CHAPTER IV

ANALYSIS OF RESULTS AND DISCUSSION - PHASE III

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4.0.0 Introduction

Based upon the experiences and findings of the Phase-II of the study (reported in Chapter III) the Phase-III of the study was conducted. An attempt was made in this phase to see whether student teachers receiving training in asking questions improve upon their previous classroom performance assessed before training or not. All the three hypotheses generated in Phase-II of the study also serve as the basis of this Phase in addition to the one of assessing the student teachers' overall classroom performances before and after training. This chapter presents the results with their interpretation and discussion of results for both Phase-II and III at the end with a view to testing the following hypotheses :

(1) Microteaching will be the most effective treatment for acquiring the skill of asking probing questions, followed

by audiomodeling and symbolic modeling treatment being the least effective of the three.

(2) Microteaching will be the most effective treatment for acquiring the skill of asking convergent questions, followed by audiomodeling and symbolic modeling treatment being the least effective of the three.

(3) Microteaching will be the most effective treatment for acquiring the skill in asking divergent questions, followed by audiomodeling and symbolic modeling treatment being the least effective of the three.

(4) Gain scores on the classroom performance of student teachers will not differ under the symbolic modeling audiomodeling and microteaching treatments.

The presentation of the results with their interpretation is made under the captions : 4.1.0 - probing questions; 4.2.0 - convergent questions; 4.3.0 - divergent questions; 4.4.0 - teaching competence in real classroom; and caption 4.5.0 is devoted to the discussion of the results presented under the three captions, namely, 3.1.0;

3.2.0; and 3.3.0 of Chapter III and captions 4.1.0; 4.2.0; 4.3.0; and 4.4.0 stated above in the light of similar studies carried out elsewhere. The study employed 'Three Factor Design with Repeated Measures - Case I' on the Lines of Winer (1962, p.319). The three factors of this factorial design are modeling; trials; and observers with repeated measures on trials. The factor of modeling had three levels - symbolic modeling (M_1); audiomodeling (M_2); and microteaching (M_3). The second factor had four levels - trial-I (T_1); trial-II (T_2); trial-III (T_3); and trial-IV (T_4). The third factor, namely observers, had three levels - peer observer-I (O_1); peer observer-II (O_2); and self-observer-III (O_3). Ten observations were made under each of the (3x4x3) thirtysix experimental conditions created in the laboratory.

4.1.0 Probing Questions

Observations in terms of raw scores are given in Table 4.1, on the next page.

TABLE 4.1

PHASE III - BASIC DATA IN TERMS OF RAW SCORES FOR SKILL-I (PROBING QUESTIONS)

Modeling	T_1			T_2			T_3			T_4		
	O_1	O_2	O_3	O_1	O_2	O_3	O_1	O_2	O_3	O_1	O_2	O_3
	11	8	13	13	13	14	15	14	13	13	14	14
	12	10	13	13	13	12	13	13	13	14	14	16
	13	11	12	13	12	11	13	13	11	14	14	13
Symbolic	9	11	11	12	13	13	13	10	13	15	12	15
modeling	13	11	14	14	12	13	13	12	11	13	14	14
(M_1)	9	9	11	15	8	14	13	12	16	16	16	15
	13	13	13	14	17	14	14	14	14	15	13	15
	9	9	9	13	12	12	13	13	13	17	16	18
	16	16	13	13	13	11	12	12	12	17	14	14
	18	9	18	16	13	16	15	15	15	14	17	17
	11	10	9	11	13	13	14	14	14	13	14	14
	12	11	11	12	12	12	13	13	13	12	14	12
	12	9	13	12	13	14	14	15	14	14	13	15
Audio	11	11	13	12	14	12	13	13	14	14	13	16
modeling	11	12	13	14	13	12	14	13	13	14	15	16
(M_2)	11	14	12	12	14	12	12	11	12	13	13	13
	14	12	14	14	13	13	10	13	13	12	12	13
	13	11	15	12	10	14	13	11	13	13	11	14
	14	15	16	10	14	15	14	9	14	13	13	15
	10	11	15	11	11	15	13	13	15	16	12	13
	10	13	16	11	11	13	11	9	12	13	12	13
	8	7	10	10	11	12	13	11	11	12	9	12
	9	11	10	8	11	10	9	13	9	11	11	12
Micro-	10	8	9	9	10	11	11	11	12	12	13	13
teaching	8	11	11	10	14	11	11	15	11	10	14	10
(M_3)	9	9	9	11	10	11	10	10	11	11	12	12
	11	11	11	12	11	12	12	12	12	11	13	13
	10	8	11	12	9	11	10	11	12	13	12	13
	9	11	12	10	11	10	10	10	13	13	13	12
	11	9	9	11	10	11	13	10	10	13	13	12

Based upon the raw scores given in Table 4.1, the results in terms of means (M), Standard deviations (SD), and Standard error of the means (SEM) arising out of the thirty-six experimental conditions are given in Table 4.2 on the next page.

TABLE 4.2

MEANS, STANDARD DEVIATIONS AND STANDARD ERROR OF MEANS FOR SKILL-I (PROBING QUESTIONS)

Modeling	Item	T_1			T_2			T_3			T_4		
		O_1	O_2	O_3	O_1	O_2	O_3	O_1	O_2	O_3	O_1	O_2	O_3
	N	10	10	10	10	10	10	10	10	10	10	10	10
M_1	Mean	12.30	10.70	12.70	13.60	12.60	13.00	13.40	12.80	13.10	14.80	14.40	15.10
	SD	3.02	2.37	2.37	1.16	2.11	1.56	2.62	1.39	1.70	1.47	1.50	1.52
	SE_M	0.96	0.75	0.75	0.37	0.69	0.49	0.83	0.44	0.54	0.47	0.47	0.48
	N	10	10	10	10	10	10	10	10	10	10	10	10
M_2	Mean	11.90	11.60	13.10	12.00	12.70	13.20	13.00	12.50	13.50	13.40	13.00	14.10
	SD	1.37	1.78	2.16	1.25	1.33	1.23	1.25	1.72	1.64	1.17	1.16	1.37
	SE_M	0.43	0.56	0.68	0.40	0.43	0.39	0.40	0.55	0.52	0.37	0.37	0.43
	N	10	10	10	10	10	10	10	10	10	10	10	10
M_3	Mean	9.50	9.80	10.80	10.40	10.80	11.20	11.00	11.20	11.30	11.90	12.20	12.20
	SD	1.08	1.88	2.10	1.27	1.32	0.92	1.33	1.75	1.16	1.10	1.40	0.92
	SE_M	0.34	0.59	0.67	0.40	0.42	0.29	0.43	0.56	0.37	0.35	0.45	0.29

The data given in Table 4.1 were subjected to the analysis of variance (3x4x3). The summary ANOVA results are given in Table 4.3 herebelow :

TABLE 4.3

SUMMARY ANOVA RESULTS FOR SKILL-I
(PROBING QUESTIONS)

Source of Variation		Sums of squares	df	Mean sums of squares	F-ratio
	: Teachers	59.71	9	6.63	1.98 NS
M	: Modeling	327.11	2	163.55	48.82 **
T	: Trials	198.55	3	66.18	19.75 **
O	: Observers	35.17	2	17.58	5.25 **
MT	: Modeling X Trials	20.30	6	3.38	1.01 NS
MO	: Modeling X Observers	19.46	4	4.86	1.45 NS
OT	: Observers X Trials	12.70	6	2.11	0.63 NS
MTO	: Modeling X Trials X Observers	49.76	12	4.14	1.23 NS
Experimental Error		1055.73	315	3.35	
	Total	1778.49	359		

* Significant at .05 level

** Significant at .01 level

Table 4.3 shows that variation due to individual differences among student teachers is not significant (F=1.98, NS with df 9/315). The main effects due to modeling (F=48.82** with d/f 2/315); trials (F=19.75** with df 3/315); and observers (F=5.25** with df 2/315) are all significant at 1 percent level. The interaction effects between modeling and trials (MxT) are not significant (F=1.01, NS with df 6/315) so also the interaction effects between modeling and observers (MxO) and between trials and observers (TxO) are not significant (F=1.45, NS with df 4/315 and F=0.63, NS with df 6/315 respectively). The interaction between the three factors -- modeling, trials, and observers (MxTxO) is also not significant (F=1.23, NS with df 12/315).

In order to pinpoint the differences and to see their direction, the F-test was followed by t-test, testing the significance of difference between means. The t-test results arising out of the thirty-six experimental treatments are given in Table 4.4 to 4.15 on the following pages.

