4.0.0 INTRODUCTION

In the present study, an attempt has been made to ascertain the effects of three teaching styles on knowledge, comprehension, application and total achievement of the pupils of standard VIII in the contents of geography under planned testing condition. The rationale for taking up the study, for selecting these teaching styles and the criterion variables as mentioned above, were presented in Chapter I. The details regarding the methodology adopted for conducting this experimental study have been included in Chapter II. Analysis of data comprises Chapter III. In the present chapter results of the experiment will be discussed and interpreted. The four null hypotheses that were formulated for the study and put to test through the experiment will be examined in the next caption.
4.1.0 Hypotheses

Hypothesis I states: there will be no significant difference in the mean achievement score for knowledge when the pupils are taught by either of the three styles $S_1$, $S_2$ or $S_3$.

Results of the experiment as presented in the caption 3.3.1 show that $F$ value of 1.329 for $df_{2/93}$ is not significant at .05 level of significance. Thus, the null hypothesis stated above could not be rejected at .05 level. This implies that all the three styles of teaching ($S_1$, $S_2$ and $S_3$) have equal effects on the development of knowledge ability of the pupils. The other interpretations of this result will be given in the next caption (4.2.0) on discussion and interpretation.

Hypothesis 2 states: there will be no significant difference in the mean achievement score for comprehension when the pupils are taught by either of the styles of teaching $S_1$, $S_2$ or $S_3$.

Results of the experiment as given under the caption 3.3.2 indicate that the $F$ value of 4.61 for $df_{2/93}$ is significant at .05 level of significance. The null hypothesis as stated above was, therefore, rejected at .05 level. In this case, rejection of the null hypothesis
implies that the three styles of teaching could produce differential effects on comprehension attainment of the pupils. On inspection of the adjusted means it seems that the Style $S_1$ (Lecturing), Style $S_2$ (Questioning - response) and Style $S_3$ (Questioning - response - feedback sequence) are in the decreasing order of effectiveness as far as comprehension objective is concerned. Some of the other interpretations of this result will be presented in the next caption (4.2.0).

Hypothesis 3 states: there will be no significant difference in the mean achievement score for application when the pupils are taught by either of the styles of teaching $S_1$, $S_2$ or $S_3$.

Results of the experiment as presented in the caption 3.3.3 show that $F$ value of 1.236 for $df_{2/93}$ is not significant at .05 level of significance. The null hypothesis as mentioned above could not, therefore, be rejected at .05 level. In this case failure to reject this null hypothesis means that the three styles of teaching failed to produce any differential effect on development of application ability of the pupils. The probable reasons for this will be discussed under the caption 4.2.0 that follows.
Hypothesis 4 states: There will be no significant difference in the mean achievement score for total achievement when the pupils are taught by either of the styles of teaching $S_1$, $S_2$ or $S_3$.

Results of the experiment as given under the caption 3.3.4 indicates that the $F$ value of 1.666 for $df_{2/93}$ is not significant at .05 level of significance. Therefore, the null hypothesis as stated above could not be rejected at .05 level. This implies that the three styles of teaching did not have any differential effect on total achievement of the pupils. The other reason for rejection of the null hypothesis will be discussed in the caption 4.2.0.

4.2.0 DISCUSSION AND INTERPRETATION

From the results of the experiment (caption 3.3.1 to 3.3.4) as well as from the testing of the hypotheses (caption 4.1.0) it can be seen that the null hypotheses 1, 3 and 4 could not be rejected, only the null hypothesis 2 could be rejected. This means that the three styles of teaching which form the treatment variables of the study, had equal effect on the criterion variables of knowledge, application and total achievement of the pupils while the styles had different effects on the comprehension ability of the sample. It remains to be interpreted why this has
happened. In the following paragraphs this has been attempted.

From the results of the experiment (caption 3.3.2) as well as from the testing of the hypothesis 2 it can be seen that the three styles of teaching could produce differential effect on the criterion of comprehension. An inspection of the adjusted means will help one to pinpoint the direction of differences caused by the three teaching styles.

