CHAPTER III

ANALYSIS OF RESULTS AND THEIR INTERPRETATION, PHASE-II

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ANALYSIS OF RESULTS AND THEIR INTERPRETATION PHASE-II

3.0.0 Introduction

Based upon the experiences and findings of the pilot study, (reported in Section I, Chapter II) Phase-II of the study was conducted in accordance to the guidelines given under caption 2.2.1 in Chapter II. This chapter is devoted to test 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 of asking divergent questions, followed by audiomodeling, and symbolic modeling treatment, being the least effective of the three.

The presentation of results is made under the captions : 3.1.0 - Probing Questions; 3.2.0 - Convergent Questions, and 3.3.0 - Divergent Questions. Caption 3.4.0 presents the summary of results due to the analysis of the data in Phase-II of the Study.

This chapter includesthe results and their interpretation for the three skills : (i) probing questions; (ii) convergent questions; and (iii) divergent questions. The study employed 'Three Factor Design with Repeated Measures - Case I' on the lines of Winer (1962, p. 319). The three factors in the factorial design (3x2x3) are modeling, trials, and observers. The factor of modeling had three levels - symbolic modeling (M_1); audiomodeling (M_2); and microteaching (M_3). The second factor had two levels - trial-I (T_1) and trial-II (T_2). The third factor had three levels - peer observer (O_1); peer observer (O_2); and self observer (O_3). Ten observations were made under each of the (3x2x3) eighteen experimental conditions of the laboratory.

3.1.0 Probing Questions

Observations in terms of raw scores are given in Table 3.1 on the next page.

TABLE 3.1

PHASE II - BASIC DATA IN TERMS OF RAW SCORES FOR DKILL-I (PROBING QUESTIONS)

Modeling	Trial-I			Trial-II		
	O_1	O_2	O_3	O_1	O_2	O_3
Symbolic modeling (M_1)	10	10	12	9	8	12
	11	10	10	11	12	11
	10	10	9	10	10	11
	10	8	11	13	11	13
	11	10	9	12	8	13
	14	14	10	12	12	12
	12	14	10	11	11	12
	14	12	14	12	12	15
	10	14	14	15	11	12
	13	12	10	15	10	12
Audiomodeling (M_2)	9	12	10	9	8	11
	10	12	11	9	10	11
	12	11	10	10	12	13
	13	8	7	13	10	11
	11	11	13	11	11	12
	11	11	15	11	11	13
	16	10	13	14	12	14
	15	13	12	13	12	12
	13	14	13	13	13	14
	14	13	11	-	-	-
Microteaching (M_3)	13	9	14	14	12	16
	11	12	12	12	10	13
	12	12	13	10	14	14
	12	10	15	13	13	17
	14	10	13	15	13	14
	11	12	14	-	-	-
	11	12	10	13	11	11
	9	13	13	12	10	14
	12	16	13	10	14	17
	13	13	12	10	13	12

O_1 - Peer Observer-I; O_2 - Peer Observer-II; O_3 - Self.

Based upon the raw scores given in Table 3.1, the results in terms of means (M); standard deviation (SD); and standard error of the mean (SEM) arising out of the eighteen experimental conditions are given in Table 3.2

TABLE 3.2

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

Modeling	Item	T_1			T_2		
		O_1	O_2	O_3	O_1	O_2	O_3
Symbolic modeling (M_1)	N	10	10	10	10	10	10
	Mean	11.50	11.40	10.90	12.00	10.50	12.30
	SD	1.65	2.12	1.85	1.93	1.51	1.16
	SEM	0.52	0.67	0.59	0.61	0.48	0.37
Audio-modeling (M_2)	N	10	10	10	9	9	9
	Mean	12.40	11.50	11.50	11.44	11.00	12.33
	SD	2.22	1.75	2.22	1.89	1.50	1.24
	SEM	0.70	0.54	0.70	0.63	0.50	0.42
Micro-teaching (M_3)	N	10	10	10	9	9	9
	Mean	11.80	11.90	12.90	12.22	12.22	14.22
	SD	1.40	1.97	1.37	2.06	1.57	2.12
	SEM	0.44	0.62	0.43	0.68	0.52	0.71

The data given in Table 3.1 were subjectedto the analysis of variance (3x2x3). The Summary ANOVA results are given in Table 3.3 below.

TABLE 3.3

SUMMARY ANOVA RESULTS FOR SKILL-I
(PROBING QUESTIONS)

Source of Variation			Sums of Squares	D.F.	Mean sums of squares	F-ratio
		Teachers	82.72	9	9.19	3.48 **
M	:	Modeling	37.60	2	18.80	7.12 **
T	:	Trials	2.86	1	2.86	1.08 NS
O	:	Observers	24.24	2	12.12	4.59 *
MT	:	Modeling X Trials	6.15	2	3.07	1.16 NS
MO	:	Modeling X Observers	17.02	4	4.25	1.61 NS
OT	:	Observers X Trials	18.85	2	9.42	3.57 **
MTO	:	Modeling X Trials X Observers	28.83	4	7.21	2.73 *
Experimental Error			388.20	147	2.64	
		TOTAL	606.47	173		

