CHAPTER V

DISCUSSION AND INTERPRETATION OF RESULTS

5.0.0 Introduction

In the present study, an attempt has been made to find out the effectiveness of three strategies on attainment and retention of knowledge, comprehension, applicational abilities and total achievement of students of standard IX in Geography under planned as well as surprise testing conditions. The rationale for undertaking this study for selecting three strategies and criterion variables have been presented in chapter I.

A review of related studies, hypotheses and assumptions have been included in chapter II. The details regarding the methods and procedures adopted in the experiments have been treated in chapter III. Chapter IV has comprised the analysis of data and the results of the experiment.

In the present chapter the results of the experiments will be discussed and interpreted. Discussion of results for attainment scores with hypotheses is given under captions 5.1.1 to 5.1.4, and that of retention score with hypotheses is given under captions 5.2.1 to 5.2.4. Caption 5.3.0 comprises the general discussion and interpretation of results. Educational implications of the present study have been discussed under caption 5.4.0.

5.1.1 Hypotheses related to Posttest Achievement

There will be no significant difference in the mean scores of the groups taught by using Strategy S_1 (Lecturing and Questioning-Answering), Strategy S_2 (Lecturing and Questioning-Answering by using Behavioural Objectives), Strategy S_3 (Discussion by using Instructional Materials) in terms of pupils' attainment of instructional objectives at knowledge level in Geography for students of standard IX.

Results of the experiment as presented in Table 4.1.1 show that F-ratio of 7.56 for df 2/145 is significant at 0.01 level. This shows that the three strategies viz. Strategy S_1, Strategy S_2 and Strategy S_3 produce differential effects on the development of knowledge ability of the pupils. Thus, the null hypothesis 1 is rejected. Interpretation of this result will be given in the caption (5.3.0).

5.1.2 H_2 - There will be no significant difference in the mean scores of the groups taught by using Strategy S_1 (Lecturing and Questioning-Answering), Strategy S_2 (Lecturing and Questioning-Answering by using Behavioural Objectives), and Strategy S_3 (Discussion by using Instructional Materials) in terms of pupils' attainment of instructional objectives at comprehension level.

Results of the experiment as presented in the Table 4.1.4 show that the F-ratio is 5.86 which is significant at 0.01 level with df 2/145. The null hypothesis as mentioned above is rejected at 0.01 level. It implies that three strategies (S_1, S_2, and S_3) produce differential effects on the comprehension scores of Posttest. Interpretation of this result will be given in the caption (5.3.0).

5.1.3 H_3 - There will be no significant difference in mean scores of the groups taught by using Strategy S_1 (Lecturing and Questioning-Answering), Strategy S_2 (Lecturing and Questioning-Answering by using Behavioural Objectives), Strategy S_3 (Discussion by using Instructional Materials) in terms of pupils attainment of instructional objectives at applicational level.

Results of the experiment as presented in 4.1.7 shows that F-ratio is 15.51 which is significant at 0.01 level with df 2/145. The null hypothesis as stated above is therefore, rejected at 0.01 level. In this case of rejection of hypothesis means that the three strategies of teaching

produced differential effects on development of applicational ability of pupils. On inspection of the adjusted means it seems that Strategy (S_2), Strategy (S_3) and Strategy (S_1) are in decreasing order of effectiveness. Interpretations of this result will be presented in caption (5.3.0).

5.1.4 H_4 - There will be no significant difference in the mean scores of the groups taught by using Strategy S_1 (Lecturing and Questioning-Answering), Strategy S_2 (Lecturing and Questioning-Answering by using Behavioural Objectives), Strategy S_3 (Discussion by using Instructional Materials) in terms of pupils' total achievement (knowledge, comprehension, applicational ability taken together).

Results of the experiment as given in Table 4.1.10 indicate that the F-ratio is 10.28 which is significant at 0.01 level with df 2/145. This shows that the three strategies, S_1, S_2 and S_3 produce differential effects on Total Achievement scores of Posttest. The null hypothesis 4 as stated above is rejected at 0.01 level. The other reasons for rejection of the null hypothesis will be discussed in the caption (5.3.0).

Null Hypothesis related to the Scores on Retention Test

5.2.1 H_5 - There will be no significant difference in the mean scores of the groups taught by using Strategy S_1 (Lecturing and Questioning-Answering), Strategy S_2 (Lecturing and Questioning-Answering by using Behavioural Objectives) and Strategy S_3 (Discussion by using Instructional Materials) on retention of pupils' attainment of instructional objectives at knowledge level.

