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METHOD

AND

PROCEDURE
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METHOD AND PROCEDURE

"Research methodology is a way to systematically solve the research problem"

Research design is the plan, structure and strategy of investigation concerned, so as to obtain answers to research questions and to control variances. So the selection of research method is of utmost importance in the research process. It refers to the general strategy followed in collecting and analysing the necessary data.

In this study effect of Student Feedback, Peer Feedback, Supervisor Feedback, Audio-self Feedback, Audio+Supervisor Feedback, Video-self Feedback & Video+Supervisor Feedback on teaching competence of student teachers was studied by controlling age, sex, academic qualification of student teachers & aptitude towards teaching learning process of student teachers. In this study to increase the dependability of results, the number of factors accounted for with accuracy was further increased. In this study factors like age, sex, intelligence, academic record in graduation, aptitude towards teaching learning process & academic motivation was controlled. The basic purpose of conducting the Present Work was to study the effect of different aspects of microteaching on the general teaching competence and to compare the general teaching competence developed among the student teachers by different types of feedback.

4.1 OBJECTIVES OF THE STUDY

1. To find out the impact of the knowledge of skills of teaching on general teaching competence of students-teachers.

2. To asses the effect of knowledge of components of skills of teaching on general teaching competence of students-teachers.
3. To ascertain the relationship between efficiency of using the five selected teaching skills and general teaching competence with different types of feedback.

4. To find out the effect of different modes of feedback on general teaching competence of student teachers.

5. To find out the relationship between cognitive based competence and performance based competence of students-teachers.

4.2 HYPOTHESES OF THE STUDY

1. There is no impact of the knowledge of skills of teaching on general teaching competence of students-teachers.

2. There is no effect of knowledge of components of skills of teaching on general teaching competence of students-teachers.

3. There is no effect of efficiency of using the different skills on general teaching competence.

4. There is no effect of different modes of feedback on general teaching competence of student teachers.

5. There is no relationship between cognitive-based competence and performance-based competence of students-teachers.

4.3 METHOD OF THE STUDY

Research methods are of utmost importance in a research process. They describe the various steps of the plan of attack to be adopted in solving a research problem, such as the manner in which the problem is formulated, the definition of the terms, the choice of the subjects of
investigation, the validation of data-gathering tools, the collection and analysis and interpretation of data and the process of inferences and generalization.

Research method is a method in which the investigator does his work. The research methods are broadly classified into three categories:

(a) Historical Method: It is a method of investigation to discover, describe and interpret what existed in the past.

(b) Descriptive Method: It is a method of investigation to study, describe & interpret what exists at present.

(c) Experimental Method: It is a method of investigation to derive basic relationships among phenomenon under controlled conditions or to identify the conditions underlying the occurrence of a given phenomenon.

The selection of method & specific design within that method appropriate in investigating research problem depends upon the data that the problem entails. However the method selected should be in harmony with scientific principles and adequate enough to lead to dependable generalizations as it helps the investigator to carefully plan the steps he will take in the research process and describe the method clearly before he actually starts working on the solution of the problem. So a pre planned and well described method provides the researcher a scientific and feasible plan for attacking and solving the problem under investigation. Thus for the present work of investigation, the investigator has selected experimental method as method of research.

In the experimental method a researcher deliberately manipulates some aspects of the experiment in which he is interested. He causes certain things to happen and observes how the conditions are affected or changed. This method provides for much control and therefore establishes a systematic and logical association between manipulated factors and observed
effects. The researcher defines a problem and proposes a tentative answer or hypotheses. He tests the hypotheses and accepts or rejects it in the light of the controlled variable relationship that he has observed.

There are four essential characteristics of experimental research:

1. Control
2. Manipulation
3. Observation
4. Replication

1. **Control**: It refers to the extent to which different factors in an experiment are accounted for. More the factors that are accounted for with accuracy more the researcher is confident that his results are dependable.

2. **Manipulation**: It refers to a deliberate operation of the conditions by the researcher. Here the researcher sets the stage for the occurrence of the factors whose performance is to be studied under conditions in which all other factors are controlled or eliminated.

3. **Observation**: It refers to the measurement of the effects of the manipulation of independent variable on a dependent variable.

4. **Replication**: It is matter of conducting a number of sub experiments within the framework of an overall experimental design. The researcher makes a multiple comparison of a number of cases of the control group & a number of cases of experimental group, all within the same experimental framework.

The investigator has selected the feedback as a manipulating variable to study the effect of different types of feedback on the teaching competence with the help of microteaching as device of feedback. The advantage of microteaching as a device of feedback for acquiring
teaching competence is that it is a teaching in relatively simple and non-threatening context & that the student teacher can focus his attention on clearly specified aspects of his behaviour and that provision is made for much fuller and more objective feedback. Microteaching helps a teacher to be a competent teacher by practicing small content for lesser time in front of a small group of students thus making them confident to face the whole class for full content and for normal classroom time.

The five skills i.e. Skill of Introducing the lesson, Skill of Explanation, Skill of Probing Questions, Skill of Stimulus variation & Skill of Blackboard writing are selected by the research worker for the study. For each skill the desirable components are selected on the basis of which skill is developed among student teachers. The components selected For Skill of Introducing The Lesson are: Using previous experience of pupils, Proper use of device/technique, Overall impression, Relevance, Continuity; For Skill of Explanation are: Use of explaining links, Use of introductory statements, Use of concluding statements, Covering essential points, Use of visual techniques, Testing pupils understanding by asking questions, Interesting to pupils; For Skill of Probing Questioning are: Prompting, Seeking further information, Refocusing, Redirecting, Increasing critical awareness; For Skill of Stimulus Variation are: Movements, Gestures, Change in speech pattern, Focusing, Interaction styles, Pausing, oral visual switching; For Skill of Blackboard Writing are: Legibility, Neatness, Adequate use, Proper presentation, Writing in straight lines, Visibility, Figure at proper place, Speaking with writing, Use of coloured Chalks.

The microteaching cycle adopted for the present study consists of following microteaching sessions:
4.4 DESIGN OF THE STUDY

A research design is the arrangement of conditions for collection & analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. Research design is needed because it facilitates the smooth sailing of the various research operations thereby making research as efficient as possible yielding maximal information with minimal expenditure of effort, time & money.

Experimental design refers to the framework or structure of an experiment. The basic principles of experimental designs are:

- Principle of Replication
- Principle of Randomisation
- Principle of Local Control

According to principle of Replication the experiment should be repeated more than once. Thus each treatment is applied in many experimental units instead of one. The principle of randomisation provides protection when the investigator conducts an experiment against the effects of extraneous factors by randomisation i.e. this principle indicates that the
investigator should design or plan the experiment in such a way that the variations caused by extraneous factors can all be combined under the heading of chance. Under the principle of local control the extraneous factors, known as source of variability, is made to vary deliberately as wide a range as necessary & this needs to be done in such a way that the variability it causes can be measured and hence eliminated from the experimental error.

There are several experimental designs but it is broadly classified into:

(A) Single Group Design
(B) Parallel Group Design
(C) Quasi-Experimental Designs
(D) Time Series Designs
(E) Rotation Group Design
(F) Factorial Design

For the present work the investigator had selected parallel group design. In parallel group design two or more groups, as nearly equivalent as possible, are employed at the same time. Under conditions controlled as carefully as possible only a single factor or variable is manipulated; the experimental factor is varied for one group (experimental group), while the parallel group serves as the control for the comparative purpose, undergoing non-experimental conditions. If the investigator has to vary more than one phase of the experimental factor, more than two equivalent or parallel groups are needed. The parallel group design can be further sub classified into following main types:

1. Static Design
2. Randomised Subjects, Post-test-only Design
3. Randomised Matched Subjects, Post-test-only Design
4. Randomised Subjects, Pre-test-Post-test-only Design

5. Randomised Matched Subjects, Pre-test-Post-test-only Design

6. Randomised Solomon Group Design

Out of above listed designs the investigator had selected the Randomised Matched Subjects, Pre-test-Post-test-only Design to solve the present research problem.

The investigator has conducted the two Pilot Studies i.e. Pilot Study-I & Pilot Study-II by using Parallel Group Design before conducting the present study. In the Pilot Study-I effect of Student Feedback, Peer Feedback, Supervisor Feedback, Audio-self Feedback and Audio+Supervisor Feedback in developing the teaching skills among the student teachers was studied by selecting 50 student teachers of the Session 2003-04 of D.A.V. College of Education, Hoshiarpur and subsequently they were equally divided into five groups. The groups were equated in terms of the Age, Sex & Academic Qualification. The basic purpose of conducting the Pilot Study-I was to compare the teaching competence developed among the student teachers as a result of mechanical feedback i.e. Audio-self Feedback & Audio+Supervisor Feedback versus non-mechanical feedback i.e. Student Feedback, Peer Feedback & Supervisor Feedback and to obtain the perfection in the use of various instruments used for providing audio feedback.

In the Pilot Study-II effect of Student Feedback, Peer Feedback, Supervisor Feedback, Video-self Feedback and Video+Supervisor Feedback in developing the teaching skills among the student teachers was studied by selecting 50 student teachers of the Session 2004-05 of D.A.V. College of Education, Hoshiarpur and subsequently they were equally divided into five groups. The groups were matched in terms of mean & standard deviation of marks obtained in teaching learning process paper. The basic purpose of conducting the Pilot Study-II was to compare the teaching competence developed among the student teachers as a
result of mechanical feedback i.e. Video-self Feedback & Video+Supervisor Feedback versus non-mechanical feedback i.e. Student Feedback, Peer Feedback & Supervisor Feedback and to obtain the perfection in the use of various instruments used for providing video feedback.