TABLE 4.4

MEANS AND STANDARD ERROR OF MEANS
FOR MODELING FOR SKILL-I (PROBING QUESTIONS)

Modeling	N	Mean	SE of mean
M_1	120	13.20	0.15
M_2	120	12.83	0.14
M_3	120	11.02	0.12

TABLE 4.5

MEAN DIFFERENCE, STANDARD ERROR OF THE MEAN DIFFERENCE
AND t-VALUES FOR THE SIGNIFICANCE OF MODELING
IN SKILL-I (PROBING QUESTIONS)

Comparison	MDs	SE of MDs	t-values
$M_1 - M_2$	0.43	0.20	2.15*
$M_1 - M_3$	2.18	0.19	11.47**
$M_2 - M_3$	1.81	0.18	10.05**

** Significant at .01 level
* Significant at .05 level

TABLE 4.6

MEANS AND STANDARD ERROR OF MEANS
FOR TRIALS IN SKILL-I (PROBING QUESTIONS)

Trials	N	Mean	SE of means
T_1	90	11.38	0.24
T_2	90	12.17	0.17
T_3	90	12.42	0.17
T_4	90	13.45	0.18

TABLE 4.7

MEAN DIFFERENCE, STANDARD ERROR OF THE MEAN DIFFERENCE
AND t-VALUES FOR THE SIGNIFICANCE OF TRIALS
UNDER SKILL-I (PROBING QUESTIONS)

Comparison	MDs	SE of MDs	t-values
$T_2 - T_1$	0.79	0.30	2.63 **
$T_3 - T_1$	1.04	0.30	3.46 **
$T_4 - T_1$	2.07	0.30	6.90 **
$T_3 - T_2$	0.25	0.25	1.00 NS
$T_4 - T_2$	1.28	0.25	5.12 **
$T_4 - T_3$	1.03	0.25	4.12 **

** Significant at .01 level

TABLE 4.8

MEANS AND STANDARD ERROR OF MEANS
FOR OBSERVERS UNDER SKILL-I (PROBING QUESTIONS)

Observers	N	Mean	SE of mean
O_1	120	12.27	0.18
O_2	120	12.02	0.19
O_3	120	12.77	0.17

TABLE 4.9

MEAN DIFFERENCE, STANDARD ERROR OF MEAN DIFFERENCE
AND t-VALUES FOR THE SIGNIFICANCE OF OBSERVERS
UNDER SKILL-I (PROBING QUESTIONS)

Comparisons	MDs	SE of MDs	t-values
$O_1 - O_2$	0.25	0.26	0.96 NS
$O_3 - O_1$	0.50	0.26	1.92 NS
$O_3 - O_2$	0.75	0.26	2.88 **

** Significant at .01 level

TABLE 4.10

MEANS AND STANDARD ERROR OF MEANS
FOR TRIAL UNDER EACH MODELING FOR SKILL-I
(PROBING QUESTIONS)

Modeling	Trials	N	Mean	SE of mean
M_1	T_1	30	11.90	0.48
	T_2	30	13.07	0.30
	T_3	30	13.10	0.24
	T_4	30	14.77	0.27
M_2	T_1	30	12.20	0.34
	T_2	30	12.63	0.25
	T_3	30	13.00	0.24
	T_4	30	13.50	0.23
M_3	T_1	30	10.03	0.33
	T_2	30	10.80	0.22
	T_3	30	11.16	0.25
	T_4	30	12.10	0.20

TABLE 4.11

MEAN DIFFERENCE, SE OF MEAN DIFFERENCE AND t-VALUES FOR THE SIGNIFICANCE OF TRIALS UNDER EACH MODELING FOR SKILL-I (PROBING QUESTIONS)

Modeling	Comparison	Mean Difference	SE of MDs	t-values
M_1	$T_2 - T_1$	1.17	0.57	2.05 *
	$T_3 - T_1$	1.20	0.54	2.22 *
	$T_4 - T_1$	2.87	0.55	5.22 **
	$T_3 - T_2$	0.03	0.40	0.07 NS
	$T_4 - T_2$	1.07	0.41	2.61 **
	$T_4 - T_3$	1.67	0.36	4.63 **
M_2	$T_2 - T_1$	0.43	0.42	1.02 NS
	$T_3 - T_1$	0.80	0.42	1.90 NS
	$T_4 - T_1$	1.30	0.41	3.17 **
	$T_3 - T_2$	0.37	0.34	1.09 NS
	$T_4 - T_2$	0.87	0.34	2.56 *
	$T_4 - T_3$	0.50	0.34	1.47 NS
M_3	$T_2 - T_1$	0.77	0.39	1.97 *
	$T_3 - T_1$	1.13	0.42	2.69 *
	$T_4 - T_1$	2.07	0.38	5.45 **
	$T_3 - T_2$	0.36	0.34	1.06 NS
	$T_4 - T_2$	1.30	0.29	4.48 **
	$T_4 - T_3$	0.94	0.33	2.85 **

* Significant at .05 level

** Significant at .01 level

TABLE 4.12

MEANS AND SE OF MEANS FOR OBSERVERS UNDER EACH MODELING FOR SKILL-I (PROBING QUESTIONS)

Modeling	Observer	N	Mean	SE of mean
M_1	O_1	40	13.52	0.32
	O_2	40	12.62	0.36
	O_3	40	13.47	0.31
M_2	O_1	40	12.57	0.22
	O_2	40	12.45	0.23
	O_3	40	13.47	0.23
M_3	O_1	40	10.70	0.23
	O_2	40	11.00	0.28
	O_3	40	11.37	0.23

TABLE 4.13

MEAN DIFFERENCE, SE OF THE MEAN DIFFERENCE AND t-VALUES FOR THE SIGNIFICANCE OF OBSERVERS UNDER EACH MODELING FOR SKILL-I (PROBING QUESTIONS)

Modeling	Comparison	MDs	SE of MDs	t-values
M_1	$O_2 - O_1$	0.90	0.49	1.87 NS
	$O_3 - O_1$	0.05	0.44	0.11 NS
	$O_3 - O_2$	0.85	0.46	0.18 NS
M_2	$O_1 - O_2$	0.12	0.32	0.37 NS
	$O_3 - O_1$	0.90	0.32	2.81 **
	$O_3 - O_2$	1.02	0.33	3.09 **
M_3	$O_2 - O_1$	0.30	0.36	1.20 NS
	$O_3 - O_1$	0.67	0.32	2.09 *
	$O_3 - O_2$	0.37	0.36	1.02 NS

* Significant at .05 level

** Significant at .01 level

TABLE 4.14

MEANS AND SE OF MEANS FOR OBSERVERS
UNDER EACH TRIAL FOR SKILL-I (PROBING QUESTIONS)

Trials	Observers	N	Mean	SE of Mean
	O_1	30	11.23	0.42
T_1	O_2	30	10.70	0.38
	O_3	30	12.20	0.43
	O_1	30	12.00	0.33
T_2	O_2	30	12.03	0.34
	O_3	30	12.47	0.28
	O_1	30	12.47	0.29
T_3	O_2	30	12.17	0.31
	O_3	30	12.63	0.29
	O_1	30	13.37	0.31
T_3	O_2	30	13.20	0.29
	O_3	30	13.80	0.32

TABLE 4.15

MEAN DIFFERENCES, SE OF MEAN DIFFERENCES AND t-VALUES FOR THE SIGNIFICANCE OF OBSERVERS UNDER EACH TRIAL FOR SKILL-I (PROBING QUESTIONS)

Trials	Comparison	Mean Difference	SE of MDs	T-values
	$O_1 - O_2$	0.53	0.57	0.93 NS
T_1	$O_3 - O_1$	0.97	0.60	1.62 NS
	$O_3 - O_2$	1.50	0.57	2.63 *
	$O_2 - O_1$	0.03	0.47	0.64 NS
T_2	$O_3 - O_1$	0.47	0.43	1.09 NS
	$O_3 - O_2$	0.44	0.44	1.00 NS
	$O_1 - O_2$	0.30	0.42	0.71 NS
T_3	$O_1 - O_3$	0.16	0.41	0.39 NS
	$O_2 - O_3$	0.46	0.42	1.09 NS
	$O_1 - O_2$	0.17	0.43	0.39 NS
T_4	$O_3 - O_1$	0.43	0.44	0.98 NS
	$O_3 - O_2$	0.60	0.43	1.39 NS

* Significant at .05 level

Table 4.4 gives the values of means and standard error of means. Mean score for symbolic modeling is the highest (M=13.20) followed by audiomodeling (M=12.83) and microteaching producing the least mean score (M=11.02). Table 4.5 gives the mean difference, standard error of the mean difference and t-values. The mean difference between symbolic modeling (M_1) and audiomodeling (M_2) is in favour of (M_1) and is significant (t=2.15*) at 5 percent level. The mean difference between symbolic modeling (M_1) and microteaching (M_3) is in favour of symbolic modeling (M_1) and is significant at 1 percent level (t=11.47**). The mean difference between audiomodeling (M_2) and microteaching (M_3) is in favour of audiomodeling (M_2) and is significant at 1 percent level (t=10.05**). Thus, symbolic modeling (M_1) appears to be the most effective treatment followed by audiomodeling (M_2) and microteaching (M_3) coming out to be the least effective treatment.

Table 4.6 gives the means and standard error of the means for the four trials organized in phase-III ofthe study. The mean values are progressively increasing, indicating that there is gain in scores from trial-I to

trial-II, from trial-II to trial-III, and from trial-III to trial-IV, the mean values being 11.38, 12.17, 12.42 and 13.45 respectively. Table 4.7 gives the mean differences (MDs), standard error of the mean differences (SEMD) and t-values for the comparisons of trials. All the six mean differences (MDs) are positive and five of them are significant at .01 level indicating that the gain in score from trial to trial is significant. The mean difference (MD) between trial-II and trial-III (T_3-T_2) is not significant indicating that the gain may be due to chance, and not a significant gain.

Table 4.8 shows the means and standard error of the mean for observers. It is seen from the Table 4.8 that Observer-III (O_3) - selfobserver has produced maximum score while Observer-II (O_2) has produced the least score. From Table 4.9 it is seen that the mean differences between O_1 and O_2; and O_1 and O_3 are not significant indicating that Observer-II and self-observer (O_3) do not differ in their assessment of the performance as compared to Observer-I (O_1). The difference between Observer-II and Observer-III (O_2-O_3)

is significant at .01 level in favour of O_3 (t=2.88**). This is strong individual difference coming into operation.

Table 4.10 shows the interaction between modeling and trials. Table 4.11 shows the mean differences (MDs); standard error of mean differences (SE of MDs); and t-values for the six trial differences arising out of the four trials given under each modeling treatment. All the three mean differences as represented by (T_3-T_2) for all the modeling treatments, namely (M_1); (M_2); and (M_3) are insignificant though there is gain in scores from trial-II to trial-III. The mean differences represented by (T_2-T_1) are significant at .05 level for symbolic modeling (M_1) and microteaching (M_3); but the same is not significant for audiomodeling (M_2) with (t=1.02, NS).

