4. DESIGN OF THE STUDY

The previous chapters deal with the review of the related literature, construction of HVT pertaining to the present study, "A study of the predictors of academic achievement of student teachers in terms of aptitude, attitude, participation and human values". Precise formulation of the research problem, relevant hypotheses and appropriate assumptions have been incorporated in the first chapter. This chapter describes the design of the study which includes a brief description of the method, sample, tools, data collection procedure and the statistical techniques employed for conducting the present research.

4.1 Method

The normative survey testing method and cross-sectional approach were considered appropriate for explaining the predictors of academic achievement, aptitude, attitude, participation and human values of student teachers. To study the significance of differences in aptitude, attitude, participation, human values, entry level, academic achievement, in total theory, practical, group comparisons were done.
4.2 Population and Sample

The regular male and female students of B.Ed. class of various Colleges of Education under the jurisdiction of M.D.University, Rohtak constituted the population of the study.

From the college of education under the jurisdiction of M.D.University, Rohtak identified as above, a sample of 400 student teachers (B.Ed. students) was selected randomly from the colleges of education at the rate of 25 male and 25 female students per college in general.

List of the selected colleges of education with number of student teachers is provided in Table 4.01

<table>
<thead>
<tr>
<th>Table 4.01</th>
</tr>
</thead>
<tbody>
<tr>
<td>College-wise distribution of the sampled student teachers. (N = 400)</td>
</tr>
<tr>
<td>Sr. No.</td>
</tr>
<tr>
<td>2.</td>
</tr>
<tr>
<td>3.</td>
</tr>
<tr>
<td>4.</td>
</tr>
<tr>
<td>5.</td>
</tr>
<tr>
<td>6.</td>
</tr>
<tr>
<td>7.</td>
</tr>
<tr>
<td>8.</td>
</tr>
</tbody>
</table>

200 200 400
The structure of student teachers' sample has been summarized in table 4.02

Table 4.02

Category-wise distribution of the sampled student teachers (N = 400)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Category</th>
<th>No. of male student teachers</th>
<th>No. of female student teachers</th>
<th>Total teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Sex</td>
<td>200</td>
<td>200</td>
<td>400</td>
</tr>
<tr>
<td>2.</td>
<td>Rural</td>
<td>100</td>
<td>60</td>
<td>160</td>
</tr>
<tr>
<td>3.</td>
<td>Urban</td>
<td>100</td>
<td>140</td>
<td>240</td>
</tr>
</tbody>
</table>

4.3 Description of Tools

The following four tools were employed for data collection two of which were selected, and two were developed by the investigator for the present study:

1. Personal Information Blank - developed by the investigator.
2. Teaching Aptitude Test (TAT) by Dr. Jai Prakash and Dr. R.P. Srivastava.
3. Teacher Attitude Inventory (TAT) by Dr. S.P. Ahluwalia.
4. Human Values Test (HVT) - constructed by the investigator.
4.3.1 **Personal Information Blank**

This blank was developed by the investigator to collect the information on independent variables of student teachers of colleges of Education under M.D.University, Rohtak regarding Roll No., College, Sex, rural/urban, level of participation of the student teacher during the B.Ed. course, percentage of marks obtained at entry level of B.Ed. (B.A./B.Sc./B.Com./M.A./M.Sc./M.Com.), level of participation and the marks obtained were checked from the college records.

Every student teacher was assigned a code from 001 to 400. Variables like participation, sex (male/female), Rural/Urban, Entry level were assigned codes 6, 12, 13, 14 respectively for computer analysis. A copy of information blank has been provided in the Appendix No. 7.

4.3.2 **Teaching Aptitude Test**

Teaching Aptitude Test (TAT) was constructed and standardized by Dr. Jai Parkash and Dr. R.P. Srivastava. It was employed for the present research investigation, as it was considered most appropriate as the basis of its responded characteristics.

