CHAPTER - FOUR

RESULT, DISCUSSION AND INTERPRETATION

RESULTS, DISCUSSION AND INTERPRETATION

4.0 INTRODUCTION

This chapter is devoted for the presentation, discussion and interpretation of results of pilot study and the final experiment. Section 1 provides the result of the pilot study, Section II includes results of the final experiment, starting with the inter-observer reliability, ratios and percentages of variables in pre-treatment and post-treatment stages, comparison of pre-treatment and post-treatment matrices. Use of 't' test for significance of differences between means of different variables has been made. It may be noted that throughout the tables, the coded symbols have been used to represent different variables. The details have already been given in chapter III. The symbols used are given below for ready reference:

ACTs	:	Analysis of Classroom Transactions
TT	:	Teacher Talk
PT	:	Pupil Talk
Trp	:	Teacher response positive
Trn	:	Teacher response negative
Tin	:	Teacher information
Tqo	:	Teacher question open
Tqc	:	Teacher question closed
Td	:	Teacher direction
Tdt	:	Teacher does not direct
Pro	:	Pupil response open
Prc	:	Pupil response closed

Pin	:	Pupil information
Pq	:	Pupil question
Sil	:	Silence
Dis	:	Disruption

SECTION I

PILOT STUDY RESULTS

Observer Reliability

After repeated observation performance by the investigator the inter-observer reliability with a trained observer was found out by Scott's reliability coefficient described by Flanders (1960-b). The reliability was calculated on the basis of data obtained for 20 minutes of observation.

Pre-treatment and Post-treatment Matrices

The comparison of pre-treatment and post-treatment combined transaction matrices of all student-teachers observation each combined through the process of cell by cell addition of individual matrices are given in tables 4.1 - 4.6.

Comparison of Variables for Significance

The differences have been tested for significance by applying the 't' test. The formula and the procedure used to find out the value of 't' test is as given by Garrett (1969). The results are given in Table 4.7.

The purpose of the pilot study was to see the efficacy of the transaction training treatment as well as to visualise the administrative difficulties in the process of treatment. The pilot study has fulfilled the objectives. In the light of the experience gained in the process of experiment and administrative difficulties due care was taken in planning the final study.

SECTION II

FINAL EXPERIMENT RESULTS

The results of the final experiment are given below:

Inter-Observer Reliability

The investigator had already established an inter-observer reliability of 0.88. The sample was trained in observation and achieved inter-observer reliability .89 with the investigator. The results are given in the table 4.8.

Comparison of Verbal Behaviour on Variables

The simple ratios and percentages as mentioned in Chapter III provide a test to find out whether classroom behaviours of student-teachers at two stages are different from one another. The results are given in tables 4.9 - 4.16.

Comparison of Variables for Significance

In order to have further probe the differences in the variables have been tested for significance by applying the 't' test. To find out the value of 't' test the formula and procedure for calculating the significance of the difference

between two correlated means was followed according to Garrett (1969, pp.226-228). The results are given in the table 4.17.

Modification of Verbal Behaviour on Variables at Different Stages

With a view to seeing the continuity in increase or decrease of certain variables in classroom verbal behaviour of student-teachers, the phenomena has been shown on graph 1, based on the totals of the cells of combined tables 4.12, 4.13, 4.15 and 4.16.

4.3 DISCUSSION OF RESULTS AND INTERPRETATION

4.3.1 Introduction

The objectives of the present study were : (i) to provide transaction training to a group of science student-teachers based on Analysis of Classroom Transactions, (ii) to find out the significant difference on classroom behaviour patterns of student-teachers between pre-test and post-test stages, and (iii) to see the feasibility of Analysis of Classroom Transactions Category System in teacher training programme. In order to fulfil the objectives, the hypotheses were framed which are being reproduced here below to give direction to the discussion.

4.3.2 Hypotheses

(1) Student-teachers trained through transaction training, in post-test, will score higher on Trp, Tqo, Tqc, Td, Pro, Prc, Pin, Pq than in pre-test stage.

(2) Student-teachers trained through transaction training, in post-test, will score lower on Trn, Tdt, Sil and Dis than in pre-test stage.

(3) There will be significant difference in transaction patterns of student-teachers between pre-test and post-test stages.

An attempt has been made in this chapter to present a discussion on the basis of results. It includes possible interpretations of the results, relevant explanations in the context of the literature, theory and previous researches. The sequence of the discussion is based on the order of the results, starting with the discussion of pilot study followed by the discussion of final study. In this sequence more weightage has been given to the discussion of results of final study.

4.4 DISCUSSION OF PILOT STUDY

The pilot study aimed at seeing the efficacy of the ACTs treatment as well as visualising the administrative difficulties in the process of treatment being given to student-teachers. This section includes the discussion of inter-observer reliability and comparison of pre-treatment and post-treatment matrices.