Results of the experiment as given in Table 4.2.1 show that the F-ratio is 4.59 which is significant at the 0.05 level with df 2/145. This shows that the three strategies, Strategy S_1, Strategy S_2, Strategy S_3 produce differential effects on the scores of retention at knowledge level. Thus, the null hypothesis as stated above is rejected at 0.05 level. Other interpretations of this result will be given in the caption (5.3.0).

6.2.2. H_6 - There will be no significant difference in the mean scores of the groups taught by using Strategy S_1 (Lecturing and Questioning-Answering), Strategy S_2 (Lecturing and Questioning-Answering by using Behavioural objectives) and Strategy S_3 (Discussion by using Instructional Materials) on retention of pupils' attainment of instructional objectives at comprehension level.

Results of the experiment as given in Table 4.2.4 indicate that the F-ratio is 3.22 which is significant at 0.05 level with df 2/145. This shows that the strategies (S_1, S_2 and S_3) produce differential effects on retention of comprehension scores. Thus, the null hypothesis stated above is rejected at 0.05 level. Other interpretations of

this result will be discussed in the caption (5.3.0).

5.2.3 H_7 - There will be no significant difference in the mean scores of the groups taught by using Strategy S_1 (Lecturing and Questioning-Answering), Strategy S_2 (Lecturing and Questioning-Answering by using Behavioural Objectives) and Strategy S_3 (Discussion by using Instructional Materials) on retention of pupils' attainment at application level.

Results of this experiment as given in Table 4.2.7 indicate that the F-ratio is 14.77 which is significant at 0.01 level with df/145. This shows that the three strategies (S_1, S_2 and S_3) produced differential effects on retention of comprehension scores. Thus, the null hypothesis stated above is rejected at the 0.01 level of significance. Other interpretations of results will be given in the caption (5.3.0).

5.2.4 H_8 - There will be no significant difference in the mean scores of the groups taught by using Strategy S_1 (Lecturing and Questioning-Answering), Strategy S_2 (Lecturing and Questioning-Answering by using Behavioural Objectives), and Strategy S_3 (Discussion by using Instructional Materials) on retention of pupils' total attainment (knowledge, comprehension and applicational ability taken together).

Results of the experiment as given in Table 4.2.22 indicate that the F-ratio is 6.61 which is significant at 0.01 level with df 2/145. This shows that the three strategies viz., S_1, S_2, and S_3 produced differential effects

on retention of total achievement (knowledge, comprehension and applicational ability taken together).

Thus, the null hypothesis stated above is rejected at 0.01 level of significance. Other interpretations of results will be given in the caption (5.3.0).

(A Summary of Results of the Experiment is given in Table 5.1.0 on the next page)

5.3.0 General Discussion and Interpretation of Results

The study started with an attempt to identify certain strategies (combination of several teacher and pupil behaviours : verbal and operational, and integration of tactics, both planned and responsive in a particular sequence) which might help a classroom teacher to achieve desired pupil attainment in terms of instructional objectives.

By analysing different studies undertaken specially in the Indian context the investigator felt prone to identify certain teaching variables which could prove to be extremely potential so far as learning outcomes were concerned and with which again, systematically organised investigations were still absent. It was further revealed to her that most of the earlier studies treated the variables in defacto isolation. Sometimes one or few of them endeavoured to render a kind of combination in the name of pattern or style, but the omission was inherent in designing the style or pattern

Table :5.1.0: Summary of Results of the Experiment

POSTTEST LEVEL					RETENTION TEST LEVEL				
Groups	Number	Adjusted Means	t-value	Level of significance	Groups	Number	Adjusted Means	t-value	Level of Significance
				KNOWLEDGE					
1	55	16.19	3.90(gr.1-2)	**	1	55	16.17	2.46(gr.1-2)	*
2	50	18.88	2.88(gr.2-3)	**	2	50	17.85	0.30(gr.2-3)	
3	45	16.79	0.84(gr.1-3)		3	45	18.07	2.70(gr.1-3)	**
				COMPREHENSION					
1	55	11.13	3.36(gr.1-2)	**	1	55	10.84	1.86(gr.1-2)	
2	50	13.37	2.83(gr.2-3)	**	2	50	12.15	0.50(gr.2-3)	
3	45	11.39	0.37(gr.1-3)		3	45	12.51	2.31(gr.1-3)	*
				APPLICATION					
1	55	3.53	5.71(gr.1-2)	**	1	55	5.52	5.57(gr.1-2)	**
2	50	7.29	3.46(gr.2-3)	**	2	50	8.42	2.43(gr.2-3)	*
3	45	4.89	2.01(gr.1-3)	*	3	45	7.08	2.93(gr.1-3)	**
				TOTAL ACHIEVEMENT					
1	55	31.92	4.60(gr.1-2)	**	1	55	33.53	2.89(gr.1-2)	**
2	50	38.27	3.51(gr.2-3)	**	2	50	37.21	0.43(gr.2-3)	
3	45	33.17	0.88(gr.1-3)		3	45	37.78	3.25(gr.1-3)	**

