Chapter-III
Design of Research
Chapter – III
Design of Research

3.1  DESIGN AND METHODOLOGY

Design of the study is an essential part of a research project because design provides a picture of what and how to do the work before starting it. It has been determined from time to time that a suitable research design guards against the collection of co-relevant data and gives more economy, so in any research project design provides the researcher a blue-print of research, dictates the boundaries of projects and helps in controlling the experimental extraneous error variance of the problem under investigation.

The Descriptive Survey Method is used in the present investigation because it is considered as one of the important methods in education because it describes the current position of the research work. It involves interpretation comparison, measurement, classification, evaluation and generalization, all directed towards a proper understanding and solution of significant educational problems.

This is a correlation as well as comparative study in correlation part, correlation between teaching competency, academic qualification and emotional intelligence is found. And in comparative part scores of these three variables are compared for different streams and academic qualifications of pre-service teachers.

In this chapter the investigator shall discuss the method and procedure adopted in conducting the present investigation.
VARIABLES:
The variables used in the present study are as given below:

Independent Variables:

1. Emotional Intelligence:
   It has been measured on the four areas viz:
   (a) Intra-personal Awareness (own emotions)
   (b) Inter-personal Awareness (others emotions)
   (c) Intra-personal Management (own emotions)
   (d) Inter-personal Management (others emotions)

2. Academic Qualification:
   It has been recorded as:
   (1) Post-graduate pre-service teachers
      (i) Arts post graduate pre-service teachers
      (ii) Science post graduate pre-service teachers
      (iii) Commerce post graduate pre-service teachers
   (2) Graduate pre-service teacher.
      (i) Arts graduate pre-service teachers
      (ii) Science graduate pre-service teachers
      (iii) Commerce graduate pre-service teachers

Dependent Variables:

Teaching Competence
   It has been measured under five major aspect of classroom teaching:
   (i) Planning
POPULATION:

All the pre-service teachers (B.Ed. students) in different colleges of Education of Haryana State constituted the population of study for the present investigation.

Sample:

The sample for this study consisted of one thousand male and female pre-service teachers selected randomly from different government aided colleges of Haryana. For sample selection stratified random sampling technique was used. Seventeen government aided colleges of Education were selected randomly. Then from each college the number of B.Ed. students selected was proportionate to the number of total students of the college. So in this way, stratified random sampling technique was followed to obtain a sample. In this way, the final sample under study consisted of one thousand male and female B.Ed. students.
Sample Selected from Various College of Education of Haryana
TOOLS USED

The following tools were used in the investigation.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Tools</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Emotional Intelligence Inventory by Dr. S.K. Mangal</td>
<td>Emotional Intelligence</td>
</tr>
<tr>
<td>2.</td>
<td>General Teaching Competency Scale by Dr. B.K. Passi and M.S. Lalitha</td>
<td>To measure teaching competency of pre-service teachers</td>
</tr>
<tr>
<td>3.</td>
<td>Pre-Service Teacher's Qualification and Stream is noted from their records</td>
<td>Academic Qualifications</td>
</tr>
</tbody>
</table>

COLLECTION OF DATA

The data for the study were collected in two stages:

**Stage-I**: The data regarding emotional intelligence was collected with the help of tools mentioned above by getting the schedules filled in by the student teachers themselves. The data regarding academic equalization was taken from their college records.

**Stage-II**: One lesson taught by each of the thousand pre-service teachers selected in the sample was observed by the investigator, by herself in the years 2006 and 2007 using General Teaching Competency Scale by Dr. B.K. Passi and M.S. Lalitha during their teaching practice.

**Measurement of Variables**

Now, we shall discuss in detail the different variables involved in the study and the procedure used to observe their values for the respondents by using the tools mentioned earlier.

