

CHAPTER TWO

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## CHAPTER TWO

### REVIEW OF RELATED RESEARCH

Writing about contemporary research in classroom verbal interaction in the preceding chapter, it was pointed out that there is now a growing need to move from survey and correlational studies to controlled experimental studies in this area. No doubt, survey and correlational studies help in clarifying many concepts about the process of teaching but moving beyond them to the realm of experimentation is necessary not only to validate findings of survey and correlational studies but also to obtain additional empirical clarity. This need for controlled experimental classroom studies have been highlighted in the writings of Rosenshine and Furst (1971), Nuthall and Church (1973) and Jangira and Sharma (1974).

The present study, which is experimental in nature, aims at obtaining inference about functional relationship, if any, between selected aspects of verbal teaching behaviour patterns and students' achievement. The selected aspects of verbal teaching behaviours considered in this study are (i) providing verbal confirmatory and corrective feedback and (ii) asking four different types of questions.

In this chapter an attempt has been made to present a review of related research efforts that have been carried out in the area of teaching behaviour and student achievement and, as such, have relevance to the present study. These available reports have been grouped under four main sections, viz., (2.1) changing teaching behaviour through training, (2.2) providing confirmatory feedback (use of student ideas) and student achievement, (2.3) providing corrective feedback and student achievement and (2.4) questioning behaviour and student achievement. Following the review, an attempt to present *raison d'etre* for including selected process variables in the present study is given.

Some of the studies included in the review are, in fact, taken from secondary sources and, as such, are perhaps 'review of the review'. This was considered necessary when it was difficult to lay hand on the primary sources and, in such selections, suitable acknowledgements have been cited.

#### 2.1 CHANGING TEACHING BEHAVIOUR THROUGH TRAINING

Several studies have either wholly or partly focussed on the problem of changing teaching behaviour through training and feedback using different instructional procedures. These studies conducted on inservice or preservice teachers have reported consistently significant 'programme effectiveness'. Summing up the results of these studies Flanders (1970 pp. 351-352) writes, "attention to teaching behaviour, practice in analyzing it, and performing it with feedback, tends to incorporate such behaviour in the teachers' repertoire." A few studies on changing teaching behaviour through training reported in recent

years and reviewed in this chapter further substantiate Flanders generalization about 'programme effectiveness'. First six of the ten studies that now follow report attempts at changing those behaviours that have been found to contribute to general "indirectedness" of the social emotional climate i.e. more of category 1, 2 and 3 and less of category // 6 and 7 of Flanders system. The remaining four studies focus primarily on changing questioning behaviour of the teachers. Most of these studies have been conducted in India.

Desai (1970) trained the teachers in incentive treatment which included training in teacher behaviour. He reported a significant change in indirect behaviour of teachers after 8 days' continuous training. Such a change increased pupil performance to the extent of 8 per cent on objective tests.

Roy (1970) applied four sources of feedback to compare their relative effect on change in teacher behaviour. The four sources of feedback were (i) pupil observation of the learning atmosphere (POLA), (ii) teacher self-rating about the desired behaviour (TSR), (iii) feedback from the external observer and (iv) teacher's peer ratings (TPR). The study covered 54 male and female teachers teaching social studies, elementary mathematics, general science and languages to grade 6th students reading in sixteen schools of Bikaner city in Rajasthan. The result revealed change in teacher behaviour, maximum change having occurred when feedback was provided from pupils' observation (POLA). Changes in teacher behaviour in varying degrees were also revealed as a result of feedback from TSR and external

observer ratings.

Pareek and Rao (1971) provided ten-day training for a duration of six hours a day using FIAC system to a group of nine experimental teachers teaching class IV students in some of the schools of South Delhi. The training consisted of teaching FIAC system to the teachers, providing them practice in coding classroom interaction and feeding back the coded interaction patterns to the teachers. Post-training observation of experimental teachers at different periods, when compared to observation of control group teachers, revealed modification of teacher behaviour in the direction hypothesized. That is, the experimental teachers showed more and more use of praise and encouragement, acceptance of student ideas and questioning behaviour and showed less use of lecturing, giving direction and criticizing.

