

CHAPTER III

THE PROBLEM AND PROCEDURE

III.1 THE PROBLEM

In the previous chapter the research studies related to the present problem conducted in India and abroad were discussed. This chapter deals with the problem and the methodology of research adopted in the present investigation. To be specific the items discussed here will be : (i) the problem, (ii) definition of terms, (iii) hypothesizing, (iv) objectives of the study, (v) sample, (vi) the instrument of research - its development and validation, (vii) data collection, and (viii) procedure for the analysis of data.

The task of improving classroom teaching is an urgent need of the present times. It is assumed that the purpose of teaching is to promote learning. Learning is significantly influenced by the teachers and their classroom behaviours. Hence, relationship between the behaviour of teachers and that of his pupils is the central concern. If the effectiveness of a teacher is to be evaluated, it can be measured by measuring the impact of teachers behaviour on the development of pupils. Interaction analysis is the recently developed approach to study the teaching process. This technique helps to identify and observe certain teaching

activities like teachers use of ideas and opinions of pupils in their own statements, lecturing, questioning, responding etc., and to study their relationship with other variables as students' achievement, motivation, training, experience and the like. Research efforts have been made in this direction. Pareek and Rao (1970), Buch and Santhanam (1970), Santhanam (1972), Sharma (1972), Padma (1975), Shaida (1975), Roy (1976) and several other studies which have been discussed in chapter II in details. An examination of these investigations indicates, that, these investigations have studied teaching as a global act, and studied its several aspects of which it is constituted. Hence, these studies do not throw light on a particular aspect of teaching in detailed manner. But, if one wants to organise instructional activities in the classroom effectively, he should have the detailed knowledge about each activity. Gage (1963) also suggested that investigators in the area of teaching and teacher behaviour should focus upon specific aspects of teacher's task rather than all parts of teaching at a time.

Keeping in mind the above point of view, the investigator has decided to take up a problem which would focus upon a single aspect of teaching. The aspect selected for this purpose is classroom questioning. It is chosen because, it is an important aspect of the teaching - learning process as

it guarantees the overt involvement of the students in the teaching-learning process. The involvement of the students makes the classroom interaction more productive for learning. If the different kinds of questions are used appropriately they can achieve different pre-specified instructional objectives. (Francis 1968, Francis 1970, Smith 1975, Adams 1975, Marlino 1976, Sharma 1972, Roy 1976 and Chakraborty 1978 which have been discussed in details in Chapter II). Now the crucial problem for research is to investigate whether teachers use different kinds of questions in the classroom teaching and what is the extent to which each kind of question is used.

Another significant issue which is indicated by researches in the area of classroom questioning is, that, the teachers in the classroom mostly use memory type of questions which require students only to recall the previously given information. (Stevens 1912, Gallagher 1965, Tinsley 1967, Floyd 1960, Johan 1970, Adams 1964, Brannen 1974, Thakor 1973, Kaul 1975, Kumar 1976). But, efforts have not been made to find out the reasons why teachers mostly use memory type of questions. It would require researches to investigate into the factors which may be associated with the questioning behaviour of teachers in the classroom. It is difficult to decide and list out all the factors which may be associated with the questioning behaviour of teachers in the absence of research evidence. But,

to begin with such investigations one may hypothesize that some of the factors which seem to influence the questioning behaviour may be age, sex, academic qualifications, professional qualifications, subjects, experience, existing examination system etc. But, considering questioning as a cognitive activity the subjects being taught by the teacher, professional qualifications and teaching experience have been selected for the present problem. Their association has been studied with the questioning behaviour of teachers.

In addition to the above, one finds that in the classroom situation event of the moment influences what is to follow and, in turn, is influenced by what preceded. Therefore, the crucial issue for research in classroom questioning is to investigate into the preceding and succeeding events of different kinds of questions. The knowledge generated through this sort of investigations would enable the classroom teacher to use different kinds of questions to generate desired behaviours in the teaching-learning process.

Considering the above problems in the area of classroom questioning, the investigator has taken up the present investigation for research which intends to provide answers to the following questions : (i) Does the questioning behaviour of the teachers differ with respect to the subjects, training and experience ? What kinds of questions are used by the

teachers in the classroom and what is the extent of different kinds of questions in the total questioning ? Which behaviours precede and succeed the different kinds of questions ? And, what is the relationship of different kinds of questions with students' response and initiation ? Keeping in mind these questions the problem for the present investigation is stated as follows :

AN INVESTIGATION INTO THE QUESTIONING PATTERNS OF THE
SOCIAL STUDIES AND SCIENCE TEACHERS IN THE ENGLISH
MEDIUM SCHOOLS

III.2 DEFINITION OF TERMS

Certain terms are used in this study, hence it is necessary to define them. The present investigation is based on the modified version of Flanders Interaction Analysis Category System. Therefore, some of the terms are represented as they have been defined by Flanders (1970).