* Significant at 0.05 level : ** Significant at 0.01 level

itself. It may be cited as an example that the variable of questioning-answering comprises unquestionably the element of feedback. Even a simple analysis will show that the chain of questioning-answering remains incomplete if the note of feedback is absent there. That is why the relative effectiveness of the two patterns or styles such as questioning-answering with or without feedback, narrow questions with or without feedback, or broad questions with or without feedback, all failed to bring about significant differences in the mean scores of the groups belonging to the previous studies. This prompted the present investigator to be extremely cautious in selecting the teaching variables for her study. The cognitive style of thinking in the preactive process had a better appeal to the investigator. Her long experience as an experiment-oriented teacher too contributed largely to select the appropriate tactics and combine them in a synthetic proportion so as to achieve the criteria of knoweldge, comprehension and application. She found it judicious too to synthesise the teaching variables also so that different objectives inherent in the units of a particular lesson might advantageously be attained. The analysis of different type of research literature again, contributed to her conviction that a single method or technique was never equally effective to attain all types of criteria. Nature of the subject under investigation

put also an inducement to select the students who had attained a level of maturity.

All these considerations and assumptions led the investigator to frame the strategies of Lecturing and Questioning-Answering (S_1), Lecturing and Questioning-Answering by using Behavioural Objectives (S_2), Discussion by using Instructional Materials (S_3). For the effectiveness of the strategies, a sound and judicious preactive preparations had to be undertaken. This, the investigator believes, led to more interactive processes and eventualities (responsive tactics) and paid her the dividend of achieving consistently significant results with regard to knowledge, comprehension and application objectives.

Following studies corroborate to the findings of the present study:

In a comparison of Lecturing and Questioning-Answering (S_1) with Discussion using Instructional Materials (S_2) at the posttest level no significant difference was found regarding recall of knowledge.

The studies of Bane (1925, 1931), Becker et al. (1958), Carlson (1953), DiVesta (1954), Fodor (1963), Gotke (1931), Hill (1960), Johnson and Smith (1953), Leton (1961), Lifson et. al (1956), Miller (1966), Rickard (1946), Robbins (1931), Rohrer (1957), Rower (1957), Ruja (1954), Smith (1954), Spence (1928), and Ward (1956) showed almost similar results

as in the present study. The comparison in those studies, however, were restricted between lecturing (questioning-answering not included) and discussion (instructional materials not included).

In contrast again, to the findings of the present study, those of Huffaker (1931), Kirby (1951) and Miller (1966) revealed that discussion produced significant results with regard to knowledge at posttest level and also achievement in comprehension at posttest level (Yost, 1972).

The significantly better results at retention level with the criteria of knowledge and comprehension are reinforced by Bane (1925, 1931), Bond (1956), Cousins (1962), Crocker (1974), Gore (1962), Huffaker (1931), Kirby (1951), Rickard (1946), Kohut (1973), Tistaert (1965) and Yost (1972).

The present study has found Discussion by using Instructional Materials to be more significantly effective than Lecturing and Questioning-Answering (S_1) at .05 level and .01 level respectively at posttest and retention test stages taking application as criterion. Studies in support of the present findings are yet to be found in India and other countries. As the findings are quite significant at application level (one of the higher order objectives) both at posttest and retention test stages, this is indeed encouraging a result so far as teaching-learning situation is concerned.

The studies by Miller (1966), Mitchell (1972), Walker (1973), Wispé (1951), and Yanoff (1973) obtaining no significant results for total achievement at posttest stage resemble also that of the present one. But the present investigator has obtained highly significant result (.01 level) for total achievement at retention stage employing Discussion by using Instructional Materials (S_3) in contrast to Lecturing and Questioning-Answering (S_1) which is partially supported by Coatney's study (1974). In Strategy S_3, (Discussion by using Instructional Materials), the Instructional Materials have been a group of variables in this study which have not been studied so far in conjunction with other variables except by Mathias (1975). In the present study, almost similar with that of Mathias' all the three groups used existing materials while the group 3 was provided with special materials in addition to the existing ones. Mathias' treatment group scored higher on posttest than the control group. The findings of the present study once again, are remarkably supported by those of Mathias' reinforcing the importance of utilisation of instructional materials in classroom situation. It may be concluded by examining the results both at posttest and retention test level that effectiveness of Instructional Material is more significant at higher level objective (application) at posttest stage and for knowledge, comprehension, application and total achievement at retention level.