This test is meant for measuring the aptitude towards teaching profession. The scale has 10 sub-tests and a total of 150 items. Each sub-test contains 15 items. There is no time limit for the test but generally the examinees complete it within 30 minutes. The test has
the following areas belonging to each of the ten sub-tests:

1. **Co-operative Attitude**: This trait has been used for measuring the cooperative attitude of the teacher towards the taught, society and the nation. This trait is an essential link for the relationship between the teacher and the taught, the school and the community, and the society and the nation.

2. **Kindliness**: The items under this area have been used with regard to the general and particular attention of the teacher which is to be devoted for full growth and development of the personality of the pupil and to remove the hurdles and handicaps in the way of growth and development of pupil.

3. **Patience**: The patience is an important attribute of teachers' personality, as he very often meets such a critical situation which needs patience and tolerance on his part.

4. **Wide Interest**: The teacher is not supposed to stick to his work of teaching the subjects only but he is also an active participant in co-curricular activities outside the institution. He wants to see his taught growing physically, mentally, culturally, socially and in other aspects alike.
5. **Fairness**: This element has been taken in the test to measure the fairness and impartiality of the teacher which are the most essential traits of the teacher's personality.

6. **Moral Character**: Moral status in the opinions of adults, specially concerning their adherence to the adult's standard, have been tried to see through the items constituting this area.

7. **Discipline**: Discipline and problems of conduct in the classroom and elsewhere, and the methods employed in dealing with the problems are contained in this area.

8. **Optimism**: This trait is more essential in the teacher's personality as he is supposed to be always optimistic.

9. **Scholarly Taste**: A teacher is always a student in the acquisition of knowledge. He is always thirsty for knowledge, and as such items in this sub-test measure scholarly taste.

10. **Enthusiasm**: Enthusiasm is an important element of the personality of a good teacher. The importance of this trait has increased too much in the present age.
Reliability: The reliability of the test was calculated by Split-Half Method using Guttman and Spearman-Brown Prophecy formulas which yielded the coefficient of correlation as +.891 and +.91, respectively on a sample of 100 cases. The Test-Retest method on a group of 50 teachers yielded a correlation of +.94. All these coefficients are high and therefore the test has a good reliability. The test has also a higher degree of internal consistency and all the ten traits measure independently their respective qualities irrespective of a moderate over-lapping among four traits. The inter-element correlations between the 10 components mostly centre around +.5. Hardly any one of them is less than +.5 and none more than +.547.

Validity: A test is highly valid if it measures effectively the property it purports to measure. The validity of the test was secured by computing a coefficient of correlation between scores on the test and the assessment marks obtained in the final examination. The coefficient of correlation between the total marks of theory, practice teaching and craft, and the test score on 200 pupil teachers, was +.5. The obtained validity coefficient is quite satisfactory.
Cross Validation: The general psychological readers want to know how well the results hold good in other situation. For this, a fresh group of 50 pupil teachers of Government R.T. College, Rewa, with the same socio-economic and cultural impact and the same educational qualifications were taken for cross-validation as a sample for determining the validity. The test was administered to this group and the results were compared with the ratings of Principal and four lecturers of the same institution. The coefficient of correlation came to +.672 which is higher than +.579 of the earlier experimental group and revealed that the final test is more developed and predictive than the earlier experimental draft.

Administration: The test has a reusable Test-Booklet of 8 pages containing 10 parts (or sub-tests) and a two-pages Answer-Sheet, i.e. Parts 1 to 5, and on the back page 2 are part 6 to 10 running from items number 76 to 150. This means that examinees must be told in the very beginning that they have not to mark any thing on the Test-Booklets so that it can be re-used. The test is untimed but almost all examinees can easily finish within the normal class period.
Scoring: The T.A.T. is set up to permit the hand scoring of separate answer-sheet. Separate transparent Keys are available for scoring each page of the answer-sheet and for right as well as wrong answers. In all, there are four keys: (i) Right answers on page 1, (ii) Right answers on page 2, (iii) Wrong answers on page 1, (iv) Wrong answers on page 2, of the answer-sheet. Each of the 150 statements of the test has five alternative responses - HA, A, I, D and HD. For scoring these statements, the following general guidelines apply: (a) examine the answer sheet to see that only one response has been marked for each item and that it is clearly marked; (b) reject any answer-sheets that show obvious response patterns such as all of the answers in one column, etc., and (c) check to see that all of the items have been answered.