III.2.1 Interaction Analysis

Interaction analysis is nothing more than an observational technique which can be used to obtain a fairly reliable record of spontaneous verbal responses. Much of teachers' influence is exerted by verbal statements. Interaction analysis does not refer to one system but to many systems for codifying spontaneous verbal communications. The analysis of interaction helps to study patterns of teaching and learning. (Flanders 1970).

III.2.2 Teaching Behaviour

If one observes a real classroom situation, one will find that there are two different sets of activities involved

in the situation. One set of activities is exhibited by the teacher himself. These are : teacher asking questions, listening, confirming, clarifying, preprimanding, showing something to pupils, observing their efforts and so on. These activities of the teacher in the classroom have been recognised by Smith and Meux (1970) as teacher behaviour. During the teaching-learning process another set of activities is exhibited by the pupils. These may include : asking questions, responding, observing an experiment and the like. These are pupil behaviours.

Teaching behaviour, by implication, includes all the activities exhibited in the total teaching learning situation in the classroom. From the examination of definitions of teaching which have been defined earlier (caption I.2) it is clear that teaching behaviour will include both teacher behaviours and pupil behaviours in the classroom situation, and will imply both verbal and non-verbal behaviours of the teachers and the pupils. It may be pointed out here that there are certain behaviours on the part of the teacher as well as the pupils which have hardly any bearing on the goal achieving aspect of teaching. Examples of such behaviours are : teacher scratching his head while talking, student blinking eyes while responding, etc. These are mostly unavoidable mannerisms of normal psychosomatic origin, and may be safely omitted from the purview of teaching behaviour. Teaching behaviour, thus, stands specified as the total set of teacher and pupil behaviours occurring in the classroom situation which generates learning.

Thus, from the above description of teaching behaviour, it can be classified into two categories :

- (1) Teacher behaviour, and
- (2) Pupil behaviour.

Teacher Behaviour : Teacher behaviour includes the activities done by the teacher in the classroom to stimulate certain responses from the pupils which result in learning on their part. These activities are specifically, accepting feelings, praising, accepting ideas, asking questions, lecturing, giving directions and criticizing and justifying authority, etc. The teacher behaviour also is divided into two categories : (a) Direct teacher behaviour, and (b) Indirect teacher behaviour.

(a) Direct Teacher Behaviour : The behaviour of the teacher which constraints the involvement of students in teaching-learning process is termed as direct teacher behaviour. The specific activities included in this behaviour are, lecture, giving directions and criticizing and justifying authority. The teachers who used this type of behaviour relatively more are called 'direct teachers'.

(b) Indirect Teacher Behaviour : The behaviour of the teacher which increases the involvement of students in teaching-learning process is termed as indirect behaviour. The specific activities included in this type of behaviour

are accepting feelings, praise and encouragement, accepting ideas and questions. The teachers who use this type of behaviour relatively more are called indirect teachers.

Pupil Behaviour : Pupil behaviour includes the activities exhibited by the pupils in the classroom. These activities are : listening, asking a question, responding and so on.

As discussed earlier teaching behaviour is an integration of a number of activities or behaviours where questioning is one of the most important behaviours among them. This is discussed subsequently.

III.2.3 Questioning Behaviour

To define questioning behaviour it would be better if one understands the meaning of questioning first. Questioning is an act of indicating or implying a question; it is an act of asking a question. In fact, in the present study, questioning means, 'an act of indicating or implying a question or a problem which could be put forward in a classroom situation.' To avoid confusion, it is necessary to mention here that to eject the need for frequent repetition of certain terms, the word question is used to refer to any intellectual exercise calling for a response; this would include both questions and problems.

Questioning behaviour refers to an ability of a teacher to indicate or imply different kinds of questions in order to

promote different levels of thinking. In other words it is an ability of a teacher to ask different kinds of questions to suit different situations accordingly. In specific terms these different kinds of questions are memory, translation, interpretation, application, higher order and routine types. The higher order questions include those of analysis, synthesis and evaluation types. The questions mentioned above would have corresponding abilities to be developed, therefore, the kinds of questions asked in the classroom would be the indication of his questioning behaviour.

There is another term used in the study, viz., the 'Teacher Question Ratio' (T.Q.R.) which also needs to be defined at this stage.

III.2.4 Teacher Question Ratio (T.Q.R.)

This ratio, as the nomenclature indicates, points to the tendency of the teacher, to ask questions during the more content oriented part of the class discussion. In the more content oriented part mostly teachers provide information to the students regarding the different concepts. While providing information the teachers would be lecturing and asking questions to make sure that the students are developing the concepts. In this total questioning and lecturing, the percentage of questions has been termed as 'teacher question ratio'.