**Measurement of Emotional Intelligence**

**Emotional Intelligence**: For the professional preparation of teachers, the study of emotional Intelligence held by them is very important. How a teacher perform his duty as a teacher and how much effective he is depends very much on his emotional Intelligence. A high emotional Intelligence level in a person makes the work easier as well as satisfying and professionally rewarding thereby increasing effectiveness sof the teachers and competency in teaching.
A low emotional Intelligence level makes the teacher's task harder, unpleasant and thus adversely affecting his/her performance. Moreover, effective and productive learning on the part of students can be achieved by employing teacher's with desirable emotional Intelligence level.

In the present study, we have to determine the extent to which the emotional Intelligence of pre-service teachers affects their teaching competency. To measure the emotional Intelligence of pre-service teachers, Emotional Intelligence Inventory by Dr. S.K. Mangal was used.

**Mangal's Emotional Intelligence Inventory:**

This Emotional Intelligence Inventory has been designed for use with Hindi and English knowing 16+ years of age of school, college and university students for the measurement of their emotional intelligence (total as well as separately) in respect of four areas or aspects of emotional intelligence namely, intra-personal awareness (knowing about one's own emotions) interpersonal awareness (knowing about other's emotions), intra-personal management (managing one's own emotions) and interpersonal management (managing other's emotions) respectively.

**Areas or Aspect of Mangal's Emotional Intelligence Inventory**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Area/Aspect</th>
<th>No. of items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Intra-personal Awareness (own emotions)</td>
<td>25</td>
</tr>
<tr>
<td>2.</td>
<td>Interpersonal Awareness (other's emotions)</td>
<td>25</td>
</tr>
<tr>
<td>3.</td>
<td>Intra-personal Management (own emotions)</td>
<td>25</td>
</tr>
<tr>
<td>4.</td>
<td>Interpersonal Management (other's emotions)</td>
<td>25</td>
</tr>
</tbody>
</table>

**Instructions:**

Investigator distributed the test booklets and answer sheets to each student-teachers. After the B.Ed. students had received the proper test material, the experimenter said, “Don’t open it unless asked to do so.” This inventory consists of 100 statements aimed to identify the emotional intelligence of pre-
service teachers. What is wanted is your own individual feeling about the statement. Read each statement and decide how you feel about it. Then mark your answers in the space provided on the answer sheet. You are to respond in yes or no form indicating complete agreement or disagreement with the proposed statement respectively. Here the response ‘yes’ is indicative of the presence of emotional intelligence and ‘no’ for the lack of emotional intelligence. Similarly, there are items, where no response provides clue for the presence of emotional intelligence and ‘yes’ for its absence. In this inventory, there are instructions like this:

“If the statement suits you, put (√) mark in the space under ‘yes’. If the statement does not suit you, put (x) mark in the space under ‘no’.

“You have not to make any mark on this booklet. Now read each statement carefully and record your response on the answer sheet.”

SCORING

Scoring can be done by hand or with the help of stencil.

The mode of response to each of the item of the inventory is in the form of a forced choice i.e. either yes or no, indicating complete agreement or disagreement with the proposed statement respectively. In the present Emotional Intelligence Inventory thus there are item where the response ‘yes’ is indicative of the presence of emotional intelligence and ‘no’ for the lack of emotional intelligence. Similarly, there are items where ‘no’ response provides clue for the presence of emotional intelligence and ‘yes’ for its absence.

For scoring one mark into be provided for this response indicating presence of emotional intelligence and zero for the absence of emotional intelligence.
Table
Scoring Scheme of Emotional Intelligence Inventory

<table>
<thead>
<tr>
<th>S.No. of items (where ‘yes’ response shows presence of intelligence)</th>
<th>Mode of Response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>6, 18, 19, 20, 23 to 25, 27 to 29, 31, 41 to 44, 51 to 56, 58 to 68, 70, 71, 73 to 76, 79 to 82, 84, 88 to 90, 96, 99.</td>
<td>‘Yes’</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>‘No’</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S.No. of items (where ‘no’ response shows presence of intelligence)</th>
<th>Mode of Response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 5, 7 to 17, 21, 22, 26, 30, 32 to 40, 45 to 50, 57, 69, 72, 77, 78, 83, 85 to 87, 91 to 95, 97, 98, 100..</td>
<td>‘Yes’</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>‘No’</td>
<td>0</td>
</tr>
</tbody>
</table>