The first set of values, namely (T_2-T_1) indicate that there is significant gain in scores from trial-I to trial-II for modeling (M_1) and (M_3). This means that in case of microteaching (M_3) there is significant gain from teach-I to reteach-I. The same picture is presented by the set of values represented by (T_4-T_3) which are significant

at .01 level for modeling (M_1) and (M_3) but not significant for modeling (M_2) t-value being (1.47, NS). In case of microteaching (M_3) the gain from teach-II to reteach-II is significant at .01 level (t=2.85**). For modeling (M_1) the difference (T_3-T_4) is significant at .01 level (t=4.63**) while this difference is not significant for modeling (M_2) the t-value being (1.47 NS). Again the mean differences represented by (T_4-T_1) are all significant at .01 level for all the modeling treatments (M_1) and (M_2) and microteaching (M_3) followed immediately by the mean differences (T_3-T_2) which are all not significant. This means for microteaching treatment (M_3) there is no significant gain from reteach-I to teach-II the two levels appear to be almost the same as far as skill assessment is concerned. It appears that teach-II has nothing to do with reteach-I while reteach-II is significantly different from teach-II for microteaching (M_3). The mean differences represented by (T_3-T_1) are significant at .01 level for modeling (M_1) and (M_3) but is not significant for modeling (M_2).

Table 4.12 gives the means and standard error of means for the interaction of observers under each modeling

treatment. Table 4.13 gives mean differences (MDs), standard error of mean differences (SE of MDs), and t-values for interaction of observers under each modeling treatment. Out of the nine conditions representing the observer differences under the three modeling treatments, only three observer differences appear to be significant while the rest are not significant. The mean differences (O_2-O_1); (O_3-O_1); and (O_3-O_2) are not significant for symbolic modeling (M_1). For modeling (M_2), the observer differences (O_3-O_1) and (O_3-O_2) are significant at .01 level ($t=2.81^{**}$ and $t=3.09^{**}$ respectively) while the observer difference (O_3-O_1) is significant at .05 level for modeling (M_3). The self-observer (O_3) indicates a tendency to differ over estimating the performance as compared with other peer observers, namely (O_1) and (O_2).

Table 4.14 shows the interaction between observers under each trial giving means and standard error of means for the comparisons. Table 4.15 gives the mean differences (MDs), standard error of mean differences (SE of MDs), and t-values for observers under each trial. Only one observer difference (O_3-O_2) is significant at .05 level under trial-I

(T_1). The rest of the eleven observer differences generated under the three modeling treatments of the experiment are not significant indicating that observers do not differ from trial to trial in their assessment of the performance. The interaction between modeling (M); trials (T) and observers (O) as represented by (MxTxO) is not significant (F=1.23, NS) for probing questions.

4.2 Convergent Questions

Observations in terms of raw scores obtained by the trainee teachers under the various experimental conditions of the laboratory are given in Table 4.16 on the next page.

TABLE 4.16

PHASE III - BASIC DATA IN TERMS OF RAW SCORES FOR SKILL-II (CONVERGENT QUESTIONS)

Modeling	T_1			T_2			T_3			T_4		
	O_1	O_2	O_3	O_1	O_2	O_3	O_1	O_2	O_3	O_1	O_2	O_3
	8	13	11	13	10	11	12	13	13	14	12	13
	11	8	11	12	12	12	13	11	13	13	12	14
	10	11	11	12	12	13	13	13	12	13	13	14
Symbolic	10	10	13	12	10	12	12	11	12	13	11	13
Modeling	10	13	11	12	11	12	12	10	12	13	12	12
(M_1)	9	8	8	10	8	9	10	10	11	11	12	12
	10	11	9	9	10	13	12	14	10	12	12	12
	9	12	12	13	14	12	13	14	14	14	15	14
	10	12	10	12	14	12	13	14	14	14	15	14
	9	11	12	12	9	14	11	14	14	15	14	12
	11	14	12	13	14	14	15	13	14	15	14	14
	11	11	10	13	13	12	13	13	13	15	13	14
	12	13	12	15	13	11	13	13	14	14	13	14
Audio	11	12	14	13	13	14	13	14	14	14	15	14
modeling	14	13	13	15	14	13	15	15	14	14	15	15
(M_2)	12	10	12	12	13	14	15	13	13	15	14	15
	11	13	12	13	12	13	13	14	13	13	14	13
	12	12	13	13	11	14	11	11	14	12	12	14
	10	12	13	14	10	11	12	15	12	11	16	13
	10	13	14	13	14	14	13	12	14	16	12	14
	9	13	10	13	12	13	13	10	13	11	14	14
	11	12	12	14	11	13	12	12	13	14	13	14
	9	10	11	11	11	12	10	8	10	13	12	13
Micro-	10	7	11	9	11	12	10	11	11	14	12	12
teaching	14	11	13	13	11	14	13	10	13	13	14	14
(M_3)	9	8	8	11	13	12	10	11	12	13	14	12
	9	10	10	11	13	12	10	12	12	14	13	13
	8	8	11	12	11	12	13	11	13	13	14	13
	10	9	11	12	12	13	11	13	13	12	13	14
	10	12	12	14	11	13	12	14	12	12	13	14

Based upon the raw scores given in Table 4.16, the results in terms of means, standard deviation, and standard error of the means arising out of the thirtysix experimental conditions are given in Table 4.17 appearing on the next page.

TABLE 4.17

MEANS, STANDARD DEVIATIONS AND STANDARD ERROR OF MEANS FOR SKILL-II (CONVERGENT QUESTIONS)

Modeling	Item	T_1			T_2			T_3			T_4		
		O_1	O_2	O_3	O_1	O_2	O_3	O_1	O_2	O_3	O_1	O_2	O_3
M_1	N	10	10	10	10	10	10	10	10	10	10	10	10
	Mean	9.60	10.90	10.80	11.70	11.00	12.00	12.10	12.40	12.50	13.20	12.80	13.00
	SD	0.85	1.79	1.47	1.25	2.00	1.33	0.99	1.71	1.36	1.13	1.40	0.94
	SE_M	0.27	0.57	0.46	0.40	0.64	0.43	0.31	0.54	0.43	0.36	0.44	0.30
M_2	N	10	10	10	10	10	10	10	10	10	10	10	10
	Mean	11.40	12.30	12.50	13.40	12.70	13.00	13.30	13.30	13.50	13.90	13.80	14.00
	SD	1.17	1.34	1.18	0.97	1.34	1.25	1.34	1.25	0.71	1.52	1.32	0.67
	SE_M	0.37	0.43	0.37	0.31	0.43	0.40	0.43	0.40	0.23	0.48	0.42	0.21
M_3	N	10	10	10	10	10	10	10	10	10	10	10	10
	Mean	9.90	10.00	10.90	12.00	11.60	12.60	11.40	11.20	12.20	12.90	13.20	13.30
	SD	1.29	2.00	1.37	1.56	0.84	0.70	1.35	1.69	1.03	0.99	0.79	0.82
	SE_M	0.41	0.64	0.43	0.49	0.27	0.22	0.43	0.53	0.33	0.31	0.25	0.26

The data given in Table 4.16 were subjected to the Analysis of Variance (3x4x3). The summary ANOVA results are given in Table 4.18 below.

TABLE 4.18

SUMMARY ANOVA RESULTS FOR SKILL-II
(CONVERGENT QUESTIONS)

Source of Variation	Sum of squares	df	Mean sums of squares	F-ratio
Teachers	61.33	9	6.81	4.70 **
M : Modeling	133.44	2	66.72	46.01 **
T : Trials	269.11	3	89.70	6.19 **
O : Observers	15.36	2	7.68	5.30 **
MT : Modeling X Trials	20.71	6	3.45	2.38 *
MO : Modeling X Observers	4.03	4	1.01	0.70 NS
OT : Observers X Trials	28.59	6	4.76	3.28 **
MTO : Modeling X Trials X Observers	21.86	12	1.82	1.25 NS
Experimental Error	457.43	315	1.45	
Total	1011.86	359		

** Significant at .01 level
* Significant at .05 level

Table 4.18 shows that individual differences among teachers has produced significant difference (F=4.70** with d/f 9/315) at .01 level. This generally happens in experimental setups due to differences in experience, qualifications and other factors pertaining to individual differences. Since the mean sum of squares is small (6.81) this difference due to individual, is not likely to affect the experiment adversely. It is seen from the Table 4.18 that main effects due to modeling, trials, and observers produced significant differences at .01 level having F-values - 46.01**; 6.19** and 5.30** respectively. The interaction between modeling (M) and trials (T) represented by (MxT) has produced significant difference at .05 level indicating that trials under each modeling treatment have produced differential effects which appear to be significant. The interaction between observers and modeling as represented by (MxO) is, however, not significant (F=00.70, NS with d/f 4/315). The interaction between observers and trials as represented by (TxO) is significant at .01 level (F=3.28** with d/f 6/315). The interaction between observers under each trial, therefore, appears to be different producing a significant effect as

stated above. The interaction effect between modeling, trials, and observers is not significant ($F=1.25$, NS with df = 12/315).

In order to pinpoint the differences and see their directions, the F-test was followed by t-test, testing the significance of the difference between the means (MDs). The t-test results for the various experimental treatments -- modeling, trials, and observers are given in Tables 4.19 to 4.30 on the following pages.