As may be noted, the test has two sets of scoring keys: One, for the Right (R) and the other for Wrong (W) score. Accordingly, the weights of +3, +2 and +1 are given to the right responses of HA, A, and I or HD, D and I, respectively, whichever is correct as is visible through the blank circles of the Right Keys. Similarly, the weights of -3, -2 and -1 are assigned to the wrong answers of HA, A and I or HD, D and I, whichever is visible through the blank circles of Wrong Keys. Thus, the scoring keys give
two sets of scores separately, i.e. Right and Wrong Scores. The correct score is obtained by subtracting the Wrong Scores from the Right Scores (R-W) and this remainder is an individual's raw score.

Aptitude was assigned a Code 4 for computer analysis. A copy each of the test alongwith answer-sheet, have been provided in Appendix No. 8 and 9.

4.3.3 TEACHER ATTITUDE INVENTORY (TAI):

Teacher Attitude Inventory (TAI) developed and standardized by Dr.S.P.Ahluwalia was employed for the present investigation to measure the attitude of student teachers.

This inventory is a 90 item Likert instrument consisting of six sub-scales. These sub-scales were developed by the Likert summated ratings procedure. Each scale has 15 statements that pertain to a particular aspect of prospective and practising teacher's professional attitudes. The six aspects dealt within that inventory are, Attitude towards:

(i) Teaching Profession
(ii) Class-room Teaching
(iii) Child-centred Practices
(iv) Educational Process
(v) Pupils
(vi) Teachers

Keeping the rationale of attitude scale construction in mind, 90 psychometrically "good" attitude statements, 15 on each sub-scale were selected to constitute the final form of the TAI. Out of 90 items, 56 are in positive declarative form and 34 of them are in negative form. Again 43 items are meant to assess attitude in favourable direction and 46 in unfavourable direction. Thus the favourable - unfavourable continuum adequately measures the aforesaid six selected areas.

Reliability: Reliability was estimated by the split-half (odd-even) method and found to be .79 (corrected to .88) for a sample of 239 prospective teachers. The test-retest reliability coefficients after the interval of 3 months and 9 months are found to be .59 (N=102) and .64 (N=290).

Validity: Determination of validity of an attitude inventory is a hard task.

The inventory appears to have content validity, and the method of selecting items supports this supposition. In addition, differences in mean scores were found among some selected "known" groups. The mean scores for B.A. Part I and II students offering and not offering Education as an Elective subject, B.Ed. trainees and practising
teachers were computed and compared. The observed differences were found to be in the expected direction. The validity was also determined through stimulus group technique.

Administration:

The experimenter will distribute the test-booklet and answer-sheet to each subject. After all subjects have received the proper test materials the experimenter will say "Don't open it unless told to do so." This inventory consists of 90 statements aimed to identify the professional attitudes of the teachers. There is considerable disagreement as to what these attitudes should be; therefore there are no right or wrong answers. What is wanted is your own individual feeling about the statements. Read each statement and decide how you feel about it. Then mark your answer in the space provided on the answer sheet.

Think in terms of the general situation rather than specific one. There is no time limit but work as rapidly as you can. Please respond to every item."

After giving the instructions the experimenter will ask them to turn over the page and will say:

"If you strongly agree, put tick (√) mark in the space under strongly agree. If you agree, put a tick (√)
mark in the space agree. If you are undecided or uncertain, put a tick (✓) mark in the space undecided. If you disagree, put a tick (✓) mark in the space under disagree. If you strongly disagree, put a tick (✓) mark in the space under strongly disagree."