Now keeping all these findings in view it may be explained that the studies undertaken by Beseda (1973), Cohen (1972), Harris and Sherwer (1966), Harris et al.(1968), Perkins (1965), Wright and Nuthall (1970), Wright (1973), and Spaulding (1965) failed to bring any significant result for the simple reason that the variables were inadequate as they were treated in isolation.

Behavioural Objectives as Treatment Variables :

In course of the examination of the related studies on Behavioural Objectives as treatment variables, it was revealed to the investigator that almost equal number of studies taking the same as treatment variable yielded no significant difference when the mean score of the treatment group was compared with that of the control group. The investigator assumed several factors to have affected the results of the undermentioned studies. Factors associated with the studies undertaken are given hereunder.

1. Inadequate time for treatment might have affected the results of the experiments undertaken by Baker (1969 - two class periods) and Hawk (1976 - three weeks' study - total achievement).

2. There are some subjects or disciplines where objective in inbuilt whether they are spelt out or not because of their practical bias or skill orientation, for instance, Craft

where objective becomes gradually and increasingly explicit. So also is the case with the Science group of subjects where learning objectives sequencially emerge by themselves to be realisable by the students. The investigator feels that because of this lacuma in the studies of Coleman (1972 - Physical Science - Cognitive learning), David (1967 - Project Physics - achievement and retention), Payne (1972 - Chemistry - total achievement) and Theodore (1975 - Biology - achievement), the result was not found to be significant.

3. When a method with a number of variables are used in synthetic proportion it may bring about expected learning outcomes. But if this type of method is compared to Behavioural Objectives as one of the treatment variables, it might not bring significant results as both of these are rich in potential. In this context the studies of Suckley (1972 - programmed learning) and Theodore (1975 - Self-instructional multi-media approach) need mentioning.

4. Within a particular time limit it is quite difficult, rather impossible, to attain very many criteria in a teaching-learning situation as the process of teaching is very likely to become combrous and confusing. This reason may be attributed to the failure of Moody's (1974 - six levels of cognition on the basis of Bloom's Taxonomy - initial learning and retention) experiment with Behavioural Objectives, to obtain significant results.

By considering, however, the sound and well-grounded principles, behind the use of behavioural objectives, the

investigator was prompted to make an attempt to compensate the gap (as felt by the investigator) by changing the design, sample, treatment and criterion variables and the like.

In contrast to the studies which showed no significant results the Table 5.2.0 belowwill reveal an encouraging picture of using Behavioural Objectives as one of the treatment variables.

Table :5.2.0: Adjusted Mean Scores : Posttest Level (in decreasing order)

Treatment Variables	Criterion Variables			
	Know-ledge	Compre-hension	Applica-tion	Total Achievement
Strategy S_2	18.88	13.37	7.29	38.27
Strategy S_3	16.79	11.39	4.89	33.17
Strategy S_1	16.19	11.13	3.53	31.92

The Table shows the decreasing order of effectiveness of three strategies viz., Lecturing and Questioning-Answering by using Behavioural Objectives (S_2), Discussion by using Instructional Materials (S_3) and Lecturing and Questioning-Answering (S_1) at posttest level when the criterion of knowledge, comprehension, application and total achievement were considered.

With all the criterion variables (knowledge, comprehension, application and total achievement) Lecturing and Questioning -

Answering by using Behavioural Objectives (S_2) has resulted in highly significant differences (0.01 level) when compared with Lecturing and Questioning-Answering (S_1) and Discussion by using Instructional Materials (S_3). In all the cases level of significance was 0.01 level when the posttest achievement was considered.

When the relative effectiveness of Lecturing and Questioning-Answering (S_1) was compared with Discussion by using Instructional Materials (S_3) significant results were recorded only at applicational level. But when the variables of Behavioural Objectives (provided prior to instruction) was combined with Lecturing and Questioning-Answering (S_1) it showed statistically significant difference of mean scores with all the criterion variables. Furthermore, S_2 had even shown significant differences in mean scores when S_3 was also considered. This, therefore, leads to the conclusion that if Behavioural Objectives are provided to students with the Strategy of Lecturing and Questioning-Answering (S_1) prior to the instruction they entail significant differences in the mean scores at posttest level.

