C H A P T E R III

PROCEDURE

The present chapter includes a brief outline related to the method and procedure followed in the study. The detailed steps of designing the study in terms of treatment variables, criterion variables, programming of teachers according to the conditions of the treatment variables, selection of the teaching units, preparation of lesson plans, sample, tools for measuring treatment and criterion variables and the plan of analysis are given in the following captions.

3.00 DESIGN OF THE STUDY

The study employed one way analysis of covariance experimental design with four replications in each treatment condition. The four treatment variables, namely, four patterns of teacher classroom behaviour (i) narration, (ii) open questions, (iii) narrow questions, and (iv) narrow questions with feedback employed through three teachers, would normally result into twelve experimental conditions. But the teacher variables in terms of age, sex, qualifications and experience were kept constant, thus resulting into above mentioned four experimental treatments. Twelve different classes were taught under

each of the treatments. This resulted into 4 (treatments) x 3 (teachers) x 4 (replications) that is fortyeight classroom teaching sessions. Each teaching session was planned to be conducted in an independent classroom, thereby resulting into fortyeight different classroom units. The tabular form of the design for global presentation is given below in Table 3.1.

TABLE 3.1

DESIGN OF THE STUDY

Patterns → / Teachers ↓	P_1	P_2	P_3	P_4
T_1	C_1	C_{13}	C_{25}	C_{37}
	C_2	C_{14}	C_{26}	C_{38}
	C_3	C_{15}	C_{27}	C_{39}
	C_4	C_{16}	C_{28}	C_{40}
T_2	C_5	C_{17}	C_{29}	C_{41}
	C_6	C_{18}	C_{30}	C_{42}
	C_7	C_{19}	C_{31}	C_{43}
	C_8	C_{20}	C_{32}	C_{44}
T_3	C_9	C_{21}	C_{33}	C_{45}
	C_{10}	C_{22}	C_{34}	C_{46}
	C_{11}	C_{23}	C_{35}	C_{47}
	C_{12}	C_{24}	C_{36}	C_{48}

Note: T_1, T_2 and T_3 designate three teachers involved in the study and C_1.....C_{48}, fortyeight classes of VII grade.

The details of treatments and criterion variables as well as the control of intervening variables are given below.

3.10 VARIABLES - TREATMENT AND CRITERION

The four patterns of teacher classroom behaviour, as mentioned in caption 3.00 served as the treatment variables for the present study. The details about the selection and nature have already been given in caption 2.10.

The criterion variables in the present study relate to the measures of pupils' attainment in terms of three selected instructional objectives. The details of the objectives have been given in caption 2.20.

3.20 INTERVENING VARIABLES

The design of this study is likely to allow two types of intervening variables - teachers' and pupils'. As mentioned in caption 3.00, the age, sex, experience and qualifications of the teachers were kept similar to rule out the effect of these intervening variables. As far as intervening variables relating to pupils' are concerned, intelligence and pre-achievement of pupils in the subject of history were considered to be intervening variables. These were statistically controlled through the use of analysis of covariance as shall be discussed in

caption 3.90.

3.30 SELECTION OF TEACHERS

Since the teachers were the only agents to provide treatment in the classroom units, selection and specially the training of teachers was important. In order to control the influence of inter-teacher variations, it was planned to have minimum number of teachers having maximum homogeneity in relation to some important related teacher variables. Since it was not possible to conduct such an extensive study with the help of one teacher alone which could have controlled otherwise the inter-teacher variations, a compromise was made to extend the number of teachers to three. Though the review of studies dealing with characteristics of teachers by Howsam (1960), and Fattu (1962) has shown professional knowledge to be a good predictor of teacher effectiveness, it was decided to select the three teachers of the same sex, similar age, experience, qualifications and recency of training, Baroda studies by Buch and Quraishi (1970) and Santhanam (1972) have shown these variables to be important in shaping teacher behaviour.

In order to choose three teachers, the investigator contacted thirty teachers of both the sexes. These teachers were orally explained the purpose and design of the study and their cooperation was sought. Out of this

pool of thirty teachers, twenty teachers showed a willingness to participate in the experiment. Finally three female teachers were selected.

These three female teachers belonged to the age group of 22-24 years, all were trained graduates and had no other teaching experience except for the teaching practice as a part of training programme prior to this experiment. All of them got their professional degrees two years before this experiment and had recently taken up jobs as teachers.

Before the programme and procedure of training may be explained, it seems desirable to explain the selection of content and preparation of lesson plans which were used for the training of selected teachers.

