C H A P T E R III

RESULTS AND INTERPRETATION

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3.0. INTRODUCTION :

This experimental study was specifically designed having four objectives and seven hypotheses. The hypothesis H_1 was related to the first objective on the effectiveness of microteaching in comparison with the integrated skill-based traditional practice teaching upon the development of general teaching competence. The next two hypotheses H_2 and H_3 relating to the second objective were on the relative effectiveness of various feedback treatments in microteaching upon the development of general teaching competence. The other two hypotheses H_4 and H_5 pertaining to the third objective were on the effect of acquisition of the five teaching skills on the ability to use them in macrolessons in the context of the summated scores on the five skills. The last two hypotheses H_6 and H_7 relating to the fourth and last objective were on the effect of teaching skills either through microteaching or through integrated skill-based traditional practice under varying sources of feedback upon teachers' attitudes towards teaching. In order to reach an objective decision as to whether these hypotheses were confirmed by data, the objective procedures for either rejecting, accepting or revising those were established through statistical analysis.

Before reporting the testing of the hypotheses the data in terms of the raw scores; gain scores on the general teaching competence (GTC), on the summated scores of the five teaching

skills and on the teachers' attitudes towards teaching; teaching performance on the general teaching competence and attitudes towards teaching before and after the experimental work out; and testing of homogeneity of variances have also been reported in this chapter.

3.1. Raw and Gain Score Data :

The data can be comprehended and interpreted if these are summarised in terms of central tendency and variability of scores. Hence, the mean and standard deviation of the raw scores and gain scores are depicted along with the data in the following tables.

The table 3.1 presents the raw scores on general teaching competence (GTC) at pretest, post test and retention test; and on the attitudes of the teachers towards teaching at pretest and post test under various treatments in 'E_1' (n=9), 'E_2' (n=9), 'E_3'(n=6), and 'F'(n=9) groups. This table also refers the means and standard deviations of the raw scores on GTC and attitudes of teachers towards teaching of each group under pretest, post and retention test measures.

Gain Scores :

The gain scores on general teaching competence (GTC), attitudes towards teaching and summated scores of teaching competence specific to the five teaching skills of all the teachers in the groups, 'E_1'(n=9), 'E_2'(n=9), 'E_3'(n=6), and 'F'(n=9) are depicted in the Tables 3.2 and 3.3.

TABLE : 3.1 : Scores at Pretest, Post test and Retention test of Teachers under Various Treatments in E_1, E_2, E_3 and F Groups for the Criterion Variables on General Teaching Competence and Attitudes towards Teaching measured through the BGTC and the ATAI.

Institutions Code	E_1 (n=9)					E_2 (n=6)					E_3 (n=6)					F (n=9)				
	Pretest		Post test		Ret. test	Pretest		Post test		Ret. test	Pretest		Post test		Ret. test	Pretest		Post test		Ret. test
	GTC	Attitude	GTC	Attitude	GTC	GTC	Attitude.	GTC	Attitude.	GTC	GTC	Attitude	GTC	Attitude	GTC	GTC	Attitude	GTC	Attitude	GTC
I_1	32	261	69	260	65	35	267	71	278	71	-	-	-	-	-	28	208	54	230	56
I_2	33	237	65	245	67	40	259	86	278	87	38	267	79	285	80	33	243	63	272	61
I_3	46	280	74	282	75	53	250	[illegible]	243	79	51	271	85	288	84	43	244	68	253	65
I_4	52	275	80	279	86	48	317	80	331	81	-	-	-	-	-	41	247	64	254	64
I_5	42	208	72	219	68	51	251	82	262	80	49	219	81	227	80	54	286	70	315	67
I_6	53	211	76	241	77	55	260	82	268	78	53	256	86	287	85	50	232	64	254	69
I_7	53	247	76	269	70	41	257	81	279	73	45	217	32	227	77	46	294	74	329	73
I_8	58	256	77	253	73	57	244	81	261	80	52	267	76	312	78	52	261	74	272	72
I_9	50	225	72	226	71	58	241	78	247	74	-	-	-	-	-	52	291	70	302	73
Mean	46.60	244.44	73.40	252.66	72.40	48.10	260.61	80.20	271.66	78.10	48.00	249.15	81.50	272.66	80.70	44.90	256.33	66.90	273.44	66.
SD	9.09	26.15	4.53	22.08	6.36	7.67	22.64	4.05	25.75	4.86	5.66	24.96	3.72	35.53	3.20	9.10	29.30	6.28	32.49	5.8

Table 3.2 refers to four types of gain scores from pretest to post test scores (G_1); from pretest to retention test scores (G_2); from post test to retention test scores (G_3) on general teaching competence measured through the BGTC; and from pretest to post test scores (G_4) on attitudes towards teaching measured through the ATAI of all the teachers in 'E_1', 'E_2', 'E_3' and 'F' groups. The means and standard deviations of G_1, G_2, G_3 and G_4 gain scores are also given in this table.

The table 3.3 presents the gain in summated scores on the teaching competence, specific to the five teaching skills from pretest to post test (S_1), from pretest to retantion test (S_2) and from post test to retention test (S_3) of all the teachers in 'E_1', 'E_2', 'E_3' and 'F' groups. The summated scores considering only on the five skills were extracted from the total scores on general teaching competence of the BGTC Schedule. The means and standard deviations of S_1, S_2 and S_3 gains in summated scores are also depicated in this table.

From these depicted data, their means and standard deviations, the differences in values on general teaching competence, summated scores on the five skills under considerations, and attitudes towards teaching before and after the practice of teaching skills are observed.

TABLE : 3.2 : Gain Scores from Pretest to Post test (G_1), Pretest to Retention test (G_2), Post test to Retention test (G_3) on General Teaching Competence and from Pretest to Post test (G_4) on actitudes towards teaching under various Treatments in 'E_1', 'E_2', 'E_3' and 'F' Groups measured through the BGTC and the ATAI.

Institutions' Code	E_1 (n=9)				E_2 (n=9)				E_3 (n=6)				F (n=9)			
	G_1	G_2	G_3	G_4	G_1	G_2	G_3	G_4	G_1	G_2	G_3	G_4	G_1	G_2	G_3	G_4
	Post-Pre on GTC	Ret.-Pre on GTC	Ret.-Post On GTC	Post-Pre On Attitude	Post-Pre on GTC	Ret.-Pre on GTC	Ret.-Post on GTC	Post-Pre on Attitude	Post-Pre on GTC	Ret.-Post on GTC	Ret.-Post on GTC	Post-Pre on Attitude	Post-Pre on GTC	Ret.-Pre on GTC	Ret.-Post on GTC	Post-Pre on Attitude
I_1	37	33	-4	-1	36	36	0	11	-	-	-	-	26	28	2	22
I_2	32	34	2	8	46	47	1	19	41	42	1	16	30	28	-2	9
I_3	28	29	1	2	28	26	-2	-7	34	33	-1	17	20	17	-3	9
I_4	28	34	6	4	32	33	1	14	-	-	-	-	24	23	-1	7
I_5	30	26	-4	11	31	29	-2	11	32	31	-1	18	16	13	-3	29
I_6	23	24	1	30	27	23	-4	8	33	32	-1	31	14	19	5	22
I_7	23	17	-6	22	40	32	-8	20	37	32	-5	10	28	27	-1	33
I_8	19	15	-4	-3	24	23	-1	17	24	26	2	45	22	20	-2	11
I_9	22	21	-1	1	25	21	-4	6	-	-	-	-	18	21	3	11
Mean	26.90	25.90	-1.00	8.22	32.10	30.00	-2.10	11.00	33.50	32.70	-0.83	23.16	22.00	21.80	-0.22	17.11
SD	5.66	7.21	3.80	11.18	7.34	8.17	2.90	8.27	5.28	5.22	2.40	12.60	5.48	5.21	2.86	9.68

TABLE : 3.3 : Gain in Summated Scores from Pre to post test (S_1), Pre to Retention test (S_2) and Post to Retention test (S_3) on Teaching Competence, Specific to the five Skills of the BGTC under Various Treatments in 'E_1', 'E_2', 'E_3' and 'F' Groups.

Institutions' Code.	E_1(n=9)			E_2 (n=9)			E_3 (n=6)			F (n=9)		
	S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
	Post-Pre	Ret-Pre	Ret-Post	Post-Pre	Ret-Pre.	Ret-Post	Post-Pre	Ret-Pre.	Ret-Post	Post-Pre	Ret-Pre	Ret-post.
I_1	34	32	-2	40	41	1	-	-	-	28	30	2
I_2	39	43	4	52	51	-1	46	45	-1	26	22	-4
I_3	40	39	1	33	30	-3	39	36	-3	17	28	11
I_4	30	37	7	32	36	4	-	-	-	23	24	1
I_5	47	41	-6	45	43	-2	37	35	-2	16	15	-1
I_6	42	42	0	46	39	-7	48	45	-3	26	30	4
I_7	29	24	-5	49	42	-7	43	44	1	21	25	4
I_8	34	28	-6	40	44	4	36	39	3	32	30	-2
I_9	28	26	-2	24	23	-1	-	-	-	23	22	-1
Mean	35.90	34.67	-1.22	40-10	38.78	-1.33	41.50	40.67	-0.83	23.56	25.10	1.56
S.D.	6.50	7.30	4.40	9.04	8.22	4.03	4.92	4.59	2.40	5.12	5.03	4.44

3.2. Teaching Competence and Attitudes towards Teaching Before and After the Treatment :

To study the impact of acquisition of teaching skills on the teaching performances and attitudes towards teaching, the tests of significance between the pretest and post test scores on GTC and scores on attitudes towards teaching, pretest and retention test scores on GTC, and post test and retention test scores on GTC were applied. The 't' tests for correlated samples were used for this computational procedures.

Here, the Table 3.4 depicts t values of four groups on GTC scores for post test Vs.pretest, retention test Vs.pretest, and retention test Vs.post test with the degrees of freedom. The same table also presents the t values of the same groups on the scores of attitudes towards teaching for post test Vs. pretest with their degrees of freedom. The table shows that values of t on GTC scores of 'E_1', 'E_2', 'E_3', and 'F' groups between the pretest and post test measures are 7.90, 11.10, 12.13, and 5.90 with 8, 8, 5 and 8 degrees of freedom, whereas between pretest and retention test the t values are 7.37, 9.91, 12.30, and 6.05 with 8, 8, 5 and 8 degrees of freedom respectively. In both the cases, from pretest to post test and from pretest to retention test the mean differences on GTC scores are significant beyond the 0.001 level. But in case of post test to retention test not a single t value of 'E_1', 'E_2', 'E_3' and 'F' groups is significant. Similar is the case of the mean difference of the scores on attitudes towards teaching. With the t values of 0.72, 1.00, 1.30 and 1.17 having the degrees

of freedom 8, 8, 5 and 8 the mean differences between the two measures at pretest and post test do not differ significantly.

TABLE : 3.4 : Test of Significance (t test for correlated samples) between Post test Vs. Pretest, Retention test Vs. Pretest and Retention test Vs. Post test on GTC scores; and Post test Vs. Pretest on the scores on Attitudes towards Teaching.

Treatments	GTC Post test Vs. Pretest.		GTC Retention test Vs. Pretest.		GTC Retention test Vs. Post test.		Attitudes towards Teaching Post test Vs. Pretest.	
	df	t	df	t	df	t	df	t
E_1	8	7.90@	8	7.37@	8	0.38	8	0.72
E_2	8	11.10@	8	9.91@	8	0.99	8	1.00
E_3	5	12.13@	8	12.30@	5	0.20	5	1.30
F	8	5.90@	8	6.05@	8	0.07	8	1.17

@ Significance at 0.001 level.