After discussing the problem and defining the terms used in the present study, it is essential to state the hypotheses. In fact, it is hypothesis which makes the problem clear. Alongwith the clarity of the problem, it provides direction for the investigation and thereby makes it more specific. In order to serve this purpose, a hypothesis should have a valid ground on which it is based. Its bases could be the personal experiences, logical reasoning and related literature. Indeed, the hypothesis is the result of a process, viz., hypothesizing. Therefore, for any scientific investigation, it is essential to state the hypothesis alongwith its process. For the present investigation, the hypotheses are stated alongwith their process in the subsequent section.

III.3 HYPOTHESIZING

One of the variables assumed to be associated with the questioning behaviour of teachers is the subject. When one thinks about the association of subjects with questioning, it appears that questions are equally important for all the subjects whether it is humanities, science or social studies. In fact it may be possible to use different kinds of questions in humanities, science as well as in social studies. Even our common experience tells that during the training period of the teachers, the questioning technique is emphasised in all the subjects. Perhaps it is a general skill needed for all the

subjects. Therefore, it may be logical to state that the questioning behaviour of the social studies teachers and science teachers may not differ. Looking into the research studies related to questioning in different subjects one finds that the study conducted by Kaul (1975), revealed that science and humanities teachers differed significantly in their questioning behaviour. Whereas another study conducted by Kumar (1976), revealed that the social studies teachers did not differ in their questioning behaviour from humanities teachers. Anne (1977), found that the questions of the teachers differed in two content categories, viz., physical world, and human actions and intentions, but, there were no significant differences in the three content categories, viz., reality and history, rules and usage, and calculations. The findings of these studies reveal the contradictions about the association of questioning with subjects. Indeed there is no clear direction about the association of questioning with subjects so far as empirical evidence is concerned. Considering the logical and empirical evidence the first hypothesis regarding the association of questioning with subjects could be in the null form, which is stated as follows :

- H₁ - 'There is no significant difference in the questioning behaviour of social studies and science teachers.'

Another variable, which is assumed to be associated with the questioning behaviour of teachers is training. It is our

common experience that in all the teacher training institutions questioning is considered to be a very important skill of teaching. Teachers are trained in the use of questions. During the training period they have several occasions to prepare and use questions. These experiences may develop in a trained teacher the ability of preparing and using the questioning during the course of instruction in the classroom. Thus a teacher who has gone through these experiences may be better in questioning than a teacher who has not gone through such experiences. Looking into the research evidence one finds that, this reasoning is supported by several studies. (Thakor 1973, Kaul 1975, Kumar 1976, Amidon and Powell 1966, Moskowitz 1967, Zahn 1967, Simon and others 1966, Lohman, Hough and Obser 1967, Hanny 1967, Davidson 1968, Wright, Nuthall and Lawrence 1969, Helcomb 1970, Pareek and Rao 1971, Nath 1971, Jangira 1972, Lulla 1973 and Rajiwala 1975). The details of these studies are discussed in chapter II. On the basis of the above research evidence and the reasoning given earlier, one can say that training will have some positive impact on questioning. Keeping in mind this point of view, the second hypothesis is formulated in the directional form. This is stated as follows :

- H 2 - 'The trained teachers will use questioning to a greater extent than untrained teachers.'

The third variable, which is assumed to be associated

with questioning behaviour is experience. It is obvious that when a teacher is in the teaching profession he gets several opportunities to prepare questions and use them in the classroom teaching. If one uses this opportunity certainly his questioning may get facilitated. But, our common experience tells that in Indian classrooms teachers have not yet developed the habit of using questioning for instructional purposes, although a few teachers do that. It is also seen that when a teacher enters into the profession and remains in the system for several years, becomes rigid in his teaching methods. Looking into the research evidence one finds that the study conducted by Santhanam (1972) revealed that more experienced teachers created indirect influence in the classroom. But, the study conducted by Malhotra (1976) revealed that teachers with low teaching experience were more indirect in their classroom behaviour than teachers with high teaching experience. Moreover, both Howsain (1960) and Fattu (1962) observed that none of the teachers' characteristics like age, sex, marital status, intelligence, experience, cultural background, scores on aptitude test, job interest, voice quality and special aptitudes have any links with the teacher effectiveness. Considering the reasoning, common experience and research evidence available, it would be worthwhile to state hypothesis related to experience in the null form. It is stated as follows :

- H 3 - 'There is no significant difference in the questioning behaviour of the teachers having experience upto 5 years and the teachers having experience above 10 years.'

