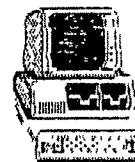


CHAPTER 4

STATISTICAL ANALYSIS



4.1 INTRODUCTION

In the previous three chapters, three important steps of the present research have been covered. In the first step the problem and the related literature have been presented. In the second step, the preparation of the audio-visual aids as per the syllabus is described. The third step gives the methodology adopted. As already described in the first chapter the main objective of the present work was to study the effect of the proposed innovative teaching techniques and the use of audio-visual aids on the vocal singing, interest and the Musical comprehension of the students. For this purpose an experiment has been carried out in four different schools in AGRA on students of class IX of the respective schools. In this chapter, the statistical analysis of the results of various tests is given. The analysis of various attributes under study have been shown in three independent sections as below:-

(1) The comparison of the effect of Normal teaching with that of the innovative teaching on the Vocal singing.

(2) The comparison between the effect of the two methods of teaching on the Interest of students towards Music.

(3) Comparison of the effect of the two methods on the Musical Comprehension.

4.2 Tests on Vocal singing.

The sample for this study has been taken from four

different schools of AGRA. The students of class IX who had opted Music as one of their subjects, as per the syllabus prescribed by the U.P. Board, were taken and four groups were formed. Before the commencement of the innovative as well as the normal teaching the students were subjected to a practical test of Vocal Music by a team of Experts and their a-priori standard was determined.

It was clearly evident that the stuff of different schools varied in standard. In one school the admission to Music was given after strict screening and class strength was kept small. In another school the class strength was big and the standard was poor. In the remaining two schools the standard was in between these two extremes. The names of the schools, their class strengths in Music is given below in the order of decreasing standard as per the preliminary test.

Name of the School	Number of students
Prem Vidyalaya	14
Ratan Muni Jain	16
Murari Lal	24
Anglo Bengali	28

For a comparative analysis of the effect of Normal Teaching and the Innovative Teaching on vocal achievement, tests were conducted. For conducting these tests on vocal music two experts were selected, who evaluated the students on five aspects. They were

1. Swara,
 2. Laya,
 3. Tal,
 4. Quality of Voice
- and 5. General impression.

Each aspect has been assigned 10 marks. The total of the practical test was thus of 50 marks.

In the beginning of the session the students of all the four groups were subjected to this practical test on vocal music so as to get a basis for comparing the different groups. Also, it enabled us to compare the gain achieved by each candidate due to different teaching methods. During the first five months of the session the teaching was carried out by the Normal teaching method by their own teachers. Practical tests on vocal Music were carried out at the middle and at the end of this period of five months by the expert committee. In the next five months the students were given training by the innovative teaching method by their own teachers. Again, two practical tests on vocal music were conducted by the same expert committee at the middle and at the end of this period. The marks awarded by each expert have been added and tabulated as shown in Table -1 of Appendix - II. The column-1 of this table gives the marks prior to normal teaching, the columns 2 and 3 show the marks of Tests taken in the middle and at the end of the Normal teaching period and columns 6 and 7 show the same for

the Innovative teaching. Table-2 of the same appendix shows the normalised marks for the above three conditions. The maximum marks for all the three periods, namely, the a-priori state, Normal teaching period and the Innovative teaching period were made equal to 50. The columns 2 and 3 of Table 1 (App.-II) are added to show the level of candidates after Normal teaching and columns 6 and 7 added to show the level after the Innovative teaching. These two added sums are divided by 4 and column 1 marks are divided by 2 so as to make the maximum marks equal to 50 in both cases. The column 1 of Table-1 (App.-II) marks are divided by 2 and shown in column 1 of Table-2 (App.-II), making the maximum marks in this column also to be of 50 marks.