TABLE 4.19

MEANS AND STANDARD ERROR OF MEANS
FOR MODELING FOR SKILL-II (CONVERGENT QUESTIONS)

Modeling	N	Mean	SE of Means
M_1	120	11.83	0.15
M_2	120	13.09	0.12
M_3	120	11.77	0.15

TABLE 4.20

MEAN DIFFERENCE, STANDARD ERROR OF MEAN DIFFERENCE
AND t-VALUES FOR THE SIGNIFICANCE OF MODELING
IN SKILL-II (CONVERGENT QUESTIONS)

Comparison	MDs	SE of MDs	t-values
$M_2 - M_1$	1.26	0.20	6.30 **
$M_1 - M_3$	0.06	0.22	0.27 NS
$M_2 - M_3$	1.32	0.19	6.95 **

** Significant at .01 level

TABLE 4.21

MEANS AND STANDARD ERROR OF MEANS
FOR TRIALS IN SKILL-II (CONVERGENT QUESTIONS)

Trials	N	Mean	SE of means
T_1	90	10.92	0.17
T_2	90	12.22	0.15
T_3	90	12.43	0.16
T_4	90	13.34	0.12

TABLE 4.22

MEAN DIFFERENCE, STANDARD ERROR OF THE MEAN DIFFERENCE
AND t-VALUES FOR THE SIGNIFICANCE OF TRIALS
UNDER SKILL-II (CONVERGENT QUESTIONS)

Comparison	MDs	SE of MDs	t-values
$T_2 - T_1$	1.30	0.23	5.65 **
$T_3 - T_1$	1.51	0.23	6.56 **
$T_4 - T_1$	2.42	0.21	11.52 **
$T_3 - T_2$	0.21	0.22	0.95 NS
$T_4 - T_2$	1.12	0.18	6.22 **
$T_4 - T_3$	0.91	0.20	4.55 **

** Significant at .01 level

TABLE 4.23

MEANS AND STANDARD ERROR OF MEANS
FOR OBSERVERS UNDER SKILL-II (CONVERGENT QUESTIONS)

Observers	N	Mean	SE of mean
O_1	120	12.06	0.16
O_2	120	12.10	0.16
O_3	120	12.52	0.13

TABLE 4.24

MEAN DIFFERENCE, STANDARD ERROR OF MEAN DIFFERENCE
AND t-VALUES FOR THE SIGNIFICANCE OF OBSERVERS
UNDER SKILL-II (CONVERGENT QUESTIONS)

Comparison	MDs	SE of MDs	t-values
$O_2 - O_1$	0.04	0.23	0.17 NS
$O_3 - O_1$	0.46	0.24	1.96 NS
$O_3 - O_2$	0.42	0.24	1.75 NS

TABLE 4.25

MEANS AND STANDARD ERROR OF MEANS
FOR TRIALS UNDER EACH MODELING FOR SKILL-II
(CONVERGENT QUESTIONS)

Modeling	Trials	N	Mean	SE of mean
M_1	T_1	30	10.40	0.31
	T_2	30	11.57	0.28
	T_3	30	12.33	0.25
	T_4	30	13.00	0.21
M_2	T_1	30	12.06	0.23
	T_2	30	13.03	0.22
	T_3	30	13.37	0.19
	T_4	30	13.90	0.22
M_3	T_1	30	10.26	0.31
	T_2	30	12.06	0.22
	T_3	30	11.60	0.26
	T_4	30	13.13	0.16

TABLE 4.26

MEAN DIFFERENCE, SE OF MEAN DIFFERENCE AND t-VALUES FOR THE SIGNIFICANCE OF TRIALS UNDER EACH MODELING FOR SKILL-II (CONVERGENT QUESTIONS)

Modeling	Comparison	Mean Difference	SE of MDs	t-values
M_1	$T_2 - T_1$	1.17	0.42	2.78 **
	$T_3 - T_1$	1.93	0.40	4.82 **
	$T_4 - T_1$	2.60	0.38	6.84 **
	$T_3 - T_2$	0.76	0.38	2.00 *
	$T_4 - T_2$	1.43	0.35	4.08 **
	$T_4 - T_3$	0.67	0.33	2.03 *
M_2	$T_2 - T_1$	0.97	0.32	3.03 **
	$T_3 - T_1$	1.31	0.30	4.37 **
	$T_4 - T_1$	1.84	0.32	5.75 **
	$T_3 - T_2$	0.34	0.29	1.17 NS
	$T_4 - T_2$	0.87	0.31	2.81 **
	$T_4 - T_3$	0.53	0.29	1.83 NS
M	$T_2 - T_1$	1.80	0.38	4.74 **
	$T_3 - T_1$	1.34	0.41	3.27 **
	$T_4 - T_1$	2.87	0.35	8.20 **
	$T_2 - T_3$	0.46	0.33	1.39 NS
	$T_4 - T_2$	1.07	0.27	3.96 **
	$T_4 - T_3$	1.53	0.29	5.27 **

** Significant at .01 level

* Significant at .05 level

TABLE 4.27

MEANS AND SE OF MEANS FOR OBSERVERS UNDER EACH MODELING FOR SKILL-II (CONVERGENT QUESTIONS)

Modeling	Observer	N	Mean	SE of mean
M_1	O_1	40	11.65	0.26
	O_2	40	11.77	0.30
	O_3	40	12.07	0.24
M_2	O_1	40	13.00	0.25
	O_2	40	13.02	0.22
	O_3	40	13.25	0.20
M	O_1	40	11.55	0.28
	O_2	40	11.50	0.29
	O_3	40	12.25	0.21

TABLE 4.28

MEAN DIFFERENCE, SE OF THE MEAN DIFFERENCE AND t-VALUES FOR THE SIGNIFICANCE OF OBSERVERS UNDER EACH MODELING FOR SKILL-II (CONVERGENT QUESTIONS)

Modeling	Comparison	MDs	SE of MDs	t-values
M_1	$O_2 - O_1$	0.12	0.40	0.30 NS
	$O_3 - O_1$	0.42	0.36	1.17 NS
	$O_3 - O_2$	0.30	0.38	0.79 NS
M_2	$O_2 - O_1$	0.02	0.33	0.06 NS
	$O_3 - O_1$	0.25	0.32	0.78 NS
	$O_3 - O_2$	0.23	0.29	0.79 NS
M_3	$O_1 - O_2$	0.05	0.40	0.12 NS
	$O_3 - O_1$	0.70	0.35	2.00 *
	$O_3 - O_2$	0.75	0.35	2.14 *

* Significant at .05 level

TABLE 4.29

MEANS AND SE OF MEANS FOR OBSERVERS UNDER EACH TRIAL FOR SKILL-II (CONVERGENT QUESTIONS)

Trials	Observers	N	Mean	SE of mean
	O_1	30	10.30	0.27
T_1	O_2	30	11.06	0.43
	O_3	30	11.40	0.28
	O_1	30	12.36	0.27
T_2	O_2	30	11.77	0.19
	O_3	30	12.53	0.21
	O_1	30	12.26	0.27
T_3	O_2	30	12.30	0.32
	O_3	30	12.73	0.22
	O_1	30	13.33	0.24
T_4	O_2	30	13.26	0.23
	O_3	30	13.43	0.17

TABLE 4.30

MEAN DIFFERENCES, SE OF MEAN DIFFERENCES AND t-VALUES FOR THE SIGNIFICANCE OF OBSERVERS UNDER EACH TRIAL FOR SKILL-II (CONVERGENT QUESTIONS)

Trials	Comparison	Mean Difference	SE of MDs	t-values
	$O_2 - O_1$	0.76	0.51	1.49 NS
T_1	$O_3 - O_1$	0.10	0.39	0.26 NS
	$O_3 - O_2$	0.34	0.51	0.67 NS
	$O_1 - O_2$	0.59	0.41	1.44 NS
T_2	$O_3 - O_1$	0.17	0.35	0.48 NS
	$O_3 - O_2$	0.76	0.36	2.11 *
	$O_2 - O_1$	0.04	0.42	0.09 NS
T_3	$O_3 - O_1$	0.47	0.34	1.38 NS
	$O_3 - O_2$	0.43	0.39	1.10 NS
	$O_1 - O_2$	0.07	0.33	0.21 NS
T_4	$O_3 - O_1$	0.10	0.58	0.17 NS
	$O_3 - O_1$	0.17	0.58	0.29 NS

* Significant at .05 level

Table 4.19 gives the means and standard error of means for modeling while Table 4.20 gives the mean differences (MDs), standard error of mean differences (SE of MDs); and t-values for the comparison between the three modelings, namely, symbolic modeling (M_1); audiomodeling (M_2); and microteaching (M_3). Table 4.19 reveals that audiomodeling (M_2) has produced maximum mean score ($\bar{m}$=13.09) followed by symbolic modeling (M_1) giving the value (m=11.83) while microteaching (M_3) has produced the least mean score (m=11.7) suggesting that (M_2) may be the most effective treatment. This indication is almost confirmed by the results given in Table 4.20. The mean difference represented by (M_2-M_1) is positive and is significant at .01 level (t=6.30**). It means that audiomodeling (M_2) has produced significant differences as compared to symbolic modeling (M_1). The mean difference represented by (M_1-M_3) is positive as is not significant indicating that symbolic modeling (M_1) having obtained higher mean score (t=0.27 NS) than microteaching (M_3) the difference is not significant. The mean difference represented by (M_2-M_3) is positive and is significant at

.01 level (t=6.95**). The results of Table 4.20 lead towards the conclusion that audio modeling (M_2) turned out to be the best treatment. Symbolic modeling (M_1) and microteaching (M_3) do not differ significantly.

Table 4.21 gives the means and standard error of means (SE of Ms) for trials while Table 4.22 gives the means differences (MDs), standard error of mean differences (SE of MDs) and t-values for comparison of trials. From Table 4.21, it is seen that there is a steady gain in scores from trial to trial (T_1=10.92; T_2=12.22; T_3=12.43; and T_4=13.34). This tendency is confirmed by the t-values of mean differences from Table 4.22. Out of the six t-values for the mean differences all but one represented by T_3-T_2 are significant at .01 level. The difference (T_3-T_2) is not significant indicating that the performance in T_3 is not significantly different from the performance in T_2 though there is slight gain in score for trial-III (T_3). Trials (T_1) and (T_2) represent 'teach-I' and 'reteach-I' for the microteaching treatment (M_3). Trials (T_3) and (T_4) represent 'teach-II' and 'reteach-II' for (M_3). Trials T_1; T_2; T_3; and

T_4 represent four different lessons based on different subject matter. In microteaching the subject matter presented in trial-I (T_1) is the same for trial-II (T_2), only the instructional group changes. The same holds good for trial-III and trial-IV which represents 'teach-II' and 'reteach-II' for microteaching treatment (M_3).

