following Self-image)
People who score low on Factor Q3 will not be bothered with will control and have little regard for social demands. They are impetuous and not overly considerate, careful, or painstaking. People who score high on Factor Q3 tend to have strong control of their emotions and general behavior, are inclined to be socially aware and careful, and evidence what is commonly termed “self-respect” and high regard for social reputation.

Factor Q4 (Relaxed vs. Tense)
Individuals who score low on Factor Q4 tend to be sedate, relaxed, composed and satisfied. Individuals who score high on Factor Q4 tend to be tense, restless, fretful, impatient and hard driving.

RELIABILITY
Every research tool has some essential characteristics, one of which is ‘Reliability’. If a test is used repeatedly on the same sample under same conditions, it should not give different results. In other words, its results should be consistent. The consistency, with which a test measures whatever it measures, is known as its reliability. There are several methods of estimating reliability of a measuring tool. In test-retest method of reliability the single form of the test is administered twice on the same sample with a reasonable time gap. In this way, the same test yields two independent sets of scores. The two sets, when correlated, give the values of reliability coefficient (Singh, 1997). The reliability of this test was estimated by the test constructors.

While there are many ways to estimate reliability, the test retest method seems especially appropriate. With this method, the 16 PF was administered by the constructors to a sample of people on two separate occasions; the correlations between the sets of scores from the two administrations were the reliability estimates. The short interval test-retest reliability coefficients are shown in the adjoining table. These values were obtained using test-retest method on 146 American subjects which comprised of 79 employment counselors and 67 undergraduates. These details are available in the test manual.
16 PF Reliability Coefficient: Test-retest after 2 weeks

<table>
<thead>
<tr>
<th>Factor</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>L</th>
<th>M</th>
<th>N</th>
<th>O</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form A</td>
<td>.81</td>
<td>.58</td>
<td>.78</td>
<td>.80</td>
<td>.79</td>
<td>.81</td>
<td>.83</td>
<td>.77</td>
<td>.75</td>
<td>.70</td>
<td>.61</td>
<td>.79</td>
<td>.73</td>
<td>.73</td>
<td>.62</td>
<td>.81</td>
</tr>
</tbody>
</table>

Source: Administrator’s Manual for the 16 PF Questionnaire, P-11, Published by the Institute for Personality and Ability Testing, 1991.

VALIDITY

Validity means truth or fidelity; it refers to the degree to which a test measures what it claims to measure. In other words, validity is the extent to which a test does the job for which it is meant. Therefore, validity depends upon purposefulness of a test. Validity is always for measurement of a particular variable. That is why there is nothing like general validity. There are as many types of validity as there are purposes of testing e.g. construct, content, curricular or predictive validities. When a test is constructed so that the contents of its items measure what the whole test claims to measure, the test is said to have content or curricular validity. Content validity of a test is examined in two ways: (i) by the expert’s judgement (ii) by statistical analysis. The 16 PF test had high criterion-related validity. The details are available in the test manual.

Validity of the 16 PF Scale

<table>
<thead>
<tr>
<th>Factor</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>L</th>
<th>M</th>
<th>N</th>
<th>O</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form A</td>
<td>.7</td>
<td>.3</td>
<td>.7</td>
<td>.6</td>
<td>.8</td>
<td>.6</td>
<td>.9</td>
<td>.7</td>
<td>.4</td>
<td>.4</td>
<td>.4</td>
<td>.7</td>
<td>.6</td>
<td>.7</td>
<td>.6</td>
<td>.5</td>
</tr>
</tbody>
</table>

Source: Administrator’s Manual for the 16 PF Questionnaire, P-16, Published by the Institute for Personality and Ability Testing, 1991.

