

C H A P T E R F I V E

TEACHER CLASSROOM BEHAVIOUR AND SUBJECT TAUGHT - ANALYSIS AND DISCUSSION -

I. TEACHER BEHAVIOUR IN RELATION TO SUBJECT TAUGHT

The present investigation has been directed towards studying teacher influence in relation to age, recency of training, experience, sex and marital status of the teacher and also with respect to the subject taught.

In the previous chapter, the problem has been studied in relation to the first-mentioned five variables - namely, age, recency of training, experience, sex and marital status of the teacher.

In this chapter, the last-mentioned variable - namely, subject taught is taken up and the problem is studied to find out, among other things, whether teacher influence significantly differs across the school subjects.

The criterion dimensions are, as in the case of the previous variables, the two measures of teacher indirect behaviour - namely, I/D and i/d.

Since the 32 teachers in the second part of the sample have been observed in respect of each one of the six subjects there are six I/D ratios which are measures of teacher indirect behaviour including content emphasis derived for the six different subjects, for each teacher.

Analysis of variance - two way was applied to the data and the results are reported in Table XXXVIII.

TABLE XXXVIII
SUMMARY OF ANALYSIS OF VARIANCE TABLE (SUBJECT
TAUGHT) - I/D's

Source of variation	SS	df	MSS	F-Ratio
Between subjects	0.2714	5	0.05428	* 9.07692
Between teachers	2.19066	31	0.07066	*11.81605
Within groups	0.92804	155	0.00598	

* Significant at .01 level.

Discussion of Results

The significant 'F' ratios as regards, both 'Between Subjects' and 'Between Teachers' indicate that the differences in either case are statistically significant

at the level of confidence indicated.

The implications of these statistical results are that teachers differ significantly in terms of the criterion behaviour (I/D) not only among themselves but also across the different subjects. In other words, teacher influence (I/D) differs significantly when the teacher shifts from one subject to another, on the whole.

Towards testing the hypothesis set up in this regard, these findings may be restated that teachers differ significantly in their influence patterns, in terms of I/D, as between different subjects.

The verdict of significance awarded by Analysis of Variance justifies and calls for the application of 't' technique for further analysis.

Hence, attempt is made to identify the pairs of 'significantly different' subjects' from among the six subjects under study.

The six subjects yield fifteen possible pairs. Student's 't' (related Sample - Difference Method) has been, therefore, applied to the I/D ratios of the 32 teachers in respect of every one of the fifteen pairs.

The results of the 't' test are reported here-under in Table XXXIX.

TABLE XXXIX
SUMMARY OF 't' TESTS - I/D's

Subject Pair	Mean _D	SD _D	SE _{MD}	't'
Tamil - English	.06	.11	.01944	3.08641*
Tamil - Mathematics	.06	.11	.01944	3.08641*
Tamil - History	.04	.08	.01414	2.82885*
Tamil - Geography	.02	.08	.01414	1.41442**
Tamil - Science	.02	.09	.0159	1.25786**
English - Mathematics	0			-
English - History	.10	.12	.02121	4.71475*
English - Geography	.08	.13	.02298	3.48128*
English - Science	.04	.11	.01944	2.05761@
Mathematics - History	.10	.12	.02121	4.71475*
Mathematics - Geography	.08	.11	.01944	4.11522*
Mathematics - Science	.05	.12	.02121	2.35737@
History - Geography	.02	.03	.0053	3.77358*
History - Science	.06	.1	.01767	3.39558*
Geography - Science	.04	.09	.0159	2.51572@

* Significant at .01 level
 ** Not significant
 @ Significant at .05 level

Discussion of Results

The individual 't' tests carried out in respect of the 15 subjects pairs yield as many as twelve

significant 't' ratios. The three pairs where 't' ratios are not found significant are Tamil-Geography, Tamil-Science, and English-Mathematics.

Of the twelve significant 't' ratios, nine are significant at .01 level and the concerned pairs are Tamil-English, Tamil-Mathematics, Tamil-History, English-History, English-Geography, Mathematics-History, Mathematics-Geography, History-Geography and History-Science.

Three 't' ratios are significant at .05 level and the concerned pairs are English-Science, Mathematics-Science and Geography-Science.

For a clearer identification of subject pairs indicating significance, a summary is given in Table XL. Under each subject in its column are given the subjects with which it makes 'significantly different' pairs.

TABLE XL

SUMMARY OF SIGNIFICANTLY DIFFERENT SUBJECT
PAIRS - I/D's

Tamil	English	Mathematics	History	Geogra- phy	Scien- ce
English	Tamil	Tamil	Tamil	English	English
Mathe- matics	History	History	English	Mathe- matics	Mathe- matics
History	Geography	Geography	Mathe- matics	History	History
	Science	Science	Geogra- phy	Science	Geogra- phy
			Science		

The self-explanatory summary clearly and separately identifies, in respect of each subject, the significantly different partners thereto.

Noteworthy is the fact that History makes a significantly different subject with every other possible subject. It means that teachers differ in their influence patterns, in terms of I/Ds when they change from History on to any other of the remaining five subjects.

Since, however, on the whole, twelve pairs turn out to be significantly different, the hypothesis is sustained only in respect of these twelve pairs of I/D.

There is, therefore, no statistical evidence to sustain the hypothesis that teachers differ in their influence patterns, in terms of I/D as between Tamil and Geography, Tamil and Science, and English and Mathematics.

In a similar manner Analysis of Variance has been applied to the data of i/d's which are measures of teacher indirect behaviour of purely social-emotional nature of the 32 teachers in all the six subjects and the results are summarised in Table XLI.

TABLE XLI
 SUMMARY OF ANALYSIS OF VARIANCE TABLE (SUBJECT
 TAUGHT - i/d's

Source of Variation	SS	df	MSS	F-Ratio
Between subjects	0.27807	5	0.05561	*4.00359
Between teachers	3.92624	31	0.12665	*9.11807
Within Groups	2.15363	155	0.01389	

* Significant at .01 level.

Discussion of Results

The significant 'F' ratios as regards both 'Between Subjects' and 'Between Teachers' indicate that the differences in either case are statistically significant at the level of confidence indicated.

The implications of these statistical results are that teachers differ significantly in terms of the criterion behaviour (i/d) not only among themselves but also across the different subjects. In other words, teacher influence (i/d) differs significantly when the teacher shifts from one subject to another, on the whole.

By way of testing the hypothesis set up in this regard, these findings may be restated that teachers significantly differ in their influence patterns in terms of i/d, as between different subjects considered as per the

Analysis of Variance.

The verdict of significance awarded by Analysis of Variance justifies, and calls for the application of 't' technique for further analysis.

Hence, attempt is made to identify the particular pairs of significantly different subjects from among the six subjects under study.

Student's 't' (related Sample - Difference Method) has been applied to the i/d ratios of the 32 teachers in respect of every one of the fifteen possible pairs.

The results of the 't' test are reported in Table XLIII.

TABLE XLII
SUMMARY OF 't' TESTS - i/d's

Subject Pair	Mean _D	SD _D	SE _{M_D}	't'
Tamil-English	.024	.158	.02792	.85959**
Tamil-Mathematics	.085	.15	.02651	3.20633*
Tamil-History	.01	.16	.02828	.3536**
Tamil-Geography	.05	.19	.03358	1.48898**
Tamil-Science	.01	.17	.03005	.33277**
English-Mathematics	.10	.19	.03358	2.97796*
English-History	.01	.15	.02651	.37721**
English-Geography	.07	.15	.02651	2.64051@
English-Science	.01	.16	.02828	.3536**
Mathematics-History	.09	.19	.03358	2.68016@
Mathematics- Geography	.02	.17	.03005	.66555**
Mathematics-Science	.08	.18	.03181	2.51493@
History-Geography	.05	.15	.02651	1.88608**
History-Science	.01	.13	.02298	.43516**
Geography-Science	.08	.17	.03005	2.66222@

* Significant at .01 level
 ** Not significant
 @ Significant at .05 level

Discussion of Results

The individual 't' tests carried out on the 15 possible pairs, yield only 6 significant 't' ratios.

In the case of two pairs the 't' ratios turn out to be significant at .01 level of confidence and the pairs are Tamil-Mathematics and English-Mathematics. In other words, the patterns of teacher influence differ significantly at the level of confidence indicated when the teachers move from Mathematics on to Tamil and English.

The 't' ratios in the case of 4 subject pairs indicate that they are significantly different at .05 level. The concerned pairs are English-Geography, Mathematics-History, Mathematics-Science and Geography-Science.

The remaining 9 non-significant 't' ratios signify that there is no statistical evidence to believe that teachers differ in their influence patterns, in terms of i/d , when they change from one to another among the pairs concerned.

Comparisons Between Subjects Taught (Matrix Comparisons)

Since all the 32 teachers in the second part of the sample have been observed each for a total of one hour in every one of the six subjects taught, when composite matrices, subjectwise, were developed they yielded six Master Matrices, one for each subject representing the combined interaction episodes of all the 32 teachers in the subject. The six composite matrices are given below in Figures 23, 24, 25, 26, 27 and 28.