Table 4.23 gives the means and standard error of the means for observers. It is seen from the Table 4.23 that the range of the mean scores for the three observers is rather small (0.46) indicating that the observers do not differ in their assessment of the performance. This indication is almost confirmed by the results given in Table 4.24 which gives the difference between means (MDs), standard error of the mean difference (SE of MDs), and t-values. The mean differences represented by (O_1-O_2); (O_1-O_3); and (O_2-O_3) are all not significant.

Table 4.25 gives the means and standard error of the means for different trials under each modeling treatment for the interaction between modeling and trials represented

by (MxT). A steady progress is seen from trial to trial as indicated previously (Table 4.21) even under different modeling treatments except the trials-II and III in the microteaching treatment (M_3). Table 4.26 gives the mean differences (MDs), standard error of mean differences (SE of the MDs), and t-values representing the interaction between trials under each modeling. Two out of six trial mean differences, namely (T_3-T_2) and (T_4-T_3) in modeling (M_1) are significant at .05 level (t=2.00* and t=2.03*). The remaining four trial mean differences are significant at .01 level for symbolic modeling (M_1). It tends to indicate that trial effects appear to be powerful. The two trial mean differences, namely, (T_3-T_2) and (T_4-T_3) are not significant for audiomodeling (M_2) though the differences between the trial means are positive (t=1.17, NS and t=1.83, NS respectively). The remaining four trial mean differences are significant at .01 level for modeling (M_2). It tends to indicate that trial effects appear to be powerful. In microteaching (M_3) treatment, the trial mean difference (T_2-T_3) is not significant (t=1.39 NS) indicating a reduction

in score from trial-II to trial-III. The remaining five trial mean differences are significant at .01 level for microteaching (M_3) indicating again that the trial effects appear to be powerful. A significant gain in score from trial-III to trial-IV in (M_3) indicates that 'reteach-II' is significantly better than 'teach-II'.

Table 4.27 gives the means and standard error of means for the interaction of observers under each modeling treatment. It is revealed from the results that observer-III - self observer (O_3) - has a tendency to overestimate as all the mean values for O_3 are higher than either O_1 or O_2 in all the modeling treatments. Table 4.28 gives the mean differences (MDs), standard error of mean differences (SE of MDs), and t-values for interaction of observers under each modeling treatment. For symbolic modeling (M_1) all the observer mean differences are not significant. The same tendency is revealed incase of symbolic modeling (M_2) as all the observer mean differences are not significant. For modeling (M_3), the observer mean difference (O_1-O_2) is positive but not significant (t=0.12 NS). The remaining

observer mean differences, namely, (O_1-O_3) and (O_2-O_3) are negative and significant at .05 level (t=2.00* and t=2.14* respectively). Self assessment (O_3) appears to produce significant differences as far as modeling -- microteaching (M_3) is concerned.

Table 4.29 gives means, standard error of means for the interaction of observers under each trial. It appears from the Table 4.29 that the mean values for observers do not differ much from each otherunder each trial. For trial-IV (T_4) the mean values are 13.33; 13.26; and 13.43 for modeling (M_3) indicating that observers do not differ much in their assessment of the performance. Table 4.30 gives mean differences (MDs); standard error of mean differences (SE of MDs), and t-values for significance of obsefvers under each trial. Of the twelve observer mean differences generated in the experimental conditions, only one observer mean difference (O_2-O_3) under trial-II (T_2) happens to negative and significant at .05 level (t=2.11*). The rest of the eleven mean differences are not significant indicating that observers do not differ in their assessment

of performance under each trial is concerned.

4.3.0 Divergent Questions

Observations in terms of raw scores are given in Table 4.31 on the next page.

TABLE 4.31

PHASE III - BASIC DATA IN TERMS OF RAW SCORES FOR SKILL-III (DIVERGENT QUESTIONS)

Modeling	T_1			T_2			T_3			T_4		
	O_1	O_2	O_3	O_1	O_2	O_3	O_1	O_2	O_3	O_1	O_2	O_3
	15	17	12	16	15	19	16	17	18	17	16	19
	15	14	12	17	16	14	16	16	17	17	16	17
	14	15	17	17	16	16	17	17	18	18	17	17
Symbolic	14	14	15	13	14	16	14	16	15	16	16	17
modeling	15	15	16	17	14	16	15	17	16	16	17	16
(M_1)	15	14	13	13	13	18	11	18	14	14	16	19
	9	17	16	10	18	14	14	16	14	16	17	17
	17	16	16	19	19	16	19	21	15	19	19	18
	18	14	13	16	16	14	17	16	14	15	17	14
	14	17	13	15	17	15	15	18	14	16	16	18
	16	17	17	15	19	17	17	19	19	19	19	18
	16	15	15	18	15	15	17	19	16	18	19	16
	16	17	17	17	19	17	19	19	19	18	19	19
Audio	15	15	18	18	17	18	18	19	18	20	18	19
modeling	19	19	17	18	19	17	19	19	15	19	19	16
(M_2)	15	19	17	18	17	18	17	19	17	18	18	19
	17	17	15	18	16	18	18	18	17	18	19	18
	17	17	13	17	18	15	17	17	17	18	18	18
	17	16	17	17	15	18	19	18	19	18	19	19
	16	15	20	15	17	19	16	16	20	16	18	18
	16	13	15	18	15	13	17	15	16	19	16	15
	14	15	15	18	14	17	16	15	17	17	15	16
	15	14	17	13	14	18	14	16	15	17	15	17
Micro-	14	15	13	18	15	15	14	11	13	17	11	15
teaching	15	13	16	18	17	17	18	17	16	18	18	18
(M_3)	11	12	19	18	18	17	19	16	18	18	20	19
	15	17	16	17	19	18	17	19	18	21	18	20
	16	17	18	19	18	18	19	17	18	17	20	19
	14	20	10	17	16	18	18	17	19	17	20	19
	14	14	16	18	16	18	18	18	17	21	17	18

Based upon the raw scores given in Table 4.1, the results in terms of means, standard deviations, and standard error of means arising out of the thirtysix experimental conditions are given in Table 4.32 on the next page.

TABLE 4.32

MEANS, STANDARD DEVIATIONS AND STANDARD ERROR OF MEANS FOR SKILL-III (DIVERGENT QUESTIONS)

Modeling	Item	T_1			T_2			T_3			T_4		
		O_1	O_2	O_3	O_1	O_2	O_3	O_1	O_2	O_3	O_1	O_2	O_3
	N	10	10	10	10	10	10	10	10	10	10	10	10
M_1	Mean	14.60	15.30	14.30	15.30	15.80	15.80	14.40	17.20	15.50	16.40	16.70	17.20
	SD	2.37	1.34	1.88	2.63	1.88	1.69	2.17	1.55	1.65	1.63	0.95	1.47
	SE_M	0.75	0.43	0.59	0.84	0.59	0.53	0.69	0.49	0.52	0.45	0.30	0.47
	N	10	10	10	10	10	10	10	10	10	10	10	10
M_2	Mean	16.40	16.70	16.60	17.10	17.20	17.20	17.70	18.30	17.60	18.20	18.60	18.00
	SD	1.17	1.43	1.90	1.20	1.55	1.32	1.06	1.06	1.51	1.40	0.52	1.16
	SE_M	0.37	0.45	0.60	0.38	0.49	0.42	0.34	0.34	0.48	0.45	0.16	0.37
	N	10	10	10	10	10	10	10	10	10	10	10	10
M_3	Mean	14.40	15.00	15.50	17.40	16.20	16.90	17.00	16.10	16.70	18.20	17.00	17.60
	SD	1.43	2.40	2.54	1.65	1.75	1.67	1.83	2.18	1.77	1.88	2.87	1.72
	SE_M	0.45	0.76	0.80	0.52	0.55	0.53	0.58	0.69	0.56	0.59	0.91	0.57

The data given in Table 4.31 were subjected to the analysis of variance (3x4x3). The summary ANOVA results are given in Table 4.33 herebelow.

TABLE 4.33

SUMMARY ANOVA RESULTS FOR SKILL-III
(DIVERGENT QUESTIONS)

Source of Variation		Sums of squares	df	Mean sums of squares	F-ratio
	Teachers	78.13	9	8.68	3.25 **
M	: Modeling	169.67	2	84.83	31.77 **
T	: Trials	210.23	3	70.07	26.24 **
O	: Observers	1.68	2	0.84	0.31 NS
MT	: Modeling X Trials	17.86	6	2.97	1.11 NS
MO	: Modeling X Observers	26.65	4	6.66	2.49 *
OT	: Trials x Observers	10.39	6	1.73	0.65 NS
MTO	: Modeling X Trials X Observers	64.46	12	5.37	2.01 NS
Experimental Error		842.26	315	2.67	
	Total	1421.33	359		

** Significant at .01 level

* Significant at .05 level

Table 4.33 shows that individual differences among teachers are significant (F=3.25** with d/f 9/315) at .01 level which may be due to their previous background; age; qualifications; etc. Such differences are normal in experimental designs. The MSS is small (8.68) indicating that these differences are not harmful and are not likely to produce any adverse effects. Main effects due to the three modeling treatments are significant (F=31.77** with d/f 2/315) at .01 level. Trials have also produced differences (F=26.24** with d/f 3/315) significant at .01 level. The differences due to observers appear to be not significant (F=0.31 NS with d/f 2/315). The interaction effects due to modeling and trials (MxT) are not significant (F=1.11 NS with d/f 6/315). The interaction effects due to modeling and observers (MxO) are significant (F=2.49* with d/f 4/315) at .05 level indicating that observers have produced different assessments under different modelings. The interaction effects due to observers under different trials is not significant (F=0.65, NS with d/f 6/315). The interaction, thus, indicates that observers do not differ in their assessment of the performance under different

trials. The interaction between modeling, trials, and observers (MxTxO) is not significant (F=2.01, NS with d/f 12/315). The MSS for experimental error is small (2.67) indicating that no factors other than those included under the experimental setup have affected the results of the experiments.