** Significant at .01 level

* Significant at .05 level

Table 3.3 indicates that response from one teacher is different from that of the other as the F-ratio is significant at 1 percent level (F=3.48** with df 9/147). This may be due to individual differences in educational background and experience of the teachers. Such differences are natural and can not be avoided or accounted for in experimental design. The main effects due to modeling are highly significant at 1 percent level (F=7.12** with df 2/147). Therefore, it appears that responses from modeling to modeling are different. Modeling treatments, as is evident, have produced significant effects. The F-ratio due to trials is not significant (F=1.08 NS with df 1/147). It indicates that performance in trial-II is not significantly different from the performance in trial-I. The F-ratio due to observers is significant at 5 percent level (F=4.59* with df 2/147). Therefore, the responses of observers are different. The interaction effect (MxT) between modeling and trials is not significant. The main effect due to trials is not significant. It thus, indicates that modeling treatments appear to have no effect on the performance from trial to trial. Though

the main effects due to modeling and observers (MxO) are significant, their interation effects (MxO) are not significant. The interaction effect between trials and observers (TxO) is significant at 1 percent level (F=3.57** with df 2/147). Observers differed in their assessment from trial to trial. The overall interaction between modeling, trials, and observers (MxTxO) is significant at 5 percent level (F=273* with df 4/147). It appears that the observers might have contributed significantly to the overall effect rather than any other factor, namely modeling and trials.

In order to pinpoint the differences and to see their directions, the F-test was followed by t-test for testing the significance of differences between means. The t-test results due to various experimental conditions, namely, modeling, trials and observers are given in Tables 3.4 to 3.14 on the following pages.

TABLE 3.4

MEANS AND STANDARD ERROR OF THE MEAN FOR THE THREE MODELINGS FOR SKILL-I (PROBING QUESTIONS)

Modeling	N	Mean	SE of mean
M_1	60	11.43	0.23
M_2	57	11.71	0.24
M_3	57	12.52	0.25

TABLE 3.5

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

Comparison	Mean difference (MD)	SE of MDs	t-value
$M_2 - M_1$	0.28	0.33	0.84 NS
$M_3 - M_1$	1.09	0.34	3.20 **
$M_3 - M_2$	0.81	0.35	2.31 **

** Significant at .01 level

TABLE 3.6

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

Item	N	Mean	SE of mean	MD	SE of MD	T-value
Trial-I (T_1)	90	10.63	0.13			
				1.38	0.22	6.04**
Trial-II (T_2)	84	12.01	0.18			

** Significant at .01 level

TABLE 3.7

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

Observers	N	Mean	SE of mean
O_1	58	11.89	0.24
O_2	58	11.41	0.23
O_3	58	12.32	0.18

TABLE 3.8

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

Observer comparision	MDs	SE of MDs	t-value
$O_1 - O_2$	0.48	0.34	1.41 NS
$O_3 - O_1$	0.43	0.31	1.38 NS
$O_3 - O_2$	0.91	0.30	3.33 **

** Significant at .01 level

TABLE 3.9

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

Modeling	Trial-I (T_1)			Trial-II (T_2)		
	N	Mean	SE of mean	N	Mean	SE of mean
M_1	30	11.27	0.34	30	11.60	0.31
M_2	30	11.77	0.41	27	11.59	0.31
M_3	30	12.00	0.30	27	12.89	0.40

TABLE 3.10

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

Modeling	Comparison	MDs	SE of MDs	t-values
M_1	$T_2 - T_1$	0.33	0.46	0.72 NS
M_2	$T_1 - T_2$	0.18	0.51	0.35 NS
M_3	$T_2 - T_1$	0.69	0.50	1.38 NS

TABLE 3.11

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

Modeling	Observer-I(O_1)			Observer-II(O_2)			Observer-III(O_3)		
	N	Mean	SE of Mean	N	Mean	SE of Mean	N	Mean	SE of Mean
M_1	20	11.75	0.49	20	10.95	0.41	20	11.60	0.37
M_2	19	11.95	0.47	19	11.26	0.37	19	11.89	0.42
M_3	19	12.00	0.39	19	12.05	0.40	19	13.53	0.42

TABLE 3.12

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

Modeling	Comparison	MDs	SE of MDs	t-values
	$O_2 - O_1$	0.80	0.57	1.40 NS
M_1	$O_1 - O_3$	0.15	0.54	0.28 NS
	$O_3 - O_2$	0.65	0.55	1.10 NS
	$O_1 - O_2$	0.69	0.60	1.15 NS
M_2	$O_1 - O_3$	0.06	0.64	0.09 NS
	$O_3 - O_2$	0.63	0.56	1.12 NS
	$O_2 - O_1$	0.05	0.56	0.09 NS
M_3	$O_3 - O_1$	1.53	0.57	2.68 **
	$O_3 - O_2$	1.48	0.58	2.55 **

** Significant at .01 level

TABLE 3.13

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

Observers	Trial-I(T_1)			Trial-II(T_2)		
	N	Mean	SE of Mean	N	Mean	SE of Mean
O_1	30	11.90	0.32	28	11.89	0.36
O_2	30	11.60	0.34	28	11.21	0.31
O_3	30	11.77	0.36	28	12.93	0.33

TABLE 3.14

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

Trial	Comparison	MDs	SE of MDs	t-values
T_1	$O_1 - O_2$	0.30	0.47	0.64 NS
	$O_1 - O_3$	0.13	0.48	0.27 NS
	$O_3 - O_2$	0.12	0.51	0.23 NS
T_2	$O_1 - O_2$	0.68	0.48	1.42 NS
	$O_3 - O_1$	1.04	0.49	2.12 *
	$O_3 - O_2$	1.72	0.45	3.82 **

* Significant at .05 level

** Significant at .01 level

Table 3.4 gives the means (M) and standard error of the means (SEM) for the three modelings, namely, symbolic (M_1), audio (M_2), and microteaching (M_3), while Table 3.5 gives the mean differences (MDs), standard error of the mean differences (SE of MDs), and t-values for modelings for the skill in asking probing questions. From Table 3.4 it is seen that microteaching (M_3) has the greatest mean score (12.52), followed by audiomodeling (M_2) having (M=11.71), and symbolic modeling (M_1) having (M=11.43). From Table 3.5, however, the difference between (M_1) and M_2 though in favour of (M_2) is not significant (t=1.41, NS). Microteaching (M_3) appears to be significantly effective from both the modelings (M_2) and (M_1).