3.40 CONTENT OF LESSONS

A pilot study with two experienced teachers instructing pupils of seventh grade on 'Coming of Aryans to India', a unit in history selected for the experiment, was conducted. It helped in determining the content and sequence of lessons as well as in the preparation of instructional material. These two teachers were first briefed about the three instructional objectives, namely, knowledge, comprehension and application, and four patterns of teacher classroom behaviour (details about

patterns and objectives in captions 2.10 and 2.20). The unit on Aryans was taken from the course content of VIII grade. It has been assumed that this topic is new to all the pupils of VII grade. The two teachers were given this unit content (content of the unit given in Appendix 3.1). They were asked to plan their lessonsin such a way as to cover all the three above mentioned objectives through 'narration' only (as described in caption 2.10). Their teaching was tape-recorded and later on transcripts were prepared. The time required to cover the content was noted. These transcripts were further scrutinised by a committee of five experts, including the two teachers who taught in the pilot study, to see that the three selected instructional objectives have been taken care of in the teaching. After necessary modifications, these transcripts were again handed over to these two teachers. They were asked to prepare open and narrow questions to help develop the three objectives in place of pure narration (details of questions given in caption 2.10). These questions were incorporated in the transcript of teaching through narration in accordance with the treatment variables. The two teachers were again taken to different classrooms to give four lesson each for the four patterns. It helped to see the working of these four behaviour patterns in actual classroom situations. They took fiftyfive to sixty minutes to complete the unit through one pattern. Hence, the

time for teaching through treatment variables was fixed to be within fiftyfive to sixty minutes, distributed over two class periods. Thus, the content and the lesson plans using four patterns of teacher classroom behaviour were prepared.

A sample of lesson plan has been given in Appendix 3.2. In order to understand the use of this lesson plan for the four patterns, a few lines given below will help the reader:

(i) For 'narration' pattern, the whole lesson plan is to be used as it is ignoring the questions.

(ii) For patterns II, III and IV (open questions, narrow questions and narrow questions with feedback), the red signs (*) indicate the incorporation of open questions, listed separately and blue signs (*) indicate the incorporation of narrow question. The method of feedback and teacher response has already been explained in caption 2.10. The excerpts from different patterns as given in caption 2.10 will further help to understand the working of the lesson plans for different patterns.

After preparing the content and lesson plans, the next step was to train the selected three teachers for producing these four patterns in the classrooms.

3.50 PROGRAMME OF TRAINING TEACHERS

The three teachers (see caption 3.30) selected to apply the treatments were first oriented to the four patterns of teacher behaviour. They were explained the meaning of each pattern in terms of their behaviour and also in terms of expected pupil behaviour. The differences between the four treatments were explained in terms of their solicitation and responding behaviour as well as the way to deal with pupil response behaviour. They were given one week's time to go through the content and prepare themselves for teaching. The patterns were also explained to them in terms of FIACS presentations as explained in caption 2.10.

They were taken to actual classroom situations for practice in producing the treatment behaviours. 'Teach-Discussion-Reteach' pattern was followed for training these teachers. When a teacher was teaching through a particular pattern, the other two teachers and the investigator observed that teacher. At the end of one period of teaching, discussion for half an hour was held within this group of four to find out the deviations from the plan or other difficulties felt by the teacher. The

reteach session for that teacher was to be held on the next day. They were asked to stick to the fixed time limit for the completion of unit. In this way, they were given practice for all the four patterns. The programme of training is given in Table 3.2 below.

TABLE 3.2

THE PROGRAMME OF TRAINING

Time → / days ↓	7-30 to 9-00 a.m.	9-30 to 11-00 a.m.	11-30 a.m. to 1.00 p.m.
First day	T_1P_1	T_2P_1	T_3P_1
Second day	T_3P_1	T_1P_1	T_2P_1
Third day	T_2P_1	T_3P_1	T_1P_1
Fourth day	T_1P_2	T_2P_2	T_3P_2
Fifth day	T_3P_2	T_1P_2	T_2P_2
Sixth day	T_2P_2	T_3P_2	T_1P_2
Seventh day	T_1P_3	T_2P_3	T_3P_3
Eighth day	T_3P_3	T_1P_3	T_2P_3
Ninth day	T_2P_3	T_3P_3	T_1P_3
Tenth day	T_1P_4	T_2P_4	T_3P_4
Eleventh day	T_3P_4	T_1P_4	T_2P_4
Twelfth day	T_2P_4	T_3P_4	T_1P_4

Note: T_1, T_2 and T_3 designates three teachers and P_1, P_2, P_3 and P_4 designates the four patterns, namely, (i) narration; (ii) open questions, (iii) narrow questions, and (iv) narrow questions with feedback respectively.