Scoring

Scoring was done by fitting and aligning the first stencil key over the answer sheet and counting the marks visible through the holes for respective factor, allowing either 2 or 1, as indicated by the number adjacent to the hole. These scores were summed and the total was entered in the space given for raw score of respective
factor. But factor B was peculiar in that each correct mark visible gave a score of 1 only. The raw scores of all sixteen factors were converted to standard scores (sten scores) using standardization tables (norm tables). Norm tables were available in three groups: high school students, university and college undergraduate students, and general adult population. Within each group tables were available for male, female and for male and female together. To convert the raw scores into standard (sten) scores, the raw score for respective factor was given in one line and the corresponding sten score above it in the norm table. The procedure was done for all the sixteen factors as suggested in the test manual.

**Sten Score:**

*Sten scores* are used to compare the raw scores of the organisation (or subgroup) to another comparison group. Sten scores are therefore an indication of how the results fair *relative* to the comparison group. Sten scores are based on a “Standard-Ten” point scale and are a validated statistical measure used in social science analysis.

Term ‘sten’ is a short form of ‘standard ten’. The main tests on which sten scores are used are the personality questionnaires prepared by R. B. Cattell and his associates (original authors). Cattell himself defined stens as: ‘Units in a standard ten scale, in which ten score points are used to cover the population range in fixed and equal standard deviation intervals, extending from 2.5 standard deviations below the mean (sten 10) to 2.5 standard deviations above the mean (sten 10). The mean is fixed at 5.5 stens (Cattell, 1965, *The Scientific Study of Personality*, London: Pelican, p.374)’. These are like stannine-scores which divide the distribution in 9 equal parts. The author of the test used ten parts/categories instead of nine and called them sten-scores. Since all sten scores cover equal intervals on the scale, all operations used with measures on interval scale are usable on them. Sten (Standard Ten) scores are used to divide the score scale in to ten units. Each unit has a band width of half a standard deviation except the highest unit (Sten 10) which extends from 2 standard deviations above the mean, and the lowest unit (Sten 1) which extends from 2 standard deviations below the mean.
A sten score is calculated as follows:

\[
\text{Sten} = 2 \frac{(x - \bar{x})}{SD} + 5.5
\]

Where

- \(x\) is the mean of the current data.
- \(\bar{x}\) is the mean of the population (comparison group).
- SD is the standard deviation of the population (comparison group).

The figure below shows a normally distributed set of data (or bell-shaped curve). This is a common phenomenon seen in many questionnaire findings, where the majority of answers tend to centre around the average (mean) point, with fewer people responding towards the extreme scores. The graph helps to show how raw data (represented by the curve) is related to sten scores and standard deviations. Stens 5 and 6 (at the centre of the curve) represent the bulk of the data – i.e. stens 5 and 6 are ‘typical’ and do not deviate much from the mean. Sten 1 (and sten 10) at the tail-end of the curve represent fewer responses and more deviation from the mean.

**Standard deviations and sten scores:**

Assuming the responses are normally distributed around the central (mean) point, we can typically say that 68% of responses will be within one standard deviation of the average and 99% of responses will be within two standard deviations. Any score that
varies from the mean by more than two standard deviations is seen as an extreme score – i.e. much larger or smaller than the average response.

3.2.2 **RAVEN’S STANDARD PROGRESSIVE MATRICES (SPM)**

For measuring intelligence of subjects, the researcher studied the various published tests of intelligence. Finally, the Raven’s Progressive Matrices prepared by J. C. Raven’s, J. H. Courtand J. Raven in 1938 was selected for use in this study. Raven’s Standard Progressive Matrices test is widely regarded as the best test of abstract or non-verbal reasoning ability. This test was originally developed in the mid-1930 and was revised and standardized many times in the years 1938, 1943, 1948, 1972, 1979 and 1983. The investigator used 1983 edition of SPM reprinted in 1991. The scale is intended to cover the whole range of intellectual development from the time a child is to grasp the idea of finding a missing piece to complete a pattern, and sufficiently long to assess a person’s maximum capacity to form comparisons and reason by analogy without being unduly exhausted or unwieldy.