The means, SE of means, the difference between means (MD) and standard error of the difference (SE of MD), and the t-values are given in Table 3.6. It is clear from Table 3.6 that the difference (T_2-T_1) is in favour of (T_2) and is significant at 1 percent level (t=6.04**). This means that responses in trial-II (T_2) are significantly different from the responses in trial-I (T_1) indicating an improvement. For microteaching treatment (M_3), it means

that 'reteach-I' is significantly different from 'teach-I' and so also for other modeling treatments. The interaction effects are being considered separately.

Table 3.7 gives the means and SE of means for observers and Table 3.8 gives the mean difference (MD), SE of MDs, and t-values for observers. It appears that self observer (O_3) has scored the maximum (M=12.32) vide Table 3.7. Table 3.8 indicates that self observer (O_3) differs significantly from peer observer (O_2) giving (t=3.33**, significant at .01 level) while other observer differences indicated by (O_1-O_2) and (O_1-O_3) are not significant indicating that observers (O_2) and (O_3) as compared to observer (O_1) do not differ in their assessment of the performance. The difference (O_2-O_3) may be due to individual differences in respect of assessment of performance under different experimental conditions.

Table 3.9 gives means and standard error of means for trials under each modeling while Table 3.10 gives the t-values for the significance of mean differences (MDs) with values for standard error of the difference in means

(SE of MDs). (T_1) and (T_2) have produced maximum scores under microteaching (M_3) but the differences between the trials under each modeling treatment are not significant (vide Table 3.10). The differences appear to be due to sampling.

Table 3.11 indicates that observer (O_3) has produced consistly maximum scores under each modeling the mean values being 12.00; 12.05 and 13.53 under modeling (M_1); (M_2); and (M_3) respectively. Table 3.12 shows the significance of differences between the mean scores due to observers under each modeling treatment, namely (M_1), (M_2) and (M_3). Except for the differences represented by (O_1-O_3) and (O_2-O_3) which are in favour of O_3 are significant at 1 percent level (t=2.68**; t=2.53** respectively), all other observer differences are not significant indicating that observers do not differ in their assessment of the performance in seven out of the nine experimental conditions created under the three modeling treatments. The difference under (M_3) may be to the differences of opinion between peer observers (O_1) and (O_2) and self-observer (O_3) regarding

the improvement over 'teach-I' of trial-I to 'reteach-I' of trial-II.

Tables 3.13 and 3.14 give means and significance of difference between means for observers under trial-I (T_1) and trial-II (T_2). It is seen from Table 3.13, that self observer (O_3) has produced maximum score under trial-II (T_2) (M=12.93). The differences between the scores due to peer observers (O_1) and (O_2) are not significant under trial-I (T_1) and trial-II (T_2) indicating that peer observers do not differ in their assessment of performance under (T_1) and (T_2). The self-observer (O_3), however, differs significantly from the peer observers (O_1) and (O_2) under trial-II (T_2). This may again be due to differences regarding the improvement and its assessment in trial-I (T_1) and trial-II (T_2) which have contributed significantly.

It appears from the Table 3.3 that interaction of the three factors, namely, modeling, trials, and observers is significant at 5 percent level (F=2.73* with df 4/147). The difference is mainly due to self-observer (O_3) under modeling (M_3) and trial-II (T_2). Otherwise

other factors, namely modeling and trials do not appear to contribute significantly as far as probing questions practised under the laboratory conditions. Since the experimental error 2.64 is small, no other factor except the ones under study has affected the results of the experiment indicating that the experiment is performed systematically and scientifically.

From the above results and their interpretation the following trends appear to emerge in case of probing questions practised under the laboratory conditions.

(1) Microteaching (M_3) appears to be significantly more effective treatment as compared with either audio-modeling (M_2) or symbolic modeling (M_1) treatments. The difference between the effectiveness of symbolic modeling (M_1) and audiomodeling (M_2) is not significant.

(2) The performance in trial-II (T_2) is significantly better than the performance in trial-I (T_1) under the microteaching (M_3) treatment. It means 'reteach-I' is significantly higher results than 'teach-I' for microteaching (M_3).

(3) Self-observer (O_3) differs significantly from peer observer (O_1) and peer observer (O_2) in the assessment of performance of trial-II (T_2) under microteaching (M_3).

3.2 Convergent Questions

Observations in terms of raw scores are given in Table 3.15, on the next page.