The difference of columns 2 and 1 of Table-2 (App.-II) shows the gain achieved by the candidates due to normal teaching and the difference of columns 3 and 2 shows the gain due to Innovative teaching. These two differences are shown in columns 4 and 5 of Table-2 (App.-II) respectively. The mean and standard deviation of the marks listed in the five columns of Table-2 (App.-II) have been calculated and are given in the Table-1 (Ch.-4)

The Table-1 (Ch.-4) shows the marks of the students of all the four groups taken together. The average marks due to Normal teaching improved from 15.78 to 18.00 - an improvement of 2.22, while the average marks due to the innovative teaching improved from 18.00 to 24.69 - an improvement of 6.69. The

TABLE-1
RESULTS OF TESTS ON VOCAL ACHIEVEMENT OF TOTAL SAMPLE

S.No.	ITEM	Number of students	MEAN	STANDARD DEVIATION
1.	Marks prior to Normal teaching	82	15.78	5.54
2.	Marks after the Normal teaching	82	18.00	5.62
3.	Marks after the Innovative teaching	82	24.69	5.39
4.	Gain in Marks due to Normal teaching	82	2.22	
5.	Gain in Marks due to Innovative teaching	82	6.69	

improvement in the practical performance is more than 3 times by the innovative techniques. This clearly establishes the superiority of the new teaching methods in improving the practical performance of the Vocal music. The results pertain to the combined performance of all the four groups of students. A greater insight can be obtained if the performance of these four groups is studied independently. The four groups consisted of students of different caliber, one consisting of students of

comparatively higher talents and one having students of lower talents and the other two falling in between the two limits.

The Table -2 (Ch.-4) gives the statistical results of the comparative achievement of the four groups. In this Table column-2 gives the number of students in each group. The average marks of the students of each group at the beginning of normal teaching, the average marks after normal teaching and after the innovative teaching, in the tests taken in the middle and at the end of these periods, are given in columns 3,4 and 6 respectively. The columns 5 and 7 show the improvement in the average score due to normal and innovative teaching respectively. The t-values between the increase in marks due to the two methods is shown in the last column. It is obvious from the Table that all the four groups have shown significant improvement in their achievement due to the innovative teaching methods compared to normal teaching. A close study of the improvement in marks of various groups due to innovative teaching shows that the increase in marks is greater in the case of average students, i.e., of group 3. The achievement of groups 3 and 4 is better than that of groups 1 and 2. As the improvement of the weakest group is more than the best group, one can say that the range of difference of levels among various students has decreased. The decrease in the difference of levels between students causes a decrease in the Standard Deviation. Table-1 (Ch.-4) shows the combined standard deviation of all the four

RESULTS OF THE VOCAL ACHIEVEMENT TESTS OF THE FOUR GROUPS

Group Number	Mean marks		Increase		Mean marks		Increase		t-value
	prior to	after the	in mean	due to	after the	Inn. T.	in mean	due to	
students	Normal	Normal Teaching	Normal T.	Normal T.	Innovative Teaching	Inn. T.	Inn. T.	Increase	
I	II	III	IV	V	VI	VII	VIII		
1.	14	23.40	25.28	1.89	31.39	6.10	6.28		
2.	16	16.13	18.30	2.17	24.74	6.44	2.75		
3.	24	14.90	17.45	2.55	24.75	7.30	7.26		
4.	28	12.90	14.32	1.42	21.26	6.94	9.12		
TOTAL	82	15.78	18.00	2.22	24.69	6.69	12.16		

groups prior to normal teaching, after normal teaching and after the innovative teaching. The values are respectively 5.54, 5.62 and 5.39 . It can be seen that the standard deviation has decreased due to the innovative teaching. On the contrary, the standard deviation increased after normal teaching indicating that the differences of level between students had actually increased.

From the above analysis it is obvious that the innovative teaching techniques have a profound impact on the musical achievement of the students. However, to eliminate the chance factor, one has to establish that the gain is statistically significant. The statistical significance of the difference between two arrays is found by evaluating the t-value of the two arrays. The t-values at various levels of significance and for various values of the sample size are tabulated in the literature. For a sample size of 82 a figure of 3.40 for the t-value shows that the difference is significant at 0.001 level. This is equivalent to saying that one array has its 99.9% elements clearly higher than those of the other array. In the case of the increase in marks due to normal teaching and the innovative teaching the t-value is found to be 12.16, which leads to a significance level of 0.00001 which establishes a 99.999% superiority statistically.