For this study the investigator had selected Parallel Group Design with Randomised Matched Subjects, Pre-test-Post-test-only to solve the present research problem. The study was done by using parallel group design as follows:

1. Control Group
2. Experimental Group-A
3. Experimental Group-B

The Control Group had been provided with only knowledge of teaching skills, the Experimental Group-A had been provided knowledge of teaching skills & knowledge of components of teaching skills and Experimental Group-B had provided with knowledge of teaching skills, knowledge of components of teaching skills & the five teaching skills were also developed in them by using different types of feedback.

To study the effect of different types of feedback the Experimental Group-B is further sub-divided into seven equal groups:

1. Sub-Group EB-I trained by providing Student Feedback.
2. Sub-Group EB-II trained by providing Peer Feedback.
4. Sub-Group EB-IV trained by providing Audio Self Feedback.
5. Sub-Group EB-V trained by providing Audio+Supervisor Feedback.
7. Sub-Group EB-VII trained by providing Video+Supervisor Feedback.

The Table 4.1 shows the design of the study:
Table 4.1: Design of the Study

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Group</td>
<td>Exp. Group A</td>
</tr>
<tr>
<td>N = 70</td>
<td>N = 70</td>
</tr>
</tbody>
</table>

Equating the groups on the factors of age, sex, Intelligence, Aptitude towards Teaching Learning Process, Academic Motivation & Academic Record in Graduation

- Dividing the Exp. Group B into seven sub groups by equating the groups on the above mentioned factors
- EB-I | EB-II | EB-III | EB-IV | EB-V | EB-VI | EB-VII |
- N = 10 | N = 10 | N = 10 | N = 10 | N = 10 | N = 10 |

Pre-Test
- Administration of Baroda General Teaching Competence Scale

Training Imparted
- Knowledge of Micro Teaching Skills
- Knowledge of Components of Five Selected Teaching Skills through live, audio & video Demonstration Lessons
- Development of Five Selected Teaching Skills through M.T.
- Administration of Observation Schedule cum Rating Scales of the five selected skills for Teach Session taken as Initial Score
- Administration of Observation Schedule cum Rating Scales of the five selected skills for final Re-teach Session taken as Final Score

Post-Test
- Administration of Baroda General Teaching Competence Scale
4.5 SAMPLE & SAMPLING TECHNIQUE OF THE STUDY

The representative proportion of the population is called a sample. The four main steps involved in the process of selecting the sample are:

1. Defining the Population
2. Listing the Population
3. Selecting a representative sample
4. Obtaining an adequate sample

1. **Defining the Population**: A population refers to any collection of specified group of human beings or of non-human entities. For the present study student teachers enrolled for B. Ed. during session 2005-06 at D.A.V. College of Education, Hoshiarpur was selected as population.

2. **Listing the Population**: In order to select a sample from a given population it is necessary to have a complete, accurate & up-to-date list of all the units in the population. For this Master List of all the student teachers admitted in 2005-06 session in D.A.V. College of Education, Hoshiarpur was prepared along with relevant information collected from the office record.

3. **Selecting a representative sample**: After listing all the units a researcher selects a sample of required units from the list. The process of such a selection is called sampling. Sampling may be defined as the selection of some part of an aggregate or totality on the basis of which a judgment or inference about the aggregate or totality is made i.e. it is a process by which a relatively small number of individuals measures of individuals, objects, events is selected and analysed in order to find some thing about the entire population from which it was selected. There are two broad categories of sampling
   - Non-probability Sampling
   - Probability Sampling
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For selecting a representative sample the researcher has adopted Probability Sampling Method. Under this method the researcher has used systematic sampling method for selecting the representative sample, which is used when a population can be listed accurately and is finite.

4. **Obtaining an adequate sample**: If the population under study is homogeneous a small sample is sufficient. On the other hand a larger sample is necessary if there is greater variability in the units of population.

The sample was selected from 299 students enrolled for B.Ed. in 2005-06 out of which 229 were female & 70 were male. From these 210 was selected for the present study. Initially the Master List of all the students admitted in 2005-06 batch in D.A.V. College of Education, Hoshiarpur was prepared. Subsequently age, sex & B. Ed. Entrance Test marks of all the student teachers was collected from the office records. Using above information two different lists of male & female student teachers were prepared who fall in the age group of 20-23 years. Subsequently marks of all the student teachers were arranged in the descending order. From the list of female student teachers first three students were selected & randomly placed into three groups i.e. Control Group, Experimental Group-A & Experimental Group-B by lottery like system. Subsequently next student was skipped in the list & next three students were selected & distributed into the three groups by adopting the procedure as described above. For example after placing the 1st, 2nd & 3rd student teachers the 4th student was left in the list. Subsequently 5th, 6th & 7th student teachers were selected for distribution. This was done to include the low intelligence student teachers in all the three groups & for group adjustment in terms of number of male & female student teachers in each group. The students remaining in the list formed a standby list of student teachers. Above procedure of distribution by selecting three students & leaving the next was repeated till each group has 42 female student teachers. For distribution of male student teachers, from the list of male
student teachers first three students were selected & randomly placed into three groups i.e. Control Group, Experimental Group-A & Experimental Group-B by lottery like system. Subsequently very next three students were selected without skipping anyone & distributed into the three groups randomly. Above procedure of distribution of male student teachers was repeated till each group has 14 male student teachers. Subsequently rest of 28 male student teachers were divided into two groups by selecting two student teachers at a time and randomly placing them in each group and mean score of each group was calculated. After this an equivalent group of 14 female student teachers was made in such a way that its mean score was similar to above mentioned two 14 male student teachers groups. Subsequently two groups of 14 male student teachers each was attached randomly to the Control Group & Experimental Group-B and a group of 14 female student teachers was attached to Experimental Group-A. This was done to keep 6:4 ratio of female to male student teachers in each sub group of Experimental Group-B. Then Mean & Standard Deviation of B. Ed. Entrance Test marks of all the three groups i.e. Control Group, Experimental Group-A & Experimental Group-B was calculated.

Experimental Group-B was further divided into seven sub groups i.e. EB-I, EB-II, EB-III, EB-IV, EB-V, EB-VI & EB-VII by adopting the same procedure as described above. As mentioned earlier the sub group EB-I, EB-II, EB-III, EB-IV, EB-V, EB-VI & EB-VII was trained with Student Feedback, Peer Feedback, Supervisor Feedback, Audio Self Feedback, Audio+Supervisor Feedback, Video-self Feedback & Video+Supervisor Feedback respectively. There were ten student teachers in each sub group and each sub group was having 6 female student teachers & 4 male student teachers.

Subsequently Teaching Learning Process Paper marks conducted in Ist House Test Examination, and % marks in graduation of all the student teachers of Control Group, Experimental Group-A & Experimental Group-B was collected from the office records. Index
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of Academic Motivation was also determined by administering JIM Scale on all the student teachers. Subsequently the each group & sub group was matched for Mean & Standard Deviation of Teaching Learning Process Paper marks, % marks in graduation and Index of Academic Motivation of all the three groups was calculated. It had been found there was small difference in the mean & standard deviation of Teaching Learning Process Paper marks among different groups.

The Table 4.2 shows the detail of Control group, Experimental Group-A and Experimental Group-B & its Sub-Groups & the Figure 4.1 shows the Sample & Sampling Technique for the Session 2005-06:

| Table 4.2 : Mean & Standard Deviation of different Extraneous Variables for Control Group, Experimental Group-A and Experimental Group-B & its Sub-Groups |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Variable        | CG   | EG-A | EG-B | EB-I | EB-II | EB-III | EB-IV | EB-V | EB-VI | EB-VII |
| MBEET Mean      | 121.72| 121.71| 121.57| 122.30| 121.53| 122.53| 121.40| 121.18| 120.90| 121.15 |
| SD              | 11.38 | 11.95 | 10.88 | 11.01 | 9.90 | 13.35 | 11.94 | 11.47 | 11.21 | 10.39 |
| MTLPP Mean      | 35.37 | 35.73 | 35.2  | 34.70 | 33.50 | 35.30 | 35.70 | 36.10 | 35.00 | 36.10 |
| PMG Mean        | 60.35 | 59.92 | 59.19 | 60.96 | 55.11 | 56.80 | 61.92 | 59.50 | 58.26 | 61.80 |
| SD              | 7.13  | 5.66  | 8.02  | 8.36  | 8.67  | 6.63  | 9.15  | 7.29  | 5.29  | 9.69  |
| IAM Mean        | 108.83| 115.57| 111.81| 105.7 | 106.50| 111.50| 105.50| 118.60| 115.60| 119.30 |
| SD              | 18.18 | 15.98 | 15.32 | 13.42 | 21.82 | 12.24 | 17.89 | 16.15 | 5.50  | 11.67 |

4.6 TOOLS USED FOR THE STUDY

In a research project this step is very crucial because wise selection of tools facilitates both process of data collection and data analysis. As the study under taken was basically intensive in its approach so the investigator selected the following tools to collect the desired data:

1. Junior Index of Motivation (Jim Scale) by Jack F. Frymer
2. Baroda General Teaching Competence Scale, prepared at the Centre of Advanced Study in Education, (CASE) M.S. University, Baroda.
3. Observation Schedule cum Rating Scale for the Skill of Introducing the Lesson
4. Observation Schedule cum Rating Scale for the Skill of Blackboard Writing
5. Observation Schedule cum Rating Scale for the Skill of Probing Questioning
6. Observation Schedule cum Rating Scale for the Skill of Stimulus Variation
7. Observation Schedule cum Rating Scale for the Skill of Explanation
8. Instruments for Audio Recording
9. Instruments for Video Recording
10. Questionnaire for Student Teachers to evaluate their cognitive aspect (Self-made)
4.7 DESCRIPTION OF TOOLS USED

4.7.1 JUNIOR INDEX OF MOTIVATION (JIM SCALE) : In order to access the academic Motivation Level of student Teachers Junior Index of Motivation (Jim Scale) : (Form F) by Jack F. Frymer was used. This is a scale, which has been prepared by Jack F. Frymer in order to measure pupils motivation level. This is a paper pencil test. The scale consists of 80 statements, which unfold student’s motivation towards learning and their desire to excel in the school subjects. These statements are to be rated on a five point scale i.e. agree, slightly agree, indecision, slightly disagree & disagree. There is no time limit for the scale but generally students complete it within 30 minutes. The instructions to be followed are given at the top of the scale.