"Remember you have not to make any mark on this booklet. Now read each statement carefully and record your response on the answer-sheet."

Scoring: Each item alternative is assigned a weight ranging from 4 (Strongly Agree) to 0 (Strongly disagree) for favourable items. In the case of unfavourable items range of weights is reversed i.e. from 0 (Strongly Agree) to 4 (Strongly Disagree). The attitude score of a subject is the sum total of item scores of all the six sub-scales. The theoretical range of scores is from 0 to 360 with the higher score indicating the more favourable attitude towards teaching and allied aspects.

Attitude was assigned code 5 for computer analysis. A copy each of the inventory, alongwith answer-sheet have been provided in Appendix No. 10 and 11.

4.3.4 Human Values Test (HVT)

Human Values Test (HVT) has been constructed by the investigator. This test is meant for measuring the human
values of student teachers. The test has five sub-tests (values) and a total of 125 items distributed over 25 questions. Each sub-test (value) contains 25 items distributed over 5 questions. There is no time limit for the test. The test has the following values belonging to each of the five sub-tests.

1. **Co-operation**: This value has been used for measuring the co-operation of the teachers towards their students, school and society. This value is the basic link between the teacher and the pupil, the school and the community, the society and the nation.

2. **Dedication**: This value has been used for measuring the dedication to teaching profession. Dedication is to keep one's knowledge of the content and methodology for teaching up to date to inspire his colleagues towards the ideals of the teaching profession and to devote maximum time for the pursuit of teaching and learning.

3. **Nationalism**: Nationalism is an important value for the teacher. Nationalism is to respect the national symbols-flag etc., to sacrifice personal interests for the sake of nation at the time of need, to work for nation's unity and to take pride in being Indian. Therefore, this value has been included to measure this area of nationalism.
4. **Scientific Outlook:** Freedom from superstition is a complimentary aspect of the scientific outlook. A teacher with scientific outlook has sensitivity to problem, has logic & rationalises his reasoning. It brings objectivity. This value has been used to measure this area of scientific outlook.

5. **Tolerance:** Tolerance is an important value of a teacher, as he very often meets such a critical situation in the class room in school, in functions and at home which needs tolerance on the part of the teacher. This value has been used to measure this area of tolerance.

The detailed information about the Human Values Test (HVT) has been presented in Chapter III.

Human Values - Co-operation, Dedication, Nationalism, Scientific Outlook and Tolerance have been assigned codes 7, 8, 9, 10, 11 respectively.

**4.4 Procedure for Collecting the Data**

The data was collected from student teachers of eight colleges of education under M.D.University, Rohtak. The principals and lecturers of the colleges were approached for their assistance and active help in the collection of data for the present investigation. Twenty five male and twenty five female student teachers of
colleges of education were randomly selected from the student teachers present on the day. They were asked to fill in the four proformas. They were motivated to do so. Rapport was also established through personal contacts. The work of data collection was completed in four parts. The first part comprised collection of data pertaining to personal variables of student teachers such as Name, Roll No., Sex, rural/urban, Marks obtained, academic achievement at the entry level and participation at B.Ed. level. Student teachers were asked to fill in the information mentioned above in the personal information blank.

Academic Achievement of student teachers were also entered in the Personal Information Blank, from the M.D.University, Rohtak Gazette of B.Ed. class. The achievement in theory and practical separately of 400 student teachers was tabulated from the university records of detail marks. Thus the information of dependent variables of student teacher was collected from the gazette and university records such as:

1. Academic Achievement in Total.
2. Academic Achievement in Theory.
3. Academic Achievement in Practical.
and were assigned codes 1,2,3 respectively for computer analysis.
This information has been provided in Appendix No.7

The second part of data collection was to study the teaching aptitude of the student teachers. Teaching Aptitude Test (TAT) of Dr. Jai Parkash and Dr. R.P. Srivastava was administered on the student teachers and their answer sheets were collected.