A number of studies were undertaken on different disciplines and at different levels which had shown significant results using Behavioural Objectives presented prior to instruction, as a treatment variable. Behavioural Objectives, in those studies, were communicated in different ways and

degrees while the present investigator has communicated Behavioural Objectives in printed form to only one experimental group. The previous studies again, took one or two criteria as dependent variables. Consequently, the findings therein will only partially corroborate with the findings in the present investigation. However, the results at the posttest level obtained by the present investigator have been similar with those of the previous researchers like Dalis (1970), Ferre (1972), Jenkins (1973), Lawson (1972), McEwen (1972), Martin (1974), Morse (1972), Mitchell (1975), Russell (1975), Sheldor (1973), and Zeigler (1974).

To put in a nut-shell now, the studies with the use of Behavioural Objectives produced significant results at posttest level with total achievement as criterion variable, which are similar with that of the present investigator. However, there is another side of the picture. The significant results with the use of Behavioural Objectives at posttest level may well-enthuse a researcher, but he will be prone to feel depressed to examine the result on using Behavioural Objectives at the retention level. Only two studies had so far been undertaken to measure the effectiveness of the Behavioural Objectives at the retention level. The studies of either of Lawson (1972), or Moody (1974) could not obtain any significant result at retention level.

Table :5.3.0: Adjusted Mean Scores : Retention Level (in decreasing order)

Treatment Variables	Criterion Variables				
	Knowledge	Comprehension	Total Achievement	Treatment Variable	Application
Strategy S_3	18.07	12.51	37.78	S_2	8.42
Strategy S_2	17.85	12.15	37.21	S_3	7.08
Strategy S_1	16.17	10.84	33.53	S_1	5.52

The Table No. 5.3.0. shows a uniform decreasing order of effectiveness of the strategies with the instructional objectives at knowledge, comprehension and total achievement levels. At the retention level for all these criterion the order is S_3, S_2 and S_1 in decreasing order, while for the application criteria the previous order i.e. S_2, S_3, S_1 (as was seen at posttest level) has been retained. This means that S_3 has shown more effectiveness. However, the use of Behavioural Objectives has shown significant difference of mean scores in group 2 than that of group 1 taught by S_1 at knowledge, application and total achievement levels. The difference of adjusted mean scores of the groups 1 and 2 is seen at the comprehension level though the difference is not statistically significant.

Now, with regard to the comparison of relative effectiveness of S_2 with S_3, it is evident from the Table 5.3.0 that S_3 has shown more effectiveness than S_2 with knowledge,

comprehension and total achievement as criteria at retention level. Regarding the criteria of application, S_2 has retained its previous rank.

The possible interpretation for the change in order may be put forward in the following way. If the contractual concept of teaching (vide the working definition in caption 1.1.0) is taken into consideration, it would indicate that there should be a constant renewal of contract (here, providing students with behavioural objectives, prior to instruction). In any social process, when a contractual relationship is there renewal of contract is obligatory, otherwise the contract loses its inducement and impact. If this is the way with average adult members of the society, it is much more usual with the young learners. When, therefore, the Behavioural Objectives are provided to the pupils in a teaching-learning situation the nature of contract is implicit therein. They are, then, likely to make conscious efforts, as was seen at the posttest level, to attain criterion objectives. But as the retention test was administered under surprise testing condition, the group taught by S_2 did not have that boostering effect which they possessed before posttest condition. This implies that the motivational aspect of using Behavioural Objectives which induces attention and interest alertness among the learners, was misssing at this stage.

Somebody in search of an effective strategy of teaching may feel perplexed while comparing the results of the groups

2 and 3 at posttest and retention test levels, specially with the criteria of knowledge, comprehension and total achievement. At the posttest level S_2 with the above criteria has showed highly significant results (0.01 level) while at the retention stage level there has been no significant difference at all. Furthermore, group 3 has shown higher adjusted mean scores than group 2 taught by S_2, of course, with no significant difference. The change to higher order of the group 3 at retention level draws immediately the attention of the researchers.

May it not be assumed, therefore, that when the variable of Instructional Materials has been combined with Discussion (which has provided much scope for using varied types of questions and answers in contrast to Lecturing and Questioning-Answering variables) it has proved to be more potential ?

In fact, the nature of difference between the two strategies Lecturing and Questioning-Answering by using Behavioural Objectives (S_2) and Discussion by using Instructional Materials (S_3) is that S_2 is more a target-oriented one while S_3 is more of a process-orientation. Behavioural objectives do not specifically spell out the 'hows' of learning specially at knowledge, comprehension and total achievement levels.