Administration of the Scale : In order to obtain reliable information, the student teachers were taken into confidence before administering the scale. The instructions were verbally read out to them. Care was taken that students do not consult each other. In order to avoid mutual consultation, the scale was administered to maximum of 30 students at a time. The scale is in English. The student teachers were asked to mark (x) at the appropriate place against each statement.

Scoring : Scoring was done to find out the total scores of each student teacher on the scale. The scoring was done as follows :

+2 marks to Agree,  
+1 marks to Slightly Agree,  0 marks to Indecision

-1 marks to Slightly Disagree,  
-2 marks to Disagree

All the scores were summed up. This gives the converted scores of academic motivation. In order to get the real score, the sign is reverted i.e. sign plus is changed to minus and vice versa, and then 100 is added. This gives the index of academic motivation of the students. The JIM Scale used to determine the academic Motivation Level of Student Teachers is
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shown in the Appendix G and the Answer Sheet for obtaining responses is shown in the Appendix H.

4.7.2 BARODA GENERAL TEACHING COMPETENCE SCALE : Baroda General Teaching Competence Scale is based on the lists of teaching skills developed at the Centre of Advanced Study in Education at the M. S. University of Baroda, Baroda. The Baroda General Teaching Competence Scale (BGTC Scale) covers the five major aspects related to teaching competence which are as follows:

A. Planning
B. Presentation
C. Closing
D. Evaluation
E. Managerial

To cover all the above aspects twenty-one skills are conceptualised which are essential for general teaching competence. The skill number 1 to 4 are related to Planning (Pre-instructional) aspect, skill number 5 to 15 are related to Presentation (Instructional) aspect, skill number 16 to 17 are related to Closing aspect, skill number 18 to 19 are related to Evaluation aspect and skill number 20 to 21 are related to Managerial aspect of teaching.

The Baroda General Teaching Competence Scale (BGTC Scale) has been developed as measuring criteria for each of the skills included in it. The BGTC is a seven point scale from 'not at all' to 'very much'. Score zero represents 'not at all' and score 6 represents 'very much'. All the twenty-one items on the scale are positive and maximum total score is 126. The BGTC scale was used to get initial test (Pre-Test) scores and final test (Post-Test) scores. The inter-observer reliability coefficient ranged from 0.85 to 0.91. The observers were the research workers of the CASE, the M.S. University, Baroda. The explanation of different components of the scale is given below:
1. **Objectives of the Lesson**:

(a) Clearly stated: An objective is said to be clearly stated when it satisfies the following criteria: (i) there is verb which describes the learning outcome in the pupils in behavioural terms; (ii) the learner is specified; (iii) the conditions under which the learning outcome is measured are indicated, and (iv) the standard (qualitative & quantitative) of achievement is specified.

(b) Relevant to the content: An objective is said to be relevant to the content when the objective is related to what is being taught.

(c) Adequate: The list of objectives is said to be adequate when it is sufficient with respect to the unit taught, different levels of learning outcomes, the maturity level of the pupils, time & facilities available.

2. **Content Selected**:

(a) Relevant: When content is related to the objectives specified, the maturity level of the pupils, time & facilities available.

(b) Adequate: When content is sufficient to cover all the objectives specified.

(c) Accurate: Content is said to be accurate when there is no technical mistake.

3. **Organisation of Content Selected**:

(a) Logical Continuity: There is logical continuity in the content when every unit of content to be presented is logically linked with the previous unit.

(b) Psychological Organisation: The content is said to be psychologically organised when it is arranged in such a way that pupil's previous knowledge forms the basis for presenting new knowledge, and it proceeds from simpler concepts to difficult concepts.

4. **Audio-Visual Material Chosen**:

(a) Suited to Pupils: To their interest & maturity levels.
(b) Suited to Content: When they are related to the content, to be presented & makes the presentation of the content more vivid.

(c) Adequate: When they are sufficient with respect to the content, which is to be explained.

(d) Necessary for the Attainment of Objectives: When they facilitate attainment of objectives to a greater extent than in their absence.

5. Lesson Introduced:

(a) Ready Emotionally: When pupils are attentive and keen to learn the new lesson as indicated by their non verbal participation like postures, attractive looks towards what the teacher does etc.

(b) Ready from knowledge point of view: Indicated by pupil's verbal participation in terms of correct responses to teacher's questions & pupil's meaningful initiation.

(c) Use of previous knowledge: When the already possessed knowledge of pupils is being used.

(d) Continuity in statements or questions: When a teacher's statement or a question is related to the immediately preceding statement or question.

(e) Relevant: When every statement or question uttered by the teacher is related to the objective of the lesson.

(f) Use of appropriate device or technique: When the devices or techniques used are suitable to the maturity level, age level, grade level, interest, culture, experience of pupils, and to unit to be taught.

6. Questions Put:

(a) Well-structured: A question is said to be well-structured when it is grammatically correct, relevant, specific and concise.

(i) Relevant: When it is related to the topics being discussed and does not contain any technical term not taught earlier.
(ii) Specific: When it calls for a single correct answer.

(iii) Concise: When it is not lengthy and does not contain extra words.

(b) Properly put: A question is said to be properly put when it is uttered with suitable speed and pause (so that it facilitates the understanding of the question) and suitable voice (audible to all pupils, raised, and clear).

7. **Questions for Probing:** Probing questions are those, which help pupils to go deep into their responses. They are asked while prompting, seeking further information, refocusing, redirecting and increasing critical awareness.

(a) Prompting question: A probing question which includes a hint for pupil that helps him in reaching the expected response; generally asked when there is a no response, partially correct response, incomplete response, or wrong response.

(b) Seeking further information question: A probing question which asks for more information about the response.

(c) Redirected question: A probing question directed to more pupils for response.

(d) Refocusing question: A probing question which seeks pupil to compare the idea or phenomenon in his response with other ideas or phenomenon (which he has already learnt) for similarity, contrast, or for any other relationship.

(e) Increasing critical awareness question: A probing question which seeks 'how' and 'why' of pupils response with an intention of increasing critical awareness about the response.

8. **Explanation of Concepts and Principles:**

(a) Statements to create set: Those that create readiness in pupils (regarding what is to be explained) emotionally and from knowledge point of view.

(b) Concluding statements: They are summary statements covering the main points of explanation.

(c) Relevant statements: Those that are related and contribute to what is being explained.
(d) Statements that have continuity: Statements that are linked logically with the previous ones and having spatial and time sequence.

(e) Appropriate vocabulary: Technical terms appropriate to the particular class, age group, and known to majority of pupils.

(f) Explaining links: Words and phrases (mostly conjunctions and prepositions), which indicate that the teacher is explaining.

(g) Fluent statements: Those that are complete and not reformulated in the middle.

9. Illustrations of Concepts & Principles:

(a) Appropriate examples: those that are simple, relevant and interesting.
   (i) Simple example: One that involves previous knowledge of pupils, which can be judged from their participation.
   (ii) Relevant example: One that exemplifies the concept or principle being illustrated.
   (iii) Interesting example: One that can arouse curiosity and interest in pupils which can be judged from their attending behaviour.

(b) Appropriate media (verbal and non verbal): Refers to those that are suited to age, grade, and maturity levels, and to the unit taught.

10. Securing and Sustaining Attention by Varying Stimuli:

(a) Movements: Those movements that are deliberately made from place to another, in order to secure pupils attention.

(b) Gestures: Include movements of head, hand and body to direct attention to emphasize importance, to express emotion, to indicate shapes, sizes, movements etc.

(c) Change in speed pattern: Includes the sudden changes in tone, volume or speed of teacher’s speech.

(d) Focussing: Includes verbal, gesture, or verbal-gesture focussing (drawing pupils attention to specific aspects in the lesson).
(e) Change in interaction styles; Includes change from one type of interaction style to another – teacher-group, teacher-pupil, and pupil-pupil.

(f) Pausing: Involves deliberate silence in order to draw pupil’s attention.

(g) Oral-visual switching: Includes change from one medium to another – oral, visual and oral-visual – through which information is conveyed to the pupils.

11. Use of Deliberate Silence and Non-verbal Cues:

(a) Silence: Includes meaningful silence meant to stimulate pupils to think, for considering pupils question, after a pupils response indicating him to continue etc.

(b) Non-verbal cues include the following:

(i) Facial cues: a smile, a frown, looking thoughtfully at the pupil, and a quizzical look.

(ii) Head movement: Nodding, shaking, tilting of head etc.

(iii) Body movement: Movement from one place to another.

(iv) Hand movement: Pointing to the student, continue cue, anything else? Cue, stop cue, pointing from one student to another etc.

12. Use of Verbal & Non-verbal Reinforcers:

(a) Verbal reinforcers: Include expressions like good, excellent, come on, think, um-um etc. and also repetition & rephrasing of pupils response which reinforce the pupils behaviour positively and encourage him to participate.