The Standard Progressive Matrices (Sets A, B, C, D & E) is a test of person’s mental capacity. The scale consists of 60 problems divided into five sets of twelve each. In each set, first problem is easy and other problems become comparative difficult as one proceeds on. The five sets provide five opportunities for grasping the method and five progressive assessments of a person’s capacity for intellectual activity. The test was designed to cover the widest possible range of mental abilities and to be equally useful with persons of all ages. A person’s total score based on five subsets provides an index of his intellectual capacity with minimizing the effects of cultural environment in which the individual grew up or got his education. The test has been described as one of the purest and the best measures of general mental functioning.

The reliability and validity of the test as reported in the test manual are discussed below.

**RELIABILITY**

Since SPM is a homogenous test, one would expect a high correlation to emerge with split-half measures of reliability. The majority of studies giving consistency data report correlations of at least 0.90 with a modal value of 0.91. Over forty studies dealing with the reliability of the SPM, have been reported in the literature. From the
original studies on SPM, *Raven (1948)* and *Foulds and Raven (1948)* found reliabilities ranging from 0.83 to 0.93, with the higher values being associated with younger subjects (Under 30). Well conducted studies, therefore, indicate satisfactory retest reliability for SPM in the period up to one year. These figures have been reported in the test manual.

**VALIDITY**

The concurrent and predictive validities of SPM vary with the age, possibly sex and homogeneity of the sample, the method of assessment of the criterion to which the test will be related and the reliabilities of the test and criterion measures in the content considered for adolescents, correlation of SPM with the Binet and Wechsler scales range from +0.54 to +0.86. The external criterion commonly adopted in predictive validity investigations is scholastic achievement assessed sometime after the administration of SPM. Validity Coefficient reported in studies with English and non-English speaking children and adolescents generally range up to +0.70. The figures have been reported in the test manual.

**ADMINISTERING THE SPM**

For administration of the test the investigator visited the selected institutions personally. The researcher explained the intelligence test to the student before distributing the booklets to them along with the answer sheets. Researcher pointed out to the figure of A₁ and explained to them that the six figures are given and one figure exactly fit into the upper figure. By seeing the figures students could tell the answer. The researcher asked them to write the answer in the answer sheet provided to them. The total time taken for the administration of the intelligence test was about 25 minutes.

**SCORING**

Scoring of intelligence test used was done by using the key sheet given in the manual of the test, in which the answers were available. The right answers were scored ‘1’ and wrong answer ‘0’ and then the total points were added up to get the total score. A person’s score on the test was the total number of problems marked correctly through the series from the beginning to the end.
3.2.3 TEACHER ATTITUDE SCALE (TAS)

For measuring the attitude of teacher trainees of both distance and face-to-face modes, the Teaching Attitude Scale was used in the present study which is a standardized scale developed by Dr. J. C. Goyal and has been published by National Psychological Corporation, Agra. It is a scale consisting of 22 items. It was developed by using Thurstone’s technique of attitude scale construction. It measures attitude towards the profession of teaching.

RELIABILITY

The reliability of the scale as reported in the test manual was determined by the split half method. It was found to be 0.90 by the Pearson Product-Moment correlation method (for the half of the test). When corrected by Spearman-Brown formula for the whole test, co-efficient of correlation was 0.95. The sample consisted of 300 teachers working in secondary school.

VALIDITY

The test constructor (Goyal, J.C.) collected statements of opinions from teachers about their profession. Out of the list of 125 statements, 98 statements were retained. The statements of opinion were got rated on an 11-point scale by 88 teacher judges. The scale value of each statement was determined by the median value obtained from the rating of judges. Content validity of the scale was ensured by the judges who carefully rated each item. The validity of the scale was also determined by self-ratings by subjects on a graphic continuum of the scale. It was found to be 0.78.