Interpretation of a Subject’s Score

For interpreting an individual score, help may be taken from the given percentile score in Tables 6 to 7 separately for male and female students. The subject’s scores denoting his level of emotional intelligence may also be interpreted (area wise as well as total) in terms of one of the five categories provided in Tables 8 and 9. Since the present emotional intelligence is scored on the positive side i.e. presence of emotional intelligence, a higher scores of the individual (in the respective areas as well as total) here shows a higher level of emotional intelligence and lower score a lower level of emotional intelligence. The higher percentile rank of a subject may provide a quite satisfactory position of his her level of emotional intelligence in a group of the population tested.

As such it is quite good inventory for measuring emotional intelligence of pre-service teachers.
Main Features of MEII

<table>
<thead>
<tr>
<th></th>
<th>Age Group</th>
<th>16+</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Areas Measured</td>
<td>Four Areas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(a) Intra-personal Awareness (own emotions)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b) Inter-personal Awareness (Others’ emotions)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(c) Intra-personal Management (own emotions)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(d) Inter-personal Management (others emotions)</td>
</tr>
<tr>
<td>3.</td>
<td>Items</td>
<td>100 (25 items for each area)</td>
</tr>
<tr>
<td>4.</td>
<td>Standardization</td>
<td>2200 (1050 males and 1150 females) of 16+ age</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(a) Split Half Method</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b) K.R. Formula Method</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(c) Test-Retest Method</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(a) Factorial Approach</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b) Criterion Related Approach</td>
</tr>
<tr>
<td>7.</td>
<td>Norms</td>
<td>Percentile Norm</td>
</tr>
<tr>
<td>8.</td>
<td>Scoring Procedure</td>
<td>1 mark for presence of emotional intelligence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 mark for absence of emotional intelligence</td>
</tr>
<tr>
<td>9.</td>
<td>Time limit</td>
<td>30-40 minutes</td>
</tr>
</tbody>
</table>

Reasons

The Mangal Emotional Intelligence Inventory was selected due to the following reasons:

1. It is the only inventory which meant to identify emotional intelligence of students (16+) including the sample of student teachers in its standardization procedure.
2. It is a standardized inventory.
3. It is easy to administered and score.
4. It has a provision for the use of separate answer sheet, it was economical.

TEACHING COMPETENCY

General speaking, effect use of various teaching skills in classroom teaching is called "Teaching Competency". Rama (1999) defines teacher
competency as "the ability of a teacher manifested through a set of overt teacher classroom behaviours which is a resultant of the interaction between the presage and the product variables of teaching within a social setting." This lack of consensus of the term ‘teaching competency’ highlights the difficulty of its measurement. If measurement of teaching competency has to be valid, objective and reliable one has to delimit to such variables that can be subjected to scientific study. While arriving at a definition of the term it may be pointed out that teaching process is determined by knowledge, a set of abilities, attitudes and skills (presage variables) which in term determine pupil outcomes. Thus, the term teaching can be defined as a set of observable teachers’ behaviour that facilitate or bring about people learning and ‘teaching competency’ means an effective performance of all the observable teacher behaviour that brings about desired pupil’s outcomes. Based on the microcriteria, approach to study teaching (Gage, 1963), teaching is perceived as a set of teaching skills, where in a teaching skill is a set of teaching behaviours that facilitate or being about a specific instructional objective. In other words, teaching competence involves effective use of these various teaching skills.

**Measurement of Teaching Competency**

As cited earlier, the lack of clarity and agreement about the concept of teaching competence has made its measurement difficult. Of course, the various teacher education institutions have their own tools of assessing teaching competency of student teachers. But there has been no agreement and clarity about such tools, although some institutions have been making attempts to refine and list the criteria for the various aspects of teaching competency being measured. There is no standardized tool in India for measuring teaching competency.