(b) Non-verbal reinforcers: Include non-verbal behaviours like nodding, smiling, moving towards responding pupil, looking attentively at the responding pupil, writing pupils response on blackboard which reinforce or strengthen pupils behaviour and encourage him to participate.

13. Pacing of the Lesson: Speed of presentation matching with the rate of pupils understanding: when before proceeding from one unit to the other, pupils understanding about the earlier unit are brought out.
14. **Pupils Participation** : Pupils participated in the classroom and responded to the teacher and initiated by giving their own ideas and reacting to others ideas.

15. **Blackboard Work** :

(a) Legibility in handwriting includes the following :

(i) Every letter is distinctly different from the other.

(ii) There is adequate spacing between two letters & between words.

(iii) Slantness of each letter is closest to the vertical.

(iv) Size of each letter is large enough to be read from the far end of the room.

(v) All capital letters are of the same size and all small letters are of the same size

(vi) Thickness of the lines is of same width.

(b) Neatness in blackboard work includes the following :

(i) Words & sentences written are parallel to the base of the board.

(ii) Spacing between lines is adequate.

(iii) There is no overwriting.

(iv) Only the relevant matter, which is under the focus of classroom discussion, is retained on the blackboard.

(c) Appropriateness of written work on blackboard includes the following :

(i) There is continuity in the points being presented on the blackboard.

(ii) The points written are brief & simple.

(iii) Important points are underlined to draw pupil’s attention.

(iv) Coloured chalks are used suitably.

(v) Diagrams/illustrations are developed along with the lesson.

(vi) Diagrams are proportional in size.

(vii) There are no unnecessary details in the diagrams/illustrations.
16. **Appropriate Closure**: It includes the following points:

(a) Main points of the lesson are consolidated.

(b) Present knowledge is linked with past knowledge.

(c) Opportunities are provided for applying present knowledge.

(d) Present knowledge is linked with future learning.

17. **Assignment**:

(a) Suitable to individual differences: Certain items are suited to weak students (simple, recall or recognition type items), certain are suited to average (more than recall & requires understanding) and others are suited to above average students (challenging, requires creative, original and higher order thinking).

(b) Relevant: Related to the content being taught.

(c) Adequate: Sufficient with respect to the content covered and to the checking of the objectives specified.

18. **Evaluation Procedures**: They can be recognising attending behaviour of pupils (verbal and visual), asking questions for feedback or giving them some test items to be answered in the class.

19. **Remedial Measures**: They can be asking prompting or seeking further information questions, repeating or re-teaching, use of more audio visual aids, using more concrete, simple & interesting examples and illustrations etc

20. **Recognition of Attending & Non-attending behaviours**: It includes the following:

(a) Attending behaviour is rewarded.

(b) Directions are given to eliminate non-attending behaviour.

(c) Questions are asked to check pupils attending behaviour.

(d) Pupil’s feelings & ideas are accepted.
(e) Use of nonverbal cues to recognise pupils attending & non-attending behaviour.

21. **Class Room Discipline** : When the pupils are following the instructions given by the teacher that are not related to the content, the class room discipline is said to be maintained. It includes statements & questions that are followed by correct pupil responses (verbal and/or non-verbal).

The glossary of each component used in the scale is given in the Appendix I and the BGTC Scale used for rating the different student teachers is shown in Appendix J.

4.7.3 **OBSERVATION SCHEDULE CUM RATING SCALE FOR THE SKILL OF INTRODUCING THE LESSON** : It has got five components namely: Using previous experience of pupils, Proper use of device/technique, Overall impression, Relevance, Continuity. The glossary of each component for the skill of introducing the lesson is given in the Appendix K. The Observation Schedule cum Rating Scale for the Skill of Introducing the Lesson is given in the Appendix L.

4.7.4 **OBSERVATION SCHEDULE CUM RATING SCALE FOR THE SKILL OF EXPLANATION** : It consists of five components namely: Use of explaining links, Use of introductory statements, Use of concluding statements, Covering essential points, Use of visual technique, Testing pupils understanding by asking questions, Interesting to pupils. The glossary of each component for the skill of explanation is given in the Appendix M. The Observation Schedule cum Rating Scale for the Skill of Explanation is given in the Appendix N.
4.7.5 OBSERVATION SCHEDULE CUM RATING SCALE FOR THE SKILL OF PROBING QUESTIONING: It consists of five components namely: Prompting, Seeking further information, Refocusing, Redirecting, and Increasing critical awareness. The glossary of each component for the skill of probing questioning is given in the Appendix O. The Observation Schedule cum Rating Scale for the Skill of Probing Questioning is given in the Appendix P.

4.7.6 OBSERVATION SCHEDULE CUM RATING SCALE FOR THE SKILL OF STIMULUS VARIATION: It consists of six components namely: Movements, Gestures, Change in speech pattern, Focusing, Interaction styles, Pausing. The glossary of each component for the skill of stimulus variation is given in the Appendix Q. The Observation Schedule cum Rating Scale for the Skill of Stimulus Variation is given in the Appendix R.

4.7.7 OBSERVATION SCHEDULE CUM RATING SCALE FOR THE SKILL OF BLACKBOARD WRITING: It consists of nine components namely: Legibility, Neatness, Adequate use, Proper presentation, Writing in straight lines, Visibility, Figure at proper place, Speaking with writing, Use of coloured chalks. The glossary of each component for the skill of blackboard writing is given in the Appendix S. The Observation Schedule cum Rating Scale for the Skill of Blackboard Writing is given in the Appendix T.

Observation Schedule cum Rating Scale for each of the above listed five skills consists of following four parts:

(a) The first part records the bio-data of the student-teacher who is to be observed on the schedule. It includes, (i) Name of the student-teacher (ii) Roll No. (iii) Class (iv) Subject (v) Topic (vi) Date (vii) Name of the supervisor.
(b) The second part of each schedule gives instructions for marking tallies & ascertaining the extent to which the particular component in a skill is used. The supervisor has to mark a tick (✓) for each occurrence of instance corresponding to use of particular component in a skill. For ascertaining the extent to which the particular component in a skill is used, the judgement has to be given on a seven point scale. The extent of the use of various components in a skill is indicated by crossing (x) the number the supervisor considers to be fit. The scale value ‘1’ indicates that student teacher did not use the particular component at all. The scale value ‘7’ indicates that student teacher used the particular component in an excellent manner.

(c) The third part of the observation schedule is further sub divided into three parts. This part records the performance of the student teacher during the first session i.e. teach session. In this first column indicates the tallies/specific observation (S.O.), if any, against different components of the particular skill. The second column specifies the components of the skill under consideration. The third one contains rating from ‘1’ to ‘7’ against each of the components. By crossing (x) the appropriate number the supervisor indicates the extent of the use of the particular component of the skill.

(d) The fourth part is the same as third part the only difference is it records the performance of the student teacher during the subsequent sessions i.e. re-teach sessions.

4.7.8 INSTRUMENTS FOR AUDIO RECORDING: Two Pentium IV Computers, My Sound Studio Software, Dynamic Stereo Headphone with Microphone & CD-RW were the instruments used for audio recording of micro lesson. The audio recording was subsequently used for Audio-self Feedback and Audio+Supervisor Feedback. The description/specifications of Two Pentium IV Computers, My Sound Studio Software, and Dynamic Stereo Headphone with Microphone & CD-RW is given in the section 3.1.5(B).
CHAPTER-IV

4.7.9 INSTRUMENTS FOR VIDEO RECORDING : Two Handy Cams, Television & HI-8 Video were the instruments used for video recording of micro lesson. The video recording was subsequently used for video-self feedback and Video+Supervisor Feedback. The description/specifications of Handy Cam, Television & HI-8 Video Cassette used for this purpose is in given the section 3.1.5(C).

4.7.10 QUESTIONNAIRE FOR STUDENT TEACHERS TO EVALUATE THEIR COGNITIVE ASPECT : The main purpose of this Questionnaire was to find out the knowledge of student teachers about general programme of student teaching, teaching competence, feedback, microteaching & teaching skills. For preparing the questionnaire there was need to have thorough knowledge about the background and organization of microteaching and feedback process.

Before the preparation of the questionnaire, the investigator consulted the various books, journals and other sources for getting latest information on the teaching in general, micro-teaching, teaching skills, components of teaching skills, teaching competence and different types of feedback.

Investigator had framed questions on the basis of knowledge acquired from different sources. It was decided that some questions would be related to general teaching, some with microteaching and others to the teaching skills - components of the teaching skills, teaching competence and feedback. The questions were framed in the form of statements, keeping in view the mental age and educational background of the student teachers. The objectives and hypothesis of the study were kept in mind during the framing of questions.
The questionnaire prepared consists of questions related to under mentioned concepts:

- Micro Teaching
  - Skill of Introducing the Lesson
  - Skill of Questioning
  - Skill of Black Board Writing
  - Skill of Stimulus Variation
  - Skill of Explanation

Initially the investigator had constructed a questionnaire consisting of 66 statements. The statements were to be rated according to a five-point scale i.e. strongly agree, agree, not clear, disagree and strongly disagree.

Questionnaire comprised 66 questions related to:

(i) General Teaching
(ii) Teaching Competency
(iii) Micro Teaching
(iv) Teaching Skills
(a) Skill of Blackboard Writing
(b) Skill of Introduction Of Lesson
(c) Skill of Stimulus Variation
(d) Skill of Probing Questions
(e) Skill of Explanation

(v) Feedback

• Standardisation of Questionnaire : The two major aspects of the standardisation of the questionnaire are validity & reliability of questionnaire.