4.4.1 Inter-Observer Reliability

In order to see the reliability of the classroom transaction observation, ACTs category system was explained to the observers. One of the observers was the investigator himself. After due practice and training a live lesson was observed along

with a trained observer and the inter-observer reliability coefficient calculated by Scott's Method was 0.88. The present reliability is higher than 0.85 recommended by Flanders (1960-b). Reliability found in this way relates only to the proportional distribution of tallies under the different categories. Perhaps no technique has been developed as yet which could verify the exact sequence of occurrences of events as recorded by different observers. But the frequent discussion by observers and resolution of the problems involving verbal events may help mitigate the consequence of this lacuna. However, present reliability coefficient in the context of literature has been considered satisfactory and thus the pilot study was executed.

4.4.2 Pre-treatment and Post-treatment matrices

For the comparison of transaction pattern of student-teachers in pilot study, the matrices of all five student-teachers without transaction training (pre-treatment) were combined to yield one master matrix. Similarly a master matrix for all five student-teachers having transaction training (post-treatment) was prepared. The two master matrices are produced in tables 4.1 and 4.4. At this stage of enquiry i.e. the discussion and interpretation of the striking features of the matrices of the same-group at two different stages, a decision was required as to the type and the intensity of probe to be undertaken. As for the possibilities, any amount of discussion pertaining to the individual as well as the combined matrices could be entered into. Only 't' test was employed to see the significance of difference between means of fifteen different variables (Table 4.7).

Table 4.1 : Showing Combined Matrix of Pretreatment data in Pilot-Study (N=5)

T	Trp	Trn	Tin	Tqo	Tqc	Td	Tdt	Pro	Prc	Pin	Pq	Sil	Dis	T
Trp	111	-	29	27	15	7	-	4	-	1	-	2	-	196
Trn	2	8	2	2	-	-	-	2	-	-	-	-	-	16
Tin	2	1	951	34	24	11	-	-	1	5	-	3	-	1032
Tqo	1	-	1	63	-	2	-	40	18	2	-	21	5	153
Tqc	-	-	2	2	49	3	-	9	26	-	-	14	-	105
Td	1	1	15	12	2	123	-	1	3	-	-	3	-	161
Tdt	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pro	45	3	2	3	2	4	-	124	1	-	-	1	2	187
Prc	31	3	16	2	3	1	-	-	62	-	-	1	-	119
Pin	1	-	5	-	1	1	-	-	-	24	-	-	-	32
Pq	-	-	1	-	-	-	-	-	-	-	2	-	-	3
Sil	1	-	1	7	8	9	-	6	6	-	1	114	-	159
Dis	1	-	1	1	1	-	-	1	2	-	-	-	30	37
T	196	16	1032	153	105	161	-	187	119	32	3	159	37	2200

Table 4.2 : Showing the pre-treatment total scores in each category of individual student-teacher in pilot-study (N=5)

SN	Trp	Trn	Tin	Tqo	Tqc	Td	Tdt	Pro	Prc	Pin	Pq	Sil	Dis
1	59	0	185	29	24	33	0	49	17	6	0	40	0
2	21	8	242	38	10	13	0	41	20	9	3	17	18
3	37	0	214	28	27	33	0	26	28	6	0	28	13
4	41	5	199	28	23	17	0	37	29	11	0	44	6
5	38	3	192	30	21	65	0	34	25	0	0	30	0
T	196	16	1032	153	105	161	0	187	119	32	3	159	37

Table 4.3 : Showing the Pretreatment total teacher talk and total Pupil talk individually in Pilot Study (N=5)

S.N.	Teacher Talk	Pupil Talk
1	330	72
2	332	73
3	339	60
4	313	77
5	349	59
T	1663	341

Table 4.4 : Showing Combined Matrix of Post-treatment Data in Pilot Study (N=5)

	Trp	Trn	Tin	Tqo	Tqc	Td	Tdt	Pro	Prc	Pin	Pq	Sil	Dis	T
Trp	39	-	54	21	17	13	-	3	1	6	-	3	-	157
Trn	-	2	-	-	-	-	-	1	-	-	-	-	-	3
Tin	1	-	536	37	46	30	-	1	2	8	-	3	-	668
Tqo	-	-	4	108	1	10	-	63	5	1	-	12	-	204
Tqc	-	-	8	-	69	2	-	3	62	-	-	4	-	148
Td	-	-	27	18	7	56	-	15	3	-	3	6	-	135
Tdt	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pro	72	1	4	3	2	8	-	348	1	1	-	1	-	441
Prc	38	-	18	7	5	5	-	-	187	-	-	1	-	261
Pin	7	-	6	1	1	1	-	-	-	68	-	-	-	84
Pq	-	-	-	-	-	3	-	-	-	-	8	-	-	11
Sil	-	-	7	9	-	7	-	7	-	-	-	62	-	92
Dis	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T	157	3	668	204	148	135	-	441	261	84	11	92	-	2200

Table 4.5 : Showing Post-treatment total scores in each category of individual student-teacher in Pilot Study (N=5)