SCORING

Each statement had been assigned a scale value. The attitude score of a subject is the sum total of the scale values of the statements agreed by him divided by the number of statements marked by him/her. It may be represented by the following formula

\[
Score = \frac{S_1 + S_2 + S_3 + \ldots}{N}
\]

where, \(S_1, S_2, S_3,\ldots\) are the scale values of statements agreed to and ‘N’ is total number of statements. Thus, the attitude score of a subject is the average score value of the statements endorsed by him/her. It is to be noted that a lower score indicates a favorable attitude and the higher score indicates unfavorable attitude of a subject.
3.2.4 PERSONAL DATA SHEET (PDS)

In order to gather certain personal information about the socioeconomic and academic backgrounds of respondents a Personal Data Sheet was developed by the investigator herself. PDS was a kind of information blank which sought to obtain information regarding the socio-economic background and academic background of the subjects included in the sample. The socio-economic background was determined by using the following variables: marital status, number of dependents in the family, academic qualification of parents and grandparents, occupation (father), income of the family, membership of any club and number of vehicles. The academic background of the respondents was measured in terms of percentage of marks (Division) obtained by them in examinations of class X, XII, Graduation and Post-Graduation. It was a combination of achievement scores of the respondents at various levels of education.

Each respondent was asked to supply the related information by filling in the blank spaces provided for the purpose. The scoring scheme was developed by the investigator herself which is given in the tables below:

Table 3.3: Weightage scheme for Academic Background

<table>
<thead>
<tr>
<th>Division</th>
<th>I (60% and above)</th>
<th>II (45% - 60%)</th>
<th>III (below 45%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weightage</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Following socio-economic variables were included in the personal data sheet to obtain the measure of socio-economic background score of respondents.

In the component ‘Nature of Family’, there were two categories. Nuclear Family is a family group consisting of a pair of adults and their children whereas Joint Family is an extended family arrangement of parents, their children, and the children’s spouses and offspring in one household. The score allotted to them are given below in Table 3.4:

Table 3.4: Weightage scheme for Nature of Family

<table>
<thead>
<tr>
<th>Nature of Family</th>
<th>Nuclear</th>
<th>Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weightage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
In the component, “No. of dependent in the family”, there were 3 categories. Within this variable, the scores allotted to them are given below:

**Table 3.5: Weightage scheme for no. of dependent in the family**

<table>
<thead>
<tr>
<th>Number of dependent</th>
<th>1 – 3</th>
<th>4 – 5</th>
<th>6 and above</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weightage</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

The component parental and grandparental education contained 5 categories. Score allotted to each category are given below;

**Table 3.6: Weightage scheme for parents & grandparents education**

<table>
<thead>
<tr>
<th>Level of Education</th>
<th>Illiterate</th>
<th>Up to class V</th>
<th>Up to class X</th>
<th>Up to class XII</th>
<th>Higher Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weightage</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

The component “Family profession” (Father) contained 6 categories: scores allotted to each category are given as below:

**Table 3.7: Weightage scheme for Family (Father) profession**

<table>
<thead>
<tr>
<th>Profession</th>
<th>Diplomat</th>
<th>Professional/Engineer/Doctor/Lawyer</th>
<th>College Teacher</th>
<th>School Teacher</th>
<th>Worker</th>
<th>Farmer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weightage</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

In income component, there were five categories of monthly income groups, within this variable, income categories with the scores allotted to them are given below in Table 3.8:

**Table 3.8: Weightage scheme for monthly income**

<table>
<thead>
<tr>
<th>Income (Rs.)</th>
<th>5,000 &amp; below</th>
<th>5,001-15,000</th>
<th>15,001-30,000</th>
<th>30,001-50,000</th>
<th>Above 50,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weightage</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
In the component “Membership of club”, there are two categories and the scores allotted to them are given below:

**Table 3.9: Weightage scheme for Membership of club**

<table>
<thead>
<tr>
<th>Member</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weightage</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

In the component “No. of vehicles”, there were following categories with their weightage:

**Table 3.10: Weightage scheme for No. of vehicles**

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>1 Car</th>
<th>1 Two-Wheeler (Scooter/Motorcycle)</th>
<th>1 Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weightage</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

The socio-economic background score of an individual was a combination/sum of all the weightages scored by him/her on the above components from Table 3.4 to Table 3.10.