(a) Validity of Questionnaire : The validity of a test means the degree to which the test actually measures which it purports to measure. The validity provides the direct check on how well the test fulfils its functions. Many a time it tells us more than the degree to which the test is fulfilling its functions.

For checking the validity of the questionnaire a number of experts in the field of education having doctorate degree in philosophy and long standing erudition & experience in the field of inquiry had been consulted through letters and by arranging personal meeting. They had been given the brief written introduction to the topic of the research study, various areas covered in the questionnaire, neatly typed Questionnaire and a blank sheet for their valuable suggestions/comments. They had been requested to tick mark the relevant statements with which the investigator could sample a significant aspect for which the questionnaire is meant and also to fill the questionnaire. The investigator had solicited the cooperation of experts in re-phrasing of the ambiguous statements & weeding out of irrelevant statements. The break up of the questionnaire on the basis of different components is shown in the Table 4.3 as:
In the light of suggestions/comments received from experts the questionnaire was modified. One statement, which appears to be irrelevant, had been deleted. Four statements for which responses of the experts had been different had also been deleted. The seven statements had been rephrased. In this way the final modified questionnaire had 61 statements. The final questionnaire and the response sheet for the questionnaire are given respectively in the Appendix U & Appendix V.
The questions under teaching skills were further broken up according to the different skills used for the purpose of investigation. The break up of the questions are shown in Table 4.4:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Skill</th>
<th>Serial number of questions under different skills</th>
<th>Total number of questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Black- board Writing</td>
<td>4, 52</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Introduction of the lesson</td>
<td>5, 12, 13, 35</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Stimulus variation</td>
<td>10, 51, 53</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Probing Questioning</td>
<td>11, 59</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Explanation</td>
<td>3, 36, 58</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>14</strong></td>
</tr>
</tbody>
</table>

(b) Reliability of Questionnaire:

Reliability refers to accuracy of the measurement. It also refers to the consistency of scores or measurement, which is reflected in the reproducibility of scores. A test is said to be consistent over a given period of time when all the individuals retain their score on two separate testing with same test.

The reliability of the questionnaire was determined by employing Test-Retest Method of reliability. For the purpose of determining the reliability questionnaire was administered over 50 student teacher of the session 2004-05 which were trained through different types of feedback just after second teaching practice. For collecting the data with the help of questionnaire, the investigator distributed the questionnaire among the student teachers and gave them important verbal instructions in addition to the already written instructions on the questionnaire. Investigator requested them to give their own views sincerely. Student teachers were free to make the things clear which they did not understand.
Their responses were subsequently converted into the scores using the key for the questionnaire. The scoring for the statements, which express the favourableness for cognitive aspect, was done as follows:

5 marks to Strongly Agree (SA), 4 marks to Agree (A), 3 marks to Uncertain (U), 2 marks to Disagree (D), 1 mark to Strongly Disagree (SD).

The scoring for the statements, which express the unfavourableness for cognitive aspect was done as follows:

1 mark to Strongly Agree (SA), 2 marks to Agree (A), 3 marks to Uncertain (U), 4 marks to Disagree (D), 5 mark to Strongly Disagree (SD).

The statements, which express the favourableness for cognitive aspect, are:

1, 2, 3, 4, 6, 12, 13, 15, 18, 19, 20, 21, 23, 24, 25, 27, 30, 33, 34, 36, 37, 41, 42, 43, 46, 47, 53, 54, 56, 58, 60.

The statements, which express the unfavourableness for cognitive aspect:

5, 7, 8, 9, 10, 11, 14, 16, 17, 22, 26, 28, 29, 31, 32, 35, 38, 39, 40, 44, 45, 48, 49, 50, 51, 52, 55, 57, 59, 61.

The second administration for the retest scores was done after one month from the first administration on the same group. Similarly answers were subsequently converted into the scores using the key for the questionnaire. Subsequently reliability coefficient was calculated by test-retest method. It was found to be +0.97. High test-retest reliability shows that there is low variable error in the two sets of scores obtained. Hence the questionnaire prepared is reliable.
4.8 DATA COLLECTION PROCEDURE FOR THE STUDY

After grouping the student teachers into Control Group, Experimental Group-A & Experimental Group-B, the cognitive based competence of student teachers of Control Group & Experimental Group-B was determined by administering the questionnaire prepared for this purpose by the investigator on them. Subsequently BGTC Scale was applied on each student teacher as pre test to obtain initial scores. After this following treatment was given to student teachers of Control Group, Experimental Group-A & Experimental Group-B to obtain data for analysis & testing of various hypotheses of the study:

1. The concept of microteaching skills was discussed in detail by the supervisors with all the student teachers of Control Group, Experimental Group-A & Experimental Group-B.

2. Subsequently all the five selected skills of teaching & their components were taught by the investigator to the student teachers of Experimental Group-A & Experimental Group-B.

3. The student teachers of Experimental Group-A & Experimental Group-B were given demonstration of all the five selected skills of teaching & their components through live model lessons & pre recorded Audio & Video model lessons on each selected skill made by the investigator himself (No further treatment was given to the student teachers of the Experimental Group-A).

4. Each student teacher of seven subgroups i.e. EB-1, EB-2, EB-3, EB-4, EB-5, EB-6 & EB-7 was asked to prepare the four micro lesson plans of about six minutes for each of the selected skill. Out of four micro lesson plans for the particular skill student teacher had to prepare two micro lessons for each teaching subject. Further out of two micro lessons for the particular subject one should be from VIII Standard & other should be from IX standard. In this way each student teacher had prepared the 20 micro lessons.
5. After this student-teacher at S. No. 1 of EB-1 was asked to deliver first micro lesson on the skill of Introducing the Lesson in front of the students in a real classroom situation during the second teaching practice and his competence was rated by the student of the class. The rating was obtained on the Observation Schedule cum rating scale prepared by Bimla Passi and M.S. Lalita. By using marks obtained by the student teacher his initial score had been calculated.

6. Immediately after the lesson Student Feedback was given to the student teacher for about six minutes. Subsequently student teacher was asked to re-plan the micro lesson within twelve minutes.

7. After this student teacher was asked to deliver the re-planned micro lesson on the skill of introducing the lesson to the different group of real students but the student providing the feedback remains the same. The feedback from the student was obtained on the Observation Schedule cum rating scale prepared by Bimla Passi and M.S. Lalita.

8. By using marks obtained by the student teacher his revised score had been calculated.

9. The steps 4 to 8 were repeated three re-teach sessions & the score obtained at the third re-teach session. (The investigator had selected three re-teach sessions for the development of microteaching skill based upon the findings of the Pilot Study-I & Pilot Study-II).

10. The steps 5 to 9 were repeated with one more micro lesson which is of another (second) teaching subject and of different Standard (Class) prepared by the student-teacher on the skill of Introducing the Lesson.

11. The steps 5 to 10 were repeated with the micro lessons of student teacher at S. No. 1 for the Skill of Explanation, Skill of Probing Questions, Skill of Stimulus Variation, and Skill of Blackboard Writing.

12. The steps 5 to 11 were repeated simultaneously with student teacher at S. No. 2 to 10 of EB-1.
13. The steps 5 to 12 were repeated simultaneously with student teachers of EB-2 in which instead of Student Feedback, Peer Feedback was used for developing five selected skills among student teachers.

14. The steps 5 to 12 were repeated simultaneously with student teachers of EB-3 in which instead of Student Feedback, Supervisor Feedback was used for developing five selected skills among student teachers.

15. The steps 5 to 12 were repeated simultaneously with student teachers of EB-4 in which instead of Student Feedback, Audio Self Feedback was used for developing five selected skills among student teachers.

16. The steps 5 to 12 were repeated simultaneously with student teachers of EB-5 in which instead of Student Feedback, Audio+Supervisor Feedback was used for developing five selected skills among student teachers.

17. The steps 5 to 12 were repeated simultaneously with student teachers of EB-6 in which instead of Student Feedback, Video-self Feedback was used for developing five selected skills among student teachers.

18. The steps 5 to 12 were repeated with student teachers of EB-7 in which instead of Student Feedback, Video+Supervisor Feedback was used for developing five selected skills among student teachers.

19. Subsequently theoretical knowledge of integration of teaching skills is given to all the student teachers of Experimental group-B by the investigator with the help of written mini model lesson prepared by integrating all the five selected teaching skills. Each student was asked to prepare four mini lessons by using integration as a whole approach of integration for the Skill of Introducing the Lesson, Skill of Explanation, Skill of Probing Questions, Skill of Stimulus Variation, Skill of Blackboard Writing. Afterwards
the investigator had checked the each mini lesson & improvements were suggested to the student teachers.

20. In the end, BGTC Scale was applied on each student teachers of Control Group, Experimental Group-A & Experimental Group-B as post-test during second discussion lesson to obtain final scores.