S.N.	Trp	Trn	Tin	Tqo	Tqc	Td	Tdt	Pro	Prc	Pin	Pq	Sil	Dis
1	27	0	133	40	19	31	0	105	31	25	0	22	0
2	30	3	148	43	27	25	0	84	65	0	0	15	0
3	38	0	134	44	43	25	0	75	46	26	0	10	0
4	29	0	125	35	31	39	0	83	62	13	0	22	0
5	33	0	124	42	28	15	0	94	57	20	11	23	0
T	157	5	664	204	148	135	0	441	261	84	11	92	0

Table 4.6 : Showing the Post-treatment total teacher talk and total pupil talk individually in Pilot Study (N=5)

S.N.	Teacher talk	Pupil Talk
1	250	161
2	276	144
3	284	147
4	259	158
5	242	182
T	1311	792

Table 4.7 : Showing the Pre-treatment - Post-treatment data: Summary of the 't' tests for Significance of Difference Between Means in Pilot Study.

Variables	Pre-treatment group (N=5)		Post-treatment group (N=5)		MD	SED	't'
	M	SD	M	SD			
Teacher Talk	332.6	13.24	262.6	17.55	70.4	3.61	19.50*
Pupil Talk	68.2	8.16	158.4	15.00	90.2	7.63	11.82*
Trp	39.2	13.33	31.4	4.27	7.8	6.32	1.23
Trn	-	-	-	-	-	-	-
Tin	206.4	22.61	132.8	9.62	73.6	5.89	12.49*
Tqo	30.6	4.22	40.8	3.54	10.2	2.45	4.16**
Tqc	21.0	6.51	29.6	8.67	8.6	4.78	1.79
Td	32.2	20.47	27.0	8.83	5.2	9.54	0.54
Tdt	-	-	-	-	-	-	-
Pro	37.4	8.50	88.4	12.34	50.8	6.36	7.98*
Prc	23.8	5.45	52.2	16.05	28.4	6.59	4.30**
Pin	6.4	4.15	16.8	10.70	10.4	4.87	2.13
Pq	-	-	-	-	-	-	-
Sil	31.8	10.64	18.4	5.68	13.4	5.29	2.53
Dis	-	-	-	-	-	-	-

* Significant at .01 level ** Significant at .05 level

Results in table 4.7 indicate that the knowledge of transaction analysis seems to have helped in modification of the classroom verbal behaviour of student-teachers in the post-treatment stage. Student-teachers tend to become more indirect in their attempts to motivate and control their pupils. Indirect behaviour consists of those verbal statements of the student-teacher that expand pupil's freedom of action by encouraging their verbal participation and initiative. These include asking questions, accepting and clarifying the ideas or feelings of pupils, and praising or encouraging pupils responses, giving opportunity to pupils to add their ideas, information and even giving freedom to ask questions. There is rapid inter-change between the teacher and the pupils indicating more flexibility in communication in classes handled by student-teachers in post-treatment stage. Spontaneous pupil talk has increased more among the pupils taught by student-teachers in post-treatment stage than in pre-treatment stage. Less silence and disruptions are marked in the classes taught by student-teachers in later stage. These are indicative of efficacy of the treatment viz., Transaction Training based on Analysis of Classroom Transactions category system for the modification of behaviour of student-teachers.

Thus the purpose of the pilot study was fulfilled. As was expected, the transaction training to pre-service teachers helped in modifying their classroom verbal behaviour. Similar to present findings of this investigation, the studies of Kirk (1963), Hough and Amidon (1964) and Hough and Ober (1967) have indicated the effectiveness of interaction analysis in modifying teacher behaviour.

4.5 DISCUSSION OF FINAL EXPERIMENT

To find out the effects of the treatment, transaction training based on Analysis of Classroom Transactions Category System, this discussion is presented in the context of the inter-observer reliability, comparison of ratios, percentages and comparison of pre-treatment and post-treatment matrices.

4.5.1 Inter-Observer Reliability

To check whether the observations by the investigator maintain the same level of reliability, the Scott's Reliability Coefficient calculated came to be 0.89. Table 4.8 (on next page) reports the result for inter-observer reliability. Thus the inter-observer reliability coefficient was found to be above 0.85. This fulfills the requirements of reliability of the observation.

4.5.2 Comparison of Transaction Matrices

Transaction matrices prepared on the basis of the observations made on each student-teacher combined to yield one master matrix for each of the pre-treatment and post-treatment stages. Some ratios and percentages were calculated, which show that the classroom behaviour patterns of student-teachers are more or less different in two stages (Tables 4.9 and 4.10). The further examination of data in greater detail (Table 4.17) indicates that there is a significant difference on the variables between pre-treatment and post-treatment stages. This might be due to the treatment given to the student-teachers.

Table 4.8 : Showing the Inter-Observer Reliability.