Adjusted mean for Style \( S_1 \) (\( \bar{Y}_{S_1} \)) = 9.894

Adjusted mean for style \( S_2 \) (\( \bar{Y}_{S_2} \)) = 9.273

Adjusted mean for style \( S_3 \) (\( \bar{Y}_{S_3} \)) = 8.940

On examining the above means it seems that the style \( S_1 \) (Lecturing), style \( S_2 \) (Question-response) and style \( S_3 \) (Questioning-response-feedback sequence) are in the decreasing order of their effectiveness in developing comprehension ability of the pupils in standard VIII geography. At first sight this finding seems to be a little paradoxical that a teaching style where the teacher presents the content through lecturing minimizing the use of questions and participation of pupils, becomes more effective in developing comprehension than other styles where the teacher makes the pupils participate in the
lesson through questioning and response as well as providing feedback. But on closer examination of the teaching-learning situation of the classroom this finding although pretty shocking, does not contradict our experience. In the average classrooms—why average—in most of the classrooms for most of the times the teacher lectures and the pupil listens and receives knowledge. The pupils are so much conditioned in this 'learning style' that any approach to teaching similar to this is naturally or habitually accepted by them, while any other new approach to teaching disturbs their learning process. In all probability this might have happened to the present experiment also. Although the teachers in geography consented not to take any class in standard VIII during the four weeks of the experiment yet in other periods every day the pupils were conditioned to lecturing. The style $S_3$ (Questioning-response-feedback sequence) in effectiveness for developing comprehension ability differs from $S_2$ (Questioning-response) only with respect to feedback provided by the teacher. This shows that feedback as a component of teaching style may have a place in the process of teaching and it may influence the learning outcome of the pupils in terms of comprehension. As the adjusted means show the element of
feedback might have acted adversely in style $S_3$. The probable reason is that the pupils were not used to this kind of reinforcers in their process of learning.

Searching for evidences in the research literature, it is found that studies which are directly related to comprehension ability and feedback, are not easily available. Sharma's (1972) study which supports the finding of the present study (effectiveness of the teaching styles with respect to comprehension objectives) has also examined the role of feedback in the teaching behaviour. Sharma (1972) found that feedback as a whole did not render any significant results in the teaching process. Fadma (1975) studying the effectiveness of teaching patterns for developing application ability found no conclusive evidence for teacher praise (as feedback) playing any role in the criterion achievement. In the present study feedback seems to have played a rather negative role in the criterion achievement. Several types of feedback were used in the experimental teaching through the style $S_3$, viz., teacher's praise, teacher acknowledging or approving pupils' ideas, repeating the pupils' responses, and integrating the pupils' ideas. It has not been possible to find (neither was it an objective of the study) which type of feedback had a role to play in influencing comprehension
of the pupils. Feedback has been studied to relate it to achievement. Teacher use of criticism forms the variables in the studies by Morsh (1966), Perkins (1968), Spaulding (1965), Harris and Serwer (1966), Soar (1966), Wallen (1st grade, 1966; 3rd grade, 1966), Anthony (1967), Cook (1967), Harris, et al. (1968), Hunter (1968), Flanders (2nd grade, 4th grade, 6th grade, 7th grade, 8th grade, 1970) and Wright and Nuthall (1970). Significant negative correlations have been reported in about half of these seventeen studies. Spaulding (1965) and Perkins (1965) found that mild criticism was positively related to achievement.

If it is considered that there is an optimum level to which the teacher use of mild criticism has a favourable influence on pupil achievement, then feedback used in style S3 does not promote achievement as it involves no criticism.

Teacher praise as an aspect of feedback was studied by quite a few people. Some got significant positive correlation between some aspect of teacher praise and a criterion measure, viz., Wallen (1st grade, 1966), Flanders (6th grade, 1970) and Wright and Nuthall (1970). Spaulding (1965) and Anthony (1967) obtained significant positive factor loading on the above aspects of teacher praise.
Significant negative correlations between praise and achievement were obtained by Wallen and Wodtke (1963). Non-significant results were obtained by Perkins (1965), Harris and Server (1966), Harris, et al. (1968), Hunter (1968), Allen (1969), Flanders (2nd grade, 4th grade, 7th grade, 9th grade, and 1970). From these studies, therefore, one does not get a clear picture whether teacher praise certainly promote pupil achievement. The present study also, among other types of feedback, used teacher praise, but it has not attempted to isolate the effect of a particular aspect of feedback. Teacher use of pupil ideas was also one of the aspects of feedback used in the present study and it has been found that adjusted mean achievement score for comprehension objective has been less in $S_3$ which includes this aspect of feedback, than $S_2$ which is without it. In respect of this aspect of feedback a positive trend was reported in the studies by Perkins (1965), Soar (1966), Flanders (2nd grade, 4th grade, 6th grade, 7th grade, 8th grade, 1970) and Wright and Nuthall (1970). But the correlations found in these studies were not significantly linear. Flanders' study (2nd grade, 1970) do not lend support to this trend. Therefore, without further conclusive research evidences one is not sure whether teacher use of pupils' ideas really promotes pupil achievement. More empirical researches
relating different aspects of feedback to pupil achievement are obviously needed. The present investigation, however, gives an inkling that probably the role of feedback in effective teaching is not at all negligible.