The definition of ‘teaching competency’ cited above provide guidelines for objective and reliable measurement of the concept. Its measurement
involves identifying all the teaching skills constituting the entire teaching task and making observations regarding the effectiveness of performance of each of those teaching skills. This tool provides a measure of teaching competency on these lines.

**Description of the GTC Scale**

There are 21 items related to 21 teaching skills which encompass the entire teaching-learning process in the classroom. They are related to live major aspects of classroom teaching, namely, planning, presentation, closing, Evaluation and Managerial. The items are such that they are centered around teacher classroom behaviour in relation to pupil behaviour. It is a 7-point rating scale measuring the use of the skill by the teacher in the classroom corresponding to each item ranging from ‘1’ for ‘Not at all’ to ‘7’ for ‘very much.’

**Distribution of Items in Different Classification of Teaching Skills**

1. **PLANNING SKILL**
   (i) Objectives of the Lesson
   (ii) Content Selected
   (iii) Organization of content selected
   (iv) Audio-visual Material Chosen

2. **PRESENTATION SKILL**
   (v) Lesson introduced
   (vi) Questions Put
   (vii) Questions for Probing
   (viii) Explanation of concept of principles
   (ix) Illustration of concepts and principles
   (x) Securing and sustaining attention by varying stimuli
   (xi) Use of deliberate silence and non-verbal cues
   (xii) Increasing pupil’s participation
(xiii) Use of verbal and non-verbal reinforcers
(xiv) Pacing of the lesson
(xv) Blackboard work

3. CLOSING SKILL
(xvi) Achieving closure
(xvii) Giving assignment

4. EVALUATION SKILLS
(xviii) Class evaluation
(xix) Diagnosing pupils difficulties

5. MANAGERIAL SKILLS
(xx) Recognizing attending behaviour
(xxi) Maintaining discipline

TABLE 3.2
Distribution of Items in Different Classification of Teaching Skills

<table>
<thead>
<tr>
<th>Classification of Teaching Skills</th>
<th>No. of Items</th>
<th>Serial No. of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning</td>
<td>4</td>
<td>1 to 4</td>
</tr>
<tr>
<td>Presentation</td>
<td>11</td>
<td>5 to 15</td>
</tr>
<tr>
<td>Closing</td>
<td>2</td>
<td>16 and 17</td>
</tr>
<tr>
<td>Evaluation</td>
<td>2</td>
<td>18 and 19</td>
</tr>
<tr>
<td>Managerial</td>
<td>2</td>
<td>20 and 21</td>
</tr>
</tbody>
</table>

PROCEDURE FOR USE

The GTC scale is generally used for measuring teaching competency of a teacher individually by a reliable observer or a group of reliable observers making direct observations of his classroom behaviour for the entire teaching period.

As the teacher teaches, the observer sits at the back for observation. At the end of the teaching period, he gives his ratings on the GTC scale against all
the items. To facilitate this process, he may either mark frequencies or write verbal descriptions against each item which would help him in giving ratings more objectively.

SCORING PROCEDURE

The sum of the ratings against all the 21 items constitutes the Score on General Teaching Competency (GTC Score) of the teacher being observed. The maximum score possible is 147 and the minimum is 21.

RELIABILITY OF THE SCALE

Since this is an observation tool, the more appropriate type of reliability is the inter-observer reliability. This scale has been used for doctoral research (Joshi, 1977, Passi, 1977) and the reported inter-observer reliability coefficients range from 0.85 to 0.91. Inter-observer reliability can be better established when the observers train themselves for using the GTC scale.