Categories	Frequencies		Percentages		Difference of percentage	$\frac{(\text{Average \%})^2}{100}$
	Observer A	Observer B	Observer A	Observer B		
Trp	8	9	2.01	2.26	0.26	0.044
Trn	3	4	0.75	1.00	0.25	0.006
Tin	258	261	64.98	65.57	0.59	42.50
Tqo	20	19	5.03	4.77	0.26	0.22
Tqc	11	13	2.77	3.26	0.49	0.09
Td	15	15	3.78	3.77	0.01	0.13
Tdt	0	0	0	0	0	0
Pro	40	35	10.07	8.79	1.28	1.04
Prc	15	11	3.77	2.75	1.02	0.106
Pin	4	3	1.00	0.75	0.25	0.006
Pq	4	4	1.00	1.00	0	0.01
Sil	12	15	3.00	3.77	0.77	0.114
Dis	7	9	1.76	2.26	0.50	0.04
Total	397	398	99.92	99.95	5.67	44.306

$$Pi = \frac{Po - Pe}{100 - Pe} = \frac{100 - 5.67 - 44.30}{100 - 44.30} = \frac{50.03}{55.67} = 0.89$$

1. Ratios

When the matrix has been completed by registering all the paired transactions, investigator has considered various aspects of the transaction patterns and calculated some ratios of student-teacher's classroom transactions. Table 4.9 reveals the comparison of Ratios of classroom transactions of student-teachers in pre-treatment and post-treatment stages. The results presented in the table 4.9 is discussed as below:

Table 4.9: Showing Comparison of Ratios of Classroom Transactions of Student-Teachers in pre-treatment and post-treatment stages: The Final Experiment (N=12)

Ratio's of variables	Pre-treatment	Post-treatment
Teacher Talk / Pupil Talk (TT / PT)	5.58	1.28
Positive response of teacher / Negative response of teacher	0.9	0.00
Teacher closed questions / Teacher open questions	0.5	0.67
Initiated Pupil Talk / Initiated Teacher Talk	0.04	0.2
Pupil closed response / Pupil Open response	0.5	0.67

The ratio of $\frac{\text{Teacher talk}}{\text{Pupil talk}}$ is 5.58 in pre-treatment and 1.28 in post-treatment. This means that student-teachers in pre-treatment talked 5.58 times as much as the pupil did and talked 1.28 times as much as pupil talked in post-treatment. The

events of teacher talk were more frequent than pupil talk in both the stages but in post-treatment teachers talks were reduced. It shows that in post-treatment stage pupils' participation was increased.

Ratio of $\frac{\text{Positive response of teacher}}{\text{Negative response of teacher}}$ is 0.9 in pretreatment and zero in post-treatment. Student-teachers in pre-treatment stage have used positive responses 0.9 times as much as negative responses. But in post-treatment stage student-teachers have not used negative responses at all. Although student-teachers in both pre- and post-treatment stages have used more positive responses in comparison to negative responses student-teachers in post-treatment stage encouraged pupil in greater measure as compared to student-teachers in pre-treatment stage by accepting and clarifying an attitude or the feelings of the pupil, indicating that pupil's answer is correct, giving credit to a pupil or the class, and developing pupil's ideas.

$$\text{Ratio of } \frac{\text{Teacher question closed}}{\text{Teacher question open}}$$

is 0.5 in pre-treatment and 0.67 in post-treatment stage. It indicates that student-teachers in both the stages have asked more open questions than closed questions. But student-teachers in post-treatment stage have asked more for divergent, original, and creative answers in comparison to pre-treatment stage.

$$\text{Ratio of } \frac{\text{Initiated Pupil Talk}}{\text{Initiated Teacher Talk}}$$

is 0.04 in pre-treatment stage and 0.2 in post-treatment stage. It means pupils under the student-teachers in post-treatment stage showed more initiative than in pre-treatment stage.

Ratio of $\frac{\text{Pupil closed response}}{\text{Pupil open response}}$ is the same as in the ratio of $\frac{\text{Teacher closed questions}}{\text{Teacher open questions}}$ reveals that pupils response behaviour is directly governed by the teachers questioning behaviour.

Thus the results reveal that transaction training helped the student-teachers to change their transaction behaviour. The notable changes were seen when the student-teachers talked less and elicited more pupil participation. Student-teachers showed tendency towards more indirect behaviour.

2. Percentages

Percentages of different variables of classroom transactions in pre-treatment and post-treatment stages, were calculated. Table 4.10 (on next page) reveals that there is difference in the transaction patterns of student-teachers in pre-treatment and post-treatment stages. The results are discussed as below.

The student-teachers talked less (54.3 per cent) in post-treatment than in pre-treatment (78.2 per cent). Pupils talked more in post-treatment (42.2 per cent) than in pre-treatment (14.00 per cent). Pupils more participation was due to the student-teachers' indirect behaviour. It is interesting to note that pupil talks in post-treatment were increased three times that of in pre-treatment stage.

Student-teachers positive responses were increased and negative responses were decreased in post-treatment. Results

Table 4.10 : Showing the Comparision of percentages of different variables of classroom transaction in two stages : The final experiment (N=12).