An interpretation of the fact that lecturing ($S_1$) got the highest adjusted mean score for comprehension objective has already been given. Only from the face value of the experimental result one need not infer that questioning is less important, in the classroom teaching-learning process. Rather it is the other way round; questioning is one of the basic skills of teaching and its imperative role in effective teaching can hardly be over-estimated. In fact, in selecting and developing the styles of teaching for the present investigation this primary importance of teacher classroom questioning behaviour was kept in view. The styles $S_2$ and $S_3$ essentially stress on questioning aspect of teaching behaviour differing only in the presence or absence of feedback component. In research literature many other studies are available, where teacher classroom questioning behaviour has been studied in relation to its effect on the criterion of pupil achievement. Many studies have been ably reported by Rosenshine (1971), where different
aspects of teacher questioning behaviour have been investigated. But very rarely it has been found that questioning and pupil achievement in terms of comprehension objective are directly related. Solomon and others (1963) have studied comprehension in history. Attainment in any subject seems to be specific rather than global and there is need to have an analytic view of pupils' attainment and find out the relationship of each component of attainment with teaching behaviour. The study of Solomon and others (1963) classified teacher-pupil questioning under six categories. The finding was that interpretative and factual questions were significantly related to factual gain (knowledge) and comprehension. This study related attainment in knowledge and comprehension to two types of questions, namely, factual and interpretative. The finding of the present study also brings out some relationship between attainment of comprehension objective and the styles of teaching behaviour. This finding has already been stated in this section. In the study of Sharma (1972) also a teaching pattern (narrow question) is effective in the attainment of knowledge and comprehension objectives. It may be pointed out here that vis-a-vis the study by Solomon and others (1969) as well as Sharma (1972) the present study took up the questioning behaviour of the teacher rather in an integrated
sense. Too narrow specification of the questioning skill seems to restrict drastically the meaningful presentation of the content. Shephardson (1972) found that teacher questioning and response behaviour (somewhat similar to the style S2 in the present study) account for a significant production of the variance in amount of student talk during teacher directed classroom discussions.

The question of pupil participation in the teaching-learning situation is inherently involved in the execution of the styles of teaching. A variable extent of pupil participation has been conceived in the selection and development of the teaching styles in the present study. As the styles have been conceived S1 (Lecturing), S2 (Question-response) and S3 (Questioning-response-feedback sequence) seem to be in an increasing order of pupil participation in the teaching-learning process. The style S1 obviously provides for a variable of no participation. The result shows that the style S1 was effective in respect of development of comprehension ability of the pupils. This renders a point against pupil participation, and again a paradoxical position crops up. In the earlier part of this section attempt has been made to resolve this paradox through examining the real classroom situation and the way the teacher teaches traditionally. The next question that
may arise is: what should be the extent of participation?

In the present study as the styles of teaching have been conceived and developed $S_3$ has the scope of pupil participation greater than $S_2$, since it includes that additional component of feedback. Searching for research evidences one finds an inconsistency among the results of such studies as Furst, 1967; Sharp, 1966; Soar, 1966; Wright and Nuthall, 1970 on the one hand using observation system and Fortune, Gage and Shutes, 1966; Solomon, Bezdek, Rosenberg, 1964; and Torrance and Parent, 1966 on the other using ratings as the measure of amount of pupil participation. In the case of studies using observation systems the correlation for student talk and pupil achievement showed non-significant results. In the case of rating studies also the results came out non-significant. The study by Torrance and Parent (1966), however, showed that the student variations of finding errors or defects in classmate's solution and pupils suggesting improved or new ways of class working were highly significant. Church (1971) commented on the pupil participation studies. He expressed doubt about the worth and use of such studies considering the variables they have dealt with.
The discussion and interpretation of the results of the present experiment would be more meaningful if these are studied to a greater depth in the light of the previous researches. In this respect it may be seen from the foregoing discussion on trends of research on teaching (caption 1.3.0) that many studies have dealt with various aspects of teaching and teacher behaviour. Three experimental studies, however, seem to be particularly relevant as far as the discussion of the present study is concerned. These are studies by Miller (1966), Sharma (1972) and Padma (1975). Before comparing the results of the present study with those obtained by Miller, Sharma and Padma let us first take note of the salient features of these studies separately.

Miller (1966) tried to analyse teaching on a responsive-directive dimension. His study attempted to determine if highly directive teaching (Method A) was accompanied by pupil reactions less educative than when the teaching tasks were discharged through teaching roles more transactional and responsive to learner cues (Method B).