Thus, the results indicate that the practices of teaching skills either through microteaching under varying sources of feedback for the groups 'E_1', 'E_2' and 'E_3' or through an integrated approach in traditional training for the 'filler' group 'F' affect the teaching performances significantly on the development of general teaching competence. But after a gap of one month from post test to retention test there is no significant difference on the general teaching competence in each group. Considering the impact of skill acquisitions on

teachers' attitudes towards teaching, the results yield no significant differences in mean values before and after the course in each group. This shows that the acquisitions of teaching skills either through microteaching or through an integrated approach in traditional training do not affect significantly on teachers' attitudes towards teaching.

3.3. TESTING OF HYPOTHESES :

This study was designed to test seven hypotheses to find out the relative effectiveness of microteaching over integrated skill-based traditional practice on the development of general teaching competence; relative effectiveness of various feedback treatments within microteaching; the impact of acquisition of the five teaching skills on the ability to use them in macro-lessons; and on the change in attitudes of the teachers towards teaching. Of these seven hypotheses, the first five hypotheses were subjected to further analysed in accordance with the gain scores at (i) post test over pretest, (ii) retention test over pretest, (iii) retention test over post test. Out of these five, the first three hypotheses, H_1, H_2, and H_3 were on GTC gain scores and other two, H_4 and H_5 were on the gains in summated scores on the five teaching skills under consideration. The last two hypotheses, H_6 and H_7 were tested on the gain scores of attitudes towards teaching at the post test over pretest only.

Testing the Homogeneity of Variances :

The homogeneity of population variances of the contrasting groups for the different gain scores on G_1, G_2, G_3, G_4; S_1, S_2, and S_3 were first tested before proceeding to hypotheses testing. As per the statement of Glass and Stanley (1970) the hypotheses of the present study were formulated with the assumption that population variances between the treatment groups of 'E_1', 'E_2', 'E_3' and 'F' were equal, and the populations specified were independent and uncorrelated among themselves. When testing these assumptions for homogeneity of the contrasting groups Scheffe' (1959), and also Glass and Stanley (1970) referred that if the sizes of the samples of the contrasting pairs were equal, the assumption of the homogeneity of variances was unimportant and need not be concerned. Therefore the effects of violation of the homogeneous variances assumption were serious depending upon the size of the contrasting pairs.

On this basis, out of six sources of treatment in four groups, only three sources of contrasting pairs i.e. 'E_3' and 'E_1', 'E_3' and 'E_2', and 'E_3' and 'F' having unequal sizes of the samples yielded F ratios as per the test devised by Hartley. The Table 3.5 presents here the F ratios of the above contrasting pairs for the gain scores of G_1, G_2, G_3, on GTC; G_4 on attitudes towards teaching; and of S_1, S_2, and S_3 on the gain in summated scores of the five skills. This table shows that the F ratios are not significant even at 0.05 level for all the contrasting groups in all the gain scores.

TABLE : 3.5 : Test of Homogeneity of Population Variances (Hartley test) of the contrasting groups having unequal sizes for the gain scores on GTC, Summated scores on the five skills, and Attitudes towards Teaching.

Contrasts / Gain Scores	E_3 and E_1 (n=6) (n=9)			E_3 and E_2 (n=6) (n=9)			E_3 and F (n=6) (n=9)		
	S^2_g	S^2_1	F ratio	S^2_g	S^2_1	F ratio	S^2_g	S^2_1	F ratio
On GTC									
Post-Pre (G_1)	32.03	27.66	1.16	53.87	27.66	1.95	30.03	27.87	1.08
Retention-Pre (G_2)	51.98	27.24	1.90	66.74	27.24	2.45	27.24	27.14	1.04
Retention-Post (G_3)	14.44	5.76	2.50	8.41	5.76	1.46	8.17	5.76	1.41
On Summated Scores									
Post-Pre (S_1)	42.25	24.20	1.74	81.72	24.20	3.37	25.21	24.20	1.04
Retention-Pre (S_2)	53.29	21.06	2.53	67.56	21.06	3.28	25.30	21.06	1.20
Retention-Post (S_3)	19.36	5.76	3.36	16.24	5.76	2.82	19.71	5.76	3.58
On Attitudes Towards Teaching									
Post-Pre(G_4)	158.76	124.99	1.27	158.76	68.39	2.32	158.76	93.70	1.69

Hence, it was observed that the populations among the groups 'E_1', 'E_2', 'E_3' and 'F' were homogenous and the tenability of the homogeneity of variances among the groups was existed. After the assumption of homogeneity of variances was accepted, the testing of the hypotheses as per the objectives was undertaken through the parametric and nonparametric statistical measures.

Justification of Using both Parametric and Nonparametric Statistical Measures :

The necessity of using both parametric and nonparametric statistical measures is reported in greater details in the second chapter under the caption 'the Statistical Measures Employed'.

3.3.1. Testing of Hypothesis H_1 :

The first hypothesis, "the gain in scores on general teaching competence at the post test over the pretest and of the retention test over the pre/post test is significantly higher for the microteaching group using any of the three feedback treatments (Self-analysis through audiotape, supervisory feedback and supervisory-cum-audiotape) than the 'filler' group under integrated skill-based traditional supervision" was formulated. The tenability of this hypothesis H_1 was tested through the one-factor ANOVA and Scheffe' method in parametric statistical measures and Wilcoxon test, a non-parametric measures in accordance with the gain scores G_1, G_2, and G_3 on general teaching competence.

Study Through ANOVA :

This hypothesis was tested through one-factor ANOVA for the significance of mean differences among the groups of 'E$_1$', 'E$_2$', 'E$_3$' and 'F' simultaneously. The Table 3.6 presents the sum of gain scores and squared gain socres on general teaching competence measured through the BGTC Schedule for G_1, G_2, and G_3 gain scores of all the four groups.

TABLE : 3.6 : Sum of Gain Scores (Sum X) and Squared Gain Scores (Sum X^2) on the General Teaching Competence under Various Treatments in 'E$_1$', 'E$_2$', 'E$_3$' and 'F' groups.

Gain Scores on GTC	Sum X and Sum X^2	E_1(n=9)	E_2(n=9)	E_3(n=6)	F (n=9)
Post-Pre (G_1)	Sum X	242	299	201	198
	Sum X^2	6764	10351	6895	4596
Retention -Pre (G_2)	Sum X	233	270	196	196
	Sum X^2	6449	8634	6538	4486
Retention -Post (G_3)	Sum X	-9	-19	-5	-2
	Sum X^2	127	107	33	66

In Table 3.7 a Summary on the test of significance through ANOVA is presented in which the analysis on the gain scores G_1, G_2, and G_3 of four groups of 'E_1', 'E_2', 'E_3' and 'F' having thirty three teachers is revealed. The F values for the gain scores G_1, G_2 and G_3 are 6.78, 3.93 and 0.57 respectively for the degrees of freedom 3 and 29 in each case. After comparing with the standard values these F values in case of G_1 and G_2 gain scores are statistically significant at 0.01 and 0.05 levels respectively. But in case of G_3 gain score the F value, 0.57, is not significant at all.

Hence, the hypothesis H_1 is retained for G_1 and G_2 gain scores but the same hypothesis is rejected in case of G_3 gain scores. Therefore the groups under microteaching are significantly higher than that of the 'filler' group on the G_1 and G_2 gain scores of general teaching competence, whereas the treatments in groups under microteaching are equally effective to that of 'filler' group on G_3 gain scores of general teaching competece.

Study Through Scheffe' Method :

The hypothesis H_1 was accepted in case of G_1 and G_2 gain scores after testing through ANOVA. But nothing was clearly known about the relative effectiveness of the treatments

TABLE : 3.7 : Summary of ANOVA for the Gain Scores on General Teaching Competence of Four groups 'E_1', 'E_2', 'E_3', and 'F' having thirty three teachers under various treatments.

Gain Score on GTC	Source of Variation	Sum of Squares	Degrees of Freedom (df)	Mean Square	F Value	Level of Significance.
Post test-Pretest (G_1)	Between Groups.	754.46	3	251.48	6.78	$P < 0.01$
	Within Groups.	1075.79	29	37.09		
	Total	1830.25	32			
Retention test - Pretest (G_2)	Between Groups.	529.73	3	176.57	3.93	$P < 0.05$
	Within Groups.	1303.79	29	44.95		
	Total	1833.52	32			
Retention test - Post test (G_3)	Between Groups.	16.59	3	5.53	0.57	NS
	Within Groups.	279.29	29	9.63		
	Total	295.88	32			

given to the groups under microteaching i.e. 'E_1', 'E_2', and 'E_3(with that of 'filler' group 'F'. Hence, the inferential statement about the relative effectiveness on the above groups was drawn through the multiple comparison computed by S-Method.

As the same hypothesis H_1 for G_3 gain score was untenable and null characteristic was sustained through ANOVA, no further statistical measures were necessary for G_3 gain score. But for G_1 and G_2 gain scores the Table 3.8 represents the multiple comparison among the three pairs of contrasts 'E_1', 'F'; 'E_2','F'; and 'E_3','F' for testing the significant mean differences. This table gives the values of estimate of contrasts; estimate of variance of contrast computed through within mean squares of 37.09 and 44.95 for the variables of G_1 and G_2 respectively (vide Table 3.7); square root of estimate of variance; and the absolute values of the ratios on estimate of contrasts with the the square root of estimate of variance of contrasts. The absolute values of the contrasts 'E_1' and 'F'; 'E_2' and 'F' and 'E_3' and 'F' are 1.70; 3.52; and 3.58, for G_1 gain scores, whereas 1.29; 2.96; and 3.08 happen to be the absolute values for G_2 gain scores respectivly. These values are compared to 2.96, the square root of 3 times the 100(1-0.05) percentile in the F-distribution with the degrees of freedom, 3 and 29. Out of the three absolute values only two of 'E_2' and 'F'; and 'E_3' and 'F' pairs are significant at 0.05

level in both G_1 and G_2 gain scores, whereas no significant difference is indicated for 'E' and 'F' contrasting pair in both G_1 and G_2 gain scores.

The same table also gives the confidence intervals around the differences between the means of these three contrasting pairs. Only two pairs i.e. 'E_2' and 'F'; and 'E_3' and 'F' for G_1 and G_2 gain scores differ significantly from zero. The differences lie between 18.59 and 1.61; 21.00 and 1.99 for G_1 and between 17.55 and 0.25; 21.35 and 0.45 for G_2 scores respectively. On the other hand, the S-method gives no evidence to conclude with confidence that the contrasting group 'E_1' and 'F' differs significantly from zero in both the cases of G_1 and G_2 gain scores.

Hence, the tenability of hypothesis H_1 in the case of G_1 and G_2 is further strengthened from this computational procedure. But at the same time some relative evidences are observed. That, 'E_2' and 'E_3' groups under microteaching treatment are having higher mean gain scores on general teaching competence than that of 'F' group under skill-based traditional practice teaching. Moreover, no significant mean difference is indicated among 'E_1' and 'F' groups. Thus, it is concluded that the treatment in the microteaching group under self-analysis through audio-tape feedback is as effective as that of 'filler' group under integrated skill-based traditional supervision when compared on the gain scores of general teaching competence.

TABLE : 3.8 : Multiple Comparison among the Treatment Groups; 'E_1', 'E_2', 'E_3' with 'F' on the Gain Scores of General Teaching Competence and Confidence Intervals around the contrasts by the S-Method.