Variables of classroom Behaviour	Percentages of variables in two stages	
	Pre-treatment	Post-treatment
Total Teacher Talk	78.2	54.3
Total Pupil Talk	14.0	42.2
Trp	2.43	5.04
Trn	2.66	0.00
Tin	58.9	3.16
Tqo	5.64	7.85
Tqc	2.9	5.29
Td	4.9	6.00
Tdt	0.66	0.00
Pro	7.1	18.62
Prc	3.9	12.5
Pin	1.5	6.5
Pq	1.6	4.5
Sil	5.2	3.37
Dis	2.5	0.00

REV
reveal that student-teachers in post-treatment were friendly, democratic and able to accept pupils feelings, attitude and ideas.

Out of total teacher talk (78.2 per cent), student-teachers have given 58.9 per cent information to the class in pre-treatment

But remarkable change is seen in post-treatment when it was minimised to only 3.16 per cent in post-treatment stage. Questioning behaviour of the student-teachers were influenced by the behaviour of the teachers, giving information. Student-teachers were able to control their information giving behaviour and modified it to ask more and more open and closed questions in post-treatment stage.

Giving directions at different steps of learning to the pupils has increased in post-treatment and giving negative responses has minimised to zero in post-treatment stage. Thus student-teachers have controlled their negative behaviour and changed it to giving directions to pupils, where necessary.

Pupils response open and closed, both have increased in post-treatment stage. This is due to the increased questioning behaviour of teachers in post-treatment stage. Student-teachers have asked more and more open as well as closed, questions and in return they received more open and closed responses from the pupils. Hence transaction between teacher and pupils was maintained.

In post-treatment, pupil giving information to the class and to the teacher is five times as that in pre-treatment. This is a noticeable change on the part of pupils behaviour which is the sign of teachers indirect behaviour and successful teaching. Asking questions to teacher is more in post-treatment (4.5 per cent) that in pre-treatment (1.6 per cent). It shows the friendly, sympathetic and democratic climate of the class.

Silence-short period of pause and disruption - when transaction is stopped, were decreased in post-treatment stage. It has also fruitful bearing that the entire class was engaged in teaching-learning activity.

The effect of transaction training seems to be prominent in the direction of increasing the indirect influence, creating a social atmosphere or climate that appears conducive to teaching-learning process. Table 4.10 reveals consistent results of change in the direction of increasing the indirect influence. The situations are indicative of the teacher's more concern for positive motivation and reinforcement perhaps due to the transactional training treatment based on Analysis of Classroom Transactions (ACTs). There is remarkable increase in the pupil initiated talk. The result seems to be in line with the result of increase in pupil participation.

Thus the results presented in tables 4.9 to 4.16 reveal that the treatment of Transaction Training based on ACTs did help student-teachers change their classroom behaviour. Student-teachers scored higher on Trp, Tqo, Tqc, Td, Pro, Prc, Pin, Pq in post-treatment and lower on Trn, Tin, Tdt, Sil and Dis in pre-treatment stage. Thus the first and second hypotheses are retained. There is ample evidence to show that pre-service teachers who have been taught and trained in transaction could change their teaching behaviour in the studies of Hough and Amidon 1964 (a) (b), Kirk (1964), Furst (1965), Flanders (1960-a), Amidon & Flanders (1961), Lashier (1965), Pareek and Rao (1971), Jangira (1972), and Singh (1973).

4.5.3 Effect of Transaction Training on Classroom Behaviour of Student-Teachers

To test the third hypothesis concerning significant difference in transaction patterns of student-teachers between pre-treatment and post-treatment stages only combined matrices of the student-teachers of pre-treatment and post-treagment stages (Tables 4.11 - 4.16) were tested. Table 4.17 shows the significant difference in transaction patterns of student-teachers in two stages. Student-teachers differ significantly on most of the variables between pre and post-treatment stages. Student-teachers scored zero on variables viz. Trn, Tdt and Dis in post-treatment stage and they did not differ significantly on only one variable, Td.

The third hypothesis is accepted at .01 level of confidence and this seems to be enough evidence to infer that student-teachers trained in ACTs (in post-treatment) differ significantly in their verbal behaviour in classroom from their verbal behaviour in classroom in pre-treatment stage.

4.6 OVERVIEW

A study of the results of the effects of treatment, transaction training based on Analysis of Classroom Transactions (ACTs) reveals the fact that the training could help the student-teachers to change their classroom verbal behaviour. As a result of the training student-teachers classroom behaviour changed significantly. Pupil participation increased significantly in

Table 4.11 : Combined Matrix of Pre-treatment data in Final Experiment (N=12)