TABLE 3.15

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

Modeling	Trial-I			Trial-II		
	O_1	O_2	O_3	O_1	O_2	O_3
Symbolic modeling (M_1)	10	10	10	12	8	10
	10	9	10	10	10	10
	11	9	10	10	10	11
	10	9	11	9	9	11
	10	10	10	13	11	10
	9	13	10	9	11	11
	11	10	11	11	11	11
	8	6	10	10	11	11
	10	10	11	11	9	10
	7	8	9	9	11	10
Audiomodeling (M_2)	11	10	10	7	10	10
	11	11	11	10	12	11
	9	11	12	-	-	-
	11	10	12	11	10	13
	11	12	13	9	11	11
	12	10	10	12	13	13
	11	11	14	12	11	13
	12	13	12	11	11	11
	13	12	12	14	13	14
	-	-	-	14	12	13
Microteaching (M_3)	-	-	-	-	-	-
	11	11	11	12	11	13
	12	11	13	12	14	14
	14	14	14	13	14	17
	8	9	11	13	10	14
	11	13	10	14	14	11
	11	11	11	11	12	12
	10	11	10	11	12	13
	-	-	-	-	-	-
	10	12	13	13	14	13

Based upon the raw scores given in Table 3.15, the results in terms of means (M), standard deviations (SD), and standard error of the mean (SEM) arising out of the eighteen experimental conditions (3x2x3) are given in table 3.16, below.

TABLE 3.16

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

Modeling	Item	T_1			T_2		
		O_1	O_2	O_3	O_1	O_2	O_3
Symbolic modeling (M_1)	N	10	10	10	10	10	10
	Mean	9.60	9.40	10.20	10.40	10.10	10.50
	SD	1.27	1.78	0.64	1.34	1.10	0.52
	SEM	0.40	0.56	0.20	0.43	0.35	0.17
Audio-Modeling (M_2)	N	9	8	9	9	9	9
	Mean	11.22	11.00	11.78	11.33	11.22	12.11
	SD	1.11	1.07	1.29	2.13	0.44	1.37
	SEM	0.37	0.38	0.43	0.71	0.15	0.45
Micro-teaching (M_3)	N	8	8	8	8	8	8
	Mean	10.87	11.50	11.62	12.37	12.62	13.37
	SD	1.75	1.51	1.53	1.09	1.62	1.79
	SEM	0.62	0.53	0.54	0.38	0.57	0.64

The data given in Table 3.15 were subjected to the abalysis of variance (3x2x3). The summary ANOVA results are given in Table 3.17 below.

TABLE 3.17

SUMMARY ANOVA RESULTS FOR SKILL-II
(CONVERGENT QUESTIONS)

Source of variation		Sums of Squares	df	Mean sums of squares	F-ratio
	Teachers	39.15	9	4.35	2.67**
M :	Modeling	119.34	2	58.67	36.61**
T :	Trials	21.55	1	21.55	13.22**
O :	Observers	13.37	2	6.93	4.25*
MT :	Modeling X Trials	9.94	2	4.97	3.05NS
MO :	Modeling X Observers	2.68	4	0.67	0.41NS
TO :	Trials X Observers	4.15	2	2.57	1.58NS
MTO :	Modeling X Trials X Observers	14.09	4	3.52	2.16NS
Experimental Error		218.44	134	1.63	
	TOTAL	443.21	160		

** Significant at .01 level

* Significant at .05 level

Table 3.17 shows that variation due to teachers is significant at 1 percent level ($F=2.67^{**}$ with df 9/134). This difference may be due to individual differences in the personal background, previous teaching experience, etc. which happens to be a normal phenomena in psychological testing. The main effects due to modeling and trials are significant at 1 percent level($F=36.61^{**}$ with df 2/134 and $F=13.22^{**}$ with df 1/134 respectively). The main effect due to observers is found to be significant at 5 percent level ($F=4.25^{*}$ with df 2/134). This means that scores under different modeling treatments are different so as to produce significant effects. Scores also differ under two trial so as to produce significant effects. Observer responses also differ from each other so as to produce significant effects. The interaction effects due to two trials under different modelings, and observers under different modelings and observers under two trials along with the interaction effects of the three factors, namely modeling, trials, and observers (MxTxO) are all not significant indicating that scores under different conditions are not much different so as to produce significant interaction effects. The

MSS for experimental error is 1.63 with df 134 indicating that the experiment has not been influenced by extraneous factors other than those under study.

In order to pinpoint the differences and to note their direction the F-test was followed by t-test testing the significance of differencesbetween means. The t-test results due to various experimental conditions are given in Tables 3.18 to 3.28 on the following pages.

TABLE 3.18

MEANS AND STANDARD ERROR OF THE MEANS FOR THE THREE MODELINGS FOR SKILL-II (CONVERGENT QUESTIONS)

Modeling	N	Mean	SE of mean
M_1	60	10.03	0.23
M_2	53	11.45	0.15
M_3	48	12.06	0.18

TABLE 3.19

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

Comparison	MDs	SE of MDs	t-value
$M_2 - M_1$	1.42	0.27	5.25 **
$M_3 - M_1$	2.03	0.29	7.00 **
$M_3 - M_2$	0.61	0.23	2.65 **

** Significant at .01 level

TABLE 3.20

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

Item	N	Mean	SE of Mean	MD (T_2-T_1)	SE of MD	t-value
Trial-I (T_1)	80	10.73	0.16	0.73	0.25	2.92**
Trial-II (T_2)	81	11.46	0.19			

** Significant at .01 level

TABLE 3.21

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

Observers	N	Mean	SE of mean
O_1	54	10.90	0.23
O_2	53	10.88	0.24
O_3	54	11.51	0.22

TABLE 3.22

MEAN DIFFERENCES, 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_1-O_2	0.02	0.33	0.06 NS
O_3-O_1	0.61	0.32	1.90 NS
O_3-O_2	0.63	0.32	1.96 *