1	2	3	4	5	6	7	8	9	10	Total
1	-	1	-	1	-	2	-	3	-	9
2	195	146	331	416	100	37	813	102	225	2365
3	-	142	87	268	12	6	23	16	35	600
4	-	64	4	229	32	16	1544	348	388	2714
5	-	143	20	9728	153	64	388	329	641	12361
6	-	17	9	128	113	53	317	54	522	1315
7	-	36	10	85	126	144	128	47	224	856
8	-	1598	116	538	318	177	3156	56	630	7016
9	9	185	130	326	88	131	12	253	259	1508
10	-	115	23	783	371	228	633	300	782	3706
Total	9	2365	600	2714	12361	856	7016	1508	3706	32450

FIGURE 23
COMBINED MATRIX FOR TAMIL

	1	2	3	4	5	6	7	8	9	10	Total
1	-	-	-	1	-	1	-	5	-	2	9
2	-	174	91	310	273	182	20	1849	69	298	3266
3	-	11	58	41	108	6	3	16	7	39	289
4	-	111	8	467	118	68	10	1346	227	539	2894
5	-	48	14	609	7581	152	49	974	212	930	10569
6	-	50	4	172	192	168	31	514	50	543	1724
7	-	22	2	43	59	72	45	62	14	122	441
8	-	2517	59	482	934	443	124	2867	21	814	8261
9	8	136	38	80	198	94	43	17	50	180	844
10	1	197	15	689	1106	538	116	611	194	1012	4479
Total	9	3266	289	2894	10569	1724	441	8261	844	4479	32776

FIGURE 24
COMBINED MATRIX FOR ENGLISH

	1	2	3	4	5	6	7	8	9	10	Total
1	1	2	-	-	3	1	-	-	-	4	11
2	-	111	87	415	283	81	23	402	49	194	1645
3	-	9	87	64	154	8	6	26	16	21	391
4	-	41	9	352	85	42	23	1835	294	321	3002
5	1	59	16	791	4705	194	73	448	248	714	7249
6	-	27	10	111	173	169	58	107	54	447	1156
7	-	20	5	68	108	82	158	44	44	220	749
8	1	1167	93	606	559	125	106	260	16	391	3324
9	6	118	72	107	236	73	115	8	56	203	994
10	2	91	12	488	943	381	187	194	217	941	3456
Total	11	1645	391	3002	7249	1156	749	3324	994	3456	21977

FIGURE 25

COMBINED MATRIX FOR MATHEMATICS

	1	2	3	4	5	6	7	8	9	10	Total
1	1	-	-	1	-	1	1	5	2	-	11
2	1	122	164	292	371	53	24	590	59	187	1863
3	-	15	191	89	285	9	-	28	24	34	675
4	-	53	4	273	128	39	19	1457	222	384	2579
5	-	79	31	905	11507	150	54	417	238	779	14160
6	1	17	5	75	118	105	55	231	47	346	1000
7	-	28	1	55	65	83	87	89	31	197	636
8	1	1322	136	374	559	186	133	2924	64	465	6164
9	6	121	110	78	212	59	101	14	151	192	1044
10	1	106	33	437	915	315	162	409	206	706	3290
Total	11	1863	675	2579	14160	1000	636	6164	1044	3290	31422

FIGURE 26

COMBINED MATRIX FOR HISTORY

	1	2	3	4	5	6	7	8	9	10	Total
1	-	1	-	3	2	2	1	4	-	3	16
2	1	89	113	261	327	99	30	722	65	182	1889
3	-	14	97	65	197	6	7	17	23	49	475
4	-	34	8	259	129	35	22	1394	281	398	2560
5	-	47	27	811	9086	242	96	494	433	1031	12267
6	1	18	5	104	220	140	58	255	42	484	1327
7	-	33	1	81	131	104	103	114	47	219	833
8	2	1430	93	382	572	269	171	2605	50	524	6098
9	12	119	106	124	372	81	114	19	92	248	1287
10	-	104	25	470	1231	349	231	474	254	985	4123
Total	16	1889	475	2560	12267	1327	833	6098	1287	4123	30875

FIGURE 27

COMBINED MATRIX FOR GEOGRAPHY

	1	2	3	4	5	6	7	8	9	10	Total
1	1	-	-	1	4	2	1	3	6	2	20
2	-	158	191	313	432	75	16	685	117	280	2267
3	-	14	214	115	324	13	3	27	42	63	815
4	-	40	9	256	107	21	18	1519	396	402	2768
5	2	194	35	902	8935	189	68	357	415	703	11800
6	-	17	11	115	79	109	62	307	51	408	1159
7	-	17	5	69	98	100	105	85	44	226	749
8	1	1474	137	354	546	229	129	2787	73	562	6292
9	14	220	167	145	373	81	111	23	230	345	1709
10	2	133	46	498	902	340	236	499	335	833	3824
Total	20	2267	815	2768	11800	1159	749	6292	1709	3824	31403

FIGURE 28

COMBINED MATRIX FOR SCIENCE

Comparisons of Matrices

It has been decided to apply Darwin's likelihood Ratio Criterion test for every possible pair of the six subject - matrices. The six subjects give rise to fifteen possible pairs, for purposes of comparison.

The Darwin's Criterion test was applied to all the fifteen pairs of subjects obviously for testing the significance of differences in the sequential distributions in the matrices.

The results of the calculations are given in Table XLIII. Logarithms to the base ten have been used.

TABLE XLIII
SUMMARY OF RESULTS OF DARWIN TESTS

Subject Pair	χ^2	Z
Tamil - English	4320.0426	79.571*
Tamil - Mathematics	3115.7895	65.561*
Tamil - History	336.4399	12.561*
Tamil - Geography	7198.45004	106.521*
Tamil - Science	2652.41562	59.321*
English - Mathematics	2218.2106	33.2 *
English - History	4391.2147	80.2 *
English - Geography	3728.7758	72.9 *
English - Science	4495.3936	81.4 *
Mathematics - History	3110.858	65.4 *
Mathematics - Geography	2297.7172	54.3 *
Mathematics - Science	2324.0804	54.7 *
History - Geography	11012.627	135.0 *
History - Science	464.0021	17.0 *
Geography - Science	425.226	15.7 *

* Significant at .01 level

Discussion of Results

The 'Z' values in all the fifteen cases thus turn out to be each greater than the critical value of 2.58 and hence the null hypothesis concerning the sequential distributions in the matrices is rejected at 0.01 level of confidence.

This implies that the two matrices in each of the fifteen combinations are significantly different from each other.

This finding relating to the significance of differences gives statistical sanction to subsequent attempts at comparing the matrices and seeking conclusions relating to the sequential distribution of tallies in the matrices.

II. CLASSROOM BEHAVIOUR OF TEACHERS WHILE TEACHING DIFFERENT SUBJECTS (STUDY OF MATRICES)

General Features

On a preliminary review of the matrices given in section (1), certain general features of comparison and contrast come up demanding our attention and discussion.

Total Time of Recorded Interaction

Since all the 32 teachers have been observed for a uniform combined spell of one hour in each of the six subjects, the different measures of total time of recorded interaction in them lend themselves readily for comparison.

Due to the occurrence of non-verbal events in classes and even otherwise, as has been earlier stated, the recorded interaction time differs between subjects despite the uniform schedules of observation. The spells of recorded interaction are given in Table XLIV.

TABLE XLIV

SOME GENERAL FEATURES OF INTERACTION IN
DIFFERENT SUBJECTS

Description	Tamil	English	Mathematics	History	Geogra- phy	Science	Average
Total time of recorded interaction (in hours)	27.04	27.31	18.31	26.18	25.72	26.16	25.12
Per hour/per teacher's interaction (Number of tallies)	1014	1024	687	982	965	981	942
Number of vacant cells	13	13	10	8	8	7	10

Total time of recorded interaction is ranging from 27.31 hours to 18.31 hours. While English is topping the list Mathematics is coming at the ^eand, the range (27.31 - 18.31 = 9.0 hours) being quite sizeable. As between Tamil and English, the only two language subjects under study, the difference (27.31 - 27.04 = 0.27 hours) is not marked. Still less marked is the difference between History and Science (26.18 - 26.16 = 0.02 hours).

Perhaps, the position in the case of Mathematics should not be surprising since in this subject, unlike as in any other subjects, the non-verbal events like pupils' desk work while doing sums etc. are more profuse and common. The average time of recorded interaction works out to 25.12 hours and it is noteworthy that all the subjects except Mathematics are above the average while Mathematics falls short of the average by (25.12 - 18.31) 6.81 hours.

Per-Hour/Per-Teacher Interaction

As could be expected, in the light of the largest total time of recorded interaction in English the per hour/per teacher interaction, in terms of tallies, (vide Table XLIV) is largest (1024) while it is least (687) in Mathematics. While Tamil (1014) trails immediately behind English Science (981) falls short by one tally only of History (982). The average works out to 942 tallies. Here again, as in the previous analysis, it is only Mathematics which falls short of the average and does so by (942 - 687)

255 tallies.

Vacant Cells

Since the number of vacant cells occurring in the matrix is an index of the thoroughness or otherwise of the use of all possible sequences of categories, a review of the vacant cells in the individual matrices is worth the salt.

The largest number of vacant cells (13) occur equally in both Tamil and English while the least number of vacant cells (7) occur in Science (vide Table XLIV) indicating that it is Science in which the largest number of possible sequences have occurred. In History and Geography, again an equal number of (8) vacant cells are occurring.

A break-up of the vacant cells in the different matrices, as shown in Table XLV leads to interesting revelations relating to the pattern of distribution of nil-frequency cells in the matrices.