In order to pinpoint the differences and to see their direction, the F-test was followed by the t-test testing the significance of difference between the means. The t-test results due to various experimental treatments -- modeling, trials, and observers are given in Tables 4.34 to 4.45 on the following pages.

TABLE 4.34

MEANS AND STANDARD ERROR OF MEANS
FOR MODELING FOR SKILL-III (DIVERGENT QUESTIONS)

Modeling	N	Mean	SE of mean
M_1	120	15.79	0.18
M_2	120	17.47	0.13
M_3	120	16.50	0.20

TABLE 4.35

MEAN DIFFERENCE, STANDARD ERROR OF MEAN DIFFERENCE
AND t-VALUES FOR THE SIGNIFICANCE OF MODELING
IN SKILL-III (DIVERGENT QUESTIONS)

Comparison	MDs	SE of MDs	t-values
$M_2 - M_1$	1.68	0.22	7.64 **
$M_3 - M_1$	0.71	0.27	2.63 **
$M_2 - M_3$	0.97	0.24	4.04 **

** Significant at .01 level

TABLE 4.36

MEANS AND STANDARD ERROR OF MEANS
FOR TRIALS IN SKILL-III (DIVERGENT QUESTIONS)

Trials	N	Means	SE of means
T_1	90	15.42	0.21
T_2	90	16.54	0.19
T_3	90	16.83	0.20
T_4	90	17.54	0.18

TABLE 4.37

MEAN DIFFERENCE, STANDARD ERROR OF MEAN DIFFERENCE
AND t-VALUES FOR THE SIGNIFICANCE OF TRIALS
UNDER SKILL-III (DIVERGENT QUESTIONS)

Comparison	MDs	SE of MDs	t-values
$T_2 - T_1$	1.12	0.29	3.86 **
$T_3 - T_1$	1.41	0.29	4.86 **
$T_4 - T_1$	2.12.	0.28	7.57 **
$T_3 - T_2$	0.29	0.28	1.03 NS
$T_4 - T_2$	1.00	0.26	3.85 **
$T_4 - T_3$	0.71	0.27	2.63 **

** Significant at .01 level

TABLE 4.38

MEANS AND STANDARD ERROR OF MEANS
FOR OBSERVERS UNDER SKILL-III (DIVERGENT QUESTIONS)

Observers	N	Mean	SE of mean
O_1	120	16.51	0.19
O_2	120	16.67	0.19
O_3	120	16.57	0.18

TABLE 4.39

MEAN DIFFERENCE, STANDARD ERROR OF MEAN DIFFERENCE
AND t-VALUES FOR THE SIGNIFICANCE OF OBSERVERS
UNDER SKILL-III (DIVERGENT QUESTIONS)

Comparison	MDs	SE of MDs	t-values
$O_2 - O_1$	0.16	0.27	0.59 NS
$O_3 - O_1$	0.06	0.26	0.23 NS
$O_2 - O_3$	0.10	0.27	0.37 NS

TABLE 4.40

MEANS AND STANDARD ERROR OF MEANS
FOR TRIALS UNDER EACH MODELING FOR SKILL-III
(DIVERGENT QUESTIONS)

Modeling	Trials	N	Mean	SE of mean
M_1	T_1	30	14.73	0.35
	T_2	30	15.63	0.38
	T_3	30	16.03	0.36
	T_4	30	16.77	0.24
M_2	T_1	30	16.57	0.27
	T_2	30	17.17	0.24
	T_3	30	17.87	0.22
	T_4	30	18.27	0.17
M_3	T_1	30	14.97	0.19
	T_2	30	16.83	0.31
	T_3	30	16.60	0.35
	T_4	30	17.60	0.39

TABLE 4.41

MEAN DIFFERENCE, SE OF MEAN DIFFERENCE AND t-VALUES FOR THE SIGNIFICANCE OF TRIALS UNDER EACH MODELING FOR SKILL-III (DIVERGENT QUESTIONS)

Modeling	Comparison	Mean Difference	SE of MDs	t-values
M_1	$T_2 - T_1$	0.90	0.51	1.76 NS
	$T_3 - T_1$	1.30	0.50	2.60 **
	$T_4 - T_1$	2.04	0.42	4.86 **
	$T_3 - T_2$	0.40	0.52	0.77 NS
	$T_4 - T_2$	1.14	0.44	2.59 **
	$T_4 - T_3$	0.74	0.43	1.72 NS
M_2	$T_2 - T_1$	0.60	0.36	1.67 NS
	$T_3 - T_1$	1.30	0.35	3.71 **
	$T_4 - T_1$	1.70	0.32	5.31 **
	$T_3 - T_2$	0.70	0.32	2.19 *
	$T_4 - T_2$	1.10	0.29	3.79 **
	$T_4 - T_3$	0.40	0.27	1.48 NS
M_3	$T_2 - T_1$	1.86	0.37	5.03 **
	$T_3 - T_1$	1.63	0.40	4.07 **
	$T_4 - T_1$	2.63	0.44	5.98 **
	$T_3 - T_2$	0.23	0.47	0.49 NS
	$T_4 - T_2$	0.77	0.50	1.54 NS
	$T_4 - T_3$	1.00	0.52	1.92 NS

** Significant at .01 level

* Significant at .05 level

TABLE 4.42

MEANS AND SE OF MEANS FOR OBSERVERS UNDER EACH MODELING FOR SKILL-III (DIVERGENT QUESTIONS)

Modeling	Observer	N	Mean	SE of mean
M_1	O_1	40	15.42	0.41
	O_2	40	16.25	0.25
	O_3	40	15.70	0.30
M_2	O_1	40	17.35	0.23
	O_2	40	17.70	0.22
	O_3	40	17.35	0.24
M_3	O_1	40	16.75	0.34
	O_2	40	16.07	0.38
	O_3	40	16.67	0.33

TABLE 4.43

MEAN DIFFERENCE, SE OF THE MEAN DIFFERENCE AND t-VALUES FOR THE SIGNIFICANCE OF OBSERVERS UNDER EACH MODELING FOR SKILL-III (DIVERGENT QUESTIONS)

Modeling	Comparison	MDs	SE of MDs	t-values
M_1	$O_2 - O_1$	0.83	0.48	1.72 NS
	$O_3 - O_1$	0.28	0.50	0.56 NS
	$O_2 - O_3$	0.55	0.39	1.41 NS
M	$O_2 - O_1$	0.35	0.32	1.09 NS
	$O_1 - O_3$	0.00	0.34	0.00 NS
	$O_2 - O_3$	0.35	0.33	1.06 NS
M_3	$O_1 - O_2$	0.68	0.50	1.36 NS
	$O_1 - O_3$	0.08	0.47	0.17 NS
	$O_3 - O_2$	0.60	0.50	1.20 NS

TABLE 4.44

MEANS AND SE OF MEANS FOR OBSERVERS
UNDER EACH TRIAL FOR SKILL-III (DIVERGENT QUESTIONS)

Trials	Observers	N	Mean	SE of mean
	O_1	30	15.13	0.34
T_1	O_2	30	15.67	0.34
	O_3	30	15.41	0.42
	O_1	30	16.60	0.44
T_2	O_2	30	16.40	0.33
	O_3	30	16.63	0.30
	O_1	30	16.70	0.36
T_3	O_2	30	17.20	0.34
	O_3	30	16.60	0.33
	O_1	30	17.60	0.29
T_4	O_2	30	17.43	0.35
	O_3	30	17.60	0.27

TABLE 4.45

MEAN DIFFERENCES, SE OF MEAN DIFFERENCES AND t-VALUES FOR THE SIGNIFICANCE OF OBSERVERS UNDER EACH TRIAL FOR SKILL-III (DIVERGENT QUESTIONS)

Trial	Comparison	Mean Difference	SE of MDs	t-values
	$O_2 - O_1$	0.54	0.48	1.12 NS
T_1	$O_3 - O_1$	0.34	0.54	0.62 NS
	$O_2 - O_3$	0.26	0.54	0.37 NS
	$O_1 - O_2$	0.20	0.55	0.36 NS
T_2	$O_3 - O_1$	0.03	0.53	0.05 NS
	$O_3 - O_2$	0.23	0.44	0.52 NS
	$O_2 - O_1$	0.50	0.49	1.02 NS
T_3	$O_1 - O_3$	0.10	0.49	0.20 NS
	$O_2 - O_3$	0.60	0.47	1.27 NS
	$O_1 - O_2$	0.17	0.45	0.37 NS
T_4	$O_1 - O_3$	0.00	0.40	0.00 NS
	$O_3 - O_2$	0.17	0.44	0.38 NS

Tables 4.34 gives the means and standard error of means for modeling. The Table 4.34 indicates that modeling (M_2) has produced maximum mean score (17.47) followed by microteaching (M_3) which has the mean value (16.50) and symbolic modeling (M_1) producing the least response (15.79). It leads to infer that the treatment (M_2) appears to be the best of the three treatments. Table 4.35 gives the mean differences (MDs), standard error of mean differences (SE of MDs), and t-values due to comparison of modeling. The mean difference (M_2-M_1) is significant at .01 level (t=7.64**). The mean difference represented by (M_3-M_1) is significant at .01 level (t=2.63**) indicating that modeling (M_3) is better than modeling (M_1). The mean difference represented by (M_2-M_3) is positive and significant at .01 level (t=4.04**) indicating that audiomodeling (M_2) is better than microteaching (M_3). These comparisons suggest that treatment (M_2) - audiomodeling - is the best treatment, followed by microteaching (M_3), and the treatment (M_1) -- symbolic modeling to be the least effective in the case of divergent questions.