The t-values for the increase in marks of the individual groups show that the highest t-value is obtained by

the weakest group. The figure for the Group-4 from the column 7 of Table -2 (Ch.-4) is 9.12. This shows that the weakest group obtained the maximum benefit. Group -3 with a t-value of 7.26 got the next best benefit. The Group-1 which has the best talent got lesser benefit as shown by their t-value of 6.28. The t-value of the Group-2 was the worst and is equal to 2.75. But even this figure is significant at 0.05 level. A careful investigation revealed that there were some external disturbances in the school during the days when the innovative teaching was carried out at this school.

From the above analysis the following conclusions may be drawn.

1. There is a significant improvement in the standard of vocal music by the innovative teaching techniques.
2. The weaker groups were benefitted more than the talented ones thus decreasing the difference of levels between the students.

Apart from vocal singing, tests were conducted to find the effect of innovative teaching on the interest of the students towards music and on their musical comprehension. The results of these tests are analysed in the following.

4.3 Test on Musical Interest.

The test on Musical Interest was conducted at the end of Normal teaching and again at the end of the innovative teaching through a questionnaire. The results of these tests

are tabulated in the Table-1 (App.-2). The column-1 of this Table shows the marks obtained by each candidate in the test conducted at the end of Normal teaching and the column-2 shows the score at the end of Innovative teaching. The results of statistical analysis of these marks are shown in the Table-3 given below.

T A B L E - 3

RESULTS OF TESTS ON MUSICAL INTEREST OF TOTAL SAMPLE

TEST conducted after	Number of students	Mean	Standard Deviation	t-value
Normal Teaching	82	36.82	4.40	4.10
Innovative Teaching	82	38.67	2.86	

The above Table shows that the interest of students towards music increased by the Innovative teaching method compared to the Normal teaching. Also the standard deviation has decreased from 4.40 to 2.86 which shows that the difference between the levels of the students also decreased. The t-value obtained is 4.10 which shows that the improvement in the inter-

est is significant at 0.001 level. (This is equivalent to saying that 99.9% improvement is observed). The effect on the musical interest of the four groups individually, which were classified in the decreasing order of their vocal singing capability, is shown in the Table-4 below.

T A B L E - 4

RESULTS OF TESTS ON MUSICAL INTEREST OF THE FOUR GROUPS

Group Number	No. of students	Mean marks (Normal teaching)	Mean marks (Innovat. teaching)	Standard (Normal teaching)	Standard (Innovat. teaching)
1	14	35.93	39.64	4.47	2.63
2.	16	39.50	37.75	3.44	3.28
3	24	35.375	38.416	4.89	3.19
4.	28	36.964	38.928	4.02	2.30

On comparison with the results of vocal singing, there is little correlation between Musical Interest and Vocal singing. In the normal teaching period the Group-1 showed lesser interest than the Group-4. The innovative teaching seems to have given a thrust to their interest which became highest of all. It may be said that the innovative teaching tended to increase the interest of those whose interest was minimum. This seems to have the effect of decreasing the level differences

among students as in the case of vocal singing. This is also reflected in the fact that the standard deviation of all the groups decreased.

The only group whose interest decreased during the innovative teaching is the Group-2 as is evident from the average marks given in Table-4 (Ch.-4) where the mean marks of group-2 for Normal teaching was 39.50 which decreased to 37.75 after the innovative teaching. This is the same school where some disturbances in the administrative setup disturbed the students as well. In the vocal singing too, this group could not get the same advantage as other groups as already discussed. In the case of vocal singing, two tests were conducted during the innovative teaching period. In the first test which was conducted after two months of innovative teaching, this group fared very well. The disturbances started in the last two months of the session. The final test of Vocal singing and test on Musical Interest were conducted during this period which affected their results considerably. The marks of the two tests on vocal singing are shown in the columns 6 and 7 of table-1 (App.-II) respectively. But for one student, the marks of all the students of this group went down in the later test. This shows how important it is to control the atmosphere of the Institute if academic excellence is desired.