TABLE XLV
BREAK-UP OF VACANT CELLS IN DIFFERENT
SUBJECTS

No.	Sequence	Tamil	Engl- ish	Mathe- matics	Hist- ory	Geogra- phy	Sci- ence	Total
1	(1-1)	1	1	-	-	1	-	3
2	(1-2)	-	1	-	1	-	1	3
3	(1-3)	1	1	1	1	1	1	6
4	(1-4)	-	-	1	-	-	-	1
5	(1-5)	1	1	-	1	-	-	3
6	(1-7)	1	1	1	-	-	-	3
7	(1-8)	-	-	1	-	-	-	1
8	(1-9)	-	1	1	-	1	-	3
9	(1-10)	1	-	-	1	-	-	2
10	(2-1)	1	1	1	-	-	1	4
11	(3-1)	1	1	1	1	1	1	6
12	(4-1)	1	1	1	1	1	1	6
13	(5-1)	1	1	-	1	1	-	4
14	(6-1)	1	1	1	-	-	1	4
15	(7-1)	1	1	1	1	1	1	6
16	(8-1)	1	1	-	-	-	-	2
17	(10-1)	1	-	-	-	1	-	2
Total		13	13	10	8	8	7	59

As is clear from the Table XLV, all the various vacancies, it is noteworthy, are sequences involving category one. Within the structure of a matrix there can

be nineteen sequences involving category one including the steady state sequence (cell 1-1). Of these nineteen possibilities, it is painfully surprising, though not unusual, that as many as seventeen sequences remain absent in one or the other matrix. The only two sequences that are present consistently in all the six matrices are (1-6) and (9-1).

Of these 17 vacant cells, two involve silence/confusion (1-10 and 10-1), and three student talk (1-8, 8-1 and 1-9) the remaining 12 sequences being all well within the purview of teacher talk.

There are four sequences, (1-3), (3-1), (4-1) and (7-1) which are conspicuous, in all the matrices, by their absence. By way of elucidation, there has been - no occasion whatsoever in the communication patterns in all the six subjects, when appreciation by teacher of students' feelings either followed or preceded ^{by} his/her appreciation/acceptance of students' ideas; nor has there been any occasion whatsoever when either questions or criticism preceded teacher's appreciation of students' feelings. The least occurring vacancies are those of (1-4) and (1-8) both of which occur in Mathematics only. The two vacant cells imply the absence of sequences wherein teacher questions would follow appreciation of pupils' feelings **those in which** and/pupils' responsive talk would do so, respectively.

The total number of vacant cells in all the six

matrices being 59, on an average, 10 cells which constitute about one-tenth of every matrix fall vacant.

The question arises whether vacant cells ipso facto should cause concern. Quite obviously there ought to be some sequences which when absent would be more welcome than when present. At least, there are two such sequences (1-7) and (7-1) which stand for sequences involving the two-way transition x between appreciation of pupils' feelings and criticism from this total of 17.

Principal Components of Communication

A meaningful perspective for the subsequent detailed discussion concerning the frequency concentrations in cells/cell clusters, would be a preliminary review of the overall occurrence of the three principal components of classroom communication in the six subjects under study.

In Table XLVI are given the relative measures of the three components under the six subjects, along with the expectations in the light of Flanders' (1970) results.

TABLE XLVI

PRINCIPAL COMPONENTS OF COMMUNICATION IN DIFFERENT
SUBJECTS (IN PERCENTAGE)

Component	Tamil	English	Mathematics	History	Geogra- phy	Science	Flanders' Results
Teacher talk	62.3	58.6	64.6	66.6	62.7	62.3	68
Student talk	26.3	27.8	19.7	22.9	23.9	25.5	20
Silence/ confusion	11.4	13.6	15.7	10.5	13.4	12.2	12

Teacher talk is occurring^F to the largest extent (66.6 per cent) in History while it is least (58.6 per cent) in English. However, all these six different teacher talk measures including the highest (66.6 per cent in History) are below the expected measure.

Student talk ranges from 27.8 per cent in English to 19.7 per cent in Mathematics. It is noteworthy here that except in the case of Mathematics where it is occurring^F least - student talk in all the other five subjects is above Flanders' results of 20 per cent.

Incidence of silence/confusion is at its peak in Mathematics with 15.7 per cent and is at its lowest in History with 10.5 per cent. Silence/confusion in the two subjects, Tamil and History is below the expectation while in all the other four subjects it is above it.

Thus, it is seen how, in the case of English, teacher talk is at its lowest and student talk at its highest. History where teacher talk is topping the list comes 'last but one' in respect of student talk and quite interestingly is the subject in which silence/confusion is at its lowest ebb. Mathematics where student talk is at its lowest the occurrence of silence/confusion is at its highest.

On the whole, therefore, it is the three subjects, English, Mathematics and History which are either at the

top or at the bottom of one or the other communication component.

Teacher Talk - Student Talk Ratios

An appreciation of the extents of teacher talk and student talk in the form of a simple ratio would serve to highlight their relative occurrence. The ratio called T/S ratio, as mentioned earlier (page 120), is useful in this regard.

In Table XLVII are given the Teacher/Student Talk (T/S) Ratios. An unusually high ratio would indicate a very high occurrence of teacher talk with a relatively low level of student talk. From the Table XLVII we find that in Mathematics the T/S ratio is at its highest with 3.28 per cent while it is at its lowest in the case of English with 2.10 per cent. It is interesting to probe the cause for Mathematics being the subject with the highest T/S ratio. In Mathematics, as we noted, the student talk has been at its lowest and since student talk is the dominant factor in the calculation of T/S ratio, the ratio for this subject is at its highest. Again, for a similar reason, English turns out to be the subject with the lowest T/S ratio. Obviously, teacher talk has been at its lowest and student talk at its highest in the case of English (vide Table XLVII).

In Mathematics, therefore, teacher talk has been

about three and one-fourth times the student talk while in English it is two and one-tenth times.

Flexibility of Communication

A clue to the flexibility of communication is contained in the Steady-State Ratio (SSR). A high SSR would imply a low level of flexibility of communication since SSR measures the relative extent of sustained occurrence of a category for spells of more than three seconds and flexibility implies shifts between categories.

The SSR is computed from the combined load in the ten steady state cells (vide Figure 3) in the manner described earlier (page 123).

The SSR's for the six subjects are given in Table XLVII.

TABLE XLVII

SOME GENERAL FEATURES OF COMMUNICATION
IN DIFFERENT SUBJECTS.

Feature	Tamil	Engli- sh	Mathe- matics	Histo- ry	Geogra- phy	Scie- nce	Average
T/S Ratio	2.37	2.10	3.28	2.90	2.62	2.44	2.62
SSR (in per cent)	45.4	37.9	31.3	51.1	43.6	43.4	42.1

From the Table XLVII it is seen that it is History where SSR is at its highest indicating that speakers in History have had the least tendency to move rapidly from one category to another. They, on the contrary, are inclined to persist in the same categories for long spells of time.

On the other hand, in Mathematics, where SSR is at its lowest, the transitional behaviour of the speakers is maximal. Teachers and students, in general, in Mathematics have been most rapidly moving from one category to another indicating the highest level of flexibility of communication.

Flow of Communication

Although only a detailed review of the incidence of the category ten which stands for silence/confusion, would yield significant information relating to the uninterrupted flow of communication, the overall level of its incidence does indicate some general notion about the flow. The incidence of silence/confusion is reviewed by a scrutiny of the row ten and column ten.

As given in Table XLVI and discussed earlier, it is in Mathematics that the incidence of silence/confusion is at its highest with 15.7 per cent indicating the heaviest and most frequent occurrence of 'pauses' in communication. At the other end, the lowest incidence of silence/confusion in the case of History with 10.5 per cent signifies that communication in this subject is marked by the most uninterrupted flow.

TEACHER TALK

Indirect Teacher Behaviour

Perhaps the one aspect of teacher influence that

can make some meaningful information about its general nature is that of indirectness. The useful measures of teacher indirect behaviour are I/D and i/d which are computed as described earlier (page 128). As in the previous analysis, the I/D's and i/d's in the six individual subjects derived from their composite matrices (vide Figures 23, 24, 25, 26, 27, ^{and} 28) are examined for comparative purposes. The I/D's and i/d's are given in Table XLVIII.

TABLE XLVIII
INDIRECT TEACHER BEHAVIOUR IN DIFFERENT
SUBJECTS

Ratio	Tamil	Engli- sh	Mathe- matics	Histo- ry	Geogra- phy	Scie- nce	Average
I/D	0.28	0.33	0.35	0.24	0.25	0.29	0.29
i/d	0.57	0.62	0.51	0.60	0.52	0.61	0.57

As for I/D ratio, the highest I/D ratio (0.35) obtains in the case of Mathematics while the lowest (0.24) obtains in respect of History.

The highest among i/d ratios (0.62) appears under English while the lowest (0.51) in respect of Mathematics.

It is interesting to note that the subject Mathematics presents an interesting picture of teacher behaviour, as compared to the other subjects. The teachers while teaching Mathematics are 'most indirect' (largest I/D ratio) when content emphasis is counted and 'least

indirect' (smallest i/d ratio) when content emphasis is excluded. Emphasis on content seems to make all the difference.

Purely on the social-emotional plane, therefore, the teachers are most indirect (largest i/d ratio) in the case of English while, in Science the teachers are slightly less indirect ($i/d = 0.61$).

Another feature, as is always common, is that the i/d ratio is consistently greater than the I/D ratio under all the subjects. In fact, in the case of Tamil, History, Geography, and Science the former is twice the value of the latter in the respective subjects.

In English and Mathematics the i/d's ^{are nearly} ~~twice~~ the respective I/D's.

The average I/D ratio is 0.29. And the average i/d ratio is 0.57.