Table 4.36 gives the means and standard error of means for trials indicating a steady rise in mean values from trial-I to trial-IV. This showsthat there is improvement in performance from trial to trial and this improvement does not show a sudden rise but is steady progress. Table 4.37 gives the mean differences (MDs), standard error of mean differences (SE of MDs); and t-values for comparison of means under different trials. It is clear from Table 4.37 that all the trial mean differences are significant but for the mean difference represented by (T_2-T_3) is not significant (t=1.03 NS) indicating the response given at (T_3) is not different from response at (T_2). All other mean differences are significant at .01 level suggesting that differences due to practice appear to be powerful. The mean differences represented by (T_2-T_1) and (T_4-T_3) have a special meaning in microteaching context. They represent the sequences : (i) teach-I and reteach-I; (ii) teach-II and reteach-II. The mean difference represented by (T_1-T_4) appears to have produced maximum variation (t=7.57**).

Table 4.38 gives the means and standard error of means for observers. The range of mean values is 0.16

suggesting that observers are almost unanimous in assessing the performance. Table 4.39 almost confirms the above tendency. This Table 4.39 gives the mean differences (MDs) standard error of mean differences (SE of MDs); and t-values for the comparison of observers. All the mean differences represented by (O_2-O_1); (O_3-O_1); and (O_2-O_3) are not significant (t=0.59 NS; t=0.23 NS; and t=0.37 NS respectively).

Table 4.40 gives means and standard error of means for trials under each modeling representing the interaction between modeling and trials (MxT). A steady rise in the mean values under each modeling indicates improvement from trial to trial. Table 4.41 gives the mean differences (MDs); standard error of mean differences (SE of MDs); and t-values for interection of trials under each modeling treatment. The mean difference represented by (T_2-T_1) is not significant under symbolic modeling (M_1) and audiomodeling (M_2) but is significant at .01 level (t=5.03**) for microteaching (M_3). This means the second lesson is not different from the first as is revealed by this difference (T_2-T_1) for symbolic modeling (M_1) and (M_2). But for imcroteaching (M_3) the

difference (T_1-T_2) represents 'teach-I'and 'reteach-I' which is significant indicating that where other modeling treatments fail, microteaching (M_3) has succeeded in producing significant difference between 'teach-I' and 'reteach-I'. The trial mean differences represented by (T_2-T_1) and (T_4-T_1) are significant at .01 level for all the modeling treatments, namely, (M_1); (M_2); and (M_3). The mean difference (T_4-T_1) producing the maximum variation which is significant in favour of (T_4). The trial mean differences represented by (T_4-T_3) are not significant for all the modeling treatments including microteaching (M_3). It meant that modeling (M_1) and (M_2) could not produce significant differences for (T_4-T_3) but microteaching (M_3) also failed to produce significant difference between (T_4-T_3) that is between 'teach-II' and 'reteach-II8 - the third lesson was not different from the fourth lesson as far as all the modelings are concerned. The differences produced by trials though successively positive do not maintain the pattern under different modeling treatments producing an interaction (MxT) which is not significant (vide Table 4.33).

Table 4.42 gives the means, standard error of means for observers under each modeling treatment. The mean values do not differ much for each other, the maximum range being 0.83 for symbolic modeling (M_1). For audiomodeling (M_2) two observer means for O_1 and O_3 are identical having the value 17.35. It appears that the differences between the observers are not that great so as to produce any significant variation. Table 4.43 bears out the above tendency. Table 4.43 gives the mean differences (MDs), standard error of mean differences (SE of MDs), and t-values for comparision between observers under each modeling. All observer mean difference values under all the modeling treatments are not significant.

Table 4.44 gives means and standard error of the means for observers under each trial. Table 4.45 givesthe mean differences (MDs), standard error of the mean differences, and t-values for the comparison of observers under each trial. All mean differences under all the four trials are not significant indicating that the observers did not differ in their assessment of performance in asking divergent questions.

4.4.0 Teaching Competence in real Classrooms

The gain scores on global assessment of classroom performance obtained under three treatment conditions are given in Table 4.46 with the results of one way analysis of variance.

TABLE 4.46

SUMMARY ANOVA RESULTS FOR GAIN SCORES ON THE CLASSROOM PERFORMANCE UNDER THE THREE TREATMENTS

Factors	Gain Scores	Total score
Symbolic modeling (M_1)	22, 2, 8, 7, 12, 4, 5, 2, 18, 14	94
Audiomodeling (M_2)	17, 7, 8, 5, 6, 14, 8, 10, 14, 16	105
Microteaching (M_3)	19, 11, 7, 8, 7, 6, 0, 5, 8, 16	87

Source of Variation	df	Sum of squares	Mean square	F-ratio
Among means	2	16.5	8.25	0.257 NS
Within conditions	27	867.0	32.11	
Total	29	883.5		

It will be seen from the above Table that the F-ratio is not significant indicating that the three treatment effects do not differ significantly.

4.5.0 Discussion of results of Phase-II and Phase-III

Microteaching produced the maximum competence in all the three skills and found to be the most effective treatment for acquiring the skill in asking probing questions, convergent questions, and divergent questions in Phase-II. The difference between the symbolic modeling treatment and audiomodeling treatment was found to be not significant for probing questions and divergent questions in Phase-II. Microteaching was found to be effective in changing teacher behaviour under the laboratory conditions available in a teachers college. The student teachers of phase-II and phase-III while commenting on the effectiveness of entire programme had expressed that focussing upon a specific skill in microlessons and observing them enabled the microteachers - also acting as peer observers - to approach the job in the spirit of mastering the skill rather than

listening about it. Illingworth (1974) found a similar acceptance of microteaching by preservice teacher trainees. This appears to be a positve gain for the student teacher. It is generally agreed, however, that the use of video recording enhances the effectiveness and flexibility of microteaching (Goodkind, 1968; Kallenbach, 1969). McDonald and Allen (1967) found that observation by the student of his own recording along with supervisor's comment was the most effective single variable in the acquisition of a teaching skill. Wragg (1971) suggested that video recording and interaction analysis in combination can produce substantial changes in teacher behaviour.

Results of phase-II permit to draw the conclusion that microteaching proved to be the most effective treatment for acquiring the skills in probing questions, convergent questions and divergent questions. In case of convergent questions microteaching was followed by audiomodeling treatment and symbolic modeling proving to be the least effective. Audiomodeling treatment did not differ significantly in its effectiveness from symbolic modeling in the case of

probing questions and divergent questions. Acheson (1974) compared the relative effectiveness of written modeling with audiotape feedback and videotape modeling with videotape feedback for training in higher cognitive skills in questioning. Comparisons of pre- and post-training tapes of teaching performance indicated that the variations were of equal effectiveness in increasing teacher's use of higher cognitive questions. In the present case it may be due to several reasons. Phase-II was conducted in the first term of the academic year. Contrary to the traditional practices, microteaching was introduced in right earnest and with careful preparations done in advance. These programmes conducted from the beginning of the academic year might have acted as novel situations thus providing the needed motivation for self improvement. Restrictions on the outdoor activities due to the heavy down pour of the rainy season - special feature of the western costal strip - enforced the teachers to concerntrate on indoor activities like microteaching, unit planning, etc. The heavy rains adversely affected the presence expected at the experimental sessions. All the participants could not remain present because of illness.

DeMarte (1974) studied the effect of microteaching on the intentions, perceptions, and classroom verbal behaviour of science teachers. It was concluded that mi croteaching technique along with viewing perceptual models made significant changes in the intentions and perceptions of the student teachers regarding classroom verbal behaviour. In their self-perception of using criticism in the classroom verbal behaviour teachers trained through microteaching differed significantly from thos trained with perceptual models. The opportunity offered by microteaching to use self criticism for improving one's own performance was lso appreciated by the members of the experimental groups of phase-II and phase-III. Barbara (1973) reported a pilot study on a cooperative student teaching programme. The interns agreed, it is reported, that microteaching should be continued as a vital part of methods and student teaching programmes. A similar opinion was also expressed by the student teachers of both the Faculty of Education and Psychology of the M.S. University of Baroda and the student teachers of the Government College of Education, Ratnagiri. Favourable attitudes towards microteaching were also reported

by Passi and Shah (1974); Abraham (1974); Joshi (1974). In a recent Faculty experiment conducted at Baroda (1975) student teachers expressed to have microteaching in their method subjects. They felt that microlessons should be made a part of regular teaching practice.

Results of the analysis of the data in Phase-III do not permit to conclude that microteaching is the most effective treatment for changing teacher behaviour. On the contrary symbolic modeling was found to be the most effective treatment followed by audiomodeling and microteaching proving to be the least effective treatment for acquiring the skill in 'probing questions' (vide Table 4.5). Audiomodeling was found to be the most effective treatment for acquiring the skill in 'convergent questions'. The symbolic modeling treatment did not differ significantly when compared with microteaching in its effectivness as far as 'convergent questioning' skill was concerned. In case of 'divergent questions' audiomodeling again was found to be the best treatment followed by microteaching and symbolic modeling being the least effective treatment. These findings indicate that the relative effectiveness of modeling

treatments changes from skill to skill. Audiomodeling is found to be the most effective treatment in case of convergent and divergent questions whereas symbolic modeling in probing questions. This appears to be due to predominantly linguistic bias in the sample for phase-III. Out of thirty candidates who volunteered for phase-III, eighteen student teachers were having either English or Marathi as one of their method subjects, six had history, and the remaining six had mathematics. The ability of the group to process the material presented to them either written or oral (audio format) might have helped them better than 'reteach' of microteaching. Microteaching could come out to be the most effective treatment because of the bias that might have been created through informal discussions with the group of peers who had that experience during the first term. The student teachers for phase-III had completed about seventeen lessons assigned to them. This practice effect might have reduced the value of reteaching affecting adversely the effectiveness of microteaching as a behaviour modification process. The traditional superiority of semantic predominance of teacher's verbal behaviour might

have been proved to be effective in using either the written or audio material with advantage.