Gain Score on GTC	Contrast	Estimate of Contrast ψ	Estimate of Variance of Contrast σ^2_ψ	Square root of estimate of Variance σ_ψ	Absolute Value $\frac{\psi}{\sigma_\psi}$	Level of Significance	Confidence Interval $\psi \pm \sigma_\psi (2.96)$	
Post-Pre (G_1)	E_1 - F	4.9	8.24	2.87	1.70	NS	(13.39, -3.59)	-
	E_2 - F	10.1	8.24	2.87	3.52	$P < 0.05$	(18.59, 1.61)	Differ significantly from Zero.
	E_3 - F	11.5	10.30	3.21	3.58	$P < 0.05$	(21.00, 1.99)	-Do-
Retention - Pre. (G_2)	E_1 - F	4.1	9.99	3.16	1.29	NS	(13.45, -5.25)	-
	E_2 - F	8.2	9.99	3.16	2.96	$P < 0.05$	(17.55, 0.25)	Differ significantly from Zero.
	E_3 - F	10.9	12.49	3.53	3.08	$P < 0.05$	(21.35, 0.45)	-Do-

Study Through Wilcoxon Test :

As per the computational procedure of Wilcoxon matched-pairs signed-ranks test the Tables 3.9a, 3.9b, and 3.9.c give the T values for the gain scores on geheral teaching competence of three contrasting groups of 'E_1', 'E_2', and 'E_3' with 'F' group having matched teachers according to the Table 3.9.

TABLE : 3.9 : Equivalent Matched Pairs of the Teachers on Age and Teaching Experience for Wilcoxon test as per the Institution code (vide Table 2.4.).

E_1 and E_2		E_1 and E_3		E_1 and F		E_2 and E_3		E_2 and F		E_3 and F
9 Pairs.		6 Pairs.		9 Pairs.		6 Pairs.		9 Pairs.		6 Pairs.
I_6 ; I_6	I_7	I_6	I_6	I_6	I_1	I_6	I_6	I_6	I_6	I_3
I_5 ; I_3	I_5	I_2	I_7	I_3	I_2	I_2	I_2	I_2	I_2	I_8
I_2 ; I_2	I_1	I_8	I_8	I_1	I_4	I_5	I_7	I_7	I_5	I_9
I_1 ; I_9	I_6	I_3	I_3	I_9	I_8	I_3	I_4	I_4	I_3	I_6
I_8 ; I_1	I_3	I_7	I_2	I_8	I_9	I_8	I_3	I_8	I_8	I_5
I_7 ; I_5	I_9	I_5	I_1	I_4	I_6	I_7	I_1	I_1	I_7	I_4
I_4 ; I_8			I_9	I_7			I_9	I_9		
I_9 ; I_7			I_4	I_5			I_5	I_3		
I_3 ; I_4			I_5	I_2			I_8	I_5		

The data of the matched teachers of 'E$_1$' (n=9), and 'F' (n=9) are summarised in the Table 3.9a for G_1 and G_2 gain scores. The T values happen to be 5 and 10 for G_1 and G_2 respectively with n=8 in both the cases (eliminating one particular pair in each in which the score difference is zero) which give no significant differences in scores. Hence, the result reveals that treatment in group 'E$_1$' is as effective as that of group 'F' when compared on the gain scores of general teaching competence.

The Table 3.9b indicates the T values of the gain scores of 'E$_2$' and 'F' contrasting matched pair. The T value happens to be zero in each case of G_1 for n=9 and of G_2 for n=8 (eliminating one particular pair, in which the score difference is zero) which gives significant differences in scores at 0.01 level. Therefore 'E$_2$' group differs significantly from 'F' group on the gain scores G_1 and G_2 of general teaching Competence.

The Table 3.9c presents the T values for G_1 and G_2 gain scores of 'E$_3$' and 'F' contrasting matched pair having six matched teachers. The T value happens to be zero in each case of G_1 and G_2 for n=6 which shows significant differences in scores at 0.01 level. Hence, 'E$_3$' group differs significantly from 'F' on the gain scores G_1 and G_2 of general teaching competence.

Interpretation of the Results of Hypothesis H_1 :

The analysis through the statistical measures yielded that the tenability of the hypothesis H_1 on the gain scores of

TABLE : 3.9a : Gain Scores on General Teaching Competence of Two Groups : 'E_1' and 'F' of Matched Teachers, with their T values studied through Wilcoxon Test.

	Gain Score (G_1) Post test-Pretest						Gain Score (G_2) Retention test - Pretest					
Pair	E_1 (n=9)	F (n=9)	Difference	Rank of Difference	Rank with less Frequent Sign	Level of Significance.	E_1 (n=9)	F (n=9)	Difference	Rank of difference	Rank with less Frequent Sign	Level of Significance
1	37	24	13	8			33	23	10	5		
2	23	14	9	4			24	19	5	2		
3	30	30	0	-			26	28	-2	-1	1	
4	32	22	10	5.5			34	20	14	7		
5	28	18	10	5.5			29	21	8	4		
6	28	16	12	7			34	13	21	8		
7	19	26	-7	-3	3		15	28	-13	-6	6	
8	23	20	3	1			17	17	0	-		
9	22	28	-6	-2	2		21	27	-6	-3	3	
					T=5 n=8	NS					T=10 n=8	NS

TABLE : 3.9b : Gain Scores on General Teaching Competence of Two Groups - 'E_2' and 'F' of Matched Teachers with their T Values studied through Wilcoxon Test.

	Gain Scores (G_1) Post test - Pretest						Gain Scores (G_2) Retention Test - Pretest					
Pair	E_2 (n=9)	F (n=9)	Difference.	Rank Difference.	Rank with Less Frequent Sign	Level of Significance.	E_2 (n=9)	F (n=9)	Difference	Rank of Difference.	Rank with Less Frequent Sign.	Level of Significance.
1	36	26	10	5			36	28	8	4		
2	27	14	13	8			23	19	4	1		
3	31	20	11	6	No Negative Rank		29	17	12	7	No Negative Rank	
4	46	30	16	9			47	28	19	8		
5	28	22	6	1			26	20	6	3		
6	32	24	8	3.5			33	23	10	5.5		
7	24	16	8	3.5			23	13	10	5.5		
8	40	28	12	7			32	27	5	2		
9	25	18	7	2	T = 0 n = 9	$P < 0.01$	21	21	0		T = 0 n = 8	$P < 0.01$

TABLE : 3.9c : Gain Scores on General Teaching Competence of Two Groups 'E_3' and 'F' of Matched Teachers with their T values studied through Wilcoxon test.

	Gain Score (G_1) Post test - Pretest						Gain Score (G_2) Retention test - Pretest					
Pair	E_3 (n=6)	F (n=6)	Difference	Rank of Difference	Rank with Less Frequent Sign.	Level of Significance.	E_3 (n=6)	F (n=6)	Difference.	Rank of Difference.	Rank with Less Frequent Sign	Level of significance.
1	33	20	13	2.5			32	17	15	5		
2	32	18	14	4			31	21	10	2		
3	41	22	19	5			42	20	22	6		
4	34	14	20	6			33	19	14	4		
5	24	16	8	1			26	13	13	3		
6	37	24	13	2.5	No Negative Rank Hence, T = 0 n = 6	$P < 0.01$	32	23	9	1	No Negative Rank Hence, T = 0 n = 6	$P < 0.01$

G_1 and G_2 was accepted, whereas for the gain scores of G_3, the tenability of this hypothesis was rejected. After considering the multiple comparisons to study the relative effectiveness of the various treatments within microteaching with the integrated skill-based traditional practice in 'filler' group, the treatments in group E_1 under self-analysis through audiotape feedback in microteaching was equally effective to that of 'filler' group on the development of general teaching competence. On the other hand, the teachers in the groups 'E_2' of supervisory feedback and 'E_3' of supervisory-cum-audiotape feedback in microteaching were significantly higher on the gain scores than that of the 'filler' group on the development of general teaching competence.

3.3.2. Testing of Hypotheses H_2 and H_3 :

To study the relative effectiveness of various feedback treatments among the three groups 'E_1', 'E_2' and 'E_3' within microteaching on the development of general teaching competence the following two hypotheses H_2 and H_3 were formulated. The second hypothesis H_2 was stated like : "the gain in scores on general teaching competence at the post test over pretest and of the retention test over pre/post test is significantly higher for the microteaching group under supervisory-cum-audiotape

~~supervisory-cum-audiotape~~ feedback than the microteaching group either of self-analysis through audiotape or of supervisory feedback". The third hypothesis was also stated as under : "the gain in scores on general teaching competence at the post test over the pretest and of the retention test over pre/post test is significantly higher for the microteaching group under supervisory feedback than that of the group using self-analysis through audiotape". The tenability of these two hypotheses were tested simultaneously throgh the same statistical procedures in accordance with the gain scores G_1, G_2 and G_3 on general teaching competence.

Study Through ANOVA :

These two hypotheses were tested through one-factor ANOVA for the significance of mean differences of the three groups 'E_1', 'E_2', and 'E_3' simultaneously. The Table 3.10 represents the summary of ANOVA of the gain scores of G_1, G_2 and G_3 on general teaching competence of the above three groups having twenty four teachers. The F values for the G_1, G_2, and G_3 gain scores happen to be 2.93, 1.71, 0.39 with the degrees of freedom 2 and 21 in each case of gain scores. After comparing with the standard values it is observed that all the F values for the above three gain scores are not at all significant.

Hence, the analysis yields that both the hypotheses H_2 and H_3 are rejected for all the three gain scores of G_1, G_2 and G_3. Therefore the treatments in the microteaching groups

TABLE : 3.10 : Summary of ANOVA for the Gain Scores on General Teaching Competence of Three Groups : 'E_1', 'E_2' and 'E_3' having twenty four teachers under various Treatments.

Gain Scores on GTC	Source of Variation	Sum of Squares.	Degrees of Freedom	Mean Squares (MS)	F Value	Level of Significance.
Post test-Pre test (G_1)	Between Groups	233.89	2	116.94	2.93	NS
	Within Gourps.	835.93	21	39.80		
	Total	1069.83	23			
Retention Test - Pretest (G_2)	Between Groups.	177.40	2	88.70	1.71	NS
	Within Groups	1085.23	21	51.67		
	Total	1262.63	23			
Retention test - Post test (G_3)	Between Groups.	7.90	2	3.95	0.39	NS
	Withing Groups.	213.73	21	10.18		
	Total	221.63	23			

under self-analysis through audiotape feedback, supervisory feedback and supervisory-cum-audiotape feedback are equally effective when compared on the gain scores from pretest/post test to post test/retention test of general teaching competence.

Study Through Scheffe' Method :

After testing the two hypotheses H_2 and H_3 through the ANOVA, it was observed that the significant mean differences among the variables were happened to be null in both the hypotheses. Hence, the Scheffe' method (S-method) was not adopted separately for these two hypotheses. But during testing the first hypotheses i.e. H_1 the S-method was employed and extended further for multiple comparisons among the mean differences of the six contrasting pairs ('E_1' and 'F', 'E_2' and'F', 'E_3' and 'F' for the hypothesis H_1 ; and further 'E_3' and 'E_1', 'E_3' and 'E_2', 'E_2' and 'E_1'for the hypotheses H_2 and H_3). Hence, the Table 3.11 was an extension of the Table 3.8 for the multiple comparisons of the mean differences of GTC gain scores of 'E_1', 'E_2' and 'E_3' groups.