The total programme of training extended over a period of twelve days and about fiftytwo hours.

After training and before starting the actual experiment according to the design (see Table 3.1) these three teachers were asked to teach in classes other than those covered for training purposes or to be included in the experiment. It required twelve classes of VII grade. These classes were taken from Municipal Corporation schools of Baroda city. Each teacher taught for sixty minutes in four classes - one class per pattern for further validation of the training according to the patterns. FIACS Matrices were prepared for these twelve 'sixty minutes' teaching period. They were compared for each pattern *f* per teacher in terms of sequence of behaviour and time devoted to teacher talk, pupil participation, and feedback given. The sample matrices are given in Appendix 3.3, along with the calculated ratios. Time-line displays of the four patterns showing the sequence of behaviour are also given in the same Appendix.

3.60 SAMPLE

As explained in the design of the study (caption 3.00), the experiment necessitates fortyeight independent classrooms for data collection.

It has already been mentioned that only three

teachers (T_1,T_2 and T_3) have been involved in the present study but pupil sample has been drawn from fortyeight classes (Table 3.1). This sample has been drawn from the VII grade classes of Municipal Corporation schools of Baroda city. The medium of instruction in all these classes is the regional language - Gujarati. The Municipal Corporation schools of Baroda can be divided into three categories on the basis of class composition - sex-wise, namely, girls' schools, boys' schools and co-educational schools.

The sample for the present study is limited to only boys' and girls' classes, co-educational classes have been exempted because of small number of pupils in such classes. There are about seventyfive classes for boys and girls. Out of these twelve classes have already been covered for checking the validity of the training (caption 3.60). The selection was done at random out of the remaining classes. For the final experiment fortyeight classes were taken up. No deliberate attempt was made to equate the number of classes for boys and girls. These classes were further assigned at random to three teachers for teaching through four patterns. Table 3.3 gives in tabular form the assignment of classes patternwise and sexwise to all the three teachers, along with the number of pupils in each class which were taken up for analysis purpose. The pupils who were not present for the entire period of data collection were dropped from analysis of the data.

TABLE 3.3

STATEMENT OF THE SAMPLE ACCORDING TO THE DESIGN OF THE STUDY

	T_1		T_2		T_3	
	B	G	B	G	B	G
P_1	15	-	-	18	22	-
	14	-	-	18	-	21
	19	-	19	-	-	23
	-	17	-	14	-	39
P_2	19	-	16	-	-	23
	-	23	23	-	-	12
	21	-	-	23	-	16
	10	-	-	24	-	25
P_3	-	30	12	-	10	-
	-	32	25	-	14	-
	18	-	-	34	-	14
	23	-	15	-	-	19
P_4	19	-	18	-	-	21
	22	-	26	-	-	11
	23	-	-	25	-	22
	-	35	13	-	-	18

The total sample of 973 as covered by the study consisted of 416 boys and 557 girls.

3.70 INSTRUMENTATION

Prior to describing the process of actual data collection it is desirable to give the reference of the tools used. The study involved the use of four tools,namely,

(i) Flanders' Interaction Analysis Category System,

(ii) Desai-Bhatt Group Test of Intelligence,

(iii) Pre-test of achievement in History for VII grade,and

(iv) Post-treatment test of achievement in History for the selected unit. The details are given below:

3.71 The Flanders' Interaction Analysis Category System (FIACS)

FIACS was used for training the teachers to produce the selected patterns of teacher classroom behaviour (see caption 3.50). The details about the system have been given in Appendix 1.1.

3.72 The Desai-Bhatt Group Test of Intelligence

This is a verbal group test of intelligence developed by Desai and Bhatt. It is applicable to the pupils between the age range of 12 to 18 years. It consists of 10 sample items and 100 test items. Items are scored with the help of one and zero principle. The reliability coefficients for the test range between .84 to .93 when calculated by the methods of split-half, test-retest and Kuder-Richardson formula. The criterion validity of the

test ranges between .72 to .88 established against a verbal test (Desai Group Test), verbal and non-verbal test (Bhatt-Group Test) and non-verbal test (Bhavsar Group Test).