Jangira (1972) using FIAC system provided classroom behaviour training to 20 male elementary student teachers. Post training result reported by the investigator revealed that experimental teachers did behave differently than the control group teachers in using more of such teaching behaviours as have been found to contribute to general indirectedness of the classroom social-emotional climate. Further investigation revealed lasting trends in these teaching behaviours even 26 weeks after the classroom behaviour training.

Nath (1972) using FIAC system studied the effect of feedback based on interaction analysis. His subjects were 48 women secondary teacher trainees. Pretraining--post-training

comparison of teaching behaviour revealed effect of treatment in favour of experimental teachers whose teacher talk/student talk ratio was now less and who had higher indirect/direct talk ratio as compared to the control group.

Lulla (1973), as part of her study, provided additional training in the use of indirect teaching behaviours to 24 experimental teachers. The training consisted of discussing the theory of interaction analysis, acquaintance with the FIAC system, observation of teaching behaviours of the experimental teachers and feeding them back the coded data. Although no post-training comparison of indirect teaching behaviour with either the experimental group itself or with control group has been indicated in the thesis, the investigator, based on her observation of post-training classroom interaction, reported increased indirect behaviour in experimental teachers.

Beseda (1972) investigated, as a subproblem of the main study, the effect of feedback from university supervisor to student teachers on their convergent and divergent questioning in teaching. Eight student teachers assigned to the experimental group were trained in the use of convergent and divergent questions with an equal number of student teachers serving as control. Post-training observations of questions asked by all the teachers teaching a unit in social studies were coded and subjected to chi-square test. The investigator reported a significant greater number of divergent questions asked by the experimental teachers.

Down (1972) attempted to find out whether it was possible to teach preservice elementary education major, through either

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classroom discussion or independent study, to ask questions requiring higher levels of cognitive thinking. The investigator provided instruction on question asking one period per week. In all five fifty-five minute periods were devoted for instruction which resulted in a significant increase in the number of higher level questions and a decrease in the number of memory questions asked by the experimental teachers.

Sharma (1972), as part of her main study, trained each of the three teachers in the use of four patterns of teaching behaviours viz., narration, open question, narrow question and narrow question with feedback. Though the observational account of change in patterns of behaviour has not been indicated in the study, the investigator, based on her post-training observations of teaching behaviour, reported use of these patterns by the teachers.

Adhikary (1973) designed a study to investigate the effect of an instructional programme on questioning techniques for peace corps prospective volunteer teachers. The programme included four strategies (a) going through a programmed instruction material on classifying teacher questions, (b) discussing the use of different types of questions in teaching, (c) writing questions in lesson planning and (d) discussing why students do not answer teacher questions. The experimental teachers were exposed to this instructional programme in between the premeasure and post-measure observations while the control group received the programme only after the postmeasure observation. The result revealed that prospective teachers questioning behaviour

could be changed through instruction. This change was exemplified by increased use of convergent, divergent and evaluative questions and decreased use of cognitive memory and managerial questions.

Flanders generalization about 'programme effectiveness', confirmed further by the reviews cited above, reveal the following trend with regard to changing teaching behaviour through training :

1. teaching behaviours can be changed through training,
2. training procedures employed in changing teaching behaviours can take different strategies such as discussion, practice in writing these behaviours (questioning), observation of teaching by observer followed by feedback,
3. through training it is possible to develop awareness of and control in one's own teaching behaviour,
4. carry over effects of training, as measured through repeated observations, though showing a slight tendency to decline, tend to last over a period of time.