For developing the skill using different types of feedback the students belonging to two sections each of a VIII Standard & IX Standard were divided into five micro classes containing 5-10 students. For the division of students into five micro classes first a master list of student in descending order on basis of marks scored by them in the previous class was prepared. Subsequently they were divided into five micro classes picking five at a time randomly allocating them into five micro classes. The Micro teaching schedule was alternatively followed on VIII Standard & IX Standard micro classes. The Micro Teaching Schedule for Student Feedback, Peer Feedback, Supervisor Feedback, Audio Feedback & Video Feedback respectively shown in Table 4.5, Table 4.6, Table 4.7, Table 4.8 & Table 4.9 was followed in order to impart training to all the student teachers of different sub groups of Experimental Group-B.
Table 4.5: Micro Teaching Schedule for Student Feedback

<table>
<thead>
<tr>
<th>Time (in Min.)</th>
<th>Teaching Room</th>
<th>Feedback Room</th>
<th>Replanning Room</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teach</td>
<td>Re-teacher</td>
<td>Obs.</td>
</tr>
<tr>
<td>0-6</td>
<td>SST1</td>
<td>-</td>
<td>St-1</td>
</tr>
<tr>
<td>7-12</td>
<td>SST2</td>
<td>-</td>
<td>St-2</td>
</tr>
<tr>
<td>13-18</td>
<td>SST3</td>
<td>-</td>
<td>St-3</td>
</tr>
<tr>
<td>19-24</td>
<td>SST4</td>
<td>-</td>
<td>St-4</td>
</tr>
<tr>
<td>25-30</td>
<td>SST1</td>
<td>St-1</td>
<td></td>
</tr>
<tr>
<td>31-36</td>
<td>SST2</td>
<td>St-2</td>
<td></td>
</tr>
<tr>
<td>37-42</td>
<td>SST3</td>
<td>St-3</td>
<td></td>
</tr>
<tr>
<td>43-48</td>
<td>SST4</td>
<td>St-4</td>
<td></td>
</tr>
<tr>
<td>49-54</td>
<td>SST1</td>
<td>St-1</td>
<td></td>
</tr>
<tr>
<td>55-60</td>
<td>SST2</td>
<td>St-2</td>
<td></td>
</tr>
<tr>
<td>61-66</td>
<td>SST3</td>
<td>St-3</td>
<td></td>
</tr>
<tr>
<td>67-72</td>
<td>SST4</td>
<td>St-4</td>
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</tr>
<tr>
<td>73-78</td>
<td>SST1</td>
<td>St-1</td>
<td></td>
</tr>
<tr>
<td>79-84</td>
<td>SST2</td>
<td>St-2</td>
<td></td>
</tr>
<tr>
<td>85-90</td>
<td>SST3</td>
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<td></td>
</tr>
<tr>
<td>91-96</td>
<td>SST4</td>
<td>St-4</td>
<td></td>
</tr>
</tbody>
</table>

Note: Obs. = Observer; ST = Student Teacher; FRF = Feedback Received From; TOF = Type of Feedback; St-1,2,3,4 = Student-1,2,3,4; C-1,3,4,5 = Section-1,3,4,5 of Micro Class; SST1,2,3,4 = Student Teacher 1,2,3,4 receiving Student Feedback; St = Student Feedback
### Table 4.6: Micro Teaching Schedule for Peer Feedback

<table>
<thead>
<tr>
<th>Time (in Min.)</th>
<th>Teaching Room</th>
<th>Feedback Room</th>
<th>Replanning Room</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teach</td>
<td>Re-obs.</td>
<td>Class</td>
</tr>
<tr>
<td>0-6</td>
<td>SP1</td>
<td>-</td>
<td>P-1</td>
</tr>
<tr>
<td>7-12</td>
<td>SP2</td>
<td>-</td>
<td>P-2</td>
</tr>
<tr>
<td>13-18</td>
<td>SP3</td>
<td>-</td>
<td>P-3</td>
</tr>
<tr>
<td>19-24</td>
<td>SP4</td>
<td>-</td>
<td>P-4</td>
</tr>
<tr>
<td>25-30</td>
<td>SP1</td>
<td>P-1</td>
<td>C-3</td>
</tr>
<tr>
<td>31-36</td>
<td>SP2</td>
<td>P-2</td>
<td>C-3</td>
</tr>
<tr>
<td>37-42</td>
<td>SP3</td>
<td>P-3</td>
<td>C-3</td>
</tr>
<tr>
<td>43-48</td>
<td>SP4</td>
<td>P-4</td>
<td>C-3</td>
</tr>
<tr>
<td>49-54</td>
<td>SP1</td>
<td>P-1</td>
<td>C-5</td>
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<td>55-60</td>
<td>SP2</td>
<td>P-2</td>
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<td>SP3</td>
<td>P-3</td>
<td>C-5</td>
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<td>SP4</td>
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<td>C-5</td>
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<td>73-78</td>
<td>SP1</td>
<td>P-1</td>
<td>C-1</td>
</tr>
<tr>
<td>79-84</td>
<td>SP2</td>
<td>P-2</td>
<td>C-1</td>
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<td>85-90</td>
<td>SP3</td>
<td>P-3</td>
<td>C-1</td>
</tr>
<tr>
<td>91-96</td>
<td>SP4</td>
<td>P-4</td>
<td>C-1</td>
</tr>
</tbody>
</table>

**Note:** Obs. = Observer; ST = Student Teacher; FRF = Feedback Received From; TOF = Type of Feedback; P-1,2,3,4 = Peer-1,2,3,4; C-1,2,3,5 = Section-1,2,3,5 of Micro Class; SP1,2,3,4 = Student Teacher 1,2,3,4 receiving Peer Feedback; P = Peer Feedback
### Table 4.7: Micro Teaching Schedule for Supervisor Feedback

<table>
<thead>
<tr>
<th>Time (in Min.)</th>
<th>Teaching Room</th>
<th>Feedback Room</th>
<th>Replanning Room</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teach</td>
<td>Re-teach</td>
<td>Obs.</td>
</tr>
<tr>
<td>0-6</td>
<td>SS1</td>
<td>-</td>
<td>S-3</td>
</tr>
<tr>
<td>7-12</td>
<td>SS2</td>
<td>-</td>
<td>S-4</td>
</tr>
<tr>
<td>13-18</td>
<td>SS3</td>
<td>-</td>
<td>S-3</td>
</tr>
<tr>
<td>19-24</td>
<td>SS4</td>
<td>-</td>
<td>S-4</td>
</tr>
<tr>
<td>25-30</td>
<td>SS1</td>
<td>S-3</td>
<td>C-4</td>
</tr>
<tr>
<td>31-36</td>
<td>SS2</td>
<td>S-4</td>
<td>C-4</td>
</tr>
<tr>
<td>37-42</td>
<td>SS3</td>
<td>S-3</td>
<td>C-4</td>
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<tr>
<td>43-48</td>
<td>SS4</td>
<td>S-4</td>
<td>C-4</td>
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<td>SS1</td>
<td>S-3</td>
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<td>SS1</td>
<td>S-3</td>
<td>C-2</td>
</tr>
<tr>
<td>79-84</td>
<td>SS2</td>
<td>S-4</td>
<td>C-2</td>
</tr>
<tr>
<td>85-90</td>
<td>SS3</td>
<td>S-3</td>
<td>C-2</td>
</tr>
<tr>
<td>91-96</td>
<td>SS4</td>
<td>S-4</td>
<td>C-2</td>
</tr>
</tbody>
</table>

Note: Obs. = Observer; ST = Student Teacher; FRF = Feedback Received From; TOF = Type of Feedback; S-3,4 = Supervisor-3,4; C-1,2,3,4 = Section-1,2,3,4 of Micro Class; SS1,2,3,4 = Student Teacher 1,2,3,4 receiving Supervisor Feedback; Su = Supervisor Feedback
### Table 4.8: Micro Teaching Schedule for Audio Feedback

<table>
<thead>
<tr>
<th>Time (in Min.)</th>
<th>Teaching Room</th>
<th>Feedback Room</th>
<th>Replanning Room</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teach</td>
<td>Re-teach</td>
<td>Obs.</td>
</tr>
<tr>
<td>0-6</td>
<td>SA1</td>
<td>-</td>
<td>Self</td>
</tr>
<tr>
<td>7-12</td>
<td>SAS1</td>
<td>-</td>
<td>S-1</td>
</tr>
<tr>
<td>13-18</td>
<td>SA2</td>
<td>-</td>
<td>Self</td>
</tr>
<tr>
<td>19-24</td>
<td>SAS2</td>
<td>-</td>
<td>S-1</td>
</tr>
<tr>
<td>25-30</td>
<td>SA1</td>
<td>Self</td>
<td>S-1</td>
</tr>
<tr>
<td>31-36</td>
<td>SAS1</td>
<td>S-1</td>
<td>C-1</td>
</tr>
<tr>
<td>37-42</td>
<td>SA2</td>
<td>Self</td>
<td>S-1</td>
</tr>
<tr>
<td>43-48</td>
<td>SAS2</td>
<td>S-1</td>
<td>C-1</td>
</tr>
<tr>
<td>49-54</td>
<td>SA1</td>
<td>Self</td>
<td>C-2</td>
</tr>
<tr>
<td>55-60</td>
<td>SAS1</td>
<td>S-1</td>
<td>C-2</td>
</tr>
<tr>
<td>61-66</td>
<td>SA2</td>
<td>Self</td>
<td>C-2</td>
</tr>
<tr>
<td>67-72</td>
<td>SAS2</td>
<td>S-1</td>
<td>C-2</td>
</tr>
<tr>
<td>73-78</td>
<td>SA1</td>
<td>Self</td>
<td>C-5</td>
</tr>
<tr>
<td>79-84</td>
<td>SAS1</td>
<td>S-1</td>
<td>C-5</td>
</tr>
<tr>
<td>85-90</td>
<td>SA2</td>
<td>Self</td>
<td>C-5</td>
</tr>
<tr>
<td>91-96</td>
<td>SAS2</td>
<td>S-1</td>
<td>C-5</td>
</tr>
</tbody>
</table>