After hypothesizing and stating the hypotheses for the present study it would be necessary for a scientific inquiry to set the objectives to be achieved through the investigation. Keeping in mind the problems discussed and the hypotheses stated in the preceding section the following objectives are set :

III.4 OBJECTIVES OF THE STUDY

1. To analyse the classroom questioning behaviour of social studies and science teachers (taken together) of English medium schools in the three major cities of Gujarat, viz., Ahmedabad, Baroda and Rajkot in the context of total teaching behaviour.
2. To study the questioning behaviour of social studies and science teachers.
3. To study the questioning behaviour of trained and untrained teachers.
4. To study the questioning behaviour of the teachers having experience upto 5 years and the teachers having experience above 10 years.
5. To study the kinds of questions used by the teachers in the classroom teaching.
6. To studyt the extent to which each kind of question is used in the classroom.
7. To study the preceding and succeeding events of different kinds of questions.

8. To study the association of different kinds of questions with the students' response and initiation.

III.5 PROCEDURE

In the previous sections of this chapter, the investigator has discussed the problem, hypotheses and objectives. Now, the procedure adopted to test the hypotheses and attain the set objectives will be discussed.

III.5.1 Sample

In the present investigation it was decided that the questioning behaviour of social studies and science teachers of English medium high and higher secondary schools in three major cities of Gujarat, viz., Ahmedabad, Baroda and Rajkot will be studied. Out of 37 schools which have got high and higher secondary classes, two schools could not be undertaken due to lack of co-operation of the school authorities. From the remaining 35 schools, 205 teachers were observed. Out of 205 teachers, 99 taught science and 106 taught social studies. It included all the teachers of science and social studies in these 35 English medium schools who taught classes - VII to XII. In order to study the questioning behaviour in the context of other teaching behaviours, entire population was taken into consideration.

From the above population, different purposive samples were drawn in order to test different hypotheses and studying

teacher classroom behaviour. This system has ten observation categories as under :

1. Accepts feelings;
2. Praises or encourages;
3. Accepts or uses ideas of students;
4. Asks questions;
5. Lectures;
6. Gives directions;
7. Criticises or justifies authority;
8. Students' response;
9. Students' initiation; and
10. Silence or confusion.

The categories four and five focus on the cognitive aspects of the teacher's talk. Category four is specially concerned with the questioning behaviour of teachers. It was felt that by elaborating category 'four' a valid and usable instrument could be developed for the present investigation. It was also considered that teachers' questions give rise to classroom interaction which develops into the affective domain, viz., the classroom climate. It was, therefore, felt necessary not to study the questioning behaviour in isolation, but, to study it into the context of total teacher verbal behaviour. The modifications were made as discussed in subsequent sections.

III.5.2.1 Motivational Behaviour

In this category of the modified version, the first three categories of the FIACS, viz., acceptance of feeling, praise and

encouragement, and acceptance and use of students' ideas were combined and renamed as 'motivational behaviour'.

The acceptance of feeling is concerned with teacher's statements which accept and clarify an attitude or the feeling tone of a pupil in a non-threatening manner. The statements in this category recall past feelings referred to as enjoyable or uncomfortable. They predict happy or sad events that would occur in future. These are relatively rare and infrequent teacher statements. Perhaps this is because most persons in our culture, both teachers and pupils tend to suppress both positive and negative emotional reactions in the classroom.

Praise/encouragement consists of statements which carry the value judgment. It indicates those verbal habits which are used to reward responses of the pupils to control and change their behaviour in a desired way. Exclamations such as excellent; very good ; O.K. ; and similar expressions are often expressed automatically as soon as most pupil statements terminate.

While accepting an ideas or making use of it, a teacher can respond to the ideas which pupils express, by (a) acknowledging the pupil's idea by repeating the same and connecting it to some other idea; (b) modifying the idea, rephrasing it in his own words; (c) applying the idea, using it to reach an inference or taking the next step in a logical analysis of a problem; and (d) summarizing what was said by a pupil or a group

of pupils, etc.

These three categories in FIACS represent the motivational behaviour of the teachers' verbal talk. As the purpose of the present investigation is not to study the components of the motivational behaviour, it was decided to club the three categories under a broad title of 'motivational behaviour'. This became category 1 of the new adopted version.

III.5.2.2 Questioning

The fourth category in the FIACS is the questioning behaviour of the teachers. This category includes only those questions for which the teacher expects an answer from the pupils.

The purpose of the present inquiry was to study the nature and type of questions used by teachers in the classroom. The main aim is to study the different kinds of questions used by teachers. Flanders' category 'four' does not differentiate between various types of questions. Used without any modifications, it would be a crude tool of not much use in the present study. The demands of the present study require that any observation category system should facilitate the study of the variety of questions used in the classroom by the teachers. It was, therefore, decided to divide the questioning category into six sub-categories, viz. memory, translation, interpretation, application, higher order, and routine types of questions. The

details of these different kinds of questions are given in the first chapter under the caption I.3.1.