The third part of data collection was to administer Teacher Attitude Inventory (TAI) of Dr. S.P. Ahluwalia on the student teachers to study their attitude towards teaching. So, their answer-sheets of Teacher Attitude Inventory were collected.

The fourth part of data collection was to study the human values of the student teachers. Thus Human Values Test (HVT) constructed by the investigator, was administered on the student teachers and answer-sheets of Human Values Test were collected.

### 4.4.1 SUMMARY OF DATA COLLECTION:

<table>
<thead>
<tr>
<th>Part</th>
<th>Tools Used for Data Collection</th>
<th>Data Collected ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>Personal Information Blank</td>
<td>Information Blank</td>
</tr>
<tr>
<td>Second</td>
<td>Aptitude</td>
<td>Answer-sheet</td>
</tr>
<tr>
<td>Third</td>
<td>Attitude</td>
<td>Answer-sheet</td>
</tr>
<tr>
<td>Fourth</td>
<td>Human Values Test</td>
<td>Answer-sheet</td>
</tr>
</tbody>
</table>
Every student teacher had to complete all the four parts of data collection. Similar procedure was adopted in all the colleges of education for collecting the data of 400 student teachers.

4.5 ORGANISATION OF DATA

The data was organised and scoring was done in accordance with the procedures stipulated for each of them in the respective manuals. After scoring all the tests, the investigator organised the entire data, checked it to ascertain its accuracy, utility and completeness. Editing was done and then the data was classified and tabulated for its analysis according to the objectives of the study.

The data was organised on master charts for all the parts of the study. For the parts of the data tabulation was done and codes were given as under:

<table>
<thead>
<tr>
<th>Part</th>
<th>Dimensions</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>Personal</td>
<td>Student teachers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sex (Male/Female)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rural/Urban</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Participation at college level.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marks obtained at entry level.</td>
</tr>
<tr>
<td>Second</td>
<td>Aptitude</td>
<td>Aptitude.</td>
</tr>
</tbody>
</table>
Third Attitude Attitude
Fourth Human Values Co-operation
Dedication
Nationalism
Scientific outlook
Tolerance.

The data was thus organised as per the requirements of the computer.

**4.6 STATISTICS USED**

Scientific analysis is only possible with the use of some sort of statistical processing. The acceptance and rejection of hypotheses will ultimately determine the contribution of the investigation in the scientific development of a particular area. This is true for statistical techniques used in the analysis and interpretation of data.

Analysis of data for the present research was done through computer. Programmes for the various statistical techniques were selected as per design of the study for testing various hypotheses. The main techniques employed include C.R./ 't' test, Pearson's Product Moment correlation, Multiple correlation and Multiple regression equations. A brief rationale of the statistical techniques used is as under:
4.6.1 CRITICAL RATIO (C.R.)/'t' TEST

C.R., a critical ratio test and 't' test are used to ascertain whether two observed statistics, such as two means, two proportions or two correlation co-efficients, indicate differences in a corresponding pair of parameters. Both C.R. and 't' tests are used in similar conditions. The only difference lies in the fact that all 'ts' are C.Rs. while all C.Rs. are not 'ts' since the distribution for critical ratios happens to be normal and 't' distributions represent family of curves which are not necessarily norms. In the present case, C.R. tests were applied to test the significance of difference between mean scores of student teacher's academic achievement, aptitude, attitude, participation, human values and entry level. Significance of differences in various variables was observed through 't' test. Although some of the research hypotheses seemed to be directional, the change was not an included one and also no value judgement could be applied arbitrarily in the direction of change in a particular trait/score. The data was subjected to two tailed test of significance. The samples were usually uncorrelated. The computer programme took care of the size by using pooled estimates of standard deviations.
4.6.2 **PEARSON'S PRODUCT MOMENT CORRELATION**

Correlation is the relationship between two or more paired variables, between two or more sets of data. The degree of relationship is measured by the co-efficient of correlation, which may be described as a single number. It tells us as to what extent two things are related and to what extent variations in one go with variations in the other.