3.73 The Pre-Test of Achievement in History for VII Grade

The test for the purpose of assessing the initial assessment of the pupils in the subject of History has been taken from the standardized test constructed by Jhaveri (1970). The test has been standardized on the VII Grade pupils of Municipal Corporation schools of Baroda city. Originally, the test consists of 100 items. As at the time of the experiment, the schools had not covered the whole curriculum, it was deemed futile to use the whole test. So only those items which pertained to the part of the curriculum covered by the selected schools for study, were selected and printed for the purpose. The scoring system is based on the principle of one or zero. The test used for the experiment purpose comprises 26 items. The split-half reliability for the adopted form is .89 . The copy of the test used is given in Appendix 3.4.

3.74 The Post-Treatment Achievement Test

On the basis of instructional objectives as selected for teaching (caption 2.20), a post-treatment achievement test was constructed to measure the attainment of the

pupils in terms of the three objectives (Knowledge, comprehension and application).

A panel consisting of the experienced teacher educators in history and school teachers teaching history was approached to assign weightage to these three objectives. Table 3.4 shows the weightage fixed for the three objectives.

TABLE 3.4

WEIGHTAGE ASSIGNED TO DIFFERENT OBJECTIVES BY THE PANEL

Objectives	Members of the Panel					Mean %
	1	2	3	4	5	
Knowledge	47	54	62	47	50	52
Comprehension	35	30	27	35	38	33
Application	18	16	11	18	12	15
Total	100	100	100	100	100	100

On the basis of the weightage assigned to the objectives as mentioned in the above table, 50 multiple choice items were initially constructed for the purpose. They were scrutinised by the panel for language and content and finally only 33 items were retained according to the weightage assigned. The split-half reliability of this test was found to be .92 . According to Thorndike and Hagen (1961) a test may be shown to have validity for a particular

school or a particular curriculum in so far as the tasks that it presents to the examinee corresponds to and represents the objectives accepted in that school or curriculum. They have referred to it as content validity. In the case of post-treatment achievement test, the content validity has been established as the weightage assigned to different instructional objectives and corresponding items in the test is same. Table 3.5 shows the distribution of items in the final test for each instructional objective.

TABLE 3.5

DISTRIBUTION OF THE ITEMS IN THE FINAL FORM OF POST-TREATMENT ACHIEVEMENT TEST

Objectives	Items	Total	Percentage distribution
Knowledge	2 to 11 and 27 to 33	17	51.52
Comprehension	1 and 12 to 21	11	33.33
Application	22 to 26	5	15.15
Total		33	100.00

The final test comprises 33 items and normally requires twenty minutes. No rigid time limit has been fixed for the test. The sample of test is given in Appendix 3.5.

3.80 DATA COLLECTION

After the preparation and collection of the

necessary tools for pre-treatment and post-treatment testing and specifying the treatment conditions as mentioned in the foregoing presentation, the data were collected from the selected 48 VII grade classes in accordance with the design given in Table 3.1. The programme of data collection is given in Table 3.6.

3.90 STATISTICAL TECHNIQUES USED

Different statistical techniques were employed for analysing the data to test the hypotheses (caption 2.40). Justification and other details of the techniques will be given at the place of their use wherever necessary. Only a brief summary of the various techniques used has been given below.

3.91 FIACS Matrices and Time-Line Display of Patterns

FIACS matrices were prepared for proving the validity of the treatment patterns for the difference amongst the patterns and similarity between each pattern across the three teachers. Time-line displays of all the four patterns were also prepared to show the sequencing of behaviours in the patterns (see Appendix 3.3).