* Significant at .05 level

TABLE 3.23

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

Modeling	Trial-I (T_1)			Trial-II (T_2)		
	N	Mean	SE of mean	N	Mean	SE of mean
M_1	30	9.73	0.24	30	10.33	0.19
M_2	26	11.35	0.23	27	11.55	0.32
M_3	24	11.33	0.32	24	12.79	0.31

TABLE 3.24

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

Modeling	Comparison	MDs	SE of MDs	t-values
M_1	$T_2 - T_1$	0.60	0.32	1.87 NS
M_2	$T_2 - T_1$	0.20	0.39	0.51 NS
M_3	$T_2 - T_1$	1.46	0.44	3.56 **

** Significant at .01 level

TABLE 3.25

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

Modeling	O_1			O_2			O_3		
	N	Mean	SE of Mean	N	Mean	SE of Mean	N	Mean	SE of Mean
M_1	20	10.00	0.30	20	9.75	0.33	20	10.35	0.13
M_2	18	11.28	0.38	17	11.12	0.29	18	11.94	0.31
M_3	16	11.62	0.40	16	12.06	0.41	16	12.50	0.46

TABLE 3.26

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

Modeling	Comparison	MDs	SE of MDs	t-values
	$O_1 - O_2$	0.25	0.45	0.55 NS
M_1	$O_3 - O_1$	0.35	0.33	1.06 NS
	$O_3 - O_2$	0.60	0.36	1.66 NS
	$O_1 - O_2$	0.16	0.48	0.33 NS
M_2	$O_3 - O_1$	0.66	0.43	1.35 NS
	$O_3 - O_2$	0.82	0.43	1.91 NS
	$O_2 - O_1$	0.44	0.57	0.77 NS
M_3	$O_3 - O_1$	0.88	0.61	1.44 NS
	$O_3 - O_2$	0.44	0.61	0.72 NS

TABLE 3.27

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

Observers	Trial-I(T_1)			Trial-II(T_2)		
	N	Mean	SE of Mean	N	Mean	SE of Mean
O_1	27	10.52	0.29	27	11.29	0.34
O_2	26	10.54	0.34	27	11.22	0.16
O_3	27	11.15	0.27	27	11.89	0.33

TABLE 3.28

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

Trial	Comparison	MDs	SE of MDs	t-values
T_1	$O_2 - O_1$	0.02	0.45	0.04 NS
	$O_3 - O_1$	0.63	0.39	1.61 NS
	$O_3 - O_2$	0.61	0.43	1.42 NS
T_2	$O_1 - O_2$	0.07	0.37	0.19 NS
	$O_3 - O_1$	0.60	0.47	1.28 NS
	$O_3 - O_2$	0.67	0.37	1.81 NS

Table 3.18 gives the mean (M) and standard error of the mean (SEM) for the three modelings. It is clear from the Table 3.18 that microteaching (M_3) has produced the maximum score as compared to other modeling treatments. Table 3.19 gives the mean differences (MDs); standard error of the mean difference (SE of MDs) and t-values for testing the significance of the mean differences. The differences and their t-values indicate that all the modeling treatments are significantly different in producing different scores. The difference (M_1-M_2) is in favour of (M_2) is significant at 1 percent level (t=5.25**). The difference (M_1-M_3) is in favour of (M_3) which happens to be the maximum value (t=7.00**) is significant at 1 percent level. The mean difference (M_2-M_3) is in favour of (M_3) and is significant at 1 percent level (t=2.65**). It, therefore, appears that the microteaching treatment (M_3) comes out to be the best of the three followed by audiomodeling (M_2) and symbolic modeling (M_1) coming out as the least effective of the three treatments.

Table 3.20 gives the means, standard error of the means and mean difference (MD), SE of (MD) and t-value

for the two trials. The scores for trial-II (T_2) are significantly different (t=2.92**) from the scores for trial-I (T_1). A general gain in score is, thereby, suggested.

Table 3.21 gives the means and standard error of the means for observers. Self-observer (O_3) appears to have produced maximum score (M=11.51) as comparedto peer observers. Table 3.22 givesthe mean differences (MDs) and standard errors of mean differences (SE of MDs) and t-values for the significance of differences between the observers. It is clear from the Table 3.22, that self-observer (O_3) as compared to peer observer-II (O_2) has produced significant difference at 5 percent level (t=1.96*). Peer observers (O_1) and (O_2) have produced almost the same score (MD=0.02) as indicated by the t-value (t=0.06, NS). The other difference (O_1-O_3) is not significant (t=1.90, NS). It is only the self-observer (O_3), as it appears to be, is contributing towards the variation due to observers in general.

Table 3.23 gives the means (M) and SE of means for trials under the three modeling. The trial-II (T_2) under (M_3) appears to have produced the largest value for the mean. Table 3.24 gives t-values for the significance of the mean differences. The difference (T_1-T_2) in favour of (T_2) is significant at 1 percent level (t=3.56**) under microteaching (M_3). That means 'reteach-I' is significantly different from 'teach-I' for microteaching (M_3) while there is no such significant difference for other modeling treatments, namely, symbolic modeling (M_1) and audiomodeling (M_2). Microteaching (M_3) appears to be effective in producing significant difference in scores for teach-reteach.

Table 3.25 gives means (M) and standard error of the mean for observers under each modeling. Table 3.26 gives t-values for the significance of mean differences under each modeling. All the nine mean differences created out the experimental conditions under the three modeling treatments are found to be not significant suggesting that observers do not differ in their assessment under any of the modeling treatments.