III. 5.2.3 Lecturing

The third category of the modified version is lecturing which happens to be the fifth category in the FIACS. Lecturing is the form of verbal behaviour used to give information, facts, opinions, ideas or orientation to children. The presentation of material may be used to introduce, review or focus the attention of the class on an important topic. Usually information in the form of lecture is given in fairly extended time period but it may be interspersed with children's comments, questions and encouragement, praise, etc.

Whenever the teacher is explaining, discussing, giving opinion, or giving facts or information, category three is used in the present system. When the teacher is orienting the class to a topic or explaining the procedure that the class would follow, that is also classified in this category. Rhetorical questions are also included in this category. Category three is the one most frequently used.

III. 5.2.4 Authoritarian Behaviour

In the fourth category of the modified system, the sixth and seventh categories of the FIACS are combined and renamed as authoritarian behaviour. These categories are (i) giving directions and (ii) criticizing and justifying authority.

The decision whether or not to classify the statement as a direction or command is based on the degree of freedom that the student has to respond to teacher direction. When the teacher says, ' will all of you open page 35 ? ', he is obviously giving a direction. If he says, 'Mohan, please go to the board and write your name', he is giving a direction or command. When he says, 'Mohan I want^{you}to tell me what you have done regarding your home work which I gave yesterday ', he is still giving a direction. This category is used only when the student's compliance takes the form of an observable act.

A statement of criticism is one that is designed to change student's behaviour from non-acceptable to acceptable behaviour. The teacher is saying, with effect, 'I do not like what you are doing, do something else'. Another group of statements included in this category is, those statements that may be called statements of defence or self justification. These statements are particularly difficult to detect when a teacher appears to be explaining a lesson or the reasons for the particular lesson. If the teacher is explaining using his authority or defending himself against the student or justifying himself, the statement falls in this category. Other kinds of statements that fall in this category are those of extreme self-reference or those in which the teacher is constantly asking

the children to do something as special favour to the teacher.

III. 5.2.5 Response

The fifth category of the modified version is response which appears as the eighth category in the FIACS. This category is used when the teacher initiates the contact or solicits student's statements, and the student answers a question asked by the teachers, or when he responds verbally to a direction the teacher gives : Anything that the student says which is clearly in response to initiation by the teacher belongs to category five.

III. 5.2.6 Initiation

The sixth category of the modified version is initiation which happens to be the ninth category in the FIACS. This category is used to indicate the expression of the students' own ideas in spontaneous interaction. If the student raises his hand to make a statement or to ask a question when he is not prompted to do so by the teacher, the appropriate category is 6.

It is difficult to distinguish between categories 5 and 6. Predicting the general kind of answer that the student would give in response to a question from the teacher is important in making this distinction. If the answer is one that is predicted by the observer (as well as the teacher and the class), then the statement comes under category 5. When the student's response differs from the expected one the category used is 6.

III. 5.2.7 Silence or Confusion

The seventh and the last category of the present system is silence and confusion which is the tenth category in the FIACS. The purpose of this category is to record pause, silence, and periods of confusion as they occur during classroom interaction. It is not intended to record longer periods of silence or confusion, for example, those that are more than two minutes. The continuous use of this category for long periods of silence does not serve any useful purpose.

Silence occurs in two situations. In one situation, silence is observed when the student is in the thinking stage to explore appropriate response to certain types of questions like application and higher order. In the second situation silence occurs when there is no interaction in the classroom. The category has been taken as it enables the investigator to study the thinking pattern of different kinds of questions.

The new modified observation tool thus consists of 7 categories, where, 2nd category is divided into 6 sub-categories. Those categories are as under :

1. Motivational behaviour ;
2. Questioning :
 - (2a) Memory questions,
 - (2b) Translation questions,
 - (2c) Interpretation questions,
 - (2d) Application questions,
 - (2e) Higher order questions,
 - (2f) Routine questions,

3. Lecturing;
4. Authoritarian behaviour;
5. Response;
6. Initiation; and
7. Silence or confusion.

III. 5.3 RATIONALE FOR THE MODIFICATION IN FIACS

In the modified version of the FIACS prepared by the investigator some of the categories of the FIACS are combined and one of them, viz., questioning has been elaborated. These elaborations were made to suit the requirements of the present study, which purports to analyse the questioning behaviour in greater details. Combinations of certain categories in the FIACS have been made to decrease the complexity which may arise at the time of observation, and thereby to increase the reliability of the data.

Although in the modified version of the FIACS some of the categories of the FIACS are combined and one of them, viz., questioning has been elaborated, however, the basic structure of FIACS has not been changed. Using modified version too, teacher behaviour could be categorised into (i) direct, (ii) indirect, or one could categorise the same into (i) teacher talk, (ii) pupil talk and (iii) silence and confusion also. Most of the operations which are seen in the FIACS they are also seen in the modified version. For example, the ratios like i/d , I/D , TQR , etc. can be calculated with the help of modified

version on one hand does not damage the basic structure of the FIACS, whereas, on the other hand, it allows the investigator facilities to study the questioning behaviour in greater details and decreases the complexity in observation and increases the reliability of data.