The Table 3.11 gives the absolute values of the ratios on estimate of the contrasts 'E_3' and 'E_2', 'E_3' and 'E_1', and 'E_2' and 'E_1' with that of square root of estimate of variance. The absolute values are 0.43, 2.05 and 1.81 for G_1 gain scores, whereas 0.76, 1.92, and 1.29 for G_2 gain scores. These values are not significant even comparing with 2.96, the square root of 3 times the 100 (1-0.05) percentile in the F distribution with the degrees of freedom, 3 and 29. Thus, the table shows that not a single contrasting groups within microteaching treatment even in

TABLE : 3.11 : Multiple Comparison among the Microteaching Groups 'E_1', 'E_2', and 'E_3' on the Gain Scores of General Teaching Competence and Confidence Intervals around the Contrasts by S-method.
(An extension of Table 3.8)

Gain Score on GTC	Contrast	Estimate of Contrast ψ	Estimate of Variance of Contrast $\hat{\sigma}^2_\psi$	Square root of Estimate of Variance σ_ψ	Absolute Value $\frac{\psi}{\sigma_\psi}$	Level of Significance.	Confidence interval $\psi \pm \sigma_\psi(2.96)$	
Post - Pre. (G_1)	$E_3 - E_2$	1.4	10.30	3.21	0.43	NS	(10.9, -8.1)	Not differ significantly from Zero.
	$E_3 - E_1$	6.6	10.30	3.21	2.05	NS	(16.1, -2.9)	-DO-
	$E_2 - E_1$	5.2	8.24	2.87	1.81	NS	(13.69, -3.29)	-DO-
Retention - Pre. (G_2)	$E_3 - E_2$	2.7	12.49	3.53	0.76	NS	(13.15, -7.75)	Not differ significantly from Zero.
	$E_3 - E_1$	6.8	12.49	3.53	1.92	NS	(17.25, -3.65)	-DO-
	$E_2 - E_1$	4.1	9.99	3.16	1.29	NS	(13.45, -5.25)	-DO-

G_1 or G_2 gain scores yields a higher mean gain score on the development of general teaching competence.

The same table also gives the confidence intervals around the differences between the means of these three contrasting pairs. The differences between the means of all the three contrasting pairs lie between 10.9 and -8.1, 16.1 and -2.9, and 13.69 and -3.29 for G_1; 13.15 and -7.75, 17.25 and -3.65, 13.45 and -5.25 for G_2 respectively. Thus the S-method does not give any evidence to conclude with confidence that the contrasting groups 'E_3' and 'E_2'; 'E_3' and 'E_1'; and 'E_2' and 'E_1' differ significantly from zero in both the cases of G_1 and G_2 gain scores.

Hence, the treatments on the varying sources of feedback under self-analysis through audiotape, supervisor, and supervisor with audiotape within microteaching technique are equally effective on the development of general teaching competence.

Study Through Wilcoxon Test :

As per the computational procedure of Wilcoxon test the Tables 3.12a, 3.12b, 3.12c present the T values for the gain scores on general teaching competence of three contrasting pairs 'E_3' and 'E_1', 'E_3' and 'E_2', and 'E_2' and 'E_1' having matched teachers, indicated as per the Table 3.9 .

The data are summarised in Table 3.12a of 'E_3' (n=6) and 'E_1' (n=6) of matched teachers on the gain scores of G_1 and G_2.

TABLE : 3.12a : Gain Scores on General Teaching Competence of Two Groups : 'E_3' and 'E_1' of Matched Teachers with their T values studied through Wilcoxon Test.

	Gain Score (G_1) Post test - Pretest						Gain Score (G_2) Retention test - Pretest					
Pair	E_3 (n=6)	E_1 (n=6)	Difference	Rank of Difference.	Rank with Less Frequent Sign.	Level of Significance.	E_3 (n=6)	E_1 (n=6)	Difference	Rank of Difference.	Rank with less Frequent. Sign.	Level of Significance.
1	24	19	5	1			26	15	11	4		
2	34	23	11	5.5	No Negative Rank.		33	24	9	2	No Negative Rank.	
3	41	30	11	5.5			42	26	16	6		
4	37	28	9	2			32	29	3	1		
5	33	23	10	3.5			32	17	15	5		
6	32	22	10	3.5			31	21	10	3		
					T = 0 n = 6	$P < 0.05$					T = 0 n = 6	$P < 0.05$

TABLE : 3.12b : Gain Scores on General Teaching Competence of Two Groups : 'E_3' and 'E_2' of Matched Teachers with their T Values studied through Wilcoxon Test.

	Gain Score (G_1) Post test - Pretest						Gain Score (G_2) Retention Test - Pretest					
Pair	E_3 (n=6)	E_2 (n=6)	Difference	Rank of Difference	Rank with less Frequent Sign	Level of Significance.	E_3 (n=6)	E_2 (n=6)	Difference.	Rank of Difference.	Rank with Less Frequent Sign.	Level of Significance.
1	33	36	-3	-2	2		32	36	-4	-2	2	
2	32	32	0	-			31	33	-2	-1	1	
3	41	46	-5	-3	3		42	47	-5	-3.5	3.5	
4	34	24	10	4.5			33	23	10	6		
5	24	25	-1	-1	1		26	21	5	3.5		
6	37	27	10	4.5		NS	32	23	9	5		NS
					T = 6						T = 6.5	
					n = 5						n = 6	

TABLE : 3.12c : Gain Scores on General Teaching Competence of Two Groups : 'E_2' and 'E_1' of Matched Teachers with their T values studied through Wilcoxon Test.

	Gain Score (G_1) Post test - Pretest						Gain Score (G_2) Retention test - Pretest					
Pair	E_2 (n=9)	E_1 (n=9)	Difference	Rank of Difference	Rank with less Frequent Sign	Level of Significance.	E_2 (n=9)	E_1 (n=9)	Difference.	Rank of Difference.	Rank with Less Frequent Sign.	Level of Significance.
1	25	37	-12	-6	6		21	33	-12	-5.5	5.5	
2	27	23	4	3			23	24	- 1	-1	1	
3	28	30	- 2	-1	1		26	26	0	-		
4	46	32	14	7			47	34	13	7		
5	32	28	4	3			33	29	4	2		
6	24	28	- 4	-3	3		23	34	-11	-3.5	3.5	
7	36	19	17	8			36	15	21	8		
8	31	23	8	5			29	17	12	5.5		
9	40	22	18	9		NS	32	21	11	3.5		NS
					T = 10						T = 10	
					n = 9						n = 8	

The T values happen to be zero in each gain scores for n=6 which give significant difference in scores at 0.05 level. Hence, the result indicates that the teachers in 'E_3' group are significantly higher in gain scores G_1 and G_2 of the general teaching competence than that of 'E_1' group of six teachers only. But this analysis does not signify the tenability of differences in its original size (n=9) of the teachers in 'E_1' group.

The Table 3.12b indicates the T values for G_1 and G_2 gain scores of the contrasting pair 'E_3' and 'E_2' groups having six matched teachers. The T values happen to be 6 for G_1 with n=5 (no difference in scores for a particular pair) and 6.5 for G_2 with n=6 which give no significant differences in scores. Hence, it concludes that both the treatments in group of 'E_3' and 'E_2' are equally effective on the gain scores G_1 and G_2 of general teaching competence.

The Table 3.12c presents the T values for G_1 and G_2 gain scores of the contrasting matched pair 'E_2' and 'E_1' groups. The T values are 10 with n=9 for G_1 and also 10 with n=8 (eliminating one particular matched pair) for G_2 which indicate no significant differences in scores. Hence, both the treatments in group of 'E_2' and 'E_1' are equally effective on the gain scores G_1 and G_2 of general teaching competence.

Interpretation of the Results of Hypotheses H_2 and H_3 :

After testing the hypotheses H_2 and H_3 through the above parametric and non-parametric statistical measures the

tenabilities of both the hypotheses on the gain scores of G_1, G_2, and G_3 did not sustain. Therefore the teachers under supervisory-cum-audiotape feedback equally achieved the gain scores of general teaching competence at the post test/retention test over pretest/post test with that of teachers either under supervisory feedback or self-analysis through audiotape feedback. Moreover, the teachers under supervisory feedback also equally achieved the gain scores of general teaching competence at the post test/retention test over pretest/post test with that of teachers under self-analysis through audio-tape feedback.

3.3.3. Testing of Hypotheses H_4 and H_5 :

The hypotheses H_4 and H_5 pertaining to the third objective about the effect of training of the five specific teaching skills on the ability to use in macrolessons were formulated as follows. The hypothesis H_4 was "the gain in summated scores on the five specific skills of general teaching competence at the post test over pretest and of the retention test over pretest/post test is significantly higher for the microteaching group using any of the three different feedback treatments than that of the 'filler' group under integrated skill-based traditional supervision". The hypothesis H_5 was "there is no significant difference in gain in summated scores on the five specific skills of general teaching competence at the post test/retention test over pretest/post test in case of

three microteaching groups". The testing of these two hypotheses were undertaken in accordance with the gain in summated scores for S_1, S_2, and S_3 on the specific five teaching skills of general teaching competence.

Study Through ANOVA :

(a) Testing of Hypothesis H_4

The Table 3.13 indicates the sum of gain in summated scores and squared gain scores on the five teaching skills of the thirty three teachers under four various treatments in 'E_1' (n=9), 'E_2'(n=9), 'E_3' (n=6), and 'F'(n=9) for S_1, S_2, and S_3 gain scores.

In Table 3.14 a summary on the test of significance through ANOVA is presented. The F values for the gain in summated scores of the five skills under consideration for S_1, S_2, and S_3 happen to be 13.18, 9.94, and 0.93 with the degrees of freedom 3 and 29 in each case. After comparing this observed F values with the standard values, the F values are found to be statistically significant at 0.01 level in both the cases of S_1 and S_1 gains, whereas in the case of S_3 gains the F value is not significant.

Hence, through the computational procedures of ANOVA the hypothesis H_4 is accepted at the level of 0.01 significant in case of S_1 and S_2 gains but the same hypothesis for S_3 gains is rejected and does not sustain in any significant level.

TABLE : 3.13 : Sum of Gain in Summated Scores (Sum X) and Squared gain Scores (Sum X^2) on the Five Specific Skills under various treatments in 'E_1', 'E_2', 'E_3' and 'F' Groups.

Gain in Summated Scores on the Five Skills.	Sum X and Sum X^2	E_1(n=9)	E_2 (n=9)	E_3(n=6)	F(n=9)
Post - Pretest (S_1)	Sum X	323	361	249	212
	Sum X^2	11831	15135	10455	5204
Retention - Pretest (S_2)	Sum X	312	349	244	226
	Sum X^2	11244	14077	10028	5878
Retention - Post test (S_3)	Sum X	- 9	-12	- 5	14
	Sum X^2	171	146	33	180

TABLE : 3.14 : Summary of ANOVA for the Gains in Summated Scores on the Five Teaching Skills of General Teaching Competence for the four groups 'E_1', 'E_2', 'E_3' and 'F' having thirty three teachers under various treatments.