**Note:** Obs. = Observer; ST = Student Teacher; FRF = Feedback Received From; TOF = Type of Feedback; S-1 = Supervisor-1; C-1,2,4,5 = Section-1,2,4,5 of Micro Class; SA1 = Student Teacher 1 receiving Audio-self Feedback; SAS1 = Student Teacher 1 receiving Audio+Supervisor Feedback; SA2 = Student Teacher 2 receiving Audio-self Feedback; SAS2 = Student Teacher 2 receiving Audio+Supervisor Feedback; A = Audio-self Feedback; A+S = Audio+Supervisor Feedback.
<table>
<thead>
<tr>
<th>Time (in Min.)</th>
<th>Teaching Room</th>
<th>Feedback Room</th>
<th>Replanning Room</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teach</td>
<td>Re-teach</td>
<td>Obs.</td>
</tr>
<tr>
<td>0-6</td>
<td>SV1</td>
<td>-</td>
<td>Self</td>
</tr>
<tr>
<td>7-12</td>
<td>SVS1</td>
<td>-</td>
<td>S-2</td>
</tr>
<tr>
<td>13-18</td>
<td>SV2</td>
<td>-</td>
<td>Self</td>
</tr>
<tr>
<td>19-24</td>
<td>SVS2</td>
<td>-</td>
<td>S-2</td>
</tr>
<tr>
<td>25-30</td>
<td>SV1</td>
<td>Self</td>
<td>C-2</td>
</tr>
<tr>
<td>31-36</td>
<td>SVS1</td>
<td>S-2</td>
<td>C-2</td>
</tr>
<tr>
<td>37-42</td>
<td>SV2</td>
<td>Self</td>
<td>C-2</td>
</tr>
<tr>
<td>43-48</td>
<td>SVS2</td>
<td>S-2</td>
<td>C-2</td>
</tr>
<tr>
<td>49-54</td>
<td>SV1</td>
<td>Self</td>
<td>C-4</td>
</tr>
<tr>
<td>55-60</td>
<td>SVS1</td>
<td>S-2</td>
<td>C-4</td>
</tr>
<tr>
<td>61-66</td>
<td>SV2</td>
<td>Self</td>
<td>C-4</td>
</tr>
<tr>
<td>67-72</td>
<td>SVS2</td>
<td>S-2</td>
<td>C-4</td>
</tr>
<tr>
<td>73-78</td>
<td>SV1</td>
<td>Self</td>
<td>C-3</td>
</tr>
<tr>
<td>79-84</td>
<td>SVS1</td>
<td>S-2</td>
<td>C-3</td>
</tr>
<tr>
<td>85-90</td>
<td>SV2</td>
<td>Self</td>
<td>C-3</td>
</tr>
<tr>
<td>91-96</td>
<td>SVS2</td>
<td>S-2</td>
<td>C-3</td>
</tr>
</tbody>
</table>

**Note:** Obs. = Observer; ST = Student Teacher; FRF = Feedback Received From; TOF = Type of Feedback; S-2 = Supervisor-2; C-2,3,4,5 = Section-2,3,4,5 of Micro Class; SV1 = Student Teacher 1 receiving Video-self Feedback; SVS1 = Student Teacher 1 receiving Video+Supervisor Feedback; SV2 = Student Teacher 2 receiving Video-self Feedback; SVS2 = Student Teacher 2 receiving Video+Supervisor Feedback; V = Video-self Feedback; V+S = Video+Supervisor Feedback
4.9 STATISTICAL TREATMENT

Statistical Procedures have been developed to simplify the large quantities of numerical data and thus to assist in the task of obtaining meaning from them. In this study the undermentioned statistical treatments were applied to give numerical descriptions and meaningful shape to the obtained data:

1. Mean
2. Standard Deviation
3. Product Moment Coefficient of Correlation
4. Multiple Correlation Coefficient
5. t Test
6. Analysis of Variance (ANOVA)
7. Sum of the Ranks Test
8. Stanine Scale

4.9.1 MEAN : The computations of central tendencies like mean, median & mode are common feature in almost all investigations. Mean is the basic statistics, which no research can afford to ignore. It is used to give concise description of the whole group. In this investigation mean (Garrett, 2004) has been calculated for different purposes by using the formula:

\[ \text{Mean} = \frac{\Sigma X}{N} \]

Where \( \Sigma X \) = Sum of the scores of all student teachers

\( N \) = Total number student teachers

4.9.2 STANDARD DEVIATION : Central tendencies give us the overall picture of the performance of the group where as measures of variability like standard deviation represent
the spread of the distribution. It also tells us the degree to which scores are clustered around mean. It is referred as S.D. For small samples (when $N<30$) S.D. (Garrett, 2004) has been calculated by using following formula:

$$S.D. = \sqrt{\frac{\sum x^2}{N-1}}$$

For large samples S.D. has been calculated by using following formula:

$$S.D. = \sqrt{\frac{\sum x^2}{N}}$$

Where,

- $\sum x^2$ = Sum of squares of the scores of all student teachers
- $N$ = Total number student teachers

### 4.9.3 PRODUCT MOMENT COEFFICIENT OF CORRELATION

Whenever two variables of the same group are so related that the increase or decrease are corresponding to the increase or decrease to another or conversely, the increase or decrease are corresponding to the decrease or increase to another, then they are said to be correlated. The extent of correlation is measured in terms of coefficient of correlation. The coefficient of correlation ranges from $-1$ to $+1$. The Pearson Product Moment Method is used for calculating the coefficient of correlation for the present study. The formula used for calculating the coefficient of correlation is as follows (Sharma, 2000):

$$r_{xy} = \frac{(N \sum XY - \sum X \cdot \sum Y)\sqrt{(N \sum X^2 - (\sum X)^2)(N \sum Y^2 - (\sum Y)^2)}}{(N \sum X^2 - (\sum X)^2)(N \sum Y^2 - (\sum Y)^2)}$$

Where

- $r_{xy}$ = Coefficient of Correlation between the variable $X$ & $Y$
- $X$ = Value of Observation of variable $X$
- $Y$ = Value of Observation of variable $Y$
- $N$ = Total number student teachers

### 4.9.4 MULTIPLE CORRELATION COEFFICIENT

It is used to determine the joint relationship of two or more variables to a third variable. It is also an extension of Pearson’s
"r" technique. The coefficient of correlation between observed scores on some trait and scores predicted for that trait by a multiple regression equation is called a Coefficient of Multiple Correlation or Multiple Correlation Coefficient.

The Multiple Correlation Coefficient is defined as the Pearson’s product moment correlation coefficient between observed values of a variable X1 and the theoretical values given by the equation of linear regression of X1 on or two more variables X2, X3 .....Xk. This coefficient of joint correlation could always be obtained by finding the theoretical score X1 by using of the appropriate regression equation and correlating these with the observed scores. The Pearson’s “r’s” are the basic elements of this technique.

There are three methods, which are used for calculating multiple correlation coefficient for more than three variables as follows:

1. Aitken’s Pivotal Condensation Method
3. Doolittle multiple Correlation Method

Out of above three listed methods the investigator has used the Aitken's Pivotal Condensation Method for the calculation multiple correlation coefficient because it involves relatively small and more reliable procedure because it calculates multiple correlation coefficient by computing the regression weights directly for it. Therefore Aitkens Method is popular and widely used in multivariate analysis.

The statistical inferences are drawn from Multiple Correlation Coefficient (R) after testing the significance of R value. The interpretation may valid after testing the significance of calculated value of R. The F-test is applied for this purpose and the following formula is used (Sharma, 2000) :

\[ F = \frac{(R^2/(1- R^2)) * (N-K-1)}{K} \]

df for F value \( df_1 = K, \ df_2 = (N-K-1) \)
where, $R = \text{Multiple Correlation Coefficient}$

$R^2 = \text{Variance of } R$

$N = \text{Size of the sample}$

$K = \text{Number of Variables}$

4.9.5 $t$ TEST (PARAMETRIC TEST) : The parameters of a given population are estimated or forecasted from a sample statistic with known degree of accuracy. The degree of accuracy to which a sample represents its parameter is a measure of the significance a trustworthiness of the computed mean. In order to measure the effect of any type of practice or special training on the group or groups, the difference between the means of initial & final scores or of two groups is calculated. And in order to say with confidence with the difference between two Means is not due to sampling error it is needed to know the standard error of the difference between two Means. In the present investigation the difference between means have been calculated to see the improvement in teaching competence of student teachers using different types of feedback. The following formula is used to calculate standard error of difference between Means of two small independent samples (Best & Khan, 2002):

$$SE_D = \sqrt{((N_1-1)S_1^2+(N_2-1)S_2^2)/(N_1+N_2-2)((N_1+N_2)/(N_1N_2))}$$

The following formula is used to calculate standard error of difference between means two correlated samples (Best & Khan, 2002):

$$SE_D = \sqrt{(S_1^2/N_1)+ (S_2^2/N_2)-2r(S_1^2/N_1)(S_2^2/N_2))}$$

The $t$ ratio is calculated to test the significance of the difference between the means by using following formula:

$$t = (M_2 - M_1) / SE_D$$

where $SE_D = \text{Standard Error of difference between means}$

$M_1 = \text{Mean of the sample 1}$
**CHAPTER-IV**

\[ M_2 = \text{Mean of the sample 2} \]
\[ N_1 = \text{No. of student teachers in the sample 1} \]
\[ N_2 = \text{No. of student teachers in the sample 2} \]
\[ S_1^2 = \text{Variance of the sample 1} \]
\[ S_2^2 = \text{Variance of the sample 2}. \]