III. 5.4 TRAINING PROCEDURE FOR OBSERVATION

The first step in the training process was to memorise the categories and to understand clearly what type of communication was included in a specific category. The second aspect was to remember ground rules set for the observational system. After memorizing the categories and the ground rules the investigator and a second observer began observing the classes. The practice of observing the classes and the interaction between the two observers, helped the investigator to get trained in the procedure of observation. It is necessary to note here that in the present study tape recorder was not used as suggested by Flanders and others for training purposes. But, in this case, the two observers developed a common frame of understanding through the observation of the real classroom settings. This process enabled the investigator to overcome an error which might arise due to the differences in hearing a tape and observing in a real classroom setting.

During the preliminary training it became apparent that classroom observation involved judgments that were not as objective

as it was originally thought. It was soon realized that reliable observation required consideration of the total social situation being observed in order to understand the individual acts being classified. It was, therefore, necessary to formulate some ground rules for observation. These ground rules are given in Appendix I.

The use of these ground rules was found effective to improve the inter-observer reliability. Observers considered to be ready for classroom observation, need to be checked for the reliability of their observations. This reliability can be defined in terms of inter-observer reliability (the agreement between the two observers observing a period of classroom interaction or tallying a tape of that interaction) or in terms of self-reliability (agreement between recordings of two separate hearings of one tape session by a single observer). Below is given the procedure of establishing reliability for the present study.

III. 5.5 ESTABLISHING RELIABILITY

In the present study, the reliability of the data was established in two ways. In both the ways the reliability was inter-observer reliability. These two methods of establishing reliability were as follows :

III. 5.5.1 Method I

In this method the reliability was estimated by the method proposed by Scott (81). Scott's method is unaffected by low frequencies; it can be adopted to per cent figures, it can be estimated more rapidly and is more sensitive at higher levels of reliability. The coefficient value calculated for the present study was 0.88. This reliability could be considered to be a reliable measure of the observer's categorization according to Scott. But, this method inspite of being quite sensitive, could not meet the demands of the present study as the reliability was needed of very high level particularly to study the questioning behaviour. Therefore, for questioning behaviour another method of establishing reliability was adopted which is given below :

III. 5.5.2 Method II

In this method teachers were observed in the classroom with the help of another observer who used to write the questions asked by the teacher. Thus, the investigator recorded the interaction in the form of code numbers and the other observer wrote the questions asked in the class by the teacher.

After the observations were made, the questions were compared with their respective code numbers. Wherever the discrepancy was found the case was discussed and the consensus was arrived at. In this way, both the observers went on

observing the teachers until the code numbers tallied with the respective questions written by the other observer. It may be mentioned here that before starting the present study both the investigators had observed about 90 teachers. Through this process validity and reliability of the tool were established although not in numerical terms. It permitted the investigator to collect more reliable data for the study when compared with other techniques of estimating reliability.

III. 5.6 OBSERVATION PROCEDURE

The observer sat in the classroom in the best position to hear and see the participants. At the end of each three second interval he decided which category best represented the communication just completed. He wrote down that category number while simultaneously assessing communication in the next period and continued at a rate of 20 to 25 observations per minute, maintaining the tempo as steady as possible. His notes were merely a sequence of numbers written in a column top to bottom, so that original sequence of events in the classroom was preserved. Occasionally, marginal notes were used to explain the class formation or any unusual circumstances.

According to this procedure each teacher was observed twice for full classroom periods. The duration of each period was 30 minutes. Every activity of the teacher was observed continuously during the whole teaching period. In this way,

total verbal behaviour of the teacher was taken into consideration.

Through this procedure the investigator observed 205 teachers in 35 English medium high and higher secondary schools of Baroda, Ahmedabad and Rajkot. Out of these 205 teachers, 99 taught science and 106 taught social studies. Now the classroom behaviour was observed can be considered with the help of an illustration of a classroom episode which is given in the following :

III. 5.6.1 A Classroom Episode and Recording Data in the Classroom

There was a method of recording the sequence of events in the classroom in such a way that certain facts became really apparent. As the communication went on in the classroom, the investigator recorded those events in the sequence as they occurred in the classroom by writing the code numbers which he had decided. The following episode will give certain hints regarding the classroom observation. A seventh grade teacher began the science lesson. The investigator was in the classroom for a few minutes even before the actual commencement of the lesson to get some idea of the general classroom climate before he began to record :

Teacher : (The teacher asks) What are micro-organisms ? (2a, memory type question).

Student : Some creatures are so minute that they cannot be seen with naked eyes. Such creatures are called micro-organisms. (5, 5, 5 student's response).