Table 3.27 gives means (M) and standard error of means (SEM) for the three observers under each trial. Table 3.28 gives the mean differences (MDs), standard error of mean differences (SE of MDs) and t-values for the significance of (MDs) for observers under the two trials. All the six mean differences created out the experimental conditions under each trial are not significant. This suggests that observers do not differ in their assessment of performance under the two trials. The difference appears due to sampling.

The interaction effect of the three factors, namely - modeling, trials, and observers (MxTxO) is not significant (F=2.16, NS with df 4/137).

From the above results and their interpretation the following trends appear to emerge in case of convergent questions practised under the laboratory conditions.

(1) Microteaching (M_3) appears to be the most significantly effective treatment (vide Table 3.19) followed by audiomodeling (M_2) and symbolic modeling (M_1) coming out

to be the least effective of the three treatments.

(2) The difference between the performance in trial-II (T_2) is significantly higher than the performance in trial-I (T_1) under microteaching (M_3) vide Table 3.24.

(3) Observers do not differ in their assessment of the performances either under modeling treatments or under the two trials.

3.3 Divergent Questions

Observations in terms of raw scores are given in Table 3.29 on the next page.

TABLE 3.29

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

Modeling	Trial-I (T_1)			Trial-II (T_2)		
	O_1	O_2	O_3	O_1	O_2	O_3
Symbolic modeling (M_1)	13	16	12	13	18	14
	13	12	13	13	12	11
	13	14	14	13	14	13
	14	14	19	14	11	17
	14	18	16	11	15	17
	15	13	15	14	13	14
	14	12	13	12	13	14
	18	14	13	13	13	13
	15	14	16	14	13	15
	14	15	14	-	-	-
Audiomodeling (M_2)	12	11	11	12	13	12
	11	11	13	13	10	12
	12	14	18	14	14	17
	12	16	9	13	17	11
	12	15	12	14	14	12
	14	12	15	16	12	16
	14	15	18	13	16	17
	12	13	15	15	13	15
	16	15	15	16	16	18
	15	12	14	16	14	12
Microteaching (M_3)	18	11	17	19	12	19
	17	10	15	19	11	17
	18	18	17	18	17	19
	15	17	18	18	17	21
	14	18	11	17	19	13
	15	14	15	18	14	16
	14	14	16	14	13	16
	13	16	13	13	15	19
	15	13	17	13	15	18
	14	18	16	16	18	17

Based upon the raw scores given in Table 3.29, the results in terms of means (M), standard deviation (SD), and standard error of the mean (SEM) arising out of the eighteen experimental conditions are given in Table 3.30 here below.

TABLE 3.30

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

Modeling	Item	T_1			T_2		
		O_1	O_2	O_3	O_1	O_2	O_3
Symbolic modeling (M_1)	N	10	10	10	9	9	9
	Mean	14.30	14.20	14.50	13.00	13.55	14.22
	SD	1.49	1.81	2.07	1.00	2.03	1.93
	SEM	0.47	0.57	0.65	0.33	0.68	0.64
Audio-modeling (M_2)	N	10	10	10	10	10	10
	Mean	13.00	13.40	14.00	13.90	13.90	14.20
	SD	1.63	1.84	2.87	1.99	2.08	2.66
	SEM	0.52	0.58	0.91	0.62	0.66	0.84
Micro-teaching (M_3)	N	10	10	10	10	10	10
	Mean	15.30	14.90	15.50	16.50	15.10	17.50
	SD	1.77	2.96	2.13	2.37	2.64	2.22
	SEM	0.56	0.94	0.67	0.75	0.83	0.70

The data given in Table 3.29 above were subjected to the analysis of variance (3x2x3). The summary ANOVA results are given in Table 3.31 here under.

TABLE 3.31

SUMMARY ANOVA RESULTS FOR SKILL-III
(DIVERGENT QUESTIONS)

Source of variation		Sums of squares	df	Mean sums of squares	F-ratio
	Microteachers	94.22	9	10.47	26.84**
M	: Modeling	151.91	2	75.95	194.74**
T	: Trials	5.28	1	5.28	13.53**
O	: Observers	21.74	2	10.87	27.87**
MT	: Modeling X Trials	26.04	2	13.02	33.38**
MO	: Modeling X Observers	10.16	4	2.54	65.13**
TO	: Trials X Observers	2.67	2	1.33	3.41*
MTO	: Modeling X Trials X Observers	45.44	4	11.36	29.13**
Experimental Error		58.75	150	0.39	
	TOTAL	416.22	176		

** Significant at .01 level

* Significant at .05 level

In this Table the variation due to teachers involved in the experiment is significant at 1 percent level ($F=26.84^{**}$ with df 9/150) indicating that response from one teacher is different from that of the other. This may be due to different educational backgrounds and teaching experience of the teachers.

The F-ratio due to modeling is 194.74 significant at 1 percent level. Therefore the response from treatment to treatment, namely, symbolic modeling, audiomodeling, and microteaching is different. The main effect due to trials is significant at 1 percent level ($F=13.53^{**}$ with df 1/150). This means responses from trial-I (T_1) are different from the responses of trial-II (T_2).

The F-ratio for observers is 27.87 which is significant at 1 percent level. It means that observers differ in their responses. The interaction effects of trials under each modeling appear to be significant at 1 percent level ($F=33.38^{**}$ with df 2/150) indicating that responses in trials depend upon modeling treatment. The

The interaction effect between modelings and observers is also significant at 1 percent level ($F=65.13^{**}$ with df 4/150). It means observers differ in their assessment under each modeling. The interaction effect between observers and trials is significant at 5 percent level ($F=3.41^{*}$ with df 2/150). This indicates that observer response is different from trial to trial.