Miller actually studied higher level questions by teachers accompanied by elaboration of pupils' response. Pupils' understanding which might be inferred from their comments during classroom discussion was attempted to be judged at four levels; first and second levels corresponded
to knowledge and comprehension of the present study while the third and the fourth levels were similar to application and other higher cognitive abilities like analysis and synthesis.

The general design of Miller's study involved teaching of staged lessons about American economics. One hundred seventh and eighth grade students comprised the sample which was randomly divided into two treatment groups of equal strength (group A - directive, group B - responsive). Each treatment group was further subdivided into four instructional groups of twelve or thirteen pupils each of which studied the same ten 30-minute lessons. There were four replications of treatment through four teachers each of which taught one instructional group of pupils by Method A and one by Method B. Audio-taped classroom teaching was coded and scored.

Miller did not find any significant treatment effects with respect to the criterion variables of mastery of facts (knowledge) and higher understanding which can be categorised as comprehension as well as application.

Sharma (1972) experimentally studied the relationship between patterns of teacher classroom behaviour and pupils' attainment in terms of instructional objectives of knowledge, comprehension and application. Four patterns of
teacher classroom behaviour formed the independent or treatment variables while the three instructional objectives were the criterion variables. The patterns selected by Sharma were narration, open question, narrow question, and narrow question with feedback.

Sharma's study involved four treatments (four teaching patterns) X three teachers X four replications, that is, forty-eight classroom teaching sessions. Three teachers were programmed in the four teaching patterns to teach a unit in standard VII history. Forty-eight classrooms sessions were randomly assigned to three teachers. Four hundred and sixteen boys and five hundred and fifty-seven girls of standard VII comprised the sample which represented a fairly large section of the population in terms of intelligence and pre-achievement.

It was found that the teaching pattern of narrow questions was significantly different from other patterns as far as knowledge and comprehension abilities were concerned. But the teaching patterns did not have any of differential effect on the development/application ability.

Padma (1975) also conceived four teaching patterns defining them somewhat differently from the patterns of teaching selected by Sharma (1972). She tried to find out experimentally the differential effect of these patterns on
the development of application ability of the standard VII pupils through teaching of science topics. The teaching patterns she used were: lecturing - problem solving approach; questioning - answering - problem solving approach; questioning - answering - feedback - problem solving approach, and lecturing - no problem solving approach. The measurement of application ability was done under three different conditions - surprise testing, planned testing and retention. The study included two experiments and in both the independent or treatment variables were four teaching patterns while the dependent or the criterion variable was the application ability. In one experiment a very sophisticated design like Graeco-Latin Square was employed. In order to avoid inter-teacher variability the investigator programmed herself in four teaching patterns to teach five units of physics in standard VII in a number of schools. Both under surprise testing and planned testing conditions Padma could not find any differential effect of the teaching patterns on the development of application ability; only when the pupils were tested for retention that the patterns showed some significant difference. The pattern of "questioning-answering-feedback-problem solving approach" was significantly less in effect than the other patterns which did not show
any significant variability among themselves.

The foregoing outlines of the salient features of the studies by Miller (1966), Sharma (1972) and Padma (1975) would help to bring the results of the present study to clearer relief. It has been evident that neither the present study nor the studies by Miller (1966) and Padma (1975) have found any pattern or style of teaching which significantly contributes to the development of knowledge ability, whereas Sharma (1972) has found a pattern of teaching associated with knowledge ability. When one examines the components of Miller's treatments or the components of the teaching style of the present study vis-à-vis the components of teaching patterns conceived by Sharma one gets a clue to such results. Questioning employed in the present study as also in Miller's study was of various types and as such it had hardly any special potentiality for contributing towards knowledge ability of the pupils. But in case of Sharma the teaching pattern that was found to be significant was 'narrow questions'. One can easily see that narrow questions are ideally suited to development of knowledge ability.

In respect of comprehension one can see that whereas Miller did not find any treatment significantly contributing
towards this ability, the present study as well as the study by Sharma found a pattern or a style of teaching which is more helpful to the development of comprehension. In the case of Sharma it is again the teaching pattern of narrow question that has become significant contributor and in the present study it is lecturing as the style of teaching that seems to be associated with comprehension. It is the specificity of narrow questions that seems to have facilitated the pupils' comprehension. And in the present study lecturing as a style was fully structured beforehand through lesson plans. In essence, therefore, the effect of lecturing in the present study becomes as specific in its influence and appeal as the pattern of narrow question adopted by Sharma.