The research findings of Crocker (1974), Holtzman (1973), Kohut (1973), Leitch (1973) and Yost (1972) showing the

relative effectiveness of discussion method in comparison with other methods showed significant results at retention level. A similar trend of results has been shown in the present study in a comparison of S_3 and S_2. In a process-oriented strategy greater effectiveness in results is attainable at delayed stage only; S_3 being more process-oriented than S_2 has therefore resulted in higher scores at delayed test level.

Now, group 2 taught under S_2 has shown consistently higher significant results at applicational stage both at posttest and retention test levels when compared with S_1 and S_3. Application, again, is a higher level objective than that of knowledge and comprehension. A deeper understanding is required for achieving this objective. Until and unless one can think reflectively and apply it to a new situation the applicational ability cannot be attained. The reason for recording higher significance of group 2 taught under S_2 may be attributed to the explanations of different types of objectives presented to them at the very beginning of the lesson itself. Along with the elucidation about the applicational ability the students were given ideas as to how to create new problems and find out different solutions for them (they steadily improved in this aspect of achievement). It may further be likely that the novelty of the situation (creation and solution of problems) promoted the higher ability that they demonstrated. During

the experimental stage, group 2 was provided everyday with a printed list of behavioural objectives revelant to the day's lesson unit while group 1 and group 3 were not explained with application objectives in particular.

In the studies of Sharma (1972), Padma (1975), Shaida (1975), Roy (1976) and the present one taken together, several patterns, styles and strategies have been tried out so far in the Indian context. These are, narration, open questions, narrow questions, narrow questions with feedback (Sharma, 1972) ; Lecturing-problem solving approach, questioning-answering-problem solving approach, questioning-answering-feedback-problem solving approach, lecturing- no problem solving approach (Padma, 1975) ; Narrow questions with feedback, narrow questions without feedback, broad questions with feedback and broad questions without feedback (Shaida, 1975) ; Lecturing, questioning and response, and questioning - response - feedback sequence (Roy, 1976). The following patterns and styles were identified by them.

(1) Sharma (1972) - narrow questions were more effective in achieving the knowledge and comprehension objectives.

(2) Padma (1975) - No pattern was identified.

(3) Shaida (1975) - narrow questions with feedback, more effective for knowledge criterion than narrow questions without feedback (P 2) and broad questions with feedback ; broad questions with feedback more effective than other three patterns at applicational level.

(4) Roy (1976) - Lecturing (Style 1) more effective than questioning - response and feedback sequence at comprehensive level (Style 3).

These findings were not always consistent as Shanma and Shaida found different results with the same pattern ; Shaida and Roy found different results, again, with the same style or pattern.

All the investigators above studied the variables of Teaching and Questioning-Answering with or without feedback. The nature of feed back was of verbal appreciative type showing no significant difference in the results. In the present study the feedback was not undertaken as an experimental or treatment variable. It was present, however, as a constant factor in all the three strategies, S_1, S_2 and S_3. Whenever the variable of questioning-answering is concerned the factor of verbal or non-verbal reinforcement is implicit therein as it will follow an obvious pattern like : TQ* - Pupil Answers - Teacher Rejects or Accepts - TQ, otherwise the chain of questioning-answering is incomplete and incongruous.

Furthermore, when the Strategy of Discussion by using Instructional Materials is used, there itself the technique of questioning-answering is reinforced by the peer's feedback besides teacher's reinforcements, as this is an inseparable and integrated part of the strategy of

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* TQ = Teacher Questioning

Discussion. Therefore, in contrast to the abovementioned studies the investigator did not consider it expedient to separate the component of feedback from the variable of questioning-answering. The possible explanation for not getting significant results with or without feedback by Sharma (1972), Padma (1975) and Roy (1976) is that feed back is invariably inherent in the Questioning-Answering strategy itself whether explicitely stated or not.

From the above findings, it seems that, no particular pattern or style has been identified so far which may yield consistently significant higher mean scores either at posttest or retention test level with different criterion variables, specially at application level in particular.

The present study was conducted with three teaching strategies viz. Lecturing and Questioning-Answering (S_1), Lecturing and Questioning-Answering by using Behavioural Objectives (S_2) and Discussion by using Instructional Materials (S_3).

For the exigency of discussion, the findings of the present study is being restated, though, they have already been reported in the appropriate place. Among the findings, G_2 has shown significantly higher mean scores than G_1 for knowledge, comprehension, application and total achievement at posttest level and knowledge, application and total achievement at retention level.

Again, G_2 has shown significantly higher mean scores than G_3 for knowledge, comprehension, applicational ability and total achievement at posttest level. It has shown too significantly higher mean scores on retention of applicational ability.