VALIDITY OF THE SCALE

The scale has content validity since at every stage of its development, discussions were held with teachers and teacher educators with regard to the different teaching skills included and their behavioural components. There are 85 verbal and non-verbal behaviours that could be clustered around the below mentioned teaching behaviour:

The scale has factorial validity. This was established by Rama (1979) in her doctoral study on Factorial structure of teaching competencies among secondary school teachers. While developing an observation schedule, she made a list of teacher behaviours on the basis of behavioural components of the skills conceptualised by Passi (1976) and DeSaies (1976) which constitute the very same skills included in the GTC Scale. This resulted into 85 Verbal and non-verbal behaviours that could be clustered around 15 teaching skills. Table 2 gives the teaching skills and their behavioural components included.
TABLE 3.3
Distribution of Teacher Behaviours under the Different Teaching Skills

<table>
<thead>
<tr>
<th>Teaching Skill</th>
<th>No. of Teacher Behaviours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introducing a lesson</td>
<td>4</td>
</tr>
<tr>
<td>Fluency in questioning</td>
<td>7</td>
</tr>
<tr>
<td>Probing questioning</td>
<td>5</td>
</tr>
<tr>
<td>Explaining</td>
<td>8</td>
</tr>
<tr>
<td>Stimulus variation</td>
<td>7</td>
</tr>
<tr>
<td>Silence &amp; Non-verbal cues</td>
<td>5</td>
</tr>
<tr>
<td>Pacing the lesson</td>
<td>4</td>
</tr>
<tr>
<td>Using audio-visual aids</td>
<td>6</td>
</tr>
<tr>
<td>Illustrating with examples</td>
<td>5</td>
</tr>
<tr>
<td>Using blackboard</td>
<td>4</td>
</tr>
<tr>
<td>Reinforcement</td>
<td>5</td>
</tr>
<tr>
<td>Achieving Closure</td>
<td>4</td>
</tr>
<tr>
<td>Recognising attending behaviour</td>
<td>4</td>
</tr>
<tr>
<td>Classroom management</td>
<td>11</td>
</tr>
<tr>
<td>Giving assignment</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>85</td>
</tr>
</tbody>
</table>

Applicability of the Scale

The GTC scale can be used to measure teaching competency of any teacher irrespective of age, sex, region, socio-economic status, grade level, subject, rural/urban and so on. It can be used to train teachers both at pre-service and in-service level. A teacher can use the tool for self-evaluation purposes also.

The scale’s efficiency in measuring teaching competency through self-evaluation will be more when the teacher either views his Video recorded or audio recorded lesson rather than when he introspects.

PROCEDURE FOR USE

The GTC scale is generally used for measuring teaching competency of a teacher individually by a reliable observer or a group of reliable observers making direct observations of his classroom behaviour for the entire teaching
As the teacher teaches, the observer sits at the back for observation. At the end of the teaching period, he gives his ratings on the GTC scale against all the items. To facilitate this process, he may either mark frequencies or write verbal descriptions against each item which would help him in giving ratings more objectively.

STATISTICAL ANALYSIS

1. Objective 1: "To find out the relationships between teaching competency and academic qualifications of pre-service teachers.

Here we have taken one variable – teaching competency and the other variable – academic qualification. Our first variable is continuous variable and our second variable has natural dichotomy being a postgraduate and not being a postgraduate (i.e. graduate). So here, the investigator has used point Biserial Correlation.

1. The point biserial correlation makes no assumptions regarding the from of distribution in the dichotomized variables.

2. It may be used in regression equation.

3. The point biserial r is a product moment r and can be checked against r.

4. Like Pearson r, the range of rp.bis is equal to ± 1.

5. The standard error of rp.bis can be exactly determined and its significance can be easily tested against the null hypothesis.

6. It is always to compute rp.bis when we are not sure whether the dichotomy is natural or artificial. However, the use of rbis is always restricted to the artificial dichotomy of the dichotomized variable.

Formula for computation of point biserial correlation coefficient (rp.bis)

\[ rp.bis = \frac{M_p - M_q}{\sigma_i} \sqrt{pq} \]

\[ p = \text{Proportion of cases in one of the categories (higher group) of dichotomous variable} \]
\[ q = \text{Proportion of cases in the lower group } 1 - p. \]
\[ M_p = \text{Mean of the higher group, the first category of the dichotomous variable} \]
\[ M_q = \text{Mean of the values of lower groups.} \]
\[ M_T = \text{Mean of the entire group} \]
\[ \sigma_t = \text{Standard deviation of the entire group.} \]

2. Objective 2: “To find out the relationships between teaching competency and emotional intelligence of pre-service teachers.” Here the investigator took two variables, one variable is teaching competency and the other variable is emotional intelligence. To see these variables are correlated or not, product moment correlation is used. Assumptions of product moment correlation:

1. The relationship between two variables should be linear.
2. Standard deviation of scores in the different columns and rows should be equal and fairly homogenous.
3. Variable should be continuous
4. Distributions in two variables should be fairly symmetrical.