### 3.3 COLLECTION OF DATA

As per the requirement of the study, the investigator had to collect the data from the teacher trainees pursuing B.Ed. from Distance Mode and Face-to-Face Mode. To seek the co-operation of the Heads of the teacher training colleges of different cities, the investigator obtained an introduction letter from the Chairperson of the Department of Education, Aligarh Muslim University, Aligarh in which he had requested the concerned Heads of the teacher training colleges to extend requisite co-operation to collect data from teacher trainees under Face-to-Face mode.

In order to collect the data of Distance Mode Teacher Trainees, the investigator obtained a list of study centres of B.Ed. program of Uttar Pradesh Rajarishi Tondon Open University. She reached the selected study centers during the personal contact programs and requested heads of institutions to accord permission to collect data from teacher trainees. After receiving permission of the heads of the institutions the investigator approached the concerned teacher trainees and administered to them all the four tools in the same sitting. During this process the
investigator assured the students that the informations given by them were for research work only and would be kept confidential. It is a matter of great pleasure that this assurance along with the importance of this research work was highly convincing and proved to be very useful in obtaining relevant and genuine data. The investigator administered all the four tools, Cattell’s 16 PF questionnaire, Raven’s Progressive Matrices, Teacher Attitude Scale by J.C. Goyaland Personal Data Sheet seeking information about academic and socio-economic background to the students one by one after giving necessary instructions.

3.4 DATA ANALYSIS TECHNIQUES
Since computer facilities are now readily available, the investigator decided that the data analysis should be carried out on the computer. Before using the SPSS package, the raw data were tabulated in terms of rows and columns. The first column of the data matrix indicated the identity of the subject, that is, his serial number. The other columns listed the raw scores for each individual on all variables. Although, the study involved only five major variables, namely, personality, intelligence, professional attitude, socio-economic background and academic background, the data sheet of raw data used 24 columns including column for serial number/name. The Mode of Training, Gender, Marital Status, socioeconomic background and academic background were listed in separate columns. The 16 PF resulted in 16 scores for each individual, one on each factor, and therefore, were listed in separate 16 columns. Thus, the data sheet consisted of 22 columns. The format of data matrix is given in the form of the adjoining table.
<table>
<thead>
<tr>
<th>S.No/Name</th>
<th>Training Mode</th>
<th>Gender</th>
<th>Marital Status</th>
<th>Academic Score</th>
<th>Socio-Economic Score</th>
<th>Cattell’s 16 PF Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>511</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.11: Scheme for Tabulation of Raw Data
All descriptive statistical measures for each variable were computed which helped in making a detailed study of raw-score distributions and their relationships. A brief description of the statistical measures and techniques used has been presented below:

(i) **MEAN**

Arithmetic Mean or Mean was the value obtained by adding together all the scores and by dividing this sum by the number of scores. That is

\[ M = \frac{\sum X}{N} \]

Where;

- \( M \) = Arithmetic Mean
- \( \sum X \) = Sum of Individual scores
- \( N \) = Number of scores (Persons)

(Garrett, H.E and Woodworth, R.S, 1881, P-27)

(ii) **STANDARD DEVIATION (SD)**

It is also known as ‘Root Mean Square Deviation’ because it is the square root of the mean of the squared deviations of individual scores from the arithmetic mean. It is denoted by the Greek letter ‘\( \sigma \)’. It measures the absolute dispersion or variability of a distribution. The greater the amount of variability the greater the value of SD, the greater will be the magnitude of deviation of the values from their mean. A small SD means high degree of uniformity of the observations as well as homogeneity of scores. Standard Deviation (S.D) is calculated by the following equations:

\[ \sigma = \sqrt{\frac{\sum X^2}{N} - \left( \frac{\sum X}{N} \right)^2} \]