Gain in Summated Scores on the Five Skills.	Source of Variation	Sum of Squares	Degrees of Freedom (df)	Mean Square	F Value	Level of Significance.
Post - Pretest (S_1)	Between Groups.	1671.45	3	557.15		
	Within Groups	1225.52	29	42.26	13.18	$P < 0.01$
	Total	2896.97	32			
Retention - Pretest (S_2)	Between Groups.	1184.70	3	394.90		
	Within Groups.	1279.84	29	44.13	9.94	$P < 001$
	Total	2464.54	32			
Retention - Post test (S_3)	Between Groups.	46.59	3	15.53		
	Within Groups.	479.05	29	16.52	0.93	NS
	Total	525.64	32			

Therefore the microteaching technique under varying sources of feedback is more effective on the gain in summated scores on the five teaching skills of general teaching competence at post test/ retention test over pretest than that of the 'filler' group. But at retention test over post test the treatments in microteaching groups are equally effective on the gains in summated scores on the five skills with that of the 'filler' group.

(b) Testing of Hypothesis H_5

The Table 3.15 indicates the F values for the gains in summated scores on the five teaching skills of general teaching competence for S_1, S_2, and S_3 gains for three groups 'E_1', 'E_2', and 'E_3' having twenty four teachers. The F values happen to be 1.39, 1.42, and 0.03 for the S_1 and S_2, and S_3 gains respectively with the degrees of freedom 2 and 21 in each case. After comparing these observed F values with the standard values these F values are not statistically significant at any one of the gain scores of S_1, S_2 and S_3 .

Hence, through ANOVA the tenability of this null hypothesis H_5 on the gains in summated scores on the five teaching skills for S_1, S_2, and S_3 is accepted. Therefore the treatments under varying sources of feedback within microteaching are equally effective in achieving the gains in the summated scores on the five teaching skills of general teaching competence at post test/retention test over pretest/post test.

TABLE : 3.15 : Summary of ANOVA for the Gains in Summated Scores on the Five Teaching Skills of General Teaching Competence for three Groups 'E_1','E_2', 'E_3' having twenty four teachers under various treatments.

Gain in Summated Scores on the Five Skills.	Sources of Variation.	Sum of Squares	Degrees of Freedom (df)	Mean Square	F Value	Level of Significance.
Post-Pre test (S_1)	Between Groups.	135.33	2	67.66	1.39	NS
	Within Groups.	1015.30	21	48.35		
	Total	1150.63	23			
Retention - Pretest (S_2)	Between Groups.	146.02	2	73.01	1.42	NS
	Within Groups.	1076.94	21	51.28		
	Total	1222.96	23			
Retention -Post test (S_3).	Between Groups.	1.01	2	0.51	0.03	NS
	Within Groups.	320.83	21	15.28		
	Total	321.84	23			

Study Through Scheffe' Method :

The hypothesis H_4 was accepted for S_1 and S_2 gain scores during testing the hypothesis through ANOVA. But in testing the relative effectiveness among the various treatments upon the summated scores on the five teaching skills in 'E_1', 'E_2', 'E_3', and 'F' groups the S-method was employed for S_1 and S_2 gains. The tenability of null characteristics was sustained for S_3 gains during the ANOVA. Hence, this S-method was not applicable for testing the significance on the S_3 gain scores.

The six contrasting pairs 'E_1', and 'F', 'E_2' and 'F' 'E_3' and 'F' along with 'E_3' and 'E_1', 'E_3' and 'E_2', and 'E_2' and 'E_1' were undertaken for multiple comparisons by the S-method to verify the relative effectiveness among themselves which pertained to the testing of hypotheses H_4 and H_5 .

Table 3.16 indicates the multiple comparisons among the contrasting pairs 'E_1' and 'F', 'E_2' and 'F', and 'E_3' and 'F' on the gains in summated scores on the five teaching skills for S_1 and S_2 gains. Their confidence intervals around the differences between the means of these three contrasting pairs are also represented in this table. The absolute values happen to be 4.03, 5.40, 5.24 for S_1 and 3.06, 4.37, 4.45 for S_2 . After comparing either with 3.69 or 2.96, the square root of 3 times the 100(1-0.01) or 100(1-0.05) percentile in the F-distribution with the degrees of freedom 3 and 29, the absolute values of corresponding contrasts significantly retain at the level of 0.01 for S_1 gains. Thus, the mean values on the gain in summated scores of two groups in each contrasting pair differ significantly at the

TABLE : 3.16 : Multiple Comparison among the Treatment Groups: 'E_1', 'E_2', 'E_3' with 'F' Group on the gain in Summated Scores on the Five Specific Teaching Skills and Confidence Intervals around the Contrasts by the S-method.

Gain in Summated Scores on the Five Skills.	Contrast	Estimate of contrast ψ	Estimate of variance of contrast σ^2_ψ	Square root of Estimate variance σ_ψ	Absolute Values. $\frac{\psi}{\sigma_\psi}$	Level of Significance.	Confidence Interval $\psi \pm \sigma_\psi(2.96)$	
Post-Pretest (S_1)	E_1 - F	12.34	9.39	3.06	4.03	$P < 0.01$	(23.63,1.05)	Differ Significantly from Zero.
	E_2 - F	16.54	9.39	3.06	5.40	$P < 0.01$	(27.83,5.25)	-Do-
	E_3 - F	17.94	11.74	3.42	5.24	$P < 0.01$	(30.56,5.32)	-Do-
Retention - Pretest. (S_2)	E_1 - F	9.57	9.80	3.13	3.06	$P < 0.05$	(18.83,0.30)	Differ Significantly from zero.
	E_2 - F	13.68	9.80	3.13	4.37	$P < 0.01$	(22.94,4.41)	-Do-
	E_3 - F	15.57	12.26	3.50	4.45	$P < 0.01$	(25.93,5.21)	-Do-

post test over pretest measures. For S_2 gain scores the contrast 'E_1' and 'F' significantly differs in their mean values at the level of 0.05, whereas the two groups under each contrast 'E_2' and 'F', and 'E_3' and 'F' differ significantly at the level of 0.01. The confidence intervals around the means of the contrasts both for S_1 and S_2 gain scores are significantly ~~kgis~~ higher than zero and lie between the specific number (23.63, 1.05), (27.83, 5.25), (30.56, 5.32) for S_1 and (18.83, 0.30), (22.74, 4.41), (25.93, 5.21) for S_2 respectively. Hence, the analysis through Scheffe' method yields that the microteaching groups with varying sources of feedback are highly effective on the gains in summated scores on the five teaching skills of general teaching competence to that of 'filler' group having skillebased traditional practice teaching.

Table 3.17 is an extension of the Table 3.16 both for S_1 and S_2 gain scores in which multiple comparisons of 'E_2' and 'E_1', 'E_3' and 'E_1', and 'E_3' and 'E_1' contrasts are given. This Table 3.17 specifically illustrates the multiple comparison of the above contrasts which are concerned with the hypothesis H_5. The absolute values of 'E_2' and 'E_1', 'E_3' and 'E_1', and 'E_3' and 'E_2' happen to be 1.37, 1.63, and 0.40 for S_1 gain scores; and 1.31, 1.71, and 0.54 for S_2 gain scores respectively. After comparing with 2.96 the absolute values for both the gain scores of the corresponding contrasts are not statistically different in mean values. The confidence intervals afforded by S-method in each contrasts do not differ significantly from zero. Hence, the

TABLE : 3.17 : Multiple Comparison among the Treatment Groups : 'E_1', 'E_2', and 'E_3' under Microteaching on the Gains in Summated Scores on the Five specific Teaching Skills and Confidence Intervals around the Contrasts by the S-method. (An Extension of Table: 3.16.) .

Gain in Summated Scores on the Five Skills.	Contrast	Estimate of Contrast. ψ	Estimate of variance of Contrast σ^2_ψ	Square root of Estimate of Variance σ_ψ	Absolute Values. $\frac{\psi}{\sigma_\psi}$	Level of Significance.	Confidence Interval $\psi \pm \sigma_\psi (2.96)$	
Post-Pretest. (S_1)	$E_2 - E_1$	4.20	9.39	3.06	1.37	NS	(15.49,-7.09)	Not differ significantly from Zero.
	$E_3 - E_1$	5.60	11.74	3.42	1.63	NS	(18.22,-7.0)	-Do-
	$E_3 - E_2$	1.40	11.74	3.42	0.40	NS	(14.02, -11.22)	-do-
Retention-Pretest. (S_2)	$E_2 - E_1$	4.11	9.80	3.13	1.31	NS	(13.37, -5.15)	Not differ significantly from zero.
	$E_3 - E_1$	6.00	12.26	3.50	1.71	NS	(16.36, -4.36)	-do-
	$E_3 - E_2$	1.89	12.26	3.50	0.54	NS	(12.25, -8.47)	-Do-

analysis concluded that the treatments in the varying sources of feedback within microteaching are equally effective on the gain in summated scores, specific to the five teaching skills of general teaching competence.

Study Through Wilcoxon Test :

The Tables 3.18a, 3.18b, and 3.18c present the T values for the gain in summated scores of S_1 and S_2 on the matched pairs of teachers in 'E_1' and 'F', 'E_2' and 'F', and 'E_3' and 'F' groups during the testing of the hypothesis H_4 . Similarly the Tables 3.19a, 3.19b, and 3.19c illustrate the same for the matched pairs of teachers in 'E_3' and 'E_1', and 'E_2', and 'E_2' and 'E_1' groups in testing the hypothesis H_5 .

In the Table 3.18a the T values both for S_1 and S_2 are equal to zero and 5 respectively when n=9 in each gain scores. After comparing with the standard values, the differences of the summated scores between 'E_1' and 'F' groups are significant at 0.01 level for S_1 and 0.05 level for S_2 . Hence, the treatments in group E_1 is relatively effective on the gain in summated scores on the five teaching skills of general teaching competence than that of 'F' group. The T values come to zero in both S_1 and S_2 gain scores of 'E_2' and 'F' matched pair when n=9 and 8 respectively in the Table 3.18b. After comparing with the standard values, the levels of significance in both the gain scores S_1 and S_2 retain at 0.01. Thus, the summated scores of 'E_2' group differ significantly from that of 'F' group for both S_1 and S_2

TABLE : 3.18a : Gain in Summated Scores on the Five Specific Skills of Two groups : 'E_1' and 'F' of Matched Teachers and their T Values studied through Wilcoxon Test.

	Gain Score (S_1) Post test - Pretest						Gain Score (S_2) Retention test - Pretest					
Pair	'E_1' (n=9)	'F' (n=9)	Difference.	Rank Difference.	Rank with less Frequent Sign.	Level of significance.	E_1 (n=9)	F (n=9)	Difference.	Rank of Difference.	Rank with less Frequent sign.	Level of Significance
1	34	23	11	4			32	24	8	4		
2	42	26	16	7			42	30	12	5		
3	47	26	21	9	No Negative Rank.		41	22	19	8		
4	39	32	7	2.5			43	30	13	6		
5	40	23	17	8			39	22	17	7		
6	30	16	14	6			37	15	22	9		
7	34	28	6	1			28	30	-2	-2	2	
8	29	17	12	5			24	28	-4	-3	3	
9	28	21	7	2.5			26	25	1	1		
					T = 0 n = 9	$P < 0.01$					T = 5 n = 9	$P < 0.05$

TABLE : 3.18b : Gain in Summated Scores on the Five Specific Skills of Two Groups : 'E_2' and 'F' of Matched Teachers and their T Values studied through Wilcoxon Test.

