CHAPTER V

ANALYSIS AND INTERPRETATION OF THE DATA

5.1 INTRODUCTION :

In order to study the effectiveness of software package in terms of instructional time, students' achievement, and the effect of software package on students' achievement in relation to their IQ, motivation level and their attitude towards the package, statistical techniques namely ANOVA and ANCOVA (i.e., analysis of variance and analysis of covariance) were applied.

The Analysis of Variance is an effective way to determine whether the Means of more than two samples are different or not. It would be possible to use a number of t-tests to determine the significance of the difference between five means, two at a time, but it would involve ten separate `t' tests.

Analysis of Variance makes it possible to determine whether the five Means differ significantly with a single test, rather than more number of tests.

The Analysis of Covariance and partial correlation are those statistical techniques which can remove the effect of a confounding variables' influence from a study. Analysis of Covariance (ANCOVA) uses the principles of partial correlation with Analysis of Variance. It is particularly appropriate when the subjects in two or more groups are found

to differ on a pretest or other initial variables. In this case, the effects of a pre-test and/or other relevant variables are partialed out and the resulting adjusted means of the post-test scores are compared. Analysis of Covariance is a method of analysis that enables the researcher to equate the pre-experimental status of the groups in terms of relevant known variables. The initial status of the groups may be determined by pre-test achievement scores in a pre-test post-test study, or in post-test study only, other measures can be studied, by such measures as intelligence, reading scores, grade-point average, or differences in the initial status of the groups can be removed statistically so that they can be compared through their initial status that had been equated. The scores that have been correlated by this procedure are known as residuals, for they are, what remain after the inequalities have been removed.

Analysis of Covariance, used with one or more independent variables and one dependent variable, is an important method of analysing experiments carried on under conditions that otherwise would be unacceptable. In addition, as Glass and Hopkins (1984) pointed out, ANCOVA does not transform a quasi-experiment into a true (randomized) experiment. There is no substitute for randomization.

In order to find out the interaction effect of variables like IQ, motivation level and attitude on student's academic achievement a 2 x 2 x 2 factorial analysis was applied.

In order to achieve the objective related to studying the attitude of students regarding the effectiveness of CAI package in terms of some of it's aspects, the data collected were analysed qualitatively by carrying out content analysis.

The interpretation of data analysed is presented here objectivewise.

5.2 DEVELOPMENT OF CAI :

Objective 1 : To develop CAI package in subject of Chemistry for Standard XI science students studying GSTB syllabus. For fulfilling this objective, a CAI package was developed in the three selected chapters of Chemistry textbook viz., Organic compounds, Bonding and Molecular structure and Energy. For details refer chapter IV.

5.3 EFFECTIVENESS OF THE SOFTWARE PACKAGE IN TERMS OF ACHIEVEMENT AND TIME SCORE :

Objective 2 : To study the effectiveness of software package in terms of instructional time and achievement of students.

For finding out the effectiveness of the software package in terms of achievement, students of experimental and control group were given pre and post-achievement test. The scores of pre and post-achievement tests were subjected to the Analysis of Variance and Analysis of Covariance. Table 8 and 9 show the Analysis of Variance and Analysis of Covariance.

TABLE 8 : ANALYSIS OF VARIANCE OF PRE-TEST (X) AND POST-TEST (Y) SCORES

SOURCE OF VARIATION	df	SSX	SSY	MSx(Yx)	MSy(Vy)
Among means	1	274.86	530.694	274.69	530.69
within groups	66	3956.08	6369.174	59.9	96.5
Total	67	4230.94	6899.86	-	-

Calculated Value	Table value of F
Fx = 4.57	with df1/66 at 0.05 level 3.99
Fy = 5.998	at 0.01 level 7.045
df = 1/66	

From the above table, it can be seen that value of Fx was found as 4.57 and calculated value of Fy was found as 5.498. According to the Table-F, Garrett, H.E., and Wood Worth, R.S. (1966) the value of F should be 3.99 at 0.05 level and 7.045 at .01 level with 1/66 degrees of freedom. Thus, it can be said that the values of Fx and Fy are significant at 0.05 level. The value of Fx here indicates that the control and experimental group were not different in terms of their previous knowledge required to learn the content of the software.

The value of Fy indicates the effectiveness of software package implemented on the experimental group. But it included the effect of previous knowledge and other intervening variables. Therefore, in order to nullify the

effect of the intervening variables and to find out the effectiveness of software package alone, the investigator had employed the technique of Analysis of Covariance.

TABLE 9 : ANALYSIS OF COVARIANCE

Source of variance	df	SSx	SSy	SSxy	SSyx	MSyx (Vyx)	SD yx
Among means	1	274.86	274.86	530.694	394.85	394.86	-
within groups	65	3956.08	6369.17	593.5	6280.13	96.6	9.82
Total	66	4230.94	6899.86	975.4	6674.98		

Obtained value of Fy.x = 4.088
Table value of F at 0.05 level = 3.99
with 1/65 df at 0.01 level = 7.035

According to the F-table [Garrett, H.E., Woodworth, R.S. (ed), (1966) page no. 295, the value of Fy.x is 3.99 at 0.05 level with 1/65 degrees of freedom. Thus, it can be inferred that the value Fy.x of 4.088 was significant at 0.05 level of significance. Thus, the hypothesis no. 1 i.e. "There will be no significant difference in achievement of students between experimental and control group" is rejected. In other words it means that the software package was effective in terms of achievement of students.