## 2.2 PROVIDING CONFIRMATORY FEEDBACK (USE OF STUDENT IDEAS) AND STUDENT ACHIEVEMENT

Rosenshine (1971) surveyed nine studies which attempted to study relationship between teacher use of student ideas and student achievement. After the survey he concluded that not one study yielded significant linear correlation between the use of student ideas and student achievement. An encouraging aspect

of this survey was, however, a positive trend in eight out of the nine studies with the obtained values of  $r$  ranging from .05 to .40. Two additional studies which supported this trend were reported by him as follows :

Morrison (1966) in her study was primarily interested in the pupil trait called "internality - externality" and made a special analysis of the sixth grade Flanders Michigan data to study if pupils who scored high or low on this trait responded differently to indirect and direct patterns of instruction. Only the result as it is related to use of student ideas and learning out-come is reported here. Morrison compared the adjusted achievement scores of teachers who were in the top third and bottom third in the extended use of student ideas (cell 3 - 3). The results were significant at .01 level on all seven subtests of the Metropolitan Achievement tests. The students whose ideas were used more often by the teacher made greater achievement gain.

Fortune (1967) found that high achieving teachers, when observed presenting 5-10 minutes lessons, were characterized by an observer as using more praise or repetition of a student idea and integrating a student's idea into the lesson more frequently. This gives an indication of a positive relationship between praise and use of student ideas and student achievement. The report of these teaching behaviours were, however, based on a descriptive account of the observer who made no use of category system.

Rosenshine et. al., (1971, pp. 74) attempted to study the relationship between three subscripts of category 3 (uses student idea) and student achievement. The investigators recorded the audiotapes and transcripts prepared by Wright and Nuthall (1970) and used the expanded interaction analysis system in which category 3 was subscribed into three teaching behaviours such as (a) acknowledging the students' ideas by a few words, such as saying 'O.K.', or repeating what the students said, (b) summarizing two or more ideas of students, (c) generalizing a student idea to new situation. The results obtained revealed that repeating what the students said and summarizing two or more ideas had a correlation of about .4 with student achievement whereas category 3 taken as a whole yielded a correlation value of only .18 with student achievement.

Lulla (1973) hypothesized that students exposed to indirect influence of teaching will have better achievement than students exposed to direct influence. 24 teachers in the experimental group and 20 teachers in the control group served as the subjects of the study. Experimental teachers received additional training in the use of more indirect influence (i.e. using more of category 1, 2 and 3 of FIAC system). Teaching two lessons per week, each teacher taught eight lessons on a unit in social studies. Analysis of covariance was applied on the criterion score to adjust for initial differences in pretest score. No adjustment was considered necessary for mean score on intelligence and social status as the students in the two groups were found to match on these two variables. The F - ratio was found to be highly significant thus supporting the hypothesis

that students taught by teachers trained in using indirect behaviour achieved higher compared to students taught by teachers who were more direct.

Samph (1974) studied the extent to which teacher verbal behaviour influenced the language skill development of below average achievers. Student achievement scores and measure of verbal behaviour were obtained from Flanders 1969 study. The sample of below average students consisted of 155 sixth grade students identified by prelanguage skill achievement score on Metropolitan Achievement Test (MAT). Achievement measures used in this study were the MAT and post total language score. Analysis of covariance on post language achievement was applied to adjust for initial differences in pretest. The result indicated a significant difference in student achievement between direct and indirect teachers (  $F = 50.36$   $p < .001$  ).

Studies by Lulla (1973) and Samph (1974) focussed on total indirect teaching behaviours and not on category of accepting student ideas alone. Since accepting student ideas (category 3 in FIAC system) is one of the components in indirect teaching, these studies have been reviewed here.

### 2.3 CORRECTIVE FEEDBACK AND STUDENT ACHIEVEMENT :

Rosenshine (1971) reviewed one study conducted by Spaulding (1965) in which disapproval both by commanding conformity and by eliciting clarification in a non-threatening manner was loaded on a factor that was positively related to achievement in reading. Spaulding conducted his experiment with 21 teachers teaching reading and mathematics to 4th and 6th grade students

for two semesters. The results indicated (a) component loading of .41 with disapproval by commanding conformance and (b) component loading of .36 with disapproval by eliciting clarification in a nonthreatening way. Correlation between the total component and criterion measure of reading was found significant ( $r = .44$ ) whereas correlation between total component and criterion measure of mathematics was not significant though positive ( $r = .39$ ).