3.92 Descriptive Statistics in Terms of Central Tendency and Dispersion

Simple statistics like mean, median, standard

TABLE 3.6

PROGRAMME OF DATA COLLECTION

	7.25 to 7.55	8.00 to 8.30	8.55 to 9.25	10.00 to 10.35	11.05 to 11.35	11.45 to 12.15	12.40 to 1.10	1.15 to 1.45	2.25 to 2.55	3.30 to 4.00	4.00 to 4.30	4.30 to 5.00
9th March to 11th March	P_1T_1	P_2T_2	P_1T_1	P_2T_2	P_1T_1	P_3T_3	P_2T_2	P_3T_3	P_2T_2	P_3T_3	P_1T_1	P_3T_3
	7.25 to 7.55	7.55 to 8.25	8.55 to 9.30	10.00 to 10.35	10.45 to 11.15	12.40 to 1.10	1.15 to 1.45	1.55 to 2.25	3.30 to 4.00	4.00 to 4.30	4.35 to 5.05	5.10 to 5.40
13th March to 15th March	P_3T_2	P_4T_3	P_3T_2	P_4T_3	P_3T_2	P_2T_1	P_4T_3	P_2T_1	P_4T_3	P_2T_1	P_3T_2	P_2T_1
	7.25 to 7.55	7.55 to 8.25	8.30 to 9.00	9.10 to 9.40	10.00 to 10.30	10.35 to 11.10	12.40 to 1.15	1.25 to 1.55	2.10 to 2.40	2.45 to 3.15	3.20 to 3.50	4.00 to 4.30
16th March to 18th March	P_4T_2	P_1T_3	P_4T_2	P_1T_3	P_4T_2	P_3T_1	P_1T_3	P_3T_1	P_1T_3	P_3T_1	P_4T_2	P_3T_1
	7.25 to 7.55	7.55 to 8.25	8.30 to 8.55	9.00 to 9.30	10.10 to 10.40	12.40 to 1.10	1.15 to 1.45	1.55 to 2.30	2.40 to 3.10	3.30 to 4.00	4.10 to 4.40	4.45 to 5.15
20th March to 22nd March	P_2T_3	P_1T_2	P_2T_3	P_1T_2	P_2T_3	P_4T_1	P_1T_2	P_4T_1	P_1T_2	P_4T_1	P_2T_3	P_4T_1

Note: P_1,P_2, P_3,P_4 designates the patterns of teaching T_1,T_2, T_3 the teachers teaching the patterns.

deviation, standard error of mean and standard error of standard deviation were worked out for the total sample (N = 973) and sample under sub-groups, namely, Pattern I (N = 230), Pattern II (N = 235), Pattern III (N = 246) and Pattern IV (N = 253). These statistics were applied for describing the independent variables, namely, intelligence and pre-achievement scores as well as for the criterion variables, such as total attainment, knowledge, comprehension and application scores. These were worked out from the ungrouped data with the help of programmes available for IBM 1620 computers. The ungrouped data were further grouped into frequency distribution for the two independent and four criterion variables as well as for all the four subgroups (Pattern I, Pattern II, Pattern III and Pattern IV) and the total sample (N = 973). P_{73} and P_{27} were worked out to divide the groups into high intelligent, average intelligent and low intelligent as well as into high achievers, average achievers and low achievers. This was done in order to apply the analysis of variance and analysis of covariance.

3.93 Product-Moment Correlations

Product-moment correlations were also studied to see the inter-relationship amongst intervening and criterion variables, eventhough it was not 'must' according to the objectives and design of the study. This treatment was mostly governed by the need to see the relationships within the

criterion measures.

3.94 Analysis of Variance and Covariance

In order to test whether the variables of intelligence and pre-achievement have significant effect upon the criterion variables (pupils' attainment - total, knowledge, comprehension and application scores), three-way analysis of variance was applied. This three-way factorial design (3 x 3 x 4) of analysis of variance was employed to study the effect of intelligence (varied at three levels - high, average and low) and pre-achievement (varied at three levels - high, average and low) and treatment variables (varied at four levels - Pattern I, Pattern II, Pattern III and Pattern IV) upon the criterion measures. This design was applied four times in order to test the effect of three variables, namely, intelligence, pre-achievement and patterns upon the four criteria measures, namely, total scores, scores for knowledge, comprehension and application. To test one of the basic assumptions of analysis of variance, Bartlett Test of Homogeneity was applied to test the equal variance hypothesis for the sub-tests of three-way analysis of variance. Based upon the results of the three-way analysis of variance, it was decided to control the effect of two intervening variables, namely, intelligence and pre-achievement. This was statistically controlled with the help of one-way analysis of covariance applied eight times

to cover the variables of intelligence and pre-achievement and four criterion measures. It would have been ideal to employ two-way analysis of covariance where the effect of both the intervencing variables could be simultaneously analysed for the criterion measures. But on account of the non-availability of any computer programmes, this procedure was not followed. Nevertheless, it is emphasised here that the effect of intervening variables was statistically controlled.

3.95 Significance of Difference between Means and Standard Deviations

The techniques of analysis of variance and co-variance have helped to see the effect of intervening variables upon criterion variables as well as to see the effect of treatment variables upon the adjusted criterion measures. Such techniques could only globally tell whether the effects are significant or not. In order to see the specific effects and to pin-point these, the technique of significance of differences between means and S.D.'s were employed.

The results of the study are reported in the next chapter.