Orme (1966) attempted a study of six experimental conditions exposing interns to symbolic and perceptual modeling, or a combination of both with feedback as one more condition. All six conditions yielded significant gains, a combination of perceptual and symbolic modeling being the most productive (refer to caption 1.3). Studies by Allen, Berliner, McDonald and Sobol (1967) did not reveal significant differences between the use of symbolic and perceptual models in the acquisition of skill in asking higher order questions. The investigators explained the difference in findings between their study and Orme's study by pointing out the superfluous character of video model for a questioning skill which is predominantly verbal in nature. The symbolic modeling or the audiomodeling used in the present study being predominantly verbal in nature, might have helped specifically to acquire the verbal skills like probing questions, convergent questions, and divergent questions. Claus (1969) reported that modeling accompanied by supervisor's

criticism or pointing out the essential characteristics of the skill proved to be more effective than no supervisory comments.

Berliner (1969) reported an investigation which demonstrated that perceptual model of higher order questioning behaviour was no more effective in producing student learning than a symbolic model. The symbolic modeling for Berliner was a printed transcript of a lesson given by an experienced teacher. It was, thus, an actual example of the skill to be mastered by the microteacher. This very concept of symbolic modeling was used in the present investigation. Lesson scripts depicting the use of a particular skill tobe practised were used as symbolic models.

It appears from the evidence produced by Young (1967), Claus (1969), Koranet al. (1969), Allen and McDonald (1967) that models are effective in bringing above behaviour change by way of student learning. The issues that are raised do not relate to the efficacy of modeling as such. They are questions concerning with the best type of model for different types of skill training and for use

with different students. As pointed out previously DeMarte (1974) found that elementary teachers of science trained by microteaching technique or by viewing perceptual models made significant changes in their intentions and perceptions of classroom verbal behaviour. Burak (1975) made a comparative study of three instructional procedures for developing questioning skills of preservice elementary teachers. One group was exposedto microteaching treatment involving the use of filmed models of questioning skills and repeated practice sessions which were videotaped for feedback and evaluation purposes. The second group received training in the use of Guilford's model and Bloom's taxonomy for systematically observing and recording oral questioning behaviour during practice lessons. The third group received no direct instructions but were expected to learn the same skill through the use of self directed learning package specially developed for this purpose. The Questioning Strategy Observation System (QSOS) was used to determine growth in four different questioning skills in pretest and posttest measures of the subject's questioning ability. Results of the study did not provide clearcut support in

favour of any one of the instructional treatments used in improving preservice elementary teacher's skills in questioning.

Allen (1973) compared microteaching and traditional teaching for improving performance in a manipulative skill. Overall significant difference in favour of experimental group on the total demonstration programme was found. A study conducted by Kallenbach and Gall (1969) found that microteaching results similar to conventional teaching in onefifth of the time with fewer administrative problems. Bozardt (1975) studied the development of systematic questioning skills in an elementary science method course using sequential questioning strategy. No significant differences could be obtained. It was pointed out that the emphasis on sequential strategy was not isolated from other factors but was tested in addition to them. Similar situation might have been developed in the present study when the student teachers of the experimental group were compared with student teachers who did not receive any training in questioning skills for their global performance in the actual

classroom situation. The experimental group received extra training as compared to the so called control group. The treatments were, thus, in additionto the traditional classroom teaching experiences. It appears that factors such as cost and judicious use of student and instructor's time may be specially important in the decision to select a specific instructional for teaching questioning skill. A study reported by Philips (1973) on the effects of videotaped modeling procedure on the verbal question phrasing practices of secondary student teachers in social studies supports the above observation. The perceptual modeling concept was compared with symbolic modeling concept. It was reported that the results were in general inconsistent with the results of other research on the use of perceptual models.

Doyle (1973) studied the factors affecting the learning and utilization of questioning by elementary method students. Probing questioning skill was used to microteach peers both for pre and posttest. Lack of significant gain between the pretest-posttest measures was reported. The lack of significant gain was attributed to the possibility

that the tasks delt with might be necessary but were not sufficient for the terminal task required.

Other modeling treatments

Peterson (1973) reported a study entitled 'Microteaching in the Preservice Education of Teachers : Time for a Reexamination' investigating the effectiveness of microteaching in developing the actual classroom use of twelve questioning skills when used immediately prior to a student teaching experience. No microteaching treatment (T_2) as against microteaching treatment (T_1) consisted of providing handbooks and one small opportunity to practice the behaviour of each instructional sequence used in microteaching treatment (T_1). On the basis of comparisons of F-values each of the thirteen null hypothesis was retained. Non-microteach group exceeded the microteach group in frequency of pausing, redirection, prompting and clarification (mean scores of non-microteaching group exceededthe mean scores of microteaching group). The microteaching group exceeded the non-microteaching group in calling on more non volunteers and in using fewer

negative behaviours. The lack of significance was attributed to subjects' involvement in the busiest times of student teaching experiences resulting into their inability to concentrate much on the specific skills taught during microteaching. In the context of the present study, the lack of getting significant difference for the treatment groups [illegible] in the actual classroom performance and the general ineffectiveness of microteaching in the phase-II of the study may be attributed to the cause cited above. Second term happens to be the most bussy time for all the teacher trainees.

To summarize the evidence on modeling it can be said that skills that are more dependent on verbal interaction may be best modeled symbolically. It is clear that symbolic model for a non-verbal teaching behaviour is impossible hence out of question. What are the most effective and economical models is still a matter for investigation. The outcome of the present investigation may be described as models of different types do bring about changes in the student teacher's behaviour though the evidence in respect

of the effectiveness of microteaching happens to be inconsistent and hence inconclusive.

The present investigation was undertaken with the purpose of studying the effects of modeling and microteaching on the acquisition of skills in questioning. Along with the effects of the modeling factor the effects of trial and observer factors also emerged. There was a steady gain in the mean scores from trial to trial indicating that there was improvement in performance due to practice. As regards the peer observers it can be seen that the difference of their assessment scores was seldom significant. It allows to conclude that observers could be trained in assessing the performance of the microlessons. Ginsberg (1973) studied the effect of self evaluation on videotape proceedings of the questioning behaviour of student teachers. It was concluded that self evaluation had made the subjects of the experimental group more sophisticated in questioning than the subjects of the control group. Lemrner (1974) studied the effect of selected models of feedback on teacher behaviour in a microteaching situation. The mode of feedback

had no differential effect on the subjects ability to use the process of science as well as on the subject's attitude toward various aspects of teaching situations. Bassett (1975) studied the effects of teaching clinic form of supervision on questioning skill. A significant difference was found for both the control and experimental groups the control group received the traditional form of supervision. Stones and Morris (1972, p.93) report a survey of micro-teaching in American teacher training institutes carried out by Ward. Out of the 141 respondent institutions, 21 placed more emphasis on student participation and 18 reported an increase in self-evaluation of their own teaching behaviours.

4.6.0 Conclusions of the Study

Based upon the analysis and discussion of the results obtained in Phase-II and Phase-III of the study, the following conclusions appear to emerge.

(a) Probing Questions

(i) Microteaching appeared to be the best treatment for acquiring the skill in asking probing

questions when tried at the beginning of the academic year. The symbolic modeling treatment did not differ significantly from the audio-modeling treatment (vide Table 3.5).

(ii) Symbolic modeling proved to be the best treatment followed by audiomodeling and microteaching coming out to be the least effective (vide Table 4.5) when tried with predominently language oriented group of graduate student teachers and during the second half of the academic year.

(iii) Mean scores obtained for both 'reteach-I' and 'reteach-II' were significantly higher than mean scores for 'teach-I' and 'teach-II' (vide Table 4.11) when there were two cycles of 'teach-reteach' of microteaching. No such significant difference was found with one cycle of 'teach-reteach' (vide Table 3.10).

(b) Convergent Questions

(i) Microteaching appeared to be the best treatment for acquiring the skill followed by audiomodeling

and symbolic modeling proving to be the least effective treatment when tried at the beginning of the academic year (vide Table 3.19).

(ii) Audiomodeling proved to be the best treatment for acquiring the skill in asking convergent questions when tried during the second half of the year with predominently language oriented group of graduate student teachers (vide Table 4.20). The symbolic modeling treatment did not differ significantly from microteaching.

(iii) Mean scores obtained for both 'reteach-I' and 'reteach-II' were significantly higher than the mean scores obtained for 'teach-I' and 'teach-II' (vide Table 4.26) when there were two cycles of microteaching. Mean score for 'reteach-I' was also significantly higher than the mean score of 'teach-I' under one cycle of microteaching (vide Table 3.24).

(c) Divergent Questions

(i) Microteaching appeared to be the best treatment for acquiring the skill in asking divergent

questions when tried at the beginning of the academic year (vide Table 3.33). The symbolic modeling treatment was not significantly different from audiomodeling.

(ii) Audiomodeling was found to be the best treatment for acquiring the skill in asking divergent questions followed by microteaching and symbolic modeling proving to be the least effective treatment when tried during the later half of the academic year with predominently language oriented group (vide Table 4.35).

(iii) Mean score for 'reteach-I' was significantly higher than the mean score for 'teach-I' but the mean score for 'reteach-II' was not significantly higher when there were two cycles of 'teach-reteach' in microteaching (vide Table 4.41). The mean score for 'reteach-I' though higher than the mean score for 'teach-I' was not significantly different from it (vide Table 3.38) when there was only one cycle of microteaching.

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