	Gain Score (S_1) Post test - Pretest						Gain Score (S_2) Retention test - Pretest					
Pair	E_2 (n=9)	F (n=9)	Difference.	Rank of Difference	Rank with Less Frequent Sign.	Level of Significance.	E_2 (n=9)	F (n=9)	Difference	Rank of Difference.	Rank with Less Frequent Sign.	Level of Significance.
1	40	28	12	4			41	30	11	3		
2	46	26	20	5			39	30	9	2		
3	45	17	28	8.5	No Negative Rank.		43	28	15	5	No Negative Rank.	
4	52	26	26	7			51	22	29	7.5		
5	33	32	1	1.5			30	30	0	-		
6	32	23	9	3			36	24	12	4		
7	40	16	24	6			44	15	29	7.5		
8	49	21	28	8.5			42	25	17	6		
9	24	23	1	1.5			23	22	1	1		
					T = 0 n = 9	P < 0.01					T = 0 n = 8	P < 0.01

TABLE : 3.18c : Gain inSummated Scores on the Five Specific Skills of two groups : 'E_3' and 'F' of Matched Teachers and their T Values studied through Wilcoxon Test.

	Gain Score (S_1) Post test - Pretest						Gain Score (S_2) Retention test - Pretest					
Pair	E_3 (n=6)	F (n=6)	Difference	Rank of Difference.	Rank with Less Frequent Sign.	Level of Significance.	E_3 (n=6)	F (n=6)	Difference	Rank of Difference	Rank with Less Frequent Sign.	Level of Significance
1	48	17	31	6			45	28	17	4		
2	37	23	14	2.5	No Negative Rank		35	22	13	2	No Negative Rank	
3	46	32	14	2.5			45	30	15	3		
4	39	26	13	1			36	30	6	1		
5	36	16	20	4.5			39	15	24	6		
6	43	23	20	4.5			44	24	20	5		
					$\overline{T = 0}$ $n = 6$	$P < 0.01$					$\overline{T = 0}$ $n = 6$	$P < 0.01$

gain scores. Considering the case of the matched pair of teachers in 'E$_3$' and 'F' groups in the Table 3.18c, the T value happens to be zero in each gain scores of S_1 and S_2 at n=6 . The significant difference on the gain in summated scores of 'E$_3$' 'F' groups is tenable at the level of 0.01 and hence, the teachers in 'E$_3$' group is higher on the gains in summated scores on the five teaching skills than that of 'F' group.

From these three tables an identical inference in favour of the tenability of the hypothesis H_4 is drawn. The teachers under microteaching technique in 'E$_1$', 'E$_2$' and 'E$_3$' groups signify higher on the gains in summated scores on the five teaching skills of general teaching competence than that of the 'filler' group 'F' under integrated skill-based traditional practice teaching.

Table 3.19a represents the T values on the gains in summated scores of teachers of 'E$_3$' and 'E$_1$' matched groups for S_1 and S_2. The T values happen to be 4.5 and 3 for S_1 and S_2 respectively with n=6 in each case. After comparing with the standard values these T values do not differ significantly. Hence, the treatment in group 'E$_3$' is equally effective on the gain in summated scores of the five teaching skills with that of group 'E$_1$'. Similar is the case of the teachers in 'E$_3$' and 'E$_2$' matched groups; and 'E$_2$' and 'E$_1$' matched groups. In the Table 3.19b the T values happen to be 7 and 10 for S_1 and S_2 gains with n=6, whereas in the Table 3.19c T values happen to be 14.5 and 14 for S_1 and S_2 with n=6. In both the cases the T values

TABLE : 3.19a : Gain in Summated Scores on the Five Specific Skills of Two Groups : 'E_3' and 'E_1' of Matched Teachers and their T Values studied through Wilcoxon test.

	Gain Score (S_1) Post test - Pretest						Gain Score (S_2) Retention test - Pretest					
Pair	E_3 (n=6)	E_1 (n=6)	Difference	Rank of Difference	Rank With Less Frque-nt Sign	Level of Significance	E_3 (n=6)	E_1 (n=6)	Difference	Rank of difference.	Rank with Less Frque-nt Sign.	Level of Significance.
1	36	34	2	2			39	32	7	4		
2	39	42	-3	-3.5	3.5		36	42	-6	-3	3	
3	46	47	-1	-1	1		45	41	4	1		
4	43	40	3	3.5			44	39	5	2		
5	48	29	19	6			45	24	21	6		
6	37	28	9	5			35	26	9	5		
					T = 4.5	NS					T = 3	NS
					n = 6						n = 6	

TABLE : 3.19b : Gain in Summated Scores on the Five Specific Skills of Two groups: 'E_3' and 'E_2' of Matched Teachers and their T Values Studied through Wilcoxon test.

	Gain Score (S_1) Post test - Pretest						Gain Score (S_2) Retention test - pretest					
Pair	E_3 (n=6)	E_2 (n=6)	Difference.	Rank Difference	Rank with Less Frequent Sign.	Level of Significance.	E_3 (n=6)	E_2 (n=6)	Difference	Rank Difference.	Rank with Less Frequent Sign.	Level of Significance.
1	48	40	8	5			45	41	4	2		
2	37	32	5	3			35	36	-1	-1	1	
3	46	52	-6	-4	4		45	51	-6	-4	4	
4	39	40	-1	-1	1		36	44	-8	-5	5	
5	36	24	12	6			39	23	16	6		
6	43	46	-3	-2	2	NS	44	39	5	3		NS
					T = 7 n = 6						T = 10 n = 6	

TABLE : 3.19c : Gain in Summated Scores on Five Specific Skills of Two Groups : 'E_2' and 'E_1' of Matched Teachers and their T Values studied through Wilcoxon Test.

	Gain Score (S_1) Post test - Pretest						Gain Score (S_2) Retantion test - Pretest					
Pair	E_2 (n=9)	E_1 (n=9)	Difference	Rank Difference	Rank with Less Frquent Sign.	Level of Significance.	E_2 (n=9)	E_1 (n=9)	Difference	Rank of Diff-	Rank With Less Frquent Sign.	Level of Significance.
1	24	34	-10	-4.5	4.5		23	32	-9	-5	5	
2	46	42	4	1			39	42	-3	-1.5	1.5	
3	33	47	-14	-7	7		30	41	-11	-6	6	
4	52	39	13	6			51	43	8	4		
5	32	40	-8	-3	3		36	39	-3	-1.5	1.5	
6	40	30	10	4.5			44	37	7	3		
7	40	34	6	2			41	28	13	7		
8	45	29	16	8			43	24	19	9		
9	49	28	21	9		NS	42	26	16	8		NS
					T = 14.5 n = 9						T = 14 n = 9	

do not differ significantly. Hence, the teachers in 'E_3' group have equally achieved the gain in summated scores on the five teaching skills of the general teaching competence with that of 'E_1' group. Similar case regarding the equally effective summated scores on the five skills is sustained among the matched teachers under the treatments in 'E_2' and 'E_1' groups.

Thus the tenability of null hypothesis H_5 is accepted and no significant differences are sustained between the teachers in contrasting groups of 'E_1', 'E_2' and 'E_3' on the gains in summated scores on the five teaching skills of general teaching competence.

Interpretations of the Results of Hypotheses H_4 and H_5 :

These two hypotheses H_4 and H_5 were tested through one-factor ANOVA, Scheffe' method, and Wilcoxon test. The hypothesis H_4 was accepted for S_1 and S_2 gain scores, whereas rejected for S_3 gain scores. Therefore, the teachers in micro-teaching groups gained significantly higher in summated scores on the five teaching skills of general teaching competence than that of 'Fillen' group under integrated skill-based traditional practice teaching at the post test/retention test over pretest measures. But the teachers under microteaching treatment did not differ significantly on the gain in summated scores of general teaching competence with that of the 'fillen' group at the retention test over post test measures.

Considering the hypothesis H_5, the tenability of this null hypothesis was sustained in the case of S_1, S_2 and S_3 gain scores. Therefore, the treatments in three microteaching groups under varying sources of feedback (self-analysis through audio-tape feedback, supervisory feedback and supervisory-cum-audio-tape feedback) were equally effective on the gain in summated scores on the five teaching skills of general teaching competence at the post test/retention test over pretest/post test.

3.3.4. Testing of Hypotheses H_6 and H_7 :

The hypotheses H_6 and H_7 pertaining to the objective-4 was on the effect of skill acquisitions on the attitudes of the teachers towards teaching. The hypothesis H_6 was "the gain in scores on teachers' attitudes towards teaching at the post test over pretest is significantly higher in case of microteaching group using any of the three feedback treatments (self-analysis through audiotape, supervisory feedback, supervisory-cum-audiotape feedback) than the 'filler' group trained through integrated skill-based traditional supervision". The hypothesis H_7 was a null hypothesis which was stated as follows : "there is no significant differences in gain in scores on teachers' attitudes towards teaching at the post test over pretest in three microteaching groups using self-analysis through audiotape feedback, supervisory feedback, and supervisory-cum-audiotape feedback". These two hypotheses were tested through the same

statistical measures adopted for the previous hypotheses. The testing of these two hypotheses were undertaken in accordance with the gain scores on teachers' attitudes towards teaching at the post test over pretest (G_4) only.

Study Through ANOVA :

Before proceeding to test the hypotheses, the homogeneity of population variance was checked and was accepted for the gain in scores of G_4 (Vide Table 3.5). Then the tenability of hypotheses H_6 and H_7 were tested through one-factor ANOVA to find out the plausibility of significant mean differences of the teachers' attitudes towards teaching among the groups under various treatements.

The Table 3.20 represents the sum of gain scores and squared gain scores on teachers' attitudes towards teaching under the groups of 'E_1'(n=9), 'E_2'(n=9), 'E_3'(n=6), and 'F'(n=9). From this table the 'E_3'(n=6) group presents the maximum value in sum of squared gain scores, whereas the 'E_1' (n=9) group has a least among the four groups.

The summary of ANOVA of the gain scores G_4 of thirty three teachers in four groups 'E_1', 'E_2', 'E_3', and 'F' for H_6 and twenty four teachers in three groups 'E_1', 'E_2' and 'E_3' for H_7 are indicated in the Table 3.21 simultaneously. For the hypothesis H_6, the F value happens to be 3.01 with the degrees of freedom 3 and 29. After comparing with the standard value the observed F value retains significantly at the level of 0.05.

TABLE : 3.20 : Sum of Gain Scores (Sum X) and Squared Gain Scores (Sum X^2) on Attitudes Towards Teaching Under Various Treatments in 'E_1', 'E_2', 'E_3' and 'F' Groups.

Gain Scores on Attitudes toward Teaching.	Sum X and Sum X^2	E_1 (n=9)	E_2(n=9)	E_3(n=6)	F (n=9)
Post - Pre test (G_4)	Sum X	74	99	139	153
	Sum X^2	1601	1637	4023	3351

But it does not indicate that the treatments under microteaching technique are significantly more effective in attitudes towards teaching than that of the 'filler' group. Moreover, the mean value of 'E_3' group is the highest and that of 'E_1' group is the lowest among the four groups. However, through the multiple comparisons among the contrasting groups 'E_3' and 'F', 'E_2' and 'F', and 'E_1' and 'F' the relative effectiveness of the treatments upon attitudes towards teaching was tested.

The same table (Table 3.21) refers the hypothesis H_7 where the results through ANOVA are represented for twenty four teachers of three microteaching groups 'E_1', 'E_2', and 'E_3' . The F value happens to be 3.86 with the degrees of freedom 2 and 21 and sustains significantly at 0.05 level. Thus the tenability of this null characteristics in the original hypothesis H_7 is

TABLE : 3.21 : Summary of ANOVA for the Gain Scores at Post test over Pretest (C_4) on Teachers' Attitudes towards Teaching under Various Treatments.