Apart from the Vocal singing and Musical Interest, a test was conducted to evaluate the effect of innovative teach-

ing on the Musical Comprehension of the students and is presented in the following section.

4.4 Test on Musical Comprehension.

Two tests were conducted on the Musical Comprehension of the students, one each at the end of normal teaching and at the end of innovative teaching. The results of these tests are shown in columns 3 and 4 of the Table-1 of Appendix-2. The statistical analysis of these results is presented in Table-5 below.

T A B L E - 5

RESULTS OF TESTS ON MUSICAL COMPREHENSION OF TOTAL SAMPLE

Test conducted after	No of students	Mean	Standard deviation	t-value
Normal teaching	82	25.80	6.72	7.74
Innovative teaching	82	32.87	4.72	

The above Table shows that there is a great improvement in the average marks scored in the tests on Musical Comprehension due to the innovative teaching compared to normal teaching which increased from 25.80 to 35.87. Also the standard deviation decreased from 6.72 to 4.72, again indicating that

the difference of levels among the students decreased as in the previous tests by the innovative teaching methods. The t-value of the two arrays is found to be 7.74 which means that the increase is statistically significant at 0.0001 level. The effect on the individual groups is analysed and presented in the Table-6 given below.

T A B L E - 6
MUSICAL COMPREHENSION TEST RESULTS OF THE FOUR GROUPS

Group Number	Number of students	Mean of (Normal teaching)	Mean of (Innovative teaching)	S.D. of (Normal teaching)	S.D. of (Innovative teaching)
1.	14	37.07	38.86	3.36	2.67
2.	16	25.94	31.94	4.22	3.96
3.	24	24.00	33.88	4.26	3.27
4.	28	21.64	29.54	4.41	3.82

The gain in marks of Musical Comprehension tests due to innovative teaching is satisfactory for all the four groups. The weak and the average students gained much more than the bright ones as in earlier tests. There is a marked reduction in the Standard deviation of all the four groups implying that the difference of levels between students tended to decrease. Even the gain of Group-2 is remarkable taking into consideration

that this batch was disturbed by external events. The performance of this batch was adversely affected in both the tests of Musical interest and vocal singing. This may be due to the fact that psychologically, external disturbances affect the vocal singing and interest faster. On the other hand Musical comprehension is related to the understanding of the subject, which develops gradually with time and is not as much affected by psychological factors.

The results of the test on Musical comprehension are closely correlated to the results of vocal singing except for the Group-2. Superior vocal performance needs a better understanding of the subject which is reflected in the results of the tests on Musical Comprehension.

4.5 CONCLUSIONS.

In this Chapter the Innovative teaching method is compared with the Normal teaching methods through statistical analysis. Due to the great importance attached to vocal singing in Music Education more tests were conducted on this aspect during both periods of teaching and at the beginning. The students of the four schools taken for these tests naturally fell into four different levels. For all the four categories of students the gain of marks due to innovative teaching was higher by nearly a factor of 3 compared to normal teaching methods. Also the weaker and the average groups gained more than the bright ones. Thus the difference of levels between students

tended to decrease. In both Musical Interest and in Musical Comprehension the gain due to innovative teaching is clearly established. Also the difference of levels between the students also decreased.

It may be of interest here to have a closer look at why the brighter students did not apparently gain as much as the weaker and average groups. This may be due to the fact that as the student gains knowledge, his scores improve, but as he reaches nearer to the highest mark, the gain in marks will not be linearly proportional to his knowledge. The effort needed for a student to improve his performance from 40% to 60% cannot be as much as the effort needed to improve his performance from 60% to 80% level. The student may have to put in much more effort to improve his performance by 10 more percent, that is, to 90%. As the marks approach the limit of highest marks the gain in marks cannot be as high as at lower levels for the same amount of increment in the knowledge. Hence, we may conclude that all the groups of students were benefitted by the new innovative teaching techniques.

Although the study of the effect of external disturbances falls outside the purview of this work, it is the duty of this worker to bring to the attention of the teachers and administrators of Educational Institutions that it is their duty to see that the students get a healthy atmosphere and are not disturbed by the internal politics of the administration.