On the whole, the teachers' average i/d ratio (0.57) is almost twice as much as I/D ratio (0.29). The significant point may be that in terms of i/d, the teachers have been more indirect than direct because the value of i/d exceeds 0.5. It may be worthwhile to recall here that theoretically the range of the i/d is 0 to 1, as is, of course, also the case with I/D.

In the case of I/D, the three subjects, Tamil, History and Geography fall short of the average while as

regards i/d the two subjects, Mathematics and Geography fall short of the average. Geography thus is the only subject which is lagging behind the average in the case of both I/D and i/d.

Teachers' Response - Initiation Nexus

Teacher's response in the form of acceptance of pupils' feelings and ideas and praising/encouraging them and initiation in the form of questions are, as discussed earlier (pages 128,129) significant concepts. The phenomena leading to the two indices TRR and TQR, have been illustrated (vide Figures 4 and 5) respectively.

The Teacher Response Ratios (TRR's) and the Teacher Question Ratios (TQR's) of the teachers under the six subjects are given in Table XLIX.

As regards Teacher Response Ratio (TRR), as could be expected in the light of the earlier discussions on i/d's the teachers are responding most while teaching English (62.2 per cent), Science and History, in order, trail behind English. Again, as could be expected, it is Mathematics which records the lowest TRR (51.8 per cent), which means that in Mathematics the relative extent of teacher response is lowest. But then, as the measure of TRR (51.8) indicates, even here the teachers' acceptance of pupils' feelings and ideas and praising/encouraging them is more than orders/commands and criticism. The range is 10.4 per cent.

TABLE XLIX
TEACHER RESPONSE - INITIATION IN DIFFERENT
SUBJECTS
(in percentage)

Ratio	Tamil	Engli- sh	Mathe- matics	Histo- ry	Geogra- phy	Scie- nce	Average
TRR	57.8	62.2	51.8	60.9	52.4	61.9	58.0
TQR	18.0	21.5	29.3	15.4	17.3	19.0	20.1

On an average, the TRR is about 58.0 per cent. The two subjects, Mathematics and Geography sizeably fall short of the average while Tamil does marginally so.

As regards TQR, it is Mathematics where teachers have been asking questions most (29.3 per cent) and in sharp contrast to this they have been asking questions least in the case of History (15.4), the range being 13.9 per cent.

The average TQR is 20.1 per cent, by which standard Tamil, History, Geography and Science are all below the mark.

It is, perhaps, thought-provoking that Mathematics which harbours the lowest TRR should sustain the highest TQR. This means that although in this subject teachers have been asking questions most pupils' statement have not been in general profusely acknowledged and appreciated.

As regards TRR, the teachers have been more

constant, over lesser range, across different subjects, than as regards TQR. Their questioning behaviour, in other words, varied more widely than their responding behaviour across the different subjects.

Instantaneous Teacher Response - Initiation Nexus

Teacher's 'responding' and 'initiating' (questioning) behaviour immediately following pupil talk, giving rise to the two measures. Instantaneous Teacher Response Ratio (TRR 89) and Instantaneous Teacher Question Ratio (TQR 89), as discussed earlier (pages 129-135) and as illustrated (vide Figures 6 and 7), are significant concepts.

The Instantaneous Teacher Response and Teacher Initiation Ratios (TRR 89's and TQR 89's) under the six different subjects are given in Table L.

TABLE L

TEACHER INSTANTANEOUS RESPONSE - INITIATION
IN DIFFERENT SUBJECTS (in
percentage)

Ratio	Tamil	Engli- sh	Mathe- matics	Histo- ry	Geogra- phy	Scie- nce	Avera- -ge
TRR 89	74.1	79.7	77.7	78.0	73.5	78.5	77.0
TQR 89	38.5	33.2	47.3	37.0	34.9	35.2	37.7

As regards TRR 89, the teachers have been

instantaneously responding most in English (79.7 per cent) and doing so least in Geography (73.5 per cent) the range being 6.2 per cent. As for TQR 89, the teachers have been 'instantaneously putting questions' most in Mathematics (47.3 per cent) and doing so least in English (33.2 per cent) the range being 14.1 per cent.

In terms of TRR 89, the teachers were more constant, across the different subjects than in that of TQR 89. In other words, the teachers' TQR 89 behaviour varied more widely across the different subjects than did their TRR 89 behaviour.

A point worthy of mention here is that English which bags the highest TRR 89 (79.7 per cent) goes with the lowest TQR 89 (33.2 per cent). This means that teachers while teaching English, immediately following pupil statements, ask questions least (in comparison with other subjects) but instead accept their feelings and ideas and praise/encourage them most (in comparison with other subjects).

It is surprisingly interesting that in Mathematics where teachers have been responding least (lowest TRR) they have been not only putting questions most (highest TQR) but also been putting 'them instantaneously' (highest TQR 89).

The average of TRR 89 being 77.0 per cent, only Tamil and Geography fall below the mark. As regards TQR 89,

English, History, Geography and Science all fall below the average of 37.7 per cent.

Constructive Integration

As discussed earlier (pages 135-137) and as illustrated (vide Figure 8) teacher's sustained and continued acceptance of pupils' feelings and ideas and encouragement is described as constructive integration.

In the Table LI the extent of constructive integration under the different subjects is given.

TABLE LI
EXTENT OF CONSTRUCTIVE INTEGRATION IN DIFFERENT
SUBJECTS (in percentage)

Index	Tamil	Engli- sh	Mathe- matics	Hist- ory	Geogra- phy	Sci- ence	Ave- rage
Constructive integration with reference to total interaction	1.52	1.01	1.35	1.57	1.02	1.84	1.39
Constructive integration with reference to categories 1,2, and 3	16.64	9.37	14.50	19.38	13.23	18.63	15.29

Computed with reference to **total** interaction the extent of constructive integration is highest in Science (1.84 per cent) with History trailing immediately (1.57 per cent) behind, The subject in which it is at the lowest

(1.01 per cent) is English. The average of the scores in this regard works out to 1.39 per cent. With this as a yardstick, Mathematics, Geography and English are under-achievers. Mathematics, however, is close to the average.

The top score of 1.84 per cent in Science implies that only so much of the total interaction has been spent by the teachers, while teaching Science, by way of harnessing and integrating into the fabric of classroom communication the favourable social-emotional climate in a constructive manner. On the other hand, the teachers have done so to only 1.01 per cent while teaching English.

When reckoned with in the more sensitive context of the combined occurrence of the categories one, two and three only, the picture turns out to be different and History becomes the subject topping the list with 19.38 per cent leaving Science with 18.63 per cent, which is topping the previous list, to trail behind as the second. The lowest extent is in respect of English (9.37 per cent).

It is noteworthy that in the subject English the teachers have been consistently recording the lowest extent of constructive integration computed either way.

The average calculated for the extent of constructive integration with reference to the first three categories works out to 15.29 per cent and the alignment is that Mathematics, Geography and English are on the wrong

side of the average.

Again it is noteworthy that the same group of three subjects - namely, Mathematics, Geography and English which are below the average as regards constructive integration calculated with reference to total interaction are below the other average calculated for the index with reference to the first three categories.

Extent of constructive integration is thus decidedly scant in these three subjects.

Vicious Circle

As discussed earlier (pages 137-138) and as illustrated (vide Figure 9) sustained and continued use of orders/commands and criticism by teachers are known as vicious circle.

In Table LII the extent of vicious circle is shown in the subjects.

TABLE LII
INCIDENCE OF VICIOUS CIRCLE IN DIFFERENT
SUBJECTS (in percentage)

Index	Tamil	Engli- sh	Mathe- matics	Hist- ory	Geogra- phy	Scie- nce	Aver- age
Vicious circle with reference to total inter- -action	1.34	0.96	2.12	1.05	1.31	1.19	1.33
Vicious circle with reference to categories 6 and 7	20.08	14.59	24.51	20.17	18.75	19.70	18.63

The incidence of vicious circle with reference to total interaction is heaviest in Mathematics in that 2.12 per cent of total interaction which is the largest measure here, is contained in the area. The lowest incidence of 0.96 per cent occurs in the case of English. This means that on the whole teachers are ordering/commanding and criticising in a vicious manner, most in Mathematics and least in English. On an average 1.33 per cent of total interaction occurs as vicious circle component and at least two subjects, Tamil and Mathematics are scoring even above the average while Geography manages a narrow escape by remaining 0.02 per cent short of the average.

Examined in the more sensitive context of the combined occurrence of the two categories six and seven, the heaviest incidence (24.51 per cent) is in Mathematics while the lowest (14.59 per cent) occurs in English. This confirms the earlier position with respect to total interaction. The average works out to 19.63 per cent and the subjects, Tamil, Mathematics, History and Science are scoring above the average.

It is noteworthy that, Mathematics comes up as the subject with the heaviest incidence of vicious circle, computed either way.

Since a heavy incidence of vicious circle would indicate problems of classroom control and management the 1.33 per cent of the total interaction as this vicious

component, on an average, leaves much to be desired especially in view of the fact that, on an average, the occurrence of constructive integration, works out to 1.39 per cent which though slightly higher than the former, is nearly comparable thereto. That only as much of constructive integration there is as there is vicious circle is an alarming revelation.

Teacher Steady-State Talk

When teachers persist in the same verbal behaviour, as for example, lecture, praise and so on, for **spells** of more than three seconds each, the phenomenon, as described earlier (pages 138-142) and as illustrated (vide Figure 10) is called Teacher Steady-State Talk.

Teacher Steady-State Talk ratio (TSSR) for the six subjects are given in Table LIII.