Pearson's co-efficient of correlation may be thought of as the ratio that expresses the extent to which changes in one variable are accompanied by or dependent upon changes in second variable. Pearson's co-efficient of correlation should be used when the two variables have linear relationship and are normally distributed or atleast not badly skewed. The data in the present investigation satisfied these conditions. Co-efficient of correlations between student teachers score of academic achievement and other variables were computed and interpreted.

4.6.3 **MULTIPLE CORRELATION**

The multiple correlation analysis provides an analysis of the relations among a single criterion measure and two or more predictor measures. One result of the
analysis is an equation for predicting the unknown criterion score of a new subject from his known set of predictor's scores. The equation obtained for predicting the criterion is called as multiple regression equation. The other result of the analysis is a co-efficient of multiple correlation. The multiple correlation, represented by R, is defined as the simple correlation co-efficient between observed values of the dependent variables and those values estimated from the multiple regression equation.

Multiple R shows how accurately the scores from a given combination of variables represent the actual values of the criterion, when independent variables are combined in the best linear equation. The multiple correlation can be interpreted by squaring it.

The co-efficient $R^2$ provides an estimate of the proportion of the total variance in the criterion that can be predicted from the known variance in the predictor, and is a measure of the over-all effectiveness of the multiple regression. The quantity $100R^2$ which gives the percentage of the variation of the dependent variable which is due to regression is known as the co-efficient of determination.
In the present investigation, co-efficient of multiple correlation was employed to predict academic achievement in Total, theory, Practical of student teachers on the basis of 11 independent variables - aptitude, attitude, participation, human values, viz., co-operation, dedication, nationalism, scientific outlook, tolerance, sex, rural/urban and entry level.

4.6.4 MULTIPLE REGRESSION ANALYSIS

"Multiple Regression is a method of analysing the collective and separate contributions of two or more independent variables to the variation of dependent variable. It is indeed a general and potent tool of the behavioural scientists". By this method it is possible to compute the equation which gives the best possible linear combination of a number of independent variables for the purpose of predicting another dependent variable. This equation is known as the multiple regression equation.

The regression equation which expresses the relationship between a single variable, $x_1$ and any number of independent variables, $x_2$, $x_3$, $x_4$ -----$x_n$ may be written in deviation form as follows:

$$x_1 = b_1 2.34 \ldots n x_2 + b_1 3.24 \ldots n x_3 + \ldots b_1 n 23 \ldots (n-1)x_n$$
and in score form it will be as under:

\[ X_1 = b_{11} 2.34 \cdots n x_2 + b_{12} 3.24 \cdots n x_3 + b_{1n} 23 \cdots (n-1)x_n + k. \]

Here \( b \) coefficient gives the weights to be attached to the scores in each of the independent variables where \( x_1 \) is to be estimated from all these in combination. Furthermore, these regression co-efficients give the weights which each variable exerts in determining \( x_1 \) when the influence of the other variables is partialed out. Thus the regression equation tells just what role each of the several variables plays in determining the score in \( x_1 \), the criterion. In the present study, multiple regression equation for predicting student teacher's academic achievement in total, theory and practical on the basis of 11 independent variables- aptitude, attitude, participation, 5 human values, sex, rural/urban and entry level were developed for the total sample. Stepwise regression analysis method was followed. An attempt was also made to highlight relative contribution of the independent variables towards the predictors of academic achievement of student teachers.

Besides ascertaining total and individual contribution of predictor variables towards variance in the criterion variable, the indirect and direct contributions of predictors were also examined.
4.7 REFERENCES


7. Ibid.


14. Ibid.