The concept of corrective feedback as applied in the present study appears to have two similarities with Spaulding's concept of teacher's disapproval. These are (a) eliciting clarifications from the student and (b) in a manner which is non-threatening to him.

#### 2.4 QUESTIONING AND STUDENT ACHIEVEMENT :

Studies reviewed herein are grouped broadly under two sub-headings depending upon the similarity of results obtained. Included in the first part are the studies that did not yield significant relationship between questioning and achievement. In the second part those studies that yielded positive trends are included.

##### (a) No Significant Relationship :

Perkins (1965) conducted a study to find out relationship between types of questions and student achievement. The two categories of questions investigated by him were (i) asking questions about content and (ii) asking questions to stimulate thinking i.e. asking why? how? types of questions. Twenty seven teachers teaching different subjects to 5th grade students for two semesters

were the subjects of study. Factor analysis performed on the data revealed no loading of either of the two types of questions on any factor containing student gain.

Hutchinson (1963), who designed an experimental study, aimed at finding out relationships between levels of questioning and students' creativity and achievement. The first phase of the study included teaching the same material to one of the two matched groups of 7th grade students by four teachers. Teaching, covered 15 fifty-minute lessons by each teacher. At the end of the first phase, the teachers were given special training to increase their use of convergent, evaluative and divergent questions. After the training, the teachers taught the same unit a second time to the second matched group of students. All the lessons were tape recorded and the frequency of different types of questions was tallied. Besides revealing 'programme effectiveness', the two findings reported were (i) students who were taught the second series of lessons showed significantly more growth on some of the creativity tests, (ii) no significant difference in the mean achievement scores of the two groups of students.

Miller (1966), instead of categorization of questions into different types, classified all teacher statements as 'directive' or 'responsive'. 'Responsive' statements were those in which the teacher asked more high-level questions and elaborated student responses. In this experimental study each of the 4 teachers taught ten 30-minute lessons to two groups of pupils. In one set of lessons the teachers used responsive mode while in

the second set the directive mode was used. The result showed that though there was significant difference between the behaviours of the teachers in the two settings, no significant treatment effects, as measured by the criterion tests of (i) mastery of facts and (ii) higher understanding, were found.

Beseda (1972) investigated the effect of questioning on student achievement and critical thinking ability using experimental-control group design. Eight student teachers randomly assigned to experimental group were trained, through feedback, in asking divergent question with significant result. After the training, these eight experimental and another eight control group student teachers taught a unit in social studies for two weeks to secondary social studies students (258 students in experimental group and 263 students in control group). Pretest--post-test achievement was measured using Iowa Tests of Educational Developments (ITED) and the Sequential Tests of Educational Progress (STEP) and critical thinking ability was measured by Watson-Glaser Critical Thinking Appraisal. Analysis of data indicated no significant difference on ITED and STEP. Although not directly related to the present study, a surprising result found was a significant difference on the critical thinking appraisal but it was opposite to the direction hypothesized. That is, control students were superior in critical thinking ability. The experimental student teachers increased their divergent questions without corresponding increment in student achievement and rather producing a decrement in critical thinking of their pupils.



(b) Positive Relationship :

Wright and Nuthall (1970) in an exploratory study attempted to identify relationships between teacher behaviour and pupil achievement. It was a short term study in which the investigators tape-recorded three elementary science lessons on 'black-backed gulls' taught by each of the 17 teachers to standard two classes. To correct for initial differences on intelligence and earlier knowledge of content, intelligence and nature/science concepts test were administered. The achievement test contained 29 multiple-choice items of which four items were included to make the test more attractive to pupils but were not scored. Multiple regression formula was used to determine for each pupil a predicted achievement test score and a residual (actual minus predicted) achievement test score. 28 teacher behaviour variables were inter-correlated with each other and with class mean scores on intelligence, knowledge of nature/science concepts, and residual achievement. Such teacher behaviours as asking closed questions, redirecting the question to another pupil, use of thanks and praise and structuring at the end of an episode were positively related to achievement. Correlation between asking closed questions and residual achievement was found positive though not significant ( $r = .31$ ). Asking open questions was practically not related to residual achievement ( $r = -.08$ ).