Attention is being drawn to the fact that values for F ratio in Table 3.31 appear to be higher as compared with similar values from Tables 3.4 and 3.17. The large values for the F ratios in Table 3.31 might be due to the fact that some of the assumptions under analysis of variance might not have been fulfilled. The additivity component of the variance gets adversely affected if non-normality is present. Sometimes a large variation gets removed by individuals - in our case, teachers - resulting in small quantities for the error variance with comparatively large degrees of freedom. This results ultimately in having a large F-ratio. Basically it is the reliability and validity of the scores that is more responsible for the

non-fulfilment of the assumptions of analysis of variance. Therefore, whenever the results of F-test and t-test are not of the same type interpretations are to be made on the basis of t-values because F-test gets affected more by non-normality while t-test is affected in the least. F-test is a robust test in that, it is relatively insensitive to violations of the assumptions of normality of distribution and homogeneity of variance (Edwards, 1971 p.121).

In order to pinpoint the differences and to note their directions, the F-test was followed by t-test, testing the significance of differences between means. The t-test results due to various experimental conditions are given in Tables 3.32 to 3.42 in the following pages.

TABLE 3.32

MEANS AND STANDARD ERROR OF THE MEANS FOR THE THREE MODELINGS FOR SKILL-III (DIVERGENT QUESTIONS)

Modeling	N	Mean	SE of mean
M_1	57	13.98	0.23
M_2	60	13.73	0.28
M_3	60	15.80	0.10

TABLE 3.33

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

Item	MDs	SE of MDs	t-value
$M_1 - M_2$	0.25	0.37	0.67 NS
$M_3 - M_1$	1.82	0.25	7.28 **
$M_3 - M_2$	2.07	0.30	6.90 **

** Significant at .01 level

TABLE 3.34

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

Item	N	Mean	SE of mean	MD (T_1-T_2)	SE of MD	t-value
Trial-I (T_1)	90	14.34	0.23	1.40	0.62	2.25*
Trial-II (T_2)	87	12.94	0.57			

* Significant at .05 level

TABLE 3.35

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

Observer	N	Mean	SE of mean
O_1	59	14.35	0.28
O_2	59	14.18	0.30
O_3	59	13.30	0.74

TABLE 3.36

MEAN DIFFERENCES, 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
$O_1 - O_2$	0.17	0.41	0.41 NS
$O_1 - O_3$	1.05	0.80	1.10 NS
$O_2 - O_3$	0.88	0.79	1.32 NS

TABLE 3.37

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

Modeling	Trial-I (T_1)			Trial-II (T_2)		
	N	Mean	SE of mean	N	Mean	SE of mean
M_1	30	14.33	0.32	27	13.59	0.33
M_2	30	13.47	0.39	30	14.00	0.40
M_3	30	15.23	0.42	30	16.37	0.46

TABLE 3.38

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

Modeling	Comparison	MDs	SE of MDs	t-values
M_1	$T_1 - T_2$	0.74	0.46	1.61 NS
M_2	$T_2 - T_1$	0.53	0.56	0.95 NS
M_3	$T_2 - T_1$	1.14	0.62	1.84 NS

TABLE 3.39

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

Modeling	O_1			O_2			O_3		
	N	Mean	SE of Mean	N	Mean	SE of Mean	N	Mean	SE of Mean
M_1	19	13.68	0.33	19	13.89	0.44	19	14.37	0.45
M_2	20	13.45	0.41	20	13.65	0.43	20	14.10	0.60
M_3	20	15.90	0.48	20	15.00	0.61	20	16.50	0.53

TABLE 3.40

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

Modeling	Comparison	MDs	SE of MDs	t-values
	$O_2 - O_1$	0.21	0.55	0.38 NS
M_1	$O_3 - O_1$	0.69	0.55	1.25 NS
	$O_3 - O_2$	0.48	0.62	0.77 NS
	$O_2 - O_1$	0.20	0.59	0.34 NS
M_2	$O_3 - O_1$	0.65	0.73	0.89 NS
	$O_3 - O_2$	0.45	0.74	0.61 NS
	$O_2 - O_1$	0.90	0.77	1.17 NS
M_3	$O_3 - O_1$	0.60	0.71	0.84 NS
	$O_3 - O_2$	1.50	0.81	1.85 NS

TABLE 3.41

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

Observers	Trial-I(T_1)			Trial-II(T_2)		
	N	Mean	SE of Mean	N	Mean	SE of Mean
O_1	30	14.20	0.34	30	14.03	0.65
O_2	30	14.17	0.41	30	13.73	0.63
O_3	30	14.67	0.43	30	14.83	0.71

TABLE 3.42

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

Trials	Comparison	MDs	SE of MDs	t-values
T_1	$O_1 - O_2$	0.03	0.53	0.06 NS
	$O_3 - O_1$	0.47	0.55	0.85 NS
	$O_3 - O_2$	0.50	0.60	0.83 NS
T_2	$O_1 - O_2$	0.30	0.90	0.33 NS
	$O_3 - O_1$	0.80	0.96	0.83 NS
	$O_3 - O_2$	1.10	0.95	1.16 NS

Table 3.32 shows that microteaching (M_3) is having the maximum mean value, followed by symbolic modeling (M_1) and audiomodeling producing the least mean value. Table 3.33 indicates that though the mean difference (M_1-M_2) is in favour of symbolic modeling (M_1), the difference is not significant (t=0.67, NS). The other two mean differences, namely (M_3-M_1) and (M_3-M_2) are significant at 1 percent level (t=7.28** and t=6.90**). Microteaching (M_3) thus, appears to be more effective than either symbolic modeling (M_1) or audiomodeling (M_2). Evidence to decide the superiority between symbolic modeling (M_1) and audiomodeling (M_2) is not conclusive.