The coefficient of correlation computed by this method is known as the product moment coefficient of correlation or Pearson’s correlation coefficient and symbolically represented as ‘r’:

\[ r_{xy} = \frac{\Sigma xy}{N\sigma_x \sigma_y} \]

- \( r_{xy} \) = Correlation between \( x \) & \( y \) (two sets of scores)
- \( x \) = Deviation of any \( x \)-score from the mean in the test \( X \).
- \( y \) = Deviation of the corresponding \( y \) – score from the mean in the test \( y \).
- \( \Sigma xy \) = Sum of all the products of deviation (each \( x \) deviation multiplied by its corresponding \( y \)-deviation)
\( \sigma_x = \) Standard deviation of the distribution of score in the test \( x \).

\( \sigma_y = \) Standard deviation of the distribution of score in the test \( y \).

\( N = \) Total number of scores of frequencies.

This formula may be simplified as

\[
\sigma_x = \sqrt{\frac{\sum x^2}{N}}, \quad \sigma_y = \sqrt{\frac{\sum y^2}{N}},
\]

Now \( 'r' = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \times \Sigma y^2}} \)

3. Objective 3: “To find the relation between teaching competency of pre-service teachers and their academic qualification by partialling out the effect of emotional intelligence.” Here the investigator wanted to study the correlation between teaching competency and academic qualifications by partialling out the effect of emotional intelligence.

The important assumption of partial correlation is “Control the main variables (two or three) and they will automatically control so many other variables since other variables are related to these controlled variables. Here we used first order partial correlation

\[
r_{12,3} = \frac{r_{12} - r_{13} - r_{23}}{\sqrt{1 - r_{13}^2} \sqrt{1 - r_{23}^2}}
\]

\( r_{12,3} = \) Coefficient of partial correlation between teaching competency and academic qualifications controlling for EQ.

\( r_{12} = \) Coefficient of correlation between teaching competency and academic qualifications

\( r_{13} = \) Coefficient of correlation between teaching competency and emotional intelligence
\( r_{23} \) = Coefficient of correlation between academic qualifications and emotional intelligence

Formula for calculating the significance of partial correlation coefficient:

\[
't' = r \sqrt{\frac{N - 2 - K}{1 - r^2}}
\]

\( K \) = Order of partial 'r'
\( r \) = Value of partial correlation
\( N \) = Total frequency in the sample

Degree of freedom = N-2-K

4. **Objective 4:** “To find the relation between teaching competency of pre-service teachers and their emotional intelligence by partialling out the effect of academic qualifications.”

The important assumption of partial correlation is “Control the main variables (two or three) and they will automatically control so many other variables since other variables are related to these controlled variables. Here we used first order partial correlation

\[
r_{12,3} = \frac{r_{12} - r_{13} - r_{23}}{\sqrt{1-r_{13}^2} \sqrt{1-r_{23}^2}}
\]

\( r_{12,3} \) = Coefficient of partial correlation between teaching competency and emotional intelligence controlling for academic qualifications.

\( r_{12} \) = Value Coefficient of correlation between teaching competency and emotional intelligence.

\( r_{13} \) = Coefficient of correlation between teaching competency and academic qualifications.
\[ r_{23} \] = Coefficient of correlation between academic qualifications and emotional intelligence

Formula for calculating the significance of partial correlation coefficient:

\[
t' = \frac{r}{\sqrt{\frac{N - 2 - K}{1 - r^2}}}
\]

\( K \) = Order of partial 'r'

\( r \) = Value of partial correlation

\( N \) = Total frequency in the sample

Degree of freedom = N-2-K

5. **Objective 5**: "To compare the teaching competency between graduate pre-service teachers and post-graduate pre-service teachers."