Where;

- \( \sigma \) = Standard Deviation
- \( X \) = Raw scores
- \( N \) = Number of scores in the distribution

(Garrett, H.E and Woodworth, R.S, 1881, P-27)
(iii) **t-TEST**

It is used to test the significance of difference between two means based on different samples. It involves the computation of the ratio between experimental variance (observed difference between two sample means) and error variance (standard error of the mean difference).

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

Where;

\( t \) = t-Test Value  
\( M_1 \) = Mean of the I group  
\( M_2 \) = Mean of the II group  
\( \sigma_1 \) = Standard Deviation of I group  
\( \sigma_2 \) = Standard Deviation of II group  
\( N_1, N_2 \) = Number of cases in I and II group

*(Guildford J. P., 1950, P-157)*

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

This method was first given by R. A. Fisher. Analysis of variance is a class of statistical techniques through which the overall difference among two or more sample means is studied and its significance is tested. ANOVA is of two types – Simple ANOVA and Complex ANOVA. In the present study the investigator used Complex ANOVA.

Complex ANOVA/Two Way ANOVA – In Complex ANOVA there are two or more independent variables which are used to form the basis of classification of groups.

Such ANOVA is suited to factorial design. Statistically, the ANOVA results in an F-ratio which is further interpreted:

\[ F = \frac{\sigma_1^2}{\sigma_2^2} \]

Where;

\( F \) = F ratio

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\[ \sigma_1^2 = \text{Larger variance/between groups variance} \]
\[ \sigma_2^2 = \text{Smaller variance/within groups variance} \]

Between groups variance refers to variation among the means of each group from the total or grand mean of all groups. Within groups variance refers to the average variability of scores within each group (Singh A.K. (1997), p-441).

For testing hypotheses (i) to (v), which involved comparing means without controlling any other variable, the investigator used the t-test meant for the purpose. But, for testing hypotheses (vi) to (x), analysis of variance with factorial design was used as these hypotheses involved comparing two groups on five variables (dependent) one of which has 16 dimensions. Also, it was considered desirable to build in the design two control variables – gender and marital status, which could potentially influence the dependent variables. These two independent variables correlated significantly with the training mode. The phi-coefficient between gender and training mode was 0.175 and the one between marital status and training mode was 0.290. Both the coefficient were significant at 0.01 level The 2 X 2 x 2 factorial design was considered to be most appropriate for this analysis. With this design all the seven null hypotheses involved in a given research hypothesis could be tested simultaneously: three related to main effects and four related to interaction effects. The outline of the design is given below:
### Outline of Design

<table>
<thead>
<tr>
<th></th>
<th>Face-to-Face Mode</th>
<th>Distance Education Mode</th>
</tr>
</thead>
</table>
|                          | Male   | Female | Male | Female |\
| Married                  | X      | X      | X    | X      |
|                          | X      | X      | X    | X      |
|                          | X      | X      | X    | X      |
|                          | X      | X      | X    | X      |
| Unmarried                | X      | X      | X    | X      |
|                          | X      | X      | X    | X      |
|                          | X      | X      | X    | X      |
|                          | X      | X      | X    | X      |

**Independent variable:** Training Mode (face to face vs distance education)

**Dependent variables:** Personality (with 16 components), General Intelligence, Professional Attitude, Socio-economic Background, Academic Background

**Control variables:** Gender (male vs female), Marital status (married vs unmarried)

All descriptive statistical measures for each variable were computed which helped in making a detailed study of raw-score distributions and their relationships. The whole analysis was done on computer by using SPSS package. The details of data analysis are presented in the following chapter along with their graphical representation and interpretation.