	Trp	Trn	Tin	Tqo	Tqc	Td	Tdt	Pro	Prc	Pin	Pq	Sil	Dis	T
Trp	85	-	17	3	2	5	-	-	-	1	2	1	-	116
Trn	-	96	16	-	-	6	3	-	-	1	-	2	4	128
Tin	-	-	2697	43	16	19	2	-	-	5	6	26	14	2828
Tqo	-	1	2	205	-	2	-	54	-	-	-	7	-	271
Tqc	-	-	-	-	91	1	-	-	41	-	-	6	2	141
Td	-	-	32	7	2	190	1	1	3	-	-	2	-	238
Tdt	-	-	3	3	1	-	25	-	-	-	-	-	-	32
Pro	20	11	10	-	1	3	-	286	1	5	1	3	1	342
Prc	6	4	10	1	5	1	-	1	136	10	1	3	3	191
Pin	1	2	7	3	1	3	1	-	-	49	5	1	-	73
Pq	4	6	2	-	-	6	-	-	-	-	56	3	-	77
Sil	-	2	22	4	18	-	-	-	-	2	3	195	5	251
Dis	-	6	10	2	4	1	-	-	-	-	3	3	93	122
T	116	128	2828	271	141	238	32	342	191	73	77	251	122	4800

Table 4.12 : Showing the pre-treatment total scores in each category of individual student-teacher in final experiment (N=12)

SN	Trp	Trn	Tin	Tqo	Tqc	Td	Tdt	Pro	Prc	Pin	Pq	Sil	Dis
1	6	7	254	36	5	0	0	51	8	6	0	16	11
2	7	4	233	10	18	42	3	12	19	9	10	29	4
3	9	8	224	31	26	29	0	35	25	3	0	7	3
4	5	9	244	18	7	67	0	18	5	0	0	27	0
5	6	9	257	22	16	9	0	27	29	0	0	8	7
6	11	27	208	15	17	17	9	0	14	3	5	50	24
7	12	10	242	16	11	9	4	24	19	15	10	17	11
8	11	10	233	20	8	10	3	45	9	4	8	27	12
9	10	15	223	20	13	12	0	30	28	2	13	18	16
10	11	12	254	26	5	16	6	23	7	6	12	14	18
11	16	3	227	28	7	24	0	47	7	11	6	12	12
12	12	14	229	29	8	3	7	30	11	14	13	16	14
T	116	128	2828	271	141	238	32	342	181	73	77	251	122

Table 4.13 : Showing the Pre-treatment individual student-teacher's total teacher talk and Pupil talk in final experiment (N=12)

Sr.No.	Teacher Talk	Pupil Talk
1	308	65
2	317	50
3	327	63
4	350	23
5	319	56
6	304	22
7	304	68
8	295	66
9	293	73
10	330	48
11	305	71
12	302	68
T	3754	673

Table 4.14 : Showing combined matrix of post-treatment data in final experiment (N=12)

	Trp	Trm	Tin	Tqo	Tqc	Td	Tdt	Pro	Prc	Pin	Pq	Sil	Dis	T
Trp	89	-	45	11	8	3	-	18	8	42	16	2	-	242
Trm	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin	-	-	1209	78	44	69	-	2	-	35	9	2	-	1448
Tqo	-	-	1	192	-	6	-	137	14	2	2	23	-	377
Tqc	-	-	1	-	153	-	-	1	74	12	1	12	-	254
Td	-	-	64	40	13	133	-	10	13	3	11	2	-	288
Tdt	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pro	67	-	29	3	7	24	-	726	16	9	3	10	-	894
Prc	39	-	28	-	-	19	-	-	478	21	19	-	-	604
Pin	19	-	8	42	27	18	-	-	-	186	15	-	-	315
Pq	28	-	44	3	-	-	-	-	-	3	135	4	-	217
Sil	-	-	19	8	2	17	-	-	1	2	6	108	-	162
Dis	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T	242	0	1448	377	254	288	0	894	604	315	217	162	0	4800

Table 4.15 : Showing the Post-treatment total scores in each category of individual student-teacher in final experiment (N=12)

S.N.	Trp	Trn	Tin	Tqo	Tqc	Td	Tdt	Pro	Prc	Pin	Pq	Sil	Dis
1	18	-	119	34	22	27	-	74	48	31	18	9	-
2	27	-	130	36	25	19	-	67	52	14	11	20	-
3	20	-	123	33	22	25	-	70	51	28	17	11	-
4	20	-	129	37	23	21	-	68	45	27	16	14	-
5	22	-	112	29	20	23	-	78	57	30	16	13	-
6	20	-	121	26	19	24	-	76	47	30	20	17	-
7	20	-	114	33	22	30	-	82	46	25	20	10	-
8	20	-	120	33	22	19	-	81	48	25	18	14	-
9	21	-	117	32	19	23	-	75	43	30	27	13	-
10	21	-	114	34	22	27	-	75	56	24	17	11	-
11	18	-	113	29	19	26	-	72	64	24	19	16	-
12	14	-	136	22	19	24	-	76	47	27	18	18	-
T	242	0	1448	377	254	288	0	894	604	315	217	162	0

Table 4.16 : Showing the post-treatment individual student-teacher's total teacher talk and total pupil talk in Final Experiment (N=12)

S.N.	Teacher talk	Pupil talk
1	220	171
2	237	144
3	223	166
4	230	156
5	206	181
6	210	173
7	219	173
8	214	172
9	212	175
10	218	172
11	205	179
12	215	168
T	2609	2030

Table 4.17 : Showing the pre-treatment - post-treatment data : Summary of the 't' tests for significance of difference between means in final experiment