TABLE LIII
TEACHER STEADY STATE RATIO IN DIFFERENT SUBJECTS
(in percentage)

Ratio	Tamil	Engli- sh	Mathe- matics	Histo- ry	Geogra- phy	Scie- nce	Average
TSSR	52.18	44.25	39.31	58.72	50.47	49.94	49.14

The TSSR is highest in History (58.72 per cent) and lowest (39.31 per cent) in Mathematics. This shows that teachers while teaching History are least flexible to move

through different categories of talk and are most flexible while teaching Mathematics. This inference arises because a high steady-state talk measure would imply a low level of flexibility. The average TSSR works out to 49.14 per cent and teachers while teaching English and Mathematics show ratios falling short of the average. The average TSSR of 49.14 per cent indicates that almost half of the total teacher talk has been observed to occur in a sustained fashion.

The sustained talk of teachers is further divided into its three constituents as shown in Table LIV. The percentage figures shown obviously are with reference to the total steady talk of the teachers, in the respective subjects.

TABLE LIV
ANALYSIS OF STEADY STATE TEACHER TALK IN
DIFFERENT SUBJECTS
(in percentage)

Component	Tamil	Engli- sh	Mathe- matics	Hist- ory	Geogra- phy	Scie- nce	Aver- age
Constructive intégration	3.19	2.73	3.56	2.55	1.90	3.81	2.96
Vicious circle	2.43	2.50	5.86	1.56	2.48	2.18	2.84
Content orientation	94.37	94.76	90.57	95.88	95.61	93.99	94.20

Constructive integration component of the steady state teacher talk is occurring heaviest in Science

(3.81 per cent) and lowest in Geography (1.90 per cent). The range, $(3.81 - 1.90 = 1.91 \text{ per cent})$ is reasonably small. The average works out to 2.96 per cent. On the other hand, in the case of vicious circle component the average works out to a near - equal measure of 2.84 per cent but the individual measures are more widely distributed inflating the range. The highest measure is 5.86 per cent in Mathematics and the lowest is 1.56 per cent in History and hence the range is 4.30 per cent. That the incidence of sustained vicious circle component in Mathematics is unusually high is clearly evident on comparison with the corresponding figures in the other subjects. In the list, the next subject to trail behind Mathematics is English with only 2.50 per cent.

What makes the unusually high incidence of sustained vicious circle component in Mathematics more poignant is the fact that Mathematics otherwise turns out as the subject with the least overall TSSR measure when compared to other subjects. This is borne out also from the earlier discussions based on the distribution of tallies in vicious circle.

Content orientation component of teachers' steady state talk is, as usual, very high in general. It is highest (95.88 per cent) in History and lowest (90.57 per cent) in Mathematics. Apparently, the high incidence of sustained vicious circle has been at the cost of sustained content component. The average for sustained content component works out to 94.20 per cent.

The further break-up figures of the content orientation component of steady state teacher talk are given in Table LV.

TABLE LV
CONTENT ORIENTATION IN STEADY STATE TEACHER
TALK IN DIFFERENT SUBJECTS
(in percentage)

Cell	Tamil	Engli- sh	Mathe- matics	Hist- ory	Geogra- phy	Scie- nce	Avera- ge
Sustained lecture (Cell 5-5)	92.19	89.26	84.27	93.65	92.96	91.37	90.62
Sustained questioning (Cell 4-4)	2.17	5.49	6.30	2.22	2.64	2.61	3.57

The content orientation part of the sustained teacher talk is overwhelmingly made up of the cell (5-5) build-up signifying sustained lecture which on an average is 90.62 per cent with reference to total teacher talk leaving a paltry residue of 3.57 per cent on an average as the build-up in the cell (4-4) signifying the sustained questioning.

The significant point to note is that it is in Mathematics that sustained lecture is lowest (84.27 per cent) compared to other subjects; but surprisingly again, it is in Mathematics that the highest occurrence of sustained questioning is also found (6.30 per cent). This

means that in Mathematics where content orientation component of sustained teacher talk on the whole, has been at the minimum, and where likewise the (5-5) sustained content delivery is at the minimum, sustained questioning (4-4) is at the maximum. This perhaps reveals the very nature of the subject which is such as to heavily harbour sustained teacher questioning.

Content Emphasis

Teachers' questions and lecture are mostly content-oriented. The extent of use of questions and lecture, therefore, as discussed earlier (pages 142-145) is given by the concept called content emphasis which is manifest in the matrix in the form of a cross, as illustrated (vide Figure 11).

Emphasis on content is given by the Content Cross Ratio (CCR). The CCR's for the six subjects are given in Table LVI. The CCR is highest (53.27 per cent) in History and lowest (41.07 per cent) in English. The individual ratios varying over a range of (53.27 - 41.07) (12.20 per cent) the average ratio works out to 46.97 per cent. This means that nearly 47 per cent of all communication was content-oriented.

The relative extents to which the two components of content cross - namely, questions and information delivery obtain in different subjects are also given in

Table LVI.

TABLE LVI
CONTENT CROSS COMPONENTS IN DIFFERENT SUBJECTS
(in percentage)

Ratio/Component	Tamil	English	Mathematics	History	Geography	Science	Average
CCR	46.45	41.07	46.64	53.27	48.02	46.39	46.97
Questions	8.36	8.82	13.65	8.20	8.29	8.81	9.36
Information Delivery	38.09	32.24	32.98	45.06	39.73	37.57	37.61

Questions, on an average, occur to the extent of 9.36 per cent and information delivery to the extent of 37.61 per cent. Information delivery is thus seen to have occurred about four times the extent of questions.

Questions appear to have been used to the greatest extent (13.65 per cent). The predominant occurrence of questions in Mathematics is consistently borne out by successive findings. Even earlier in Table LV the steady state questioning behaviour has been noted to be highest in Mathematics.

Information delivery is highest in History (45.06 per cent) and lowest (32.24 per cent) in English. The highest occurrence of information delivery in History too is consistently borne out repeatedly. Earlier, likewise in Table LV the steady state information delivery has been

found to occur to the greatest extent in History.

Apart from the components of content cross, the content cross can be divided into the three segments, with reference to the context in which it occurs.

In Table LVII are given the measures of the three segments of content cross in the six subjects.

The major segment is seen to be content emphasis buried in teacher talk. The highest measure (45.07 per cent) is in History and the lowest (30.43 per cent) is in English. This means that in History teachers are asking questions and are lecturing in the context of their own talk, most while they do so least in English. The range (45.07 - 30.43) is 14.64 per cent and the average 37.04 per cent.

TABLE LVII

CONTENT EMPHASIS SEGMENTS IN DIFFERENT
SUBJECTS (in percentage)

Segment	Tamil	Engli- sh	Mathe- matics	Hist- ory	Geogra- phy	Scie- nce	Aver -age
Content emphasis buried in teacher talk	38.25	30.43	33.27	45.07	37.81	37.41	37.04
Content emphasis in the context of student talk	4.33	5.16	6.86	3.89	4.69	4.51	4.91
Content emphasis following silence/confu- sion	3.86	5.47	6.51	4.30	5.50	4.45	5.02

Content emphasis in the context of student talk, on an average is 4.91 per cent. The highest measure (6.86 per cent) is in Mathematics and the lowest (3.89 per cent) in History. This means that teachers are asking questions and are lecturing immediately following pupil talk, most in Mathematics and least in History.

Content emphasis following silence/confusion occurs to a near - equal extent, on an average, that is, 5.02 per cent. The highest measure is 6.51 per cent in Mathematics and the lowest 3.86 per cent in Tamil. This means that teachers are asking questions and are lecturing immediately following silence/confusion, most in Mathematics and least in Tamil.

On the whole, therefore, it is found that teachers are asking questions and lecturing mostly in the context of their own talk and least in that of pupil talk while teaching History.

The Use of Praise/Encouragement

The use of praise, as discussed earlier (pages 145-149) and as illustrated (vide Figure 12) is signified by category two. The sequential and quantitative details of the use of the praise/encouragement in the six subjects are given in Table LVIII.

The overall use of praise with reference to total interaction, on an average is, 7.32 per cent. While in

English it is highest (9.96 per cent), it is lowest (5.92 per cent) in History. This means that teachers are praising/encouraging to the greatest degree while teaching English and doing so in the least while teaching History.

Of the three segments of praise, that buried in teacher talk is highest (19.74 per cent) in Tamil and the lowest (12.49 per cent) in Geography. This means that teachers are praising/encouraging in the context of their own talk, most while teaching Tamil and least while teaching Geography. The average is 16.26 per cent. The other segment of praise which is in direct reaction to student talk is highest (82.00 per cent) in Geography and lowest (74.72 per cent) in Science. This implies that teachers praise/encourage immediately following pupil statements, most in Geography and least in Science. The average is 78.15 per cent.