If the samples are matched for Mean & Standard Deviation for more than one variable then following formula is used to calculate standard error of difference between Means of two correlated samples, which is subsequently used for calculation of ‘t’ value (Best & Khan, 2002):

\[ SE_D = \sqrt{(S_{1x}^2 / N_1 + S_{2x}^2 / N_2)(1 - r_{1234}^2)} \]

where

- \( SE_D \) = Standard Error of difference between means
- \( x \) = Variable under study
- \( y \) = Variable in terms which the two groups have equated in terms of Mean & SD
- \( N_1 \) = No. of student teachers in the sample/group 1
- \( N_2 \) = No. of student teachers in the sample/group 1
- \( S_{1x}^2 \) = Variance of the variable ‘x’ in the sample/group 1
- \( S_{2x}^2 \) = Variance of the variable ‘x’ in the sample/group 2
- \( r_{1234} \) = Multiple Correlation Coefficient between variable under study ‘C’ and variables 1,2,3 &4 in terms of which the groups are matched in the population from which the samples/groups have been drawn

### 4.9.6 ANALYSIS OF VARIANCE (ANOVA)

The variance is analysed to obtain the F-ratio therefore, analysis of variance (ANOVA) of F-test are used interchangeably. The total variance of ample is divided into among groups variance and within group variance. The
within groups variance indicates the sampling error. It is expressed in geometric right-angled triangle side’s relation (Sharma, 2000):

\[
SS_T = SS_B + SS_W
\]

\[
SS_B = \text{Sum of square between groups or among groups}
\]

\[
SS_W = \text{Sum of square within group}
\]

\[
F = \frac{MS_B}{MS_W}
\]

\[
MS_B = \text{Mean sum of square between groups or among groups}
\]

\[
MS_W = \text{Mean sum of square within group}
\]

The F-test is one tailed test or one-sided test. For the present study one way analysis of variance is used to determine the effect of different types of feedback on development of different teaching skills. After this by using this technique the effect of different types of feedback on development of teaching competence of student teachers has been evaluated.

**Procedure of One way Analysis of Variance** : In this effect of several treatments on one variable has been studied at a time. In this different treatments have been given to different groups and after that study variable has been measured by administering the same test on all the groups. The sum of scores of each group is obtained. The squares of scores of each group are added. The grand total of scores is obtained (\(\sum X = T\)). The following steps are used for analysis of variance (Sharma, 2000):

**Step-I** : Correction Factor (C),

\[
C = \frac{\left(\sum X\right)^2}{N} = \frac{T^2}{N}
\]

where \(N\) = Total Sample Size

**Step-II** : Total Sum of square (\(SS_T\))

\[
(SS_T) = X_{11}^2 + X_{12}^2 + \ldots \ldots + X_{21}^2 + X_{22}^2 + \ldots . . . . . . X_{3n}^2 - C
\]

**Step-III** : Sum of square between groups (\(SS_B\))

\[
(SS_B) = [\{(\sum G_1)^2 + (\sum G_2)^2 + (\sum G_3)^2\}/n] - C
\]
where $n$ = Sample Size of a Group

$\Sigma G_1$ = Sum of Scores of a Group-I

$\Sigma G_2$ = Sum of Scores of a Group-II

$\Sigma G_3$ = Sum of Scores of a Group-III

Step-IV: Sum of square within groups (SS$_W$)

$\text{(SS}_W\text{)} = \text{SS}_T - \text{SS}_B$

Step-IV: Prepare Analysis of Variance Table as follows:

<table>
<thead>
<tr>
<th>Sources of Variance</th>
<th>df</th>
<th>Sum of Square (SS)</th>
<th>Mean Sum of Square (MS)</th>
<th>F Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>(a-1)</td>
<td>SS$_B$</td>
<td>MS$_B$ = SS$_B$ /(a-1)</td>
<td>F = MS$_B$ / MS$_W$ with df (a-1), (N-1)</td>
</tr>
<tr>
<td>Within Groups</td>
<td>(N-a)</td>
<td>SS$_W$</td>
<td>MS$_W$ = SS$_W$/(N-a)</td>
<td></td>
</tr>
<tr>
<td>Total Sample</td>
<td>(N-1)</td>
<td>SS$_T$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

where 'a' = Total number of Groups/Treatments

The significance of F-value provides the global picture about difference among or between the groups who received different types of feedback (treatment). The specification of inference or significance of difference was done by t-test subsequently.

4.9.7 SUM OF THE RANKS TEST (NON-PARAMETRIC) : When making tests of the significance of the difference between two means in terms of t ratio or critical ratio, we assume that scores upon which our statistic are based are normally distributed in the population. In these tests – under null hypothesis – is to estimate from our sample statistics, the probability of a true difference between the two parameters. When N is quite small or the data is badly skewed, so that the assumption of normality is doubtful, “Parametric Tests” are of dubious value. In these cases we need techniques, which will enable us to compare
samples and to make inferences or tests of significance without having to assume normality in the populations. Such methods are known as Non-parametric or distribution free. Non-parametric methods are most useful when (1) N is small, (2) when assumptions of normality concerning the population are doubtful. Out of various Non-parametric tests available the investigator has selected the sum-of rank test (Z test) to test the hypothesis that two independent groups of observations have been drawn at random from the same population and hence there is no real difference between them. The following formula is used to calculate the Z values using sum-of rank test (Garrett, 2004):

\[
Z_1 = \frac{2R_1 - N_1(N+1)}{\sqrt{(N_1N_2(N+1))/3}}
\]
\[
Z_2 = \frac{2R_2 - N_2(N+1)}{\sqrt{(N_1N_2(N+1))/3}}
\]

where
- \( R_1 \) = Sum of the ranks of the sample/test 1
- \( R_2 \) = Sum of the ranks of the sample/test 2
- \( N_1 \) = No. of observations in the sample/test 1
- \( N_2 \) = No. of observations in the sample/test 2
- \( N = N_1 + N_2 \)

In the present study correlated ‘t’ test was used to find out significance of the difference between two means. Since the ‘t’ test is a parametric measure and the sample size is small, it is not feasible to generalise the result of the small sample to population by using parametric measure. Therefore, in order to eliminate sampling error and to generalise the result to the population parameter non-parametric statistics i.e. Z test was used. Thus analysis of ‘t’ test result of each variable was followed by analysis and interpretation of Z test results.

4.9.8 STANINE SCALE : Stanine scale is made to present the raw data against a standard norm. Stanine Norm : Stanine Norm is an improvement over the earlier norms standard score & t score norms. The major limitation of these norms are that the interpretation is
confined to above & below the mean, but they do not locate the actual position or level performance in the standardised sample. The norms involve the interpretative error. This error is minimized by stanine norms.

The stanine norms are developed by the technique of normalized standard scores. It was developed by the United State Air Force during the World War II. The 'stanine' is contraction of “standard nine" and it has scores expressed in digits or standards ranging from 1 to 9. The mean score is 5 and standard deviation is 1.96 or approximately 2. When raw scores are transformed into stanine scores, the distribution of scores take the shape of normal curve. The stanine scores are condensed scores on the C scale. In the C scale, there are 11 score points ranging from 0 to 10 with mean 5. For computational facilities with computer punched-card records the two points at the both extremes, i.e., 0 on the lower end and 10 on higher end, are combined, thus leaving only a nine point scale or called the stanine scale. Moreover the computer punchard (IBM) has 9 rows and 9 columns. The stanine scale was proposed by Confield (1951) where there are 10 units + 5 units above and -5 units below the mean. The stanine are distributed on normal curve in the following percentages.

The stanine norms are an example of normalized standard scores. The area of normal probability curve has been divided into nine standards with fixed percentages. The raw scores of a test are divided into the above 9 standards. Their limits are calculated with help of normal curve. It is assumed that the raw scores of the test are normally distributed.

The raw scores are transformed into the stanine scale by organizing them in frequency distribution and then giving the percentage of each stanine score points according to the normal distribution curve. The first stanine includes 4 percent, second scores next 7 percent, third stanine includes 12 percent and fourth stanine covers next 17 percent, the middle or fifth stanine includes middle 20 percent, sixth stanine covers 17 percent, seventh 12 percent,
eighth 7 percent and the top or ninth 4 percent of the total cases (Sharma, 2000). The Table 4.10 shows the distribution of Stanine Scale:

<table>
<thead>
<tr>
<th>Stanine</th>
<th>Description</th>
<th>Percentage</th>
<th>Limits in $\sigma$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bottom</td>
<td>4%</td>
<td>-1.75$\sigma$ and below</td>
</tr>
<tr>
<td>2</td>
<td>Above Bottom</td>
<td>7%</td>
<td>-1.23$\sigma$ to -1.75$\sigma$</td>
</tr>
<tr>
<td>3</td>
<td>Near to Second</td>
<td>12%</td>
<td>-0.74$\sigma$ to -1.23$\sigma$</td>
</tr>
<tr>
<td>4</td>
<td>Above Mean</td>
<td>17%</td>
<td>-0.25$\sigma$ to -0.74$\sigma$</td>
</tr>
<tr>
<td>5</td>
<td>Mean or Middle</td>
<td>20%</td>
<td>-0.25$\sigma$ to +0.25$\sigma$</td>
</tr>
<tr>
<td>6</td>
<td>Below Mean</td>
<td>17%</td>
<td>+0.25$\sigma$ to +0.74$\sigma$</td>
</tr>
<tr>
<td>7</td>
<td>Near to Eight</td>
<td>12%</td>
<td>+0.74$\sigma$ to +1.23$\sigma$</td>
</tr>
<tr>
<td>8</td>
<td>Below Top</td>
<td>7%</td>
<td>+1.23$\sigma$ to +1.75$\sigma$</td>
</tr>
<tr>
<td>9</td>
<td>Top</td>
<td>4%</td>
<td>+1.75$\sigma$ and above</td>
</tr>
</tbody>
</table>

This finishes the detailed description of various tools & statistical techniques used for data collection in the Present Study. The Analysis, Interpretation & Discussion of data collected for the study is included in the next chapter.