Variables	Pre-treatment group (N=12)		Post-treatment group (N=12)		MD	SED	't'
	M	SD	M	SD			
Teacher talk	312.8	16.51	217.4	9.38	95.4	5.48	17.4 *
Pupil talk	56.08	17.52	169.16	10.03	113.08	5.81	19.46*
Trp	9.6	3.17	20.0	2.39	10.6	1.10	9.63*
Trn	-	-	-	-	-	-	-
Tin	235.67	14.87	120.6	7.86	115.07	4.84	23.77*
Tqo	22.58	7.49	31.42	5.40	18.84	1.74	10.82*
Tqc	11.75	6.42	21.16	1.95	9.41	2.33	4.03*
Td	19.8	16.69	24.0	3.30	4.2	4.88	0.86
Tdt	-	-	-	-	-	-	-
Pro	28.34	14.81	74.5	4.67	46.16	4.27	10.81*
Prc	15.0	9.20	50.34	6.03	35.34	3.10	11.4*
Pin	6.0	5.12	26.25	4.59	20.25	1.88	10.77*
Pq	6.42	5.33	18.00	3.67	11.58	1.79	6.46*
Sil	20.8	10.43	13.5	3.39	7.3	2.91	2.50**
Dis	-	-	-	-	-	-	-

* Significant at .01 level
** Significant at .05 level

post-treatment stage. It may appear at the outset that it is unreasonable to expect much change in pupil participation as it is the teachers who were trained and not the pupils. On the other hand it may also be reasonable to expect the change as transaction is always between the teacher and the pupil and any change in teacher verbal behaviour may mean a corresponding change in pupil transaction. As a result of training the significant increase in indirect influence is consistently notable in post-treatment stage. Student-teachers also show consistent and significant change in the direction of using more and more acts of praising and building them up. The results indicate that there are significant changes in pupil self-initiated talk as a result of changed transaction patterns of student-teachers in post-treatment stage. Another interesting noticeable phenomena is the significant change in communication pattern and the less occurrence of silence and disruption in the post-treatment stage. This may be due to the treatment of transaction training in encouraging the pupil participation in the post-treatment which led to flexibility in communication pattern leaving less time for the occurrence of silence and even no time for the occurrence of disruption. It is indicative of the fact that transaction between student-teachers and pupils was reasonably high with more opportunity of flexibility in communication and less possibility of occurrence of silence and disruption. The significant decrease in teacher verbalisation and use of the authority by criticising or restricting the freedom of the pupil in post-treatment stage. Usually the teacher is at a vantage point in respect of monopolishing talking due to his power and authority in the classroom as the initiative lies in

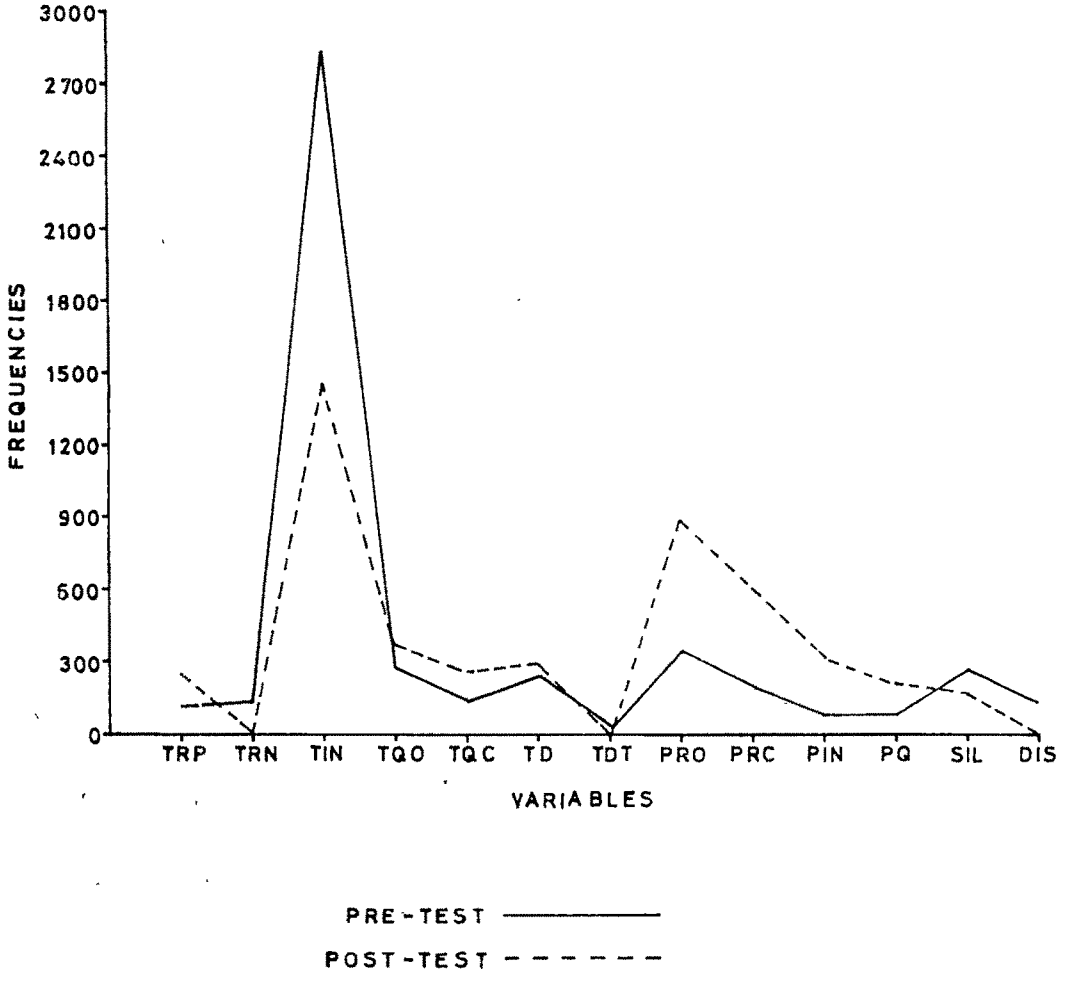
him. But that power and authority do not seem to be utilized in this case.