Teacher : That is right. Do these micro-organisms affect the human beings ? If so, how ? (1 followed by 2a as after praising the student, the teacher asked a question).

Student : Yes, micro-organisms affect the human beings. They affect us in two ways : (i) Some of them are useful to us. (ii) Some of them affect our health and even spread diseases. (5, 5, 5, 5 response).

[illegible]

Student : But, how does a micro-organism cause a disease ?
(6. initiation).

Teacher : It is a good question, Shyam ! Micro-organisms affect the metabolic activities in our body adversely and cause disease. (1, 3, 3, 3, 3 teacher encourages the student and then explains). Why is a person's health affected by the diseases ? (2c interpretation type of question).

Student : Our health is affected by the disease. Owing to the disease some cells or tissues of our body get affected or infected. (5, 5, 5, 5, 5, 5 response).

Teacher : Mohan, why is a person's health affected by the disease ? (2a memory type of question, because the question is repeated when it has been answered by a student and Mohan just has to recall the same answer).

Student : I do not know, Sir. (5, 7 response followed by silence).

Teacher : If you study like this you will never pass, Mohan ! Now listen carefully. Owing to the disease some cells or tissues fail to do their work. Thus, the disease affects our health. (4, 4, 4 followed by 3, 3, 3 because teacher first gets angry and criticises the student's behaviour. Then he directs him. Afterwards, he explains). Some micro-organisms exist in our nose, throat, stomach or intestine. When we speak, cough, clean the nose or sneeze, many minute germs come out of the body. Thus, the germs coming out of the body of a diseased person spread disease. What should we do to prevent this spreading of the disease ? (3, 3, 3, 3, 3, 3, 3, 3, 3, 7, 2C, because first lecturing continues, then a period of silence follows and next the teacher puts a question of interpretation type).

Student : We should sneeze or cough in a handkerchief.
(5 responses).

Teacher : Why should we keep a handkerchief in front of our mouth when we sneeze ? (2c, 7 interpretation type of question followed by silence).

Student : We should keep the handkerchief in front of our mouth otherwise minute germs will come out and spread the disease in the surrounding atmosphere. (5, 5, 5 student's response).

Teacher : Very good, Anuj ! Did you all follow this point ? (1, 2f, 7 teacher encourages, it is followed by a routine type of question and then there is silence).

The following is the sequence of categories occurred :

2a	3	7
5	3	4
5	3	4
5	3	4
1	3	3
2a	3	3
5	3	3
5	3	3
5	3	3
5	3	3
1	3	3
3	3	3
3	3	3
4	3	3
7	3	3
3	3	3
3	6	3
3	3	7
3	3	2c
3	3	5
3	3	2c

(continued...)

3	3	2c
3	2c	7
3	5	5
3	5	5
3	5	5
3	5	1
3	5	2f
3	5	7
3	2a	
3	6	

III. 5.7 TABULATION OF THE DATA

Tabulations were made in the matrix to represent pairs of numbers. In order to prepare the matrix, first step is to make pairs of the data obtained in the form of code numbers. These pairs were made for the convenience of tabulation so that at a time one pair can be taken into consideration for tabulation. The investigator used 7 in the beginning and 7 in the end even though it was not there. This category was chosen for the reason that it is convenient to assume that each record began and ended with silence. This procedure also permitted the total of each column to be equal to the corresponding row in the matrix. For all the 205 teachers the observations were paired as illustrated in Table 3.1

After pairing the numbers the tabulations were made in the 12 X 12 matrix to represent pairs of numbers. It is obvious from Table 3.1, that the numbers have been marked off in

Table 3.1 : Pairing the Observations - An Illustration

	7	1st Pair	3	3	3	3	6	3	5
2nd Pair	2a		3	3	3	3	7	3	5
	5	3rd Pair	4	3	3	3	4	3	1
4th Pair	5		7	3	3	3	4	3	2f
	5		2	3	2	2c	4	3	7
	1		3	3	3	5	3	3	
	2a		3	3	3	5	3	7	
	5		3	3	3	5	3	2c	
	5		3	3	3	5	3	5	
	5		3	3	3	5	3	2c	
	5		3	3	3	5	3	7	
	1		3	3	6	2a	3	5	

pairs. The first pair is 7 - 2a; the second pair is 2a - 5; the third pair is 5 - 5, etc. The particular cell of a matrix in which tabulation of the pair of numbers was made, was determined by using the first number in the pair to indicate the row and the second number in the pair for the column. Thus, 7 - 2a would be shown by a tally in the cell formed by row 7 column 2a. The second pair, 2a - 5, would be shown in the cell formed by row 2a and column 5. The third pair, 5 - 5, was entered into the cell - row 5 and column 5, etc. Each pair numbers of/overlapped with the previous pair, and each number, except the first and the last, was used twice. It was for this reason

that 7 was entered as the first and the last.