TABLE LVII

ANALYSIS OF PRAISE/ENCOURAGEMENT IN DIFFERENT SUBJECTS *
(in percentage)

Description	Tamil	English	Mathematics	History	Geography	Science	Average
Total use (with reference to total interaction)	7.28	9.36	7.48	5.92	6.11	7.21	7.32
Praise buried in teacher talk (column 2, row 1 through 7)	19.74	12.73	16.35	16.85	12.49	19.40	16.26
Praise in direct-reaction to pupil talk (cells 8-2 & 9-2)	75.39	81.23	78.11	77.45	82.00	74.72	78.15
Praise following silence (cell 10-2)	4.86	6.03	5.53	5.68	5.50	5.86	5.58
Praise following pupil response	67.56	77.06	70.94	70.96	75.70	65.01	71.20
Praise following pupil initiation	7.82	4.16	7.17	6.49	6.29	9.70	6.93
Praise as launching pad for teacher talk (Row 2, columns 1 through 7)	51.79	32.14	60.79	55.12	48.70	52.27	50.13
Praise as prompt to pupil talk (cells 2-8 & 2-9)	38.68	58.72	27.41	34.83	41.66	35.37	39.44
Praise leading to silence (2-@ 10)	9.51	9.12	11.79	10.03	9.63	12.35	10.40
Praise leading to pupil response	34.37	56.61	24.43	31.66	38.22	30.21	35.91
Praise leading to pupil initiation	4.31	2.11	2.97	3.16	3.44	5.16	3.52
Praise followed by teacher questioning	13.99	9.49	25.22	15.67	13.81	13.80	15.33
Praise followed by teacher lecture	17.58	8.35	17.20	19.91	17.31	19.05	16.61

* All the percentages given are with reference to the respective totals of praise/encouragement, except where otherwise stated.

Praise/Encouragement as reaction to student talk, on an average, is nearly five times that buried in teacher talk itself. This means that teachers praise/encourage mostly following pupil statements.

It is noteworthy that in Geography where praise in the context of teacher talk is lowest, that given in reaction to student talk is highest.

Praise/encouragement following silence/confusion, on an average, is 5.58 per cent. In English (6.03 per cent) it is highest while it is lowest (4.86 per cent) in Tamil. Since sometimes praise/encouragement following silence may be to help a struggling student to state something, this sequence is significant. The relative position here implies that teachers praise/encourage following silence, most while teaching English and least while teaching Tamil.

While the circumstances governing the use of praise have been hitherto reviewed, now may be examined the use of praise 'as the context' for different types of communication. The row two is analysed for this purpose.

Praise/encouragement has been used as launching pad for further teacher talk, on an average, to the extent of 50.13 per cent. It is used in this way most (60.79 per cent) in Mathematics and least (32.14 per cent) in English. The range is (28.65 per cent) very wide indeed and in fact the highest figure is only slightly less than double the lowest

Praise/encouragement used as prompt to student talk is highest (58.72 per cent) in English and lowest in Mathematics (27.41 per cent). This means that teachers' praise/encouragement leads to pupil talk, most in English and least in Mathematics.

It may be noted that in English praise/encouragement following silence has been most and this may be thought of as attempt to help struggling pupils. This inference is sustained now when it is seen that in English praise/encouragement leads to pupil talk most. The range is 39.44 per cent.

Again it is noteworthy that in Mathematics where praise used as launching pad for teacher talk is highest, that used as prompt to student talk is lowest while in English it is used least as context for teacher talk but most as context for student talk.

Thus, it is seen that praise/encouragement, on an average, following student talk (78.15 per cent) is about twice that preceding student talk (39.44 per cent).

Praise/encouragement used as context for teacher talk (50.13 per cent) is about half of the total use of praise while praise used in the context of teacher talk is far too little (16.26 per cent).

Praise leading to silence etc. on an average has been 10.40 per cent which is about twice the amount of

praise given following silence etc. (5.58 per cent).

It is in Science that praise mostly (12.35 per cent) led to silence while in English it does so least (9.12 per cent). It seems, therefore, that in English, where praise following silence has been highest that leading to silence is lowest.

Now some significant cell - loads may be examined.

Praise/encouragement in the context of student's responsive talk, on an average, is 71.20 per cent which is nearly three-fourths of total occurrence of praise. And praise/encouragement leading to students' responsive talk is only, on an average, 35.91 per cent which is about one-third of the total.

The position is usual since as said earlier, encouragement is given by the teacher as prompt mostly when students are asked to read from the text. While reading, the students need frequent help from the teachers. This phenomenon bolsters the build-up in the cell (8-2). This observation is strengthened when we analyse the occurrence of (8-2) sequence in the different subjects.

It is occurring^E highest (77.06 per cent) in English and lowest (65.01 per cent) in Science. Invariably we observe that students struggle hard to read from English text and English is Achilles' Heel to many.

Praise/encouragement leading to students'

responsive talk has been highest (56.61 per cent) in English and lowest (24.43 per cent) in Mathematics. Here the situation in English further corroborates the earlier finding as regards the heaviest (8-2) cell build-up.

Praise/encouragement following students' self-initiated talk, on an average, (6.93 per cent) is nearly twice that preceding such student talk (3.52 per cent).

The cell (9-2) build-up signifying praise in the context of pupil initiation is heaviest in Science (9.70 per cent) and least (4.16 per cent) in English while the cell (2-9) load signifying praise leading to pupil initiation is least in English (2.11 per cent) and heaviest (5.16 per cent) in Science. Hence, we see how the positions interchange in an exact order when the reverse transition is considered.

Thus, we see that the enormous use of praise/encouragement in direct reaction to student talk (78.15 per cent) is to a very great extent in the context of students' responsive talk (71.20 per cent) and only very small proportion in the context of their self-initiated talk (6.93 per cent).

Likewise, the total use of praise as prompt to student talk (39.44 per cent) is far more with reference to students' responsive talk (35.91 per cent) than towards their self-initiated talk (3.52 per cent).

The use of praise as launching pad for questions is on an average to the extent of 15.33 per cent and its use as launching pad for lecture is 16.61 per cent.

It is clear from these figures that the total use of praise as launching pad for teacher talk (50.13 per cent) is mostly made up of these two components which relate to questions and lecture.

Teacher Reaction to Student Statements

It may be reiterated that teacher's immediate reaction to students' statements as discussed earlier (pages 149-153) are of profound significance since that would set the tone for further student talk in the classroom communication. Whether the teacher is receptive to or impatient of student participation; if receptive, in what manner and to what extent or if indicating intolerance, with what repressive verbal weapons and to what extent, may be gathered from an analysis of the rows 8 and 9, columns 1 through 7 as illustrated (vide Figure 13).

In Table LIX are given the data relating to such analysis of teacher reaction to students' talk.

On an average, the total immediate reaction of teachers is 55.45 per cent which means that a little over half of all teacher talk has been in immediate sequence to student talk.

In Mathematics such immediate reaction is highest (78.36 per cent) and in History it is lowest (47.14 per cent). It is surprising that the range (78.36 - 47.14) 31.22 should be so very wide. Naturally, therefore, only two subjects, Mathematics and English score 'above' the average and all the remaining four subjects are falling short of the average.

Constructive reaction to students' responsive talk, on an average, is 23.10 per cent. It is highest in Mathematics (29.20 per cent) and lowest (20.10 per cent) in Tamil. However, constructive reaction following students' self-initiated talk, on an average, is 3.63 per cent. It is highest (5.01 per cent) in Science and lowest (1.99 per cent) in English.

Constructive reaction following students' responsive talk (23.10 per cent) is far greater than that following students' self-initiated talk (3.63 per cent) and is about seven-times / more than the latter. This means, therefore, that teachers react to pupils remarkably mostly in the context of the latter's responsive talk rather than their self-initiated talk. It follows that teachers' follow-up reaction obtains mostly when the pupils are responding. Pupils' self-initiated talk does not evoke as much attention and reaction from teachers.

Questions, in the context of students' responsive talk, on an average, are 6.51 per cent. They occur highest

in Mathematics (14.03 per cent) and lowest in Science (4.42 per cent). The wide variation from the average in the case of Mathematics is indeed striking. Perhaps, this is understandable since in Mathematics, the teachers are quite often found to be developing the successive 'steps' in solving problems through their short and continued questions and predictable answers from students.

TABLE LIX
TEACHER REACTION TO STUDENT TALK IN DIFFERENT SUBJECTS
(in percentage)

Component	Tamil	English	Mathematics	History	Geography	Science	Average
Total immediate reaction (sum of 14 cells - rows 8 and 9, columns 1 to 7)	48.77	56.62	78.36	47.14	52.09	49.75	55.45
Constructive reaction following students' self-initiated talk (cells 8-1, 8-2 and 8-3)	20.10	28.29	28.20	20.24	20.64	20.14	23.10
Constructive reaction following students' self-initiated talk (cells 9-1, 9-2 and 9-3)	3.80	1.99	4.53	3.28	3.20	5.01	3.63
Questions in the context of students' responsive talk (cell 8-4)	5.00	5.29	14.03	5.18	5.17	4.42	6.51
Questions following students' self-initiated talk (cell 9-4)	1.34	0.87	2.47	1.08	1.67	1.81	1.54
Content delivery in the context of students' responsive talk (cell 8-5)	6.31	10.25	12.94	7.75	7.74	6.82	8.63
Content delivery following students' self-initiated talk (cell 9-5)	3.82	2.17	5.46	2.94	5.03	4.66	4.01
Orders and criticism following students' responsive talk (cells 8-6 and 8-7)	5.80	6.22	5.34	4.42	5.95	4.47	5.36
Orders and criticism in the context of students' self-initiated talk (cells 9-6 and 9-7)	2.56	1.50	4.35	2.23	2.64	2.39	2.60

Questions following students' self-initiated talk, on an average, have occurred to the extent of 1.54 per cent which is about a quarter of that following their responsive talk (6.51 per cent) as seen earlier.

Here again the highest occurrence of questions following students' self-initiated talk (2.47 per cent) is in Mathematics and the lowest occurrence (0.87 per cent) is in English.

Questions in either context, therefore, are highest in Mathematics only.