Hypotheses H_6 / H_7	Treatments	Source of Variation	Sum of Squares	Degrees of Freedom (df)	Mean Square	F Values	Level of Significance.
H_6	Between 'E1', 'E2', 'E3' and 'F' Groups.	Between Groups.	966.33	3	322.11	3.01	$P < 0.05$
		Within Groups.	3093.39	29	106.66		(The mean value of 'E3' group is the highest score and that of 'E1' is lowest).
		Total	4059.72	32			
H_7	Between 'E1', 'E2' and 'E3'	Between Groups.	861.61	2	430.80		
		Within Groups.	2343.39	21	111.59	3.86	$P < 0.05$
		Total	3205.00	23			

rejected. But,this hypothesis was again tested through the other statistical measures for the multiple comparisons among the groups 'E_3' and 'E_1', 'E_3' and 'E_2', and 'E_2' and 'E_1' to find the relative effectiveness of the treatments upon the attitudes towards teaching.

Study Through Scheffe' Method :

Both the hypotheses were tested through this Scheffe' method for multiple comparisons and to find out the significant mean differences on the gain scores of attitudes towards teaching among the contrasting pairs : 'E_1' and 'F', 'E_2' and 'F', and 'E_3' and 'F' for the hypothesis H_6; and 'E_3' and 'E_1', 'E_3' and 'E_2', and 'E_2' and 'E_1' for the hypothesis H_7 .

The Table 3.22 gives the absolute values -1.82, -1.25, and 1.10, for the contrasts 'E_1' and 'F', 'E_2' and 'F', and 'E_3' and 'F' respectively at the gain score of G_4 on teachers' attitudes towards teaching. These values are not significant at all when compared to 2.96, the square root of 3 times the 95 percentile in the F-distribution with the degrees of freedom 3 and 29. Hence, the result reveals that the teachers under microteaching treatments equally achieve the gain in scores of their attitudes towards teaching with that of 'filler' group under integrated skill-based traditional practice teaching. The confidence intervals around this method are also presented in the same table, which shows that not a single interval is significantly differed from zero rather, their mean differences happen to be zero.

TABLE : 3.22 : Multiple Comparison among the contrasting groups of 'E_1', 'E_2', 'E_3' and 'F' on Gain Scores G_4 on Attitudes Towards Teaching and Confidence Intervals around Contrasts by the S-method.

Hypotheses.	Contrasts.	Estimate of Contrasts ψ	Estimate of Variance of Contrast σ_ψ^2	Square Root of Estimated of Variance. σ_ψ	Absolute Values. $\frac{\psi}{\sigma_\psi}$	Level of Significance.	Confidence Interval. $\psi \pm \sigma_\psi$ (2.96) for H_6 $\psi \pm \sigma_\psi$ (2.63) for H_7	
H_6	E_1 - F	-8.89	23.72	4.87	-1.82	NS	(5.52, - 23.30)	Not differ Significantly from Zero.
-do-	E_2 - F	-6.11	23.72	4.87	-1.25	NS	(8.30, - 20.52)	-do-
-do-	E_3 - F	6.05	29.69	5.44	1.10	NS	(22.15, - 10.05)	-do-
H_7	E_3 - E_1	14.94	30.99	5.56	2.69	$P < 0.05$	(29.57, 0.31)	Differ significantly from Zero.
-do-	E_3 - E_2	12.16	30.99	5.56	2.19	NS	(26.79, - 2.47)	Not differ Significantly from zero.
-do-	E_2 - E_1	2.78	24.79	4.98	0.56	NS	(25.25, - 0.93)	-do-

Hence, after testing through ANOVA and thereafter through Scheffe' method, the hypothesis H_6 was untenable and null characteristics were sustained among the microteaching groups with that of the 'filler' group.

The same table also presents the multiple comparisons among the contrasts 'E_3' and 'E_1', 'E_3' and 'E_2', and 'E_2' and 'E_1' for testing the hypothesis H_7. The absolute values of those pairs happen to be 2.69, 2.19, and 0.56 respectively. Except one value, 2.69 of the contrasts E_3 and E_1 groups, the other two values do not differ significantly after comparing with 2.63, the square root of 2 times the 95 percentile in the F-distribution on the degrees of freedom 2 and 21. Rather the former one is significant at the level of 0.05. Hence, the teachers under 'E_3' group are significantly higher on the gain scores of their attitudes towards teaching than that of 'E_1' group. But no significant gains on teachers' attitudes towards teaching are existed for other contrasting groups of 'E_3' and 'E_2', and 'E_2' and 'E_1'. The confidence interval for the contrasts 'E_3' and 'E_1' differs significantly from zero but the same intervals for other two pairs do not differ significantly from zero.

Hence, after analysing the ANOVA and Scheffe' method the tenability of null characteristics within the microteaching groups of hypothesis H_7 was rejected.

Study Through Wilcoxon Test :

As per the computational procedure of Wilcoxon matched-pairs signed-ranks test the Tables 3.23a, 3.23b, 3.23c represant the T values of the contrasting matched pairs of 'E_1' and 'F'; 'E_2' and 'F'; and 'E_3' and 'F' which happen to be 10.5 for n=9, 8 for n=9, and 2 for n=6 respectively. Not a single value of them is statistically significant. Hence, the treatments in microteaching groups are equally effective to that of 'filler' group under integrated skill-based traditional practice on the teachers' attitudes towards teaching.

TABLE : 3.23a : Gain Scores(G_4) on Attitudes towards Teaching of Two Groups : 'E_1' and 'F' of Matched Teachers with the T value studied through Wilcoxon Test.

Pair	E_1(n=9)	F(n=9)	Difference.	Rank of Difference.	'Rank with 'Less 'Frequent 'Sign.	'Level of 'Significance.
1	-1	7	-8	-3.5		
2	30	22	8	3.5	3.5	
3	11	9	2	1	1	
4	8	11	-3	-2		
5	2	11	-9	-5		
6	4	29	-25	-7.5		
7	-3	22	-25	-2.5		
8	22	9	13	6	6	
9	1	33	-32	-9		NS
					T =10.5	
					n = 9	

TABLE: 3.23b : Gain Scores(G_4) on Attitudes towards Teaching of Two Groups: 'E_2' and 'F' of Matched Teachers with the T Values Studied through Wilcoxon Test.

Pair	E_2 (n=9)	F (n=9)	Difference.	Rank of Difference.	Rank with Less Frequent Sign.	Level of Significance.
1	8	22	-14	-8		
2	19	9	10	4	4	
3	20	33	-13	-7		
4	14	7	7	3	3	
5	-7	11	-18	-9		
6	11	22	-11	-5		
7	6	11	- 5	-2		
8	11	9	2	1	1	
9	17	29	-12	-6		NS
					T = 8	
					n = 9	

TABLE : 3.23c : Gain Scores(G_4) on Attitudes towards Teaching of Two Groups: 'E_3' and 'F' of Matched Teachers with the T Value studied through Wilcoxon test.

Pair	E_3 (n=6)	F (n=6)	Difference.	Rank of Difference	Rank with Less Frequent Sign.	Level of significance
1	31	9	22	6		
2	18	11	7	3.5		
3	18	11	7	3.5		
4	17	22	-5	-2		
5	45	29	16	5	2	
6	10	7	3	1		NS
					T = 2	
					n = 6	

TABLE : 3.24a : Gain Scores(G_4) on Attitudes towards Teaching of Two Groups : 'E_3' and 'E_1' of Matched Teachers with the T Values studied through Wilcoxon Test.

Pair	E_3 (n=6	E_1 (n=6)	Difference.	Rank of Difference.	Rank With Less Frequent Sign.	Level of Significance
1	31	22	9	3		
2	18	11	7	1	No Negative Rank	
3	45	-1	46	6		
4	17	-3	20	5		
5	10	2	8	2		
6	18	1	17	4		
					T = 0 n = 6	$P < 0.05$

TABLE : 3.24b : Gain Scores(G_4) on Attitudes towards Teaching of Two Groups : 'E_3' and 'E_2' of Matched Teachers with the T Value Studied through Wilcoxon Test.

Pair	E_3 (n=6)	E_2 (n=6)	Difference.	Rank of Difference.	Rank with Less Frequent Sign.	Level of Significance.
1	31	11	20	4		
2	18	19	-1	-1	1	
3	18	14	4	3		
4	17	17	0	-		
5	45	6	39	5		
6	10	8	2	2		
					T = 1 n = 5	NS

TABLE : 3.24c : Gain Scores(G_4) on Attitudes towards Teaching of Two Groups : 'E_2' and 'E_1' of Matched Teachers with the T Value Studied through Wilcoxon Test.

Pair	E_2 (n=9)	E_1 (n=9)	Difference	Rank of Difference.	Rank with Less Frequent Sign.	Level of Significance.
1	8	30	-22	-9	9	
2	-7	11	-18	-7	7	
3	19	8	11	2.5		
4	6	-1	7	1		
5	11	-3	14	6		
6	11	22	-11	-2.5	2.5	
7	17	4	13	5		
8	20	1	19	8		
9	14	2	12	4		NS
					T = 18.5	
					n = 9	

The Tables 3.24 a, 3.24b, and 3.24c refer the T values of the contrasting pairs 'E_3' and 'E_1', 'E_3' and 'E_2', and 'E_2' and 'E_1' of the matched teachers which happen to be zero with n=6, 1 with n=5, and 18.5 with n=9 respectively. Except the T values in Table 3.24a for the contrasting pair 'E_3' and 'E_1'; all other values are not at all significant, whereas the former T value for 'E_3' and 'E_1' contrast is significant at the level of 0.05. Hence, through this statistical measures the same inference on the gain in teachers' attitudes towards teaching of 'E_3' group is sustained over that of 'E_1' group. But for other two contrasts these gains are equally significant on teachers attitudes towards teaching.

Interpretation of the Results of Hypotheses H_6 and H_7 :

The hypotheses H_6 and H_7 when tested through parametric and non-parametric statistical measures were finally rejectdd. Therefore, the gain in scores on teachers' attitudes towards teaching at the post test over pretest for the microteaching groups using either self-analysis through audiotape feedback, supervisory feedback, or supervisory-cum-audiotape feedback was equally significant to that of the 'filler' group under integrated skill-based traditional practice teaching.

Further, the gain in scores on teachers' attitudes towards teaching at the post test over pretest for the teachers under the microteaching group using supervisory-cum-audiotape feedback was significantly higher in comparison with that of the

teachers under microteaching group using self-analysis through audiotape feedback. The teachers in other two contrasting groups under microteaching using supervisory-cum-audiotape feedback with that of supervisory feedback, and self-analysis through audiotape feedback with that of supervisory feedback did not differ significantly among themselves on the gain in scores on teachers' attitudes towards teaching. Hence, the tenability of null characteristics of hypothesis H_7 was rejected and the above alterantive statements revealed.

3.4. CONTENT ANALYSIS ON SELF-EVALUATION PROFORMA :

This Proforma consisted of twelve aspects on reactions towards microteaching. These were on : teaching skills for an effective teacher, developing teaching competence, other techniques for acquisition of teaching skills, suggestions on specific teaching skills (probing questioning, explaining, illustrating with examples, stimulus variation, and reinforcement), modelling both perceptual and symbolic, the priority of acquisition of teaching skills through microteaching and their sequences, effedt of feedback and its impact on 'reteach' session and subsequent normal class teaching, the difficulties in using the teaching skills in an integrated manner for macrolessons, and overall views on their reactions towards teaching skills and microteaching. The data were collected from the participating twenty four in-service school teachers of microteaching groups only i.e. 'E_1' (n=9), 'E_2' (n=9), 'E_3' (n=6) after post test phase of the experiment. All these data were compiled according

to 'E_1', 'E_2', and 'E_3'groups. The content analysis and their interpretations were studied as per the twelve aspects considering all the participating teachers in microteaching groups only.