G_3, in turn, has shown significantly effective result than G_1 with application criteria at posttest level and conclusively significant results with all criterion variables at retention test level.

At the retention test level, again, G_3 has gained higher adjusted mean scores than G_2 at knowledge, comprehension and total achievement levels, though the difference is not significant.

G_2 with the criterion of application has shown more effectiveness than G_3 both at posttest and retention test levels.

All the inconsistent findings in the previous studies and some consistently significant ones in the present one await a reinterpretation in the light of the following working definition.

> 'Teaching is a process, preactive, interactive, contractual by nature aiming at bringing specific learning or changes among the pupils in a formalised instructional situation.'

This working definition was framed in the light of the definition of Buch (1972) and Mitra (1972).

Preactive Process and the Significance of the Studies

To date, attempts to describe the teaching process have concentrated on asto what goes on during teaching sessions when teachers and students are face-to-face. Much that the teacher does specifically, before and after the class session, to take an instance, should essentially be considered if we are to obtain a complete description of his professional activity. During solitary moments he often performs tasks and makes decisions that are vital to his overall effectiveness. Behaviour relevant to the teaching task includes many things such as selecting strategy, drawing up lesson plans, preparing instructional materials and evaluation tools and so forth. Indeed, these activities, most of which eventuate when the teacher is alone, are very crucial for effective teaching. All these activities may be termed as preactive process as found in the definition of Buch (1972). One of the chief differences between preactive and interactive teaching behaviours seems to be in the quality of the intellectual activity involved. Preactive behaviour is more or less deliberative. At such times, teaching looks like a highly rational process. In the interactive setting the teacher's behaviour is more or less spontaneous. Another reason for the difference in cognitive style between preactive and interactive teaching is the rapidity of events in the classroom. Research suggests

that things happen rather quickly during a teaching session.

The rationale for using the concept of 'preactive process' has been explained earlier in an elaborate manner. The investigator conducted the pilot study for three weeks and the main experiment (excluding administration of tests etc.) for five weeks. This was the total period for interactive process while more than six months were devoted to the different phases of preactive processes namely selection of criteria and strategy, framing of behavioural objectives, preparation of different types of lesson plans, study of source materials, preparation of different types of instructional materials (maps, study guides etc.) and evaluation tools. In terms of lesson periods at the interactive stage, the total hours devoted to preactive process was relatively colossus. The ratio already given in terms of months does not convey the real picture. If quantified in terms of hours the six months period will obviously multiply enormously.

As preactive process is largely deliberative and cognitive by nature, the investigator opted to follow the motivational theory of McClelland (1965) for the use of behavioural objective prior to instruction. The investigator further felt that primary among personal factors are motives which are affectively toned net works of cognitions, and the

important motives in goal-directed behaviours are but the need for achievement. Not that alone, persons with high need for achievement require a standard of excellence by which to evaluate their own performances. On the basis of this psychological demand the criteria of performance in the present study were specified while delineating the behavioural objectives. McClelland (1961) again establishes that persons with need for achievement prefer goals that are clearly defined and tend to work hardest when their efforts will make a substantial difference in the final outcome of a project.

Again in the preactive stage the investigator cared to take into consideration the inttial student attention to the task which is so essential for learning. Theory and research on novelty, curiosity and motivation suggest that the teacher can manipulate properties of the environment to arouse and draw student attention. Barlyne (1963) states that situations characterised by novelty (change, surprise), complexity (amount of variety and diversity in a stimulus pattern) have attention arousing properties. The study by Coats and Smidchens (1966) prompted the investigator to introduce the variability of teacher behaviour which could produce strong motivational effects on students. As teachers may opt to introduce stimulus variability by using different kinds of instructional devices and materials, and by changing

activities within the lessons to advantage, the investigator had to give careful deliberations at the preactive stage to select appropriate devices, materials and activities within the lessons to formulate effective strategies.

Therefore, it is the contention of the investigator that if the teacher devotes considerable time in cognitive style of thinking in the preactive stage for selecting strategies fof the interactive stage, it is likely to result in much significant and desired learning outcomes at the end of the interactive stage.

The process may be compared to the prolonged systematic rehearsal of a good drama before finally staging the same. Teaching, however, is more than that, in a sense that, some of the gaps and lapses may be self-compensated by mature audience in case of a drama, but it is not so with the young children as pupils. It is the nature and duration of preparation no doubt, in the preactive stage that have contributed considerably to attain significant results at the end of the interactive process in the present study.

Perhaps, because of an inadequate attention to the demands of the preactive process appropriate patterns or styles could not be selected by the previous investigators and therefore, consistently significant results could not be attained, with criterion variables, application objective in particular.