Teacher talk is less even from the normative expectation of sixty per cent of Flanders (1970). There was more pupil initiated talk in classes taught by student-teachers who had been trained in ACTs. Results report significant differences in pupil participation, occurrence of disruption, flexibility in inter-communication between student-teachers and pupils and more use of indirect influence. These distinctive modifications in the teaching behaviour of student-teachers in post-treatment stage may be due to transaction training. These results lead to the acceptance of all the three hypotheses.

4.7 MODIFICATION OF CLASSROOM VERBAL BEHAVIOUR

The extent of the modification of verbal behaviour of student-teachers are noticeable in the graph 1, drawn on the basis of tables 4.11 and 4.14. The Graph reveals increase on teacher response positive, Teacher question open, Teacher question closed, Teacher direction, Pupil response open, Pupil response closed, Pupil information, and Pupil question in post-treatment. This is an indicative of the fact that rapid change in the inter-communication process during classroom transaction is an improve-ment to reach those levels of cognitive functioning that require independent thinking and self-direction. Increase in pupil initiation works as an reinforcement to pupil's behaviour. Noticeable efficacy of the transaction training based on Analysis of classroom Transactions (ACTs) may be due to more specification

MODIFICATION OF SCIENCE STUDENT TEACHERS BEHAVIOUR
IN
PRE-TEST-POST-TEST STAGES



of the categories to be practised and more objective information and feedback about the performance. These features of teacher training programmes seems to be neglected in traditional training method to a large extent and in Flaunders Interaction Analysis category system to a certain extent (Singh 1973).

4.8 CONCLUSIONS

The results presented so far reveal that the Analysis of Classroom Transactions treatment given to student-teachers did help them to modify their verbal classroom behaviour. As a result of the training through Analysis of Classroom Transactions category system the modified verbal behaviour in the classroom in post-treatment stage is significantly different on various aspects of teacher behaviour compared to classroom verbal behaviour of student-teachers in pre-treatment stage. These indicate that: (i) quality of teacher participation is much more indirect in post-treatment, (ii) teacher is even more indirect when responding to pupil talk, (iii) flow of communication between the teacher and the pupils and the flexibility with which the teacher shifts from one category to another is higher, (iv) pupils are more encouraged and reinforced for further participation, (v) ideas suggested by pupils are usually accepted, clarified and used, (vi) there seems to be fewer pauses in the flow of communication, (vi) student-teachers were able enough to control disruption in the classroom and (vii) student-teachers have started using more of indirect influence. Thus the effect of training through Analysis of Classroom Transactions seems to be in the direction of increasing the indirect influence. This aspect of teacher behaviour is

significantly related to pupil achievement (Lashier, 1967; Lulla 1974). Rosenshine (1971) reported that positive correlations between indirect behaviour and pupil achievement were obtained in eleven of thirteen studies reviewed by him.

The less use of authority, criticism of the pupils and self-reference by the student-teachers in post-treatment stage are other distinctive aspects of Modified verbal classroom behaviour. This shows a tendency towards the use of more indirect influence. Use of indirect influence is most sensitive to positive aspects of social skill in the teacher-pupil relationship. It is a shift from praise to the clarification and development of pupil ideas. This usually indicates teacher concern for positive motivation and reward. Since this is a part of the more general indirectness, the significance of modification of behaviour in this aspect seem due to the treatment. Rosenshine (1971) reported that eight studies have been found out of thirteen reviewed by him in which use of pupil ideas were correlated with measures of pupil achievement.

Thus the distinctive results of the Transaction Training based on Analysis of Classroom Transactions category System treatment may be due to the quantitative study of classroom behaviour making it possible to describe objectively the pattern of a lesson which could help to overcome some limitations of traditional practice. The knowledge itself could serve a reliable feedback technique. But the limitations of non-verbal behaviour are unrecorded.