Table 3.34 indicates that mean score for trial-I (T_1) is greater than the mean score for trial-II (T_2) and this difference (T_1-T_2) is significant at 5 percent level (t=2.25*). This appears to be rather unusual and may be due to distraction of attention, or fatigue or some physical discomforts of the environment during trial-II (T_2).

Table 3.35 shows that peer observer (O_1) has produced maximum score, followed by peer observer (O_2) and

self-observer (O_3) producing the least mean value. Table 3.36, however, indicates that the mean differences due to observers are not significant. This may be due to the fact that observers might have grasped the subtletics of the skill and therefore they might not have differed in their assessment of the performance significantly.

Table 3.37 shows that mean trial scores for both trial-I (T_1) and trial-II (T_2) under microteaching (M_3) are the highest. Table 3.38, however, indicates that the mean differences between scores for trial-I and trial-II under the three modeling treatments are not significant. Modeling treatments could not produce significant differences in the performance for trial-I (T_1) and trial-II (T_2).

Table 3.39 gives mean score values for observers under each modeling and Table 3.40 gives the mean differences (MDs), standard error of mean differences (SE of MDs) and t-values for the significance of the differences due to three observers under three modeling treatments. All the nine mean differences due to observers

are not significant. The same observation is revealed for the differences due to observers under the two trials - trial-I (T_1) and trial-II (T_2), in Table 3.41 and Table 3.42. The differences due to observers under the two trials are not significant.

From the above results and their interpretations the following trends appear to emerge in the case of divergent questions as it was practiced in the laboratory conditions.

(1) Microteaching (M_3) appears to be significantly more effective treatment as compared with either the symbolic modeling (M_1) or audiomodeling (M_2) treatments. The difference between symbolic modeling (M_1) and audiomodeling (M_2) being not significant.

(2) The performance in terms of mean scores for trial-I (T_1) is found to be significantly higher than the performance in trial-II (T_2). The difference in the mean scores of trials I and II is not significant under all the three treatments. Reteach is not significantly better than teach under microteaching (M_3).

(3) Observers (O_1), (O_2), and (O_3) do not differ in their assessment of performance either under different modeling treatments or under the two trials.

3.4 Summary of Results of Phase-II

As a result of the analysis of the data due to the study at phase-II, the following trends are summarised below :

(1) Microteaching (M_3) developed maximum competency in all the three skills, namely - probing questions; convergent questions; and divergent questions in comparison with symbolic modeling (M_1) and audiomodeling (M_2) treatments (vide Table 3.4; 3.18; and 3.32).

(2) Microteaching (M_3) was found to score higher than either symbolic modeling (M_1) or audiomodeling (M_2). The difference between the mean scores for symbolic modeling (M_1) and audiomodeling (M_2) was not significant (vide Table 3.5) in case of probing questions and for divergent questions (vide Table 3.33).

(3) Microteaching (M_3) was found to be the most effective treatment followed by audiomodeling (M_2) and symbolic modeling (M_1) proved to be the least effective treatment in case of convergent questions (vide Table 3.19).

(4) Microteaching (M_3) produced significant gains in the mean scores for trial-I and trial-II (T_2-T_1) in convergent questions (vide Table 3.24). In case of skills in probing questions and divergent questions, the mean differences between the trial scores (T_2-T_1) were not significant either under symbolic modeling (M_1) or audiomodeling (M_2) or microteaching (M_3) (vide Tables 3.10 and 3.38).

(5) Ratings by self-observer (O_3) of the performance was higher than the ratings of peer observers (O_1) and (O_2) in skill-I - probing questions. The peer observers (O_1) and (O_2) did not differ in their assessment of the performance in probing questions (vide Table 3.14) under trial-I and trial-II.

(6) Observers did not differ in their assessment of performance under trial-I and trial-II for convergent questions and divergent questions (vide Tables 3.28 and 3.42).

(7) Ratings by self-observer (O_3) under microteaching (M_3) for probing questions were higherthan the ratings of the peer observers (O_1) and (O_2). The mean differences between the observer ratings were not significant either under symbolic modeling (M_1) or audiomodeling (M_2) vide Table 3.12.

(8) The observer differences for other skills, namely - for convergent and divergent questions - were not significant under either symbolic modeling (M_1) or audiomodeling (M_2) or microteaching (M_3) vide Tables 3.26 and 3.38 respectively.

The above trends that emerged out of the study at phase-II will be reviewed along with the trends that are likely to emerge in phase-III of the study. Phase-III was a replication of phase-II with every individual

completing four trials under each treatment, namely - symbolic modeling (M_1), audiomodeling (M_2), and microteaching (M_3). An additional dimension was that of assessing the classroom performance of the student teachers before receiving training and immediately after the training and to see whether they performed better or not. It, therefore, appears to be convenient to discuss the above trends in phase-II along with the trends in phase-III in the light of results and findings of similar investigations and studies done elsewhere. This arrangement will prove to be convenient for drawing conclusions for the entire study. The discussion of the above trends will, therefore, be done in Chapter IV along with trends that will emerge out of the phase-III of the study.

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