As far as application is concerned the results of Miller, Sharma, Padma as well as those of the present study are consistently non-significant. Neither a style, nor any teaching pattern nor any treatment has emerged from these studies that could be associated with the development of application ability. Even Miller's high level questions did not have any differential effect on pupils' attainment and growth. It may be pointed out here that from 1970 when Sharma tried to relate teaching
pattern to instructional objectives, she could find out some pattern associated with knowledge and comprehension but no pattern for application. The thread was taken up by Padma when she could find a pattern of teaching with retention of application but not with immediate learning. The present study has been the third attempt in the same area and here also no style of teaching could be identified for application. It has already been seen that Miller's results are also similar. The main conclusion one arrives at is this that for lower order objectives like knowledge, a teaching pattern has been identified by Sharma, for comprehension a teaching style has been identified by the present study, for application Padma found out a pattern with respect to retention of application. But all these four studies taken together, have failed to identify a pattern or a style of teaching associated with application as such. Here it may be worthwhile to give a second look at the patterns and styles that have been so far tried out. These are: narration, open questions, narrow questions, narrow questions with feedback (Sharma); lecturing-problem solving approach, questioning-answering-problem solving approach, questioning-answering-feedback-problem solving approach, lecturing-no problem solving approach (Padma); lecturing, questioning and response,
questioning-response-feedback sequence (the present study); directive teaching, responsive teaching (Miller). From this list of patterns and styles it seems that some component of teaching behaviour which may yield better result in application is escaping the notice of the researchers. Is it only a question of identifying a missing component? Or is it that developing application requires sustained teaching over a large period? These are the hunches. Padma could take up students from a number of schools. Sharma's sample included students with a wide range of intelligence whereas the present study has the limitation of trying a sample in the upper range of intelligence—a truncated population. Students with higher mental abilities will develop knowledge (an objective at the lower end of the learning hierarchy) even from hearing lectures. Comprehension and application are also developed at the same time, but irrespective of the style. Perhaps the future studies should avoid this mistake of experimenting on a highly selective group in the upper intelligence bent.

What does research tell now to the teacher? If Sharma's study gives some pattern for knowledge the present study has come out with some style of teaching
for comprehension. The teachers can define and develop their styles or patterns. What does the present research tell to the future researchers? In this respect, the following are the lines of thinking that crystallise out of the foregoing discussion:

(i) To avoid the mistake of dealing with the truncated sample.

(ii) To concentrate on finding out a teaching style or pattern that contributes to development of application ability.

(iii) To have a longer duration of experiment.

(iv) To develop new styles and patterns of teaching based on research experiences and put them to test in actual classroom setting.

These findings of the study are expected to provide a positive lead both to the teachers and researchers.

4.3.0 EDUCATIONAL IMPLICATION

It is perhaps a truism to say that the business of education is carried out mainly through the process of teaching. Any meaningful piece of research in the area of teaching and teacher behaviour should, therefore, be expected to have some educational implication. The present study has its implication for the teacher
educators as well as the researchers in the area of teaching.

Teacher education programmes in this country are in a process of change. Attempts are being made to reshape the entire teacher education programme on the basis of findings of empirical research in the area of teaching and teacher behaviour in the classroom. In this respect the present study can provide some valid evidences as to how a classroom teacher has to be prepared through training programmes. The immediate implication of the present study is that teacher education programmes should concentrate on developing such styles of teaching in student teachers as would contribute to the comprehension abilities of the pupils. Development of these styles of teaching in the student teachers will include thorough training in classroom questioning techniques as well as the techniques of providing feedback to the pupils. Through questioning, response and feedback the pupils get more and more involved in the teaching-learning process. Pupil participation is likely to increase by application of this teaching style and the pupils' ability for comprehension is likely to develop. This is precisely what the present study has to offer to the teacher educators. Teacher education institutions
training programmes. This innovative approach to teaching may go a long way to help the teacher educators to re-think, renovate and revitalise the programme of educating the teachers. Here one cannot do without striking a note of caution. The style of teaching that is being suggested for trying out by the teacher educators is not something like a finished product. It remains to be improved, enriched or even rejected on the basis of research findings. Here lies the implication of the study for the researchers. Every research study raises more issues than it proposes to solve. It has been found that in this study application ability is still eluding the grip of researchers in this area. Which teaching behaviours actually contributes to development of application is a challenging issue which the researchers in the area may concentrate on. Developing and experimenting on still newer styles of teaching and putting them to test in actual classroom setting is by far the most urgent implication of this study for the researchers in the area.