To know results related to this objective, the investigator used t-test to find significance of the difference between two sample means. Formula used:

\[
t = \frac{M_1 - M_2}{\sigma_D} = \frac{\text{Difference between means}}{\text{Standard error of difference between means}}
\]

Where \( \sigma_D = \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}} \)

6. **Objective 6**: "To compare the teaching competency between graduate pre-service teachers and post-graduate pre-service teachers belonging to arts stream."

To know results related to this objective, the investigator used t-test to find significance of the difference between two sample means. Formula used:

\[
t = \frac{M_1 - M_2}{\sigma_D} = \frac{\text{Difference between means}}{\text{Standard error of difference between means}}
\]

Where \( \sigma_D = \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}} \)
7. **Objective 7**: "To compare the teaching competency between graduate pre-service teachers and post-graduate pre-service teachers belonging to science stream."

To know results related to this objective, the investigator used t-test to find significance of the difference between two sample means. Formula used:

\[ t = \frac{M_1 - M_2}{\sigma D} = \frac{\text{Difference between means}}{\text{Standard error of difference between means}} \]

Where \( \sigma D = \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}} \)

8. **Objective 8**: "To compare the teaching competency between graduate pre-service teachers and post-graduate pre-service teachers belonging to Commerce stream."

To know results related to this objective, the investigator used t-test to find significance of the difference between two sample means. Formula used:

\[ t = \frac{M_1 - M_2}{\sigma D} = \frac{\text{Difference between means}}{\text{Standard error of difference between means}} \]

Where \( \sigma D = \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}} \)

9. **Objective 9**: "To compare the teaching competency between graduate pre-service teachers belonging to arts, science and commerce streams."

To know results related to this objective, the investigator used 1-way Analysis of Variance to test the significance of difference between three sample means. This One-Way ANOVA technique help to know, whether any of the differences between means of the given samples are significant or not. Here, the investigator used "Between-Group variance". This represents the variance of group means around the total or grand mean of all groups i.e. the best estimate of the population mean (as the group means may vary considerably from each other): Formula for computer of F-value.:
<table>
<thead>
<tr>
<th>Sources of Variance</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean square variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>$Sb^2$</td>
<td>$K-1$</td>
<td>$Sb^2/K-1$</td>
</tr>
<tr>
<td>Within groups</td>
<td>$Sw_2$</td>
<td>$N-K$</td>
<td>$Sw^2/N-K$</td>
</tr>
</tbody>
</table>

$$F = \frac{\text{Mean square variance between groups}}{\text{Mean square variance within group}}$$

This F value was compared with the tabulated value for greater mean square variance and smaller mean square variance.

10. **Objective 10**: "To compare the teaching competency between postgraduate pre-service teachers belonging to arts, science and commerce streams."

To know results related to this objective, the investigator used 1-way Analysis of Variance to test the significance of difference between three sample means. This One-Way ANOVA technique helps to know, whether any of the differences between means of the given samples are significant or not. Here, the investigator used "Between-Group variance". This represents the variance of group means around the total or grand mean of all groups i.e. the best estimate of the population mean (as the group means may vary considerably from each other): Formula for computer of F-value:

$$F = \frac{\text{Mean square variance between groups}}{\text{Mean square variance within group}}$$
This F value was compared with the tabulated value for greater means square variance and smaller mean square variance.

11. **Objective 11**: “To compare the teaching competency between high emotionally intelligent and low emotionally intelligent pre-service teachers.”

To know results related to this objective, the investigator used t-test to find significance of the difference between two sample means. Formula used:

\[
t = \frac{M_1 - M_2}{\sigma_d} = \frac{\text{Difference between means}}{\text{Standard error of difference between means}}
\]

Where \(\sigma_d = \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}\)