The accuracy of the matrix was checked by noting whether there was one number less ($n - 1$) in each matrix total than in the original observations recorded (N). The second check used in the present study was by noting that the sum of the columns was equal to sum of the corresponding rows.

In this illustration the investigator started with 89 numbers and the total number of tallies in the matrix is 88. This tabulation is shown in Table 3.2

Table 3.2 : Interaction Analysis Matrix - An Illustration

	1	2a	2b	2c	2d	2e	2f	3	4	5	6	7	Total
1		1					1	1					3
2a										2	1		3
2b													0
2c										2		1	3
2d													0
2e													0
2f												1	1
3				1				46	1		1	1	50
4								1	2			1	4
5	3	1		1						12			17
6								1				1	2
7		1		1				1	1	1			5
Total	3	3	0	3	0	0	1	50	4	17	2	5	88

Following the same procedure a separate matrix was prepared for each specific lesson. In this way, 410 matrices were prepared. But, as mentioned earlier each teacher was observed for two classroom periods. Therefore, two matrices of each teacher were combined and a single matrix was arrived at. In this way, 410 matrices were reduced to 205 matrices - one for each teacher. In addition to this, a master matrix was prepared for all the 205 teachers to study the classroom questioning behaviour in the context of other teaching behaviours. Separate master matrices were prepared for the different groups of teachers. How it was done is shown in the next chapter, viz., analysis of data and interpretation of results.

III. 5.8 SELECTION OF TEACHERS IN DIFFERENT GROUPS

After preparing the matrices, teachers were selected to form the different groups in order to test the different hypotheses. It is necessary to mention here that these different teachers were selected from those 205 teachers who had already been observed. After selecting teachers for a particular group, they were replaced and then only the next group was selected. The procedure of formulating different groups is given in subsequent paragraphs.

III.5.8.1 Selection of Social Studies and Science Teachers

In order to test the first hypothesis, viz., there is no significant difference in the questioning behaviour of social studies and science teachers, a sample of 140 teachers was selected. Out of these 140 teachers, 70 taught social studies and 70 taught science. These teachers of two groups were matched on the basis of their academic qualifications, professional qualification, sex and teaching experience.

III.5.8.2 Selection of Trained and Untrained Teachers

In order to test the second hypothesis, viz., the trained teachers will use questioning to a greater extent than untrained teachers, a sample of 96 teachers was drawn. Out of these 96 teachers, 48 were trained and 48 were untrained. While selecting these teachers, the two groups were matched on the basis of their subjects being taught by them, academic qualifications, teaching experience and sex.

III.5.8.3 Selection of the Teachers having Experience upto 5 Years and the Teachers having Experience above 10 Years

In order to test the third hypothesis, viz., there is no significant difference in the questioning behaviour of the teachers having experience upto 5 years and the teachers having experience above 10 years, a sample of 82 teachers was selected

Out of these 82 teachers, 41 teachers were having experience upto 5 years and 41 teachers were having experience above 10 years. The two groups were matched on the basis of their academic qualifications, professional qualifications, subjects and sex.

III.5.9 PROCEDURE FOR ANALYSIS OF DATA

For the purpose of identifying the classroom questioning behaviour of teachers and to study it in the context of other teaching behaviours a master matrix was prepared for all the 205 teachers and the following operations were carried out :

- (i) Percentage of questioning from the verbal classroom interaction.
- (ii) Percentage of questioning from the teacher talk.
- (iii) Percentage of different kinds of questions, viz., memory, translation, interpretation, application, higher order and routine types of questions from the teacher talk.
- (iv) Teacher Question Ratio (T Q R).
- (v) Percentage of response and silence, to study their relationship with each type of question, that is to what extent they are followed by students' response or silence.
- (vi) Percentages of different diagonal cells of different kinds of questions, viz., '2a - 2a, 2b - 2b, ... 2f - 2f' to study the extension of each type of question.

To test the different hypotheses, which were formulated for the present investigation, the master matrices were prepared for the different groups. The significance of difference between the respective groups was tested by taking into consideration the sums

of the questioning categories from their respective master matrices and employing the chi-square test.

To study the extent to which different kinds of questions are used from the total questioning, the percentages were calculated for each type of questions for different groups.

In order to study the preceding and succeeding events of different kinds of questions of the different groups, the columns and rows related to questioning in the master matrices of the different groups were converted into percentages.

The relationship of different kinds of questions with students' response and initiation for the respective groups also was studied by converting the sums of the questioning categories, students' response and initiation into percentages for the different groups in their respective master matrices.

The actual analysis of these percentages, different ratios and the chi-square values alongwith their results is presented in the next chapter, viz., analysis of data and interpretation of results.