1. Teaching Skills for Effective Teacher :

All the twenty four teachers were in favour of the acquisition of teaching skills through microteaching. Seven teachers, two from 'E_1' group reported that in addition to these skills, new and enriched curriculum, psychology of the child, skill in tackling the classrooms prevailing individual differences and minimising the dropout from the schools are the essential ingredients for an effective teacher. However, these reports on the effective teacher showed that in general, all accepted the importance of teaching skills for an effective teacher along with the other aspects to meet the new challenges. As per their suggestions the evolving new strategies and tactics should be implemented through microteaching for their development in teacher behaviour in addition to the skill acquisition.

2. Competencies in Teaching Skills :

All the teachers in each group accepted the practice of the teaching skills through microteaching for developing teaching competency. (i) All the nine teachers in 'E_1' group (self-analysis through audiotape feedback) complained on their difficulties about the rectification of biases on non-verbal components particularly in stimulus variation and reinforcement,

using audiotape during 'feedback' session. They suspected about their competencies on these specific skills. (ii) All the twenty four teachers were in favour of microteaching cycle for gaining the competencies on the components and sub-components of teaching skills but thirteen teachers i.e. four from 'E_1', six from 'E_2' and three from 'E_3' gave their suggestions to increase the number of cyles i.e. the number of microlessons per skill, particularly in difficult skills, like probing questioning and explaining. (iii) The teachers, two from 'E_1', four from 'E_2' and three from 'E_3' group suggested to practice each component of probing questioning separately taking each a microlesson through the same microteaching procedure for achieving competencies.

Hence, these above reactions on developing teaching competencies on teaching skills were of affirmative statements. The teachers under self-analysis through audiotape were in difficulties in using audiotape for developing non-verbal components of teaching skills. More number of cycles were suggested (two cycles were adopted for each skill through microteaching during experimentation) for important and difficult skills. They also suggested a separate practice on each component of skill of probing questioning i.e. on prompting technique, seeking further clarification, refocussing, increasing critical awareness, and redirection through microteaching in developing the teaching competence.

3. The necessity of Microteaching was felt by all the teachers for the best development of teacher behaviour achieving competencies on teaching skills. But ten teachers, three from 'E_1', five from 'E_2' and rest from 'E_3' were on a second opinion about the acuqisition of teaching skills through Herbertian steps. They reported that if proper modelling, dynamic feedback and objective supervision on particular components and sub-components of a skill, and provision of repeat the practice of that lesson with the importance of the particular skills will be provided in subsequent stages then practices of teaching skills through macrosituation may be effective.

4. Specific Suggestions on Individual Skills:

Most of the teachers in each group suggested for some improvement on the skills of explaining and probing questioning.

(a) Only seven teachers, two from 'E_1', three from 'E_2', and two from 'E_3' gave their opinions that while explaining a concept or idea, a scope may be given to the students to clear up some doubts on the related matter from previous topic or any acquired knowledge. A scope may also be given to the teacher to ask some questions on this topic to check the boredom, clarifying the doubts, maintaining discipline by asking the related matter of this concept.

(b) i) On probing questioning nine teachers - two from 'E_1', five from 'E_2' and two from 'E_3' suggested to indicate higher order questioning skills from analysis, synthesis and evaluation objectives of Bloom's Taxonomy of Cognitive Domain for achieving competencies especially to handle the talented students.

ii) Twelve teachers in addition to the previous nine [vide Item 2 (iii)] suggested to practise separately on each component of probing skill through microteaching cycle without practising all the five components of probing at a time for better competency.

iii) Ten teachers - four from each of E_1 and E_2 and two from E_3 were in their opinion about the importance of increasing critical awareness. They suggested that this component should come after 'refocussing technique' with a higher order questioning skills on analysis, synthesis and evaluative questions to handle the talented students.

iv) Eighteen teachers i.e. seven from each of 'E_1' and 'E_2' , and four from 'E_3' group suggested that more time should be devoted to the weaker children for prompting and seeking further information techniques, without redirecting

oftenly during 'no response' from them. This encourages a greater rapport both for child and teacher, and reinforces the child to think a while for a correct response.

These above suggestions given by the teachers on explaining and probing questioning were some pertinent considerations for improvement of acquisition of teaching skills.

5. Presentation of Models :

Here, item five and six were analysed on the teachers' reactions in presenting the model by the investigator. Except one teacher from 'E_2' group all the teachers in all the groups were in favourable opinion towards the orientation and theoretical discussions on these five teaching skills. Thirteen teachers were satisfied that even in absence of demonstration classes this theoretical discussions helped them a better understanding about these skills. The only one teacher who was not in favour of this theoretical discussions did not express the reason of discontentment. Even then it may be presumed that as these discussions were held usually after their regular class teachings, even some times in the morning and evening also, this

may create a resentment due to heavy workload for the teacher.

Though all the teachers were of affirmative tone about the model lessons for developing the skills, even then they required more demonstration classes in each skill on the concepts of each and every school subjects. The investigator himself demonstrated all the teaching skills taking the concept from science, geography, and mathematics subjects only.

6. Sequencing of Teaching Skills :

Regarding sequencing of the skills, except two from E_1, one each from E_2 and E_3, all the teachers agreed upon the sequence of skills i.e. stimulus variation, probing questioning, reinforcement, explaining and illustrating with examples. They gave the psychological reasons about such sequences.

Stimulus variation is an important skill for acquisition. It is simple and necessary to practise at the beginning of the practising teacher and the pupils in microlessons. Moreover, this skill influences the other skills in eliminating the boredom, unpleasantness, passivity, etc. A sense of achievement is prevailing in the learner's (teacher's) mind after practising the stimulus variation. Then the probing questioning helps the teacher to probe further during the skills of reinforcement, explaining, and illustrating with examples. Whether the pupils understand the concept clearly or not, the skill of probing is useful to test the understanding of concepts. Reinforcement skill is placed after probing and before explaining and illustration

for the purpose of prompting and reinforcing on the non-responsed activities of the pupils as per the techniques of probing. Similarly the techniques of reinforcment may be applied during explaining and illustrating if necessity arises.

7. Feedback Procedure :

Out of the nine teacher of E_1 group seven were not satisfied themselves about the provision of self-analysis through audiotape. They reported the reasons : (i) no provision of feedback was used on non-verbal items of the skills through audiotape, (ii) it was difficult and subjective to introspect the non-verbal behaviours for modification in subsequent stages, (iii) marking tallies and filling up the observation schedules by the teachers themselves were quite ineffective and creating hinderances for feedback and further development, (iv) an important point they pointed out about some biases like personal confidence, superiority complex. Moreover, all the nine teachers in this 'E_1' group were in favour of any supervisor or any peer teachers for providing feedback other than self-analysis through audiotape.

The other teachers in both the groups 'E_2' and 'E_3' were in favour of feedback provisions given to them. But the five teachers under 'E_3' treatment required more time duration (even more than eight minutes) during feedback or refeedback sessions because of the provisions of supervisor as well as audiotape for 'E_3' group and the nature of the skill to be practised.

For these above reactions, it was concluded that supervisory feedback was necessary for the acquisition of teaching skills through microteaching for in-service teachers. The provision of gadgets like audiotape and other were not also possible in Indian secondary schools.

Except the above teachers in 'E_1' group all other teachers reacted favourably towards the feedback given to them by the investigator. Though these seven teachers in 'E_1' group did not outrightly reject the feedback sensed by themselves through audiotape but they were not fully satisfied with the feedback provisions. Even then, they reacted favourably and some improvement on the verbal items sensed through audiotape during 'reteach' and in subsequent lessons were observed.

8. Integration of Skills during normal class Teaching :

The teachers under 'E_1', 'E_2', and 'E_3' groups having the science, mathematics, and geography subjects felt easier to integrate the five teaching skills during the normal class. The number was eleven. The teachers having the literatures as school subjects, reported the difficulty in integrating all the skills and in using their components and sub-components because of the slow learning of the pupils. The other difficulties were as follows : (i) Eighteen teachers were in difficulty about the duration of time for a normal class. To use all the skills in an itegrated approach, it is better to enhance the duration of the normal period. (ii) All the twenty four teachers reacted

their resentment about the existing teacher-pupil ratio (the investigator observed himself during his field study that in some schools it was 1:55). They suggested that for effective teaching and classroom transaction the size of the class should be minimised for : participating all the pupils in class discussion, thorough understanding on the subject content, one to one rapport, seeking out the individual problems and that too the individualised instruction. (iii) All of them were dissatisfied about the heavy workload both in academic and administrative activities, the non-availability of sufficient time for planning a lesson integrating all the skills before proceeding to the class, heavy stereotyped curriculums to complete those in specific time limit, and various school subjects given to a teacher in all the classes. (iv) Five teachers, two in each from 'E_1' and 'E_2', and one from 'E_3' reported that using those skills in an integrated way the talented pupils were neglected in a mixed class where the individual differences prevailed. But at the same time they stated further that the teaching in an integrated skill approach was definitely helpful for slow and average learners. (v) More demonstration classes on each subject in an integrated approach of the teaching skills were wanted by the participating teachers before the post test phase of experiment.

Over and above, all of them satisfied on the skill acquisition for further development of teaching competence, using these acquired skills in an integrated approach, helping the slow and average pupils through the refined and developed teacher behaviour.

9. The Overall Views on Microteaching :

Though all the aspects were discussed above as per the reactions of the in-service teachers even then a global picture was collected from them. After analysing their reports on this particular item it was observed that they reported more of advantages than that of disadvantages on acquisition of teaching skills through microteaching and their implementation during the normal classroom teaching. The following points which were indicated in their reports are important to be listed here.

(i) For achieving the teaching competency, the teacher should acquire some teaching skills as per the skills identified in CASE, Baroda and in other places. But the essential skills for acquisition are : set induction, fluency and probing questioning, explaining, illustrating with examples, stimulus variations, reinforcement, achieving closure, and evaluation of the pupils' learning. So they require some more literatures with model lessons of those skills which were not practised during this experimentation.

(ii) The acquisition of teaching skills affects not only the teacher behaviour in a positive direction but it also affects, even directly, the pupil behaviour and better classroom transaction simultaneously.

(iii) Microteaching technique is too much essential for developing the new teaching skills and refining the old ones in teacher behaviour.

(iv) These teaching skills are essentially required for developing the teaching competence to handle both the weaker sections and talented ones in bringing up their active participations, establishing rapport, maintaining discipline in the classroom, developing thorough understanding on their subject content.

(v) Microteaching technique is very much essential for self-correction of errors and deficiencies either in teaching skills or even content.

(vi) Some teachers stated that for revision of the courses and to test students' understanding about the subject content they can use this technique. This technique is also helpful in developing the standards of weaker sections and helpful in testing the initial level of the talented ones adopting the skill of probing questioning.

(vii) This technique focussed the teacher to adopt the skills in handling the individual differences in the normal classroom.

(viii) This technique is also helpful in testing the feasibility of a new curriculum before introducing it in normal class teaching.

At the end, the teachers suggested that microteaching is an integral part of in-service teachers' training and the acquisition of various teaching skills are essentially required for the well-developed teacher behaviour and that too the pupil behaviour for an improved classroom transction.