The same is the situation in the case of content delivery which is lecture. In Mathematics, lecture following students' responsive talk is highest (12.94 per cent) and that following their self-initiated talk is again highest (5.46 per cent).

On the whole, based on averages, lecture in the context of students' responsive talk (8.63 per cent) is about twice that in the context of their self-initiated talk (4.01 per cent).

Teachers' impatience or intolerance of student talk is given by their reaction in terms of orders/commands and criticism following student talk. This negative reaction with reference to students' responsive talk, on an average, is 5.36 per cent and that with reference to their self-initiated talk is 2.60 per cent.

The former is about twice the latter.

The negative reaction of orders/commands and criticism in the context of students' responsive talk is highest (6.22 per cent) in English and lowest (4.42 per cent) in History.

The negative reaction of orders/commands and criticism in the context of students' self-initiated talk is, however, lowest (1.50 per cent) in English and highest (4.35 per cent) in Mathematics.

PUPIL TALK

Pupils' Initiation

When pupils make statements which are of self-initiated type the phenomenon is recorded and reconstructed, as described earlier (page 154) and as illustrated (vide Figure 14). The measure of such pupil initiation is called Pupil Initiation Ratio (PIR).

The Pupil Initiation Ratio has been calculated for the communication episodes under all the six subjects. The ratios are given in Table LX.

TABLE LX
PUPIL TALK IN DIFFERENT SUBJECTS
(in percentage)

Ratio	Tamil	Engli- sh	Mathe- matics	Histo- ry	Geogra- phy	Scien- ce	Average
PIR	17.69	9.26	23.01	14.48	17.42	21.35	17.20
PSSR	39.99	32.03	7.31	42.66	36.51	37.70	32.70

It is seen from the Table LX that PIR has occurred heaviest (23.01 per cent) under Mathematics. The score which is a little short of 25 per cent indicates that nearly one-fourth of all pupil talk in Mathematics has been of the kind of initiation.

The lowest level of occurrence (9.26 per cent) is found in respect of English. This indicates that while teachers are teaching English, the pupils have the least opportunity to make self-initiated talk. The difference between the two extremes is indeed striking. The range (23.01 - 9.26) 12.75 per cent is quite wide.

The average PIR works out to 17.20 per cent by which standard two subjects, English (9.26 per cent) and History (14.48 per cent) are falling below the mark.

Steady-State Component

When pupils either 'respond' or 'initiate' the phenomena are recorded as category eight and nine

respectively. When, however, they do so in a sustained fashion for spells of more than three seconds each the phenomena have implications regarding flexibility of communication, as the steady state talk of pupils (vide Figure 15) is indicative of so much absence of flexibility in communication. A measure of such steady state pupil talk called Pupil Steady State Ratio (PSSR) is found in the manner described earlier (page 158).

The Pupil Steady State Ratios have been calculated for the interaction spells under the six different subjects.

The PSSR's are given along with PIR's in Table LX.

The heaviest ratio (42.66 per cent) is found occurring in History. The lowest score (7.31 per cent) is noticed under Mathematics.

It is interesting to note that Mathematics which harbours the least steady state ratio sustains the heaviest initiation ratio too. This implies that when teachers are teaching Mathematics, the pupils not only have opportunity to initiate most but also to be most flexible to move from one category of talk to another. Also interesting is the fact that History where the highest steady state ratio is recorded is having a 'below average' initiation ratio.

Also the relative extreme PSSR positions of Mathematics and History imply that the relative flexibility of communication in pupil talk has been highest under Mathematics and lowest under History.

The range in regard to PSSR, (42.66 - 7.31 per cent) 35.35 per cent is very striking. The average works out to 32.70 per cent. The implication is that nearly one-third of all pupil talk is sustained and only the remaining two-thirds are transitional.

Prompt to Pupil Talk

As described earlier (pages 158-159) and as illustrated (vide Figure 16) it should be significant information how pupil talk is prompted in different subjects. The total extent of pupil talk occurring in the context of teacher talk as also the extent of pupils' self-initiated talk arising in the context of teacher talk have been calculated for all the six subjects and are given in Table LXI.

TABLE LXI
PROMPT TO PUPIL TALK IN DIFFERENT SUBJECTS
(in percentage)

Description	Tamil	Engli- sh	Mathe- matics	Hist- ory	Geog- raphy	Scie- nce	Aver- age
Total pupil talk in the context of teacher talk	48.26	58.70	82.60	47.72	52.68	50.66	56.77
Self-initiated pupil talk in the context of teacher talk	10.54	6.35	16.32	8.64	12.06	13.38	11.21

The relative extent of pupil talk occurring in the

context of teacher talk is heaviest (82.60 per cent) in Mathematics while the lowest (47.72 per cent) is recorded with regard to History. This means that teachers prompt pupil talk most while teaching Mathematics and the pupils have the least opportunity to talk when the teachers are teaching History. The range (82.60 - 47.72) 34.88 per cent is very wide. The average works out to 56.77 per cent which implies that well over half of all pupil talk, on an average, is in the context of teacher talk. Hence, only the remaining 'less than half' of all pupil talk is occurring in its own context and in that of silence/confusion. The overall position thus means that teachers have been on the whole, having the reins of control over the course of pupil talk and were directing and manoeuvring it to a greater extent than it was originating otherwise.

There are four subjects where the score is below the average. They are Tamil (48.26 per cent); History (47.72 per cent); Geography (52.68 per cent) and Science (50.66 per cent).

The extent of self-initiated talk alone occurring in the context of teacher talk is heaviest in Mathematics (16.32 per cent) and lowest (6.35 per cent) in English. This again means that only when teachers are teaching Mathematics the pupils have the greatest opportunity for self-initiated talk. The average works out to 11.21 per cent which means that slightly more than one-tenth of all

pupil talk is 'self-initiated' and arising in the context of teacher talk.

The subjects where such self-initiated talk of pupils is falling short of the average are Tamil (10.54 per cent); English (6.35 per cent) and History (8.64 per cent).

A scrutiny of the two averages in Table LXI indicates that when teacher talk is the context self-initiated pupil talk is about one-fifth of the total pupil talk.

Sequential Patterns of Pupil Talk

Some significant sequences involving pupil talk are here slated for discussion. The sequences and their extents of occurrence are given in Table LXII. The computational details have been given earlier (pages 159-160).

The total responsive talk of the pupils (column 8) is heaviest - (90.73 per cent) in English while the lowest figure (76.98 per cent) is recorded in Mathematics. The average for the category works out to 82.78 per cent indicating an overwhelming proportion of 'responsive' component as distinct from the 'self-initiated' component in pupil talk.

The occurrence of self-initiated pupil talk

TABLE LXII

SIGNIFICANT SEQUENCES OF PUPIL TALK IN DIFFERENT SUBJECTS
(In percentage)

Sequence	Family	English	Mathematics	History	Geography	Science	Average
Pupil responsive talk (column 8)	82.30	90.73	76.98	85.51	82.57	73.64	82.78
Pupil responsive talk following teacher praise/encouragement (2-8)	9.53	20.30	3.30	8.18	9.77	8.56	10.94
Pupil responsive talk following teacher questions (4-8)	18.11	14.78	42.49	20.21	18.87	18.98	22.24
Pupil responsive talk following teacher directions (2-6-8)	3.71	5.64	2.47	3.20	3.45	3.83	3.71
Pupil responsive talk following silence/confusion (10-8)	7.42	6.71	4.49	5.67	6.41	6.23	6.15
Pupil self-initiated talk (column 9)	17.69	9.26	23.01	14.48	17.42	21.35	17.20
Pupil self-initiated talk following teacher response (1-9, 2-9 and 3-9)	1.41	0.83	1.50	1.17	1.19	2.06	1.36
Pupil self-initiated talk following teacher questions (4-9)	4.08	2.49	6.80	3.07	3.80	4.94	4.19
Pupil self-initiated talk following silence/confusion (10-9)	3.51	2.13	5.02	2.25	3.43	4.18	3.52
Pupil self-initiated talk following teacher directions and criticism (6-9, 7-9)	1.18	0.70	2.26	1.08	1.20	1.18	1.26
Pupil self-initiated talk developing from responsive talk (8-9)	0.65	0.23	0.37	0.88	0.67	0.91	0.61
Pupil self-initiated talk receding into responsive talk (9-8)	0.14	0.18	0.18	0.19	0.25	0.28	0.20
Pupil responsive talk followed by silence/confusion (8-10)	7.39	8.94	9.05	6.45	7.09	7.02	7.65
Pupil self-initiated talk followed by silence/confusion (9-10)	3.03	1.97	4.70	2.66	3.35	4.31	3.33

(column 9) consequently is at a low level. The average figure is 17.20 per cent. The highest score is recorded in Mathematics (23.01 per cent) and the lowest (9.26 per cent) in English. Between English and Mathematics, as regards this category there is a vast difference (23.01 per cent - 9.26 per cent) of 12.75 per cent. This measure of occurrence of category 9 has, however, already been discussed with reference to PIR.

Pupils' responsive talk following teachers' praise/encouragement (cell 2-8) has, on an average, occurred to the extent of 10.94 per cent. The highest score in this regard is bagged by English (20.30 per cent) while the lowest (8.18 per cent) by History. The subjects falling short of the average, besides History, are Tamil (9.53 per cent), Mathematics (9.30 per cent), Geography (9.77 per cent) and Science (8.56 per cent).