Sharma (1972) in a pretest--post-test experimental design trained 3 teachers in four patterns of teaching behaviours viz., (i) narration (ii) asking open questions (iii) asking

narrow questions and (iv) asking narrow question with feedback. Each of the three teachers taught in all 16 seventh grade classes using the above four patterns (4 classes x 4 patterns). The teachers who were briefed about instructional objectives taught a unit from history that was covered in 50-60 minutes distributed over two class periods. Before the lessons were taught, tests of intelligence and previous achievement were administered to 48 classes. The lessons were followed by administration of achievement test and the data thus obtained were subjected to covariance analysis to adjust for initial differences in intelligence and previous achievement. The results revealed that narrow questions were comparatively more effective than open questions in the realization of knowledge and comprehension objectives. The hypothesis that there will be comparatively high achievement for application objective when taught through the use of open questions was not supported.

Kleinman (1964) in her study classified questions into two categories - low level and high level. Low level questions included neutral, rhetorical or factual questions. High level questions included such questions that required clarification, association or critical thinking. She compared achievement in science of 7th and 8th grade students who were taught by six out of an original sample of 23 teachers identified as extreme in low level or high level questions. The results revealed that the relationship between high level Vs. low level questions for high ability students was positive and significant ( $t = 5.02$ ) whereas for average and low ability students the relationship was not significant though positive ( $t = 1.29$  and  $0.58$  respectively).

Solomon (1963) studied types of questions used by 24 teachers teaching American history in college evening school for a period of one semester. The result revealed that two types of questions viz., (i) interpretative and (ii) factual questions loaded significantly on a factor related to gain in comprehension. Factor loadings on inter-pretative and factual questions being .63 and .49 respectively. Correlation between total component and criterion measure of comprehension was found significant ( $r = .44$ ).

Chasas (1973) studied the relationship between structured teacher-student interaction on critical thinking ability of students in an introductory course in general college biology. The interaction took the form of (i) lecture (ii) discussion using broad questions, and (iii) discussion using narrow questions as the three primary 'teaching techniques'. 12 classes of general biology were selected for the study. FIAC system was used to measure student teacher interaction. In a pretest--post-test design Watson-Glaser Critical Thinking Appraisal and Nelson Biology Test translated in Spanish were administered. Analysis of covariance was applied to determine relationship between (i) 'teaching techniques' and critical thinking ability and (ii) 'teaching techniques' and achievement. Results obtained showed that (a) lecture technique produced a significantly greater increase in achievement than the discussion technique using narrow questions ( $p < .01$ ), (b) adjusted mean score difference for the discussion using broad questions though not significant, was slightly higher than that of lecture and discussion using narrow questions techniques. Further comparison

of different teachers using the same "teaching technique" revealed significant difference ( $p < .01$ ) in achievement between teachers using discussion with broad question technique. Some of the relevant conclusions drawn from this study by the investigator were (i) discussion stimulated by narrow questions were less effective for achievement than discussion stimulated by broad questions, (ii) in discussion group the difference in achievement between groups having different teachers may be related to the number of broad questions or the quality of those questions used by the teacher, (iii) the levels of questions used in discussion groups affected students' achievement.

Before any attempt is made to build upon research reports reviewed above, a point of caution may be necessary. Each study is executed within some implicit or explicit theoretical frame-work using constructs not necessarily similar to another parallel study conducted by a different investigator. Also observation systems used, grades and subjects taught, tools used to measure criterion outcomes often vary from investigator to investigator thus making it extremely difficult to compare the results. This is particularly so in an area where the amount of research reports is extremely meager. This however, is not to deny that certain trend in findings, if observable, should be ignored but to emphasize that hasty conclusions and generalizations can defeat the cause of sustained research effort about a phenomenon, called teaching, that is so complex. That is all by way of caution.