The investigator feels sad when she realises through the related studies and findings that the mass of research undertaken until now fail disappointingly to make any firm statement about the patterns of effective teaching for different ends. She is prone to observe that attempts should genuinely be made to improve the hypotheses increasingly rather than merely proving them and that the educators display more interest in students than in statistics.

As a final note it may be observed that the teachers' task is to find out the circumstances or conditions that will continue to interest the student in learning. Well, this task involves, besides all other qualities, the intrinsic sensitivity of teachers.

5.4.0 Educational Implications of the Present Study

The conviction that our research study specially in the erstwhile neglected area of teaching and teaching-behaviour would substantially contribute to the discipline of Education led to undertake the present inquiry. From the outset, however, it has been kept in constant view that the entire study is qualitatively attuned with the national as well as the international criteria. The findings of the present study have, at the same time, very direct implications for teachers in schools, persons concerned with the in-service

education of teachers, colleges of education, text-book authors and the researchers in the field.

The qualitative improvement of Education, which is an exigency of the day, is again, attainable only through progressive techniques, better methods and effective strategies of teaching on the basis of empirical research. It is all the more an obligation of the researchers to keep people constantly abreast of the continuous research findings.

The immediate implications of the present study, in particular, for all concerned with education, are -

(i) that, the strategies identified here as significantly effective for achieving educational objectives or desired learning outcomes should be passed on to the student-teachers for their wider application,

(ii) that in the teacher education departments / colleges where the objective of the lesson-plans are patently casual and decorative, so to say, the teacher educators should be far more particular not merely for imparting skill for formulating objectives, but should also effectively demonstrate as to how to use and communicate behavioural objectives to their pupils. Incidentally, the rationale for using behavioural objectives has been discussed in chapter I.

The teacher-educators should also bear in mind, in this context, that the objectives enumerated in the lesson plan

should necessarily be followed up in the strategies of teaching,

(iii) that the identical set of objectives should be provided to the pupil so as to enable him to evaluate his own individual learning as well as the teaching, the teacher imparts. The process will invariably suggest the teacher to be indeed on guard for perfoming his teaching task, in accordance with the social-contractual imparatives of the teacher,

(iv) that the performance criteria as would be delineated in the list of behavioural objectives might, as well, be used for evaluating teacher-effectiveness both in the training colleges and schools,

(v) that different types of assignments may be framed on the basis of these behavioural objectives,

(vi) that the pupils may also be encouraged to contribute to the development of a 'Question Bank' on the basis of the prior understanding about the objectives, and

(vii) that if the approach of the present study in the domain of teaching is reasonably accepted, students' awareness of their performance criteria may forestall huge wastage in the field of education by augmenting more pupil gain. Because, this approach if competently utilised and explored, may prove to be potential for the improvement of curriculum, instructional material, and evaluation.

Incidentally, by analysing the objectives of the present curricula in Geography the investigator has arrived at the conclusion that the objectives there have, firstly, been framed in extremely general manner and secondly, the contents of the syllabus do not necessarily reflect the objectives enunciated therein. In the fitness of things, the objectives of the entire curriculum should be formulated by a group of experts at the first instance and should thereafter be presented to the teachers and the examining bodies so that proper and adequate objective-based evaluation may eventuate. This gives rise to another pre-condition that persons associated with education e.g. pupil, teachers, teacher-educators, educational planners, researchers and the like, should not merely be conversant with those objectives but should also comprehend the nature of evaluation tools appropriate for the purpose. The criteria should also be made known to the public,

(viii) that the study focuses on another component of the strategy - the discussion. The import of this is highly significant in any teaching-learning situation. Consequently, the teacher-educators should necessarily be trained to select proper units for discussion and experiment with various steps for successful learning outcomes. The present study has also a direct relevance therein,

(ix) that the student-teachers should, all the more, be trained to prepare and improvise various types of instructional materials in consonance with the need of the curriculum, content and objective, and nonetheless, to use them in appropriate situations.

The present study, in this context, provides also indications and guidelines asto how to select, utilise and variate the instructional materials to illumine the content curricula area and attain the objectives. It provides, therefore, some nucleus for the orientation of the teacher-educators,

(x) that the study establishes a very significant aspect so far as average Indian school situation is concerned; the incorporation of such strategies in a teaching-learning situation, as is not expensive and sophisticated, may also give rewarding premium and suit, therefore, comfortably well with the Indian school situation in general,

(xi) and finally, the study is expected to reasonably convince and motivate the teacher-educators to opt for and experiment with the strategies which have been found significantly effective by empirical research.