Pupils' responsive talk following teachers' questions (cell 4-8) has occurred most in Mathematics (42.49 per cent) and least in English (14.78 per cent). The range is again very wide (42.49 per cent - 14.78 per cent) 27.71 per cent. The average is 22.24 per cent which indicates that nearly one-fourth of all pupil talk occurred as 'response' to teacher questions. It is surprising that all the subjects except Mathematics where the percentage is heaviest (42.49 per cent) are below the average. This situation is evidently caused by the extra-

ordinary record set in Mathematics where about half of pupil talk (42.49 per cent) is of this type.

Pupils' responsive talk following teacher directions (cell 6-8), on an average, is 3.71 per cent. The highest and the lowest records are set in English (5.64 per cent) and Mathematics (2.47 per cent) respectively.

In Mathematics, on reflection, while pupils' responsive talk in answer to teacher questions is highest that following teacher directions is lowest. The situation obviously indicates a meaningful and compatible alliance between the two types of pupil responsive talk.

The heaviest such pupil talk in the context of silence/confusion occurred in Tamil (7.42 per cent) and the lowest occurrence is in Mathematics (4.49 per cent).

Pupils' self-initiated talk following teachers' responsive talk (cells, 1-9, 2-9 and 3-9), though conceptually very significant, is found occurring, on an average, to only a very limited extent. The average occurrence is 1.36 per cent. The heaviest figure (2.06 per cent) is recorded in Science and the lowest (0.83 per cent) in English. This means that teachers' responsive behaviour in the form of accepting pupils' feelings and ideas and praising/encouraging them, while teaching Mathematics, leads to the greatest extent of pupil self-initiated talk and while teaching Science such behaviour leads to the

smallest extent of pupil self-initiated talk.

Self-initiated talk of the pupils following teacher questions (cell 4-9) has occurred, on an average, to the extent of 4.19 per cent which is far below their average responsive talk in similar context (cell 4-8), (22.24 per cent).

The highest occurrence of self-initiated talk in the context of teacher questions is recorded in Mathematics (6.80 per cent) and the lowest (2.49 per cent) in English. This means that teachers while teaching Mathematics ask questions of a broad nature which evoke self-initiated type of pupil statements most. The contrasting situation obtains when the teachers teach English wherein such pupil self-initiated talk is at the lowest level. The three subjects, English (2.49 per cent), History (3.07 per cent), and Geography (3.80 per cent) score below the average.

Self-initiated talk of the pupils emerging out of silence/confusion (cell 10-9) is heaviest in Mathematics (5.02 per cent) and lowest (2.13 per cent) in English. The average figure is 3.52 per cent which is slightly more than half of the average of pupils' responsive talk emerging out of similar context (6.15 per cent).

It is interesting to review how in Mathematics where pupils' responsive talk arising out of silence/confusion is recorded 'lowest', pupils' self-initiated talk in similar context is recorded 'highest'.

Pupils' self-initiated talk in the context of teachers' directions and criticism (cell 6-9 and 7-9), on an average is occurring to the extent of 1.26 per cent. It is well to note here that sometimes these two sequences imply eruption of defiance on the part of the pupils in the wake of teacher directions and admonitions. The highest record is in Mathematics (2.26 per cent) and the lowest (0.70 per cent) in English. Excepting the highest scoring - Mathematics, all the other five subjects are happily short of the average.

Self-initiated talk of pupils developing from their responsive talk (cell 8-9), on an average, is to the extent of 0.61 per cent while the self-initiated talk receding into responsive talk (cell 9-8), on an average, is to the still lesser extent of 0.20 per cent.

In general, it may be hypothesised that pupils' responsive talk devetailing with self-initiated talk (cell 8-9) is more welcome than its reverse transition (cell 9-8). The average positions of the subjects under study, therefore, leaves no room for concern.

Pupils' responsive talk develops into their self-initiated talk most (0.91 per cent) in Science and least (0.23 per cent) in English. The highest and the lowest figures for the reverse transition are recorded in Science (0.28 per cent) and Tamil (0.14 per cent) respectively.

Science, therefore, is seen to be the repository of the 'highest' figures in respect of both the indices.

Pupils' responsive talk followed by silence/confusion (cell 8-10) is, on an average, to the extent of 7.65 per cent while their self-initiated talk followed by silence (cell 9-10) is, on an average, 3.33 per cent.

The highest (8-10) transition is found to occur in Mathematics (9.05 per cent) which implies that pupils' responsive talk suffers interruptions most when teachers are teaching Mathematics. The lowest (6.45 per cent) is recorded in History.

The highest and the lowest figures for(9-10) transition are in Mathematics (4.70 per cent) and in English (1.97 per cent) respectively. This again means that it is when the teachers are teaching Mathematics that pupils' self-initiated talk also, as does their responsive talk, suffers interruptions most.

SILENCE/CONFUSION

The events preceding the occurrence of silence/confusion are the context of silence/confusion (vide Figure 17). Silence/confusion could occur in any of the three possible contexts-following teacher talk, following pupil talk or in a sustained fashion, in its own context.

The Context of Silence/Confusion

The relative extents of the three segments of silence/confusion in the six different subjects are given in Table LXIII (on the next page). The computational details are given earlier (page 161).

Silence/confusion occurring in the context of teacher talk is heaviest (58.57 per cent) in History and lowest (54.49 per cent) in Science. The average works out to 56.02 per cent and besides History which tops the list, Geography is the only other subject which scores above the average. Heavy occurrence of silence/confusion following teacher talk sometimes could mean relatively interrupted flow of teacher talk.

Silence/confusion following pupil talk, on an average, occurs to 20.95 per cent which is about one-fifth of the percentage relating to silence/confusion following teacher talk (56.02 per cent).

The highest and the lowest figures for pupil talk based silence/confusion are recorded in Tamil (23.98 per cent) and Mathematics (17.18 per cent) respectively.

Sustained occurrence of silence/confusion, on an average, is to the extent of 23.00 per cent which obviously is nearly one-fourth of the total silence/confusion.

The heaviest incidence of sustained silence/

TABLE LXIII

THE CONTEXT OF SILENCE/CONFUSION IN DIFFERENT SUBJECTS
(in percentage)

Description	Tamil	English	Mathematics	History	Geography	Science	Average
Silence/confusion following teacher talk (column 10, rows 1 through 7)	54.91	55.21	55.58	58.57	57.38	54.49	56.02
Silence/confusion following pupil talk (column 10, rows 8 and 9)	23.98	22.19	17.18	19.96	18.72	23.71	20.95
Sustained silence/confusion (cell 10-10)	21.10	22.59	27.22	21.45	23.89	21.78	23.00

confusion (27.22 per cent) occurs in Mathematics and the lowest (21.10 per cent) in Tamil. This means that silence/confusion for relatively long periods exist most when teachers teach Mathematics and **exist** least when they teach Tamil. Besides Mathematics, Geography (23.89 per cent) scores above the average.

All the foregoing discussion is an overall analysis of the context in which silence/confusion occurred in the communication in different subjects. The objective has been to examine, in general, the type of communication that existed 'before' the occurrence of silence/confusion and hence, rightly, the discussions have emerged under the caption given above.

The Role of Silence/Confusion

What silence/confusion was found useful or otherwise for is perhaps to be judged on a scrutiny of what 'follows' the incidence of silence/confusion. That could be, perhaps, the role of silence (vide Figure 18).

The area in the matrix, to be examined for such an information is the row 10. The three different 'resulting' categories of sequences are teacher talk, pupil talk and silence/confusion. The computational details are discussed earlier (page 164).

In Table LXIV are given the measures of occurrence of the first two categories while the last category is not

discussed since it has earlier been discussed under the previous head.

Silence/confusion has served 'as' the context for teacher talk, on an average, to the extent of 58.11 per cent, which is evidently over half the total. The highest and the lowest records are set by Mathematics (60.87 per cent) and Tamil (53.72 per cent) respectively. This implies that it is when teachers are teaching Mathematics that silence serves most as the context for teacher talk and it serves least as the context for teacher talk when they are teaching Tamil.

Silence/confusion, 'as' the context for pupil talk, on an average, has occurred to the tune of 18.86 per cent which is about one-third of the previous average discussed, involving teacher talk.

TABLE LXIV
THE ROLE OF SILENCE/CONFUSION IN DIFFERENT
SUBJECTS (in percentage)

Role	Tamil	Engli- sh	Mathe- matics	Hist- ory	Geogra- phy	Scie- nce	Avera- ge
As base for teacher talk (row 10, cols. 1 through 7)	53.72	59.43	60.87	59.84	58.45	56.40	58.11
As base for pupil talk (cells 10-8, 10-9)	25.17	17.97	11.89	18.69	17.65	21.80	18.86

The highest extent to which silence/confusion has served as the context for pupil talk (25.17 per cent) is in Tamil. The lowest (11.89 per cent) is in Mathematics, which means that when teachers are teaching Mathematics the least proportion of silence is allowed before pupil talk while the greatest proportion is allowed to precede pupil talk when Tamil is taught.

It is surprising that the relative extreme positions of Tamil and Mathematics as regards the use of silence/confusion as context for pupil talk are exactly reversed as regards its use as the context for teacher talk. In other words, the subject where the teachers have been using silence/confusion most as the context for their talk the pupil's have been doing so least and vice versa.

In this chapter the problem has been studied with respect to subject taught whereas in the preceding chapter the other variables-namely, age, recency of training, experience, sex and marital status of the teacher were dealt with. In both the chapters, the respective matrices were also studied for significant revelations on the basis of sex, marital status and subject taught differences.

In the next chapter, summary of the investigation and the principal findings are given besides some suggestions.