In the present study changing teaching behaviours through training so as to introduce two types of experimental

treatments ( $E_1$  and  $E_2$ ) was a part of the design. Flanders generalization about 'programme effectiveness', therefore, gives an indication that such effort on the part of the investigator is justified. Additional empirical support for the possibility of changing teaching behaviours through training is given by seven Indian and three foreign studies reviewed under section (2.1) above.

Providing confirmatory feedback to the student by informing him that his answer is correct, by using his idea to reach an inference, by comparing the idea with another idea expressed earlier and by summarizing what was said by a student or a group of students is one of the teaching variables manipulated in this study. Operationally, this teaching variable is in no way different from Flanders category 3 i.e., accepting or using ideas of student. The term 'providing confirmatory feedback' was preferred in place of 'accepting and using student idea' because of its more obvious reinforcing effect on student learning behaviour.

Lulla (1973) and Samph (1974) found significant relationship between indirect teaching behaviour and student achievement in social studies and language skill. Although accepting and using student idea is only one aspect of this indirect teaching, to expect its positive relationship with achievement is perhaps a safe extra-polation. Further, conclusion of positive trend in as many as eight out of the nine studies surveyed by Rosenshine (1971), significant relationship ( $p < .01$ ) between use of student ideas and student achievement (Morrison, 1966),

observer's teaching account of high achieving teachers (Fortune, 1967) and correlation value of .4 between each of the two subs-cripts of Flanders Category 3 and student achievement (Rosenshine et. al, 1971, pp. 74) lend sufficient research evidence that this teaching behaviour appears to be related positively to student achievement. In the light of this positive trend it is perhaps appropriate to include the variable of teacher providing confirmatory feedback in the teaching behaviour of experimental teachers

Not much research could be located on teacher providing corrective feedback to students in an interactive classroom learning situation and student achievement. Study by Spaulding (1965) seems to come very close to the concept of teacher providing <sup>corrective</sup> feedback to the students. Informing student about the incorrectness of his response in nonthreatening manner with the intention of eliciting clarification from him or encouraging him to give another response was included as an experimental variable in the present study assuming that this teaching behaviour is positively related to student learning. Spaulding's findings give some support to this assumption.

Research findings are divided on the problem of degree and direction of relationships between different types of questioning behaviour of teacher and student achievement. Studies by Perkins (1965), Hutchinson (1963), Miller (1966) and Beseda (1972) revealed no significant results. On the other hand, the exploratory study by Wright and Nuthall (1970), that now forms a basis for one of the most systematic research efforts being carried out at Christchurch, revealed positive though not signi-

ficant relationship between asking closed questions and residual achievement. In the same study, asking open questions was related negatively though to very small degree ( $r = -.08$ ) with residual achievement. Study by Sharma (1972) revealed positive and significant relationship between narrow questions and achievement of knowledge and comprehensive objectives of instruction whereas asking open questions and achievement of application objectives of instruction were not related significantly. Again Kleinman (1964) found, for high ability students, positive and significant relationship between higher level questions and achievement in science. Solomon (1963) found evidence of positive relationship between interpretative and factual questions and achievement in American history. Chasas (1973) study revealed slightly higher achievement for teachers using broad questions.

One might sum up the above results as a consistent contradictory trend. However, one would like to agree with what may appear to be a circular research result of Nuthall and Church (1973), "it seems that asking questions is a better procedure than not asking questions". Tisher (1972) reporting the finding of a study writes, 'pupils made greater gains on criterion tests when they were taught by teachers who more frequently asked 'high inquiry' ( i.e. high cognitive demand ) questions'.

The need for further research using different types of questions as process variables is acutely felt. Results obtained by Wright and Nuthall (1970), Sharma (1972), Kleinman

(1964), Solomon (1963), Chasas (1973) and research based conclusions of Nuthall and Church (1973) and Tisher (1972) should provide ample encouragement and empirical support for further research on questioning behaviour of the teacher and students' learning outcomes.