5.3.1 EFFECTIVENESS IN TERMS OF INSTRUCTIONAL TIME :

With regard to effectiveness of the software package in terms of instructional time, it can be seen from Table 10 that the students of experimental group took total time of 45 hours i.e. on an average, one hour every day for one and a

half month in order to learn three chapters of Standard XI Chemistry text book of Gujarat State Text Book Board 1994. While the students of control group took 60 hours to learn the same number of chapters during one and a half month duration and had to attend extra classes taken by their subject teacher. From this, it can be inferred that the software package was time-effective. When the students of experimental group were further probed in order to know the reasons for this, it was revealed by them that the learning through computer software was more interesting and the use of graphs, figures, and examples made their learning more concrete. Moreover self learning made the task of understanding three chapters more quicker. Although one thing needs to be mentioned here that though students of experimental group took lesser time than control group students, they did not spend the uniform amount of time for all the three units. The time spent for each unit has been presented in the following Table 10.

TABLE 10 : TABLE SHOWING THE TIME SPENT BY STUDENTS OF EXPERIMENTAL AND CONTROL GROUP FOR THREE CHAPTERS OF STANDARD XI CHEMISTRY.

Sr. No.	Name of the Chapter	Time taken by the students of Experimental group	Control group
1.	Organic Compounds	20	26
2.	Bonding and molecular structure	15	18
3.	Energy	10	16
	Total	45	60

5.4 EFFECTIVENESS OF SOFTWARE PACKAGE AS PER STUDENTS' CHARACTERISTICS :

Objective No. 3 : To study the effect of the software package on students' achievement in relation to students'

* Intelligence level,
* Motivation level, and
* Attitude towards the package.

In order to achieve this objective, the data were collected through, three tools namely MPIT (1970) to measure intelligence quotient, Junior Index of Motivation scale by Jack Frymier (1970) to ensure academic motivation and unstructured interview schedule for students to see their attitude towards the package. The data collected through these tools was analysed qualitatively. The data collected for IQ and Academic Motivation has been presented here under.

TABLE 11 : SHOWING THE SCORES OF ACADEMIC MOTIVATION, IQ AND ACHIEVEMENT ON POST-TEST BY THE STUDENTS OF EXPERIMENTAL GROUP.

No. of students of Experimental group	Scores of the students on			
	IQ	Motivation level	Attitude	Post-test marks out of 50
1	118	123	35	17
2	127	130	30	26
3	116	124	30	25
4	102	145	34	45
5	143	117	34	40
6	120	108	33	36
7	142	112	43	43
8	116	92	57	23
9	134	96	48	30
10	132	68	38	21
11	115	91	38	44
12	134	103	51	30
13	115	110	39	29
14	107	86	30	22
15	125	119	41	23
16	140	92	33	18
17	140	107	54	37
18	136	109	40	42
19	134	103	45	20
20	117	100	43	21
21	126	125	46	32
22	119	103	59	29
23	136	104	32	24
24	132	121	35	16
25	129	124	48	37
26	134	116	36	36
27	144	115	48	44
28	130	111	50	45
29	132	119	40	37
30	78	62	45	15
Mean	125.76	107.83	41.2	
SD	13.86	15.1062	41.7	

In order to divide the thirty students into two groups, investigator had calculated Mean scores of IQ and Academic Motivation scores. As reflected in the table 11, Mean score

for IQ was 125.76 and that for Academic Motivation was 107.83. On the basis of this the students were distributed into two groups in such a way that Group I consisted of eight such students who had scored lowerer than mean scores on both the variables i.e., IQ and Academic Motivation (Table 12). Similarly the Group II consisted of twelve students who had scored higher than the mean scores of both the variables i.e., IQ and academic motivation, while ten students could not be put into any of this groups (Table 13). After dividing the thirty students into two groups as mentioned above, their scores on post-test were compared. This was done in order to find out the relationship of Academic Achievement with IQ and Academic Motivation.

TABLE 12 : TABLE SHOWING THE SCORES OF EXPERIMENTAL GROUP STUDENTS ON IQ, ACADEMIC MOTIVATION AND POST-TEST (STUDENTS WITH SCORES LOWER THAN MEAN SCORES OF IQ AND ACADEMIC MOTIVATION)

No. of students of Experimental group	Scores of the students on		
	IQ	Motivation level	Post-test marks out of 50
1	78	62	15
2	115	91	44
3	107	86	22
4	120	108	36
5	116	92	23
6	115	110	29
7	117	100	21
8	119	103	29
Mean	125.76	107.83	27.4
S.D.	13.86	15.10	8.64

TABLE 13 : TABLE SHOWING THE SCORES OF EXPERIMENTAL GROUP STUDENTS ON IQ, ACADEMIC MOTIVATION AND POST-TEST (WITH SCORES HIGHER THAN MEAN SCORES OF IQ AND ACADEMIC MOTIVATION)

No. of students of Experimental group	Scores of the students on		
	IQ	Motivation level	Post-test marks out of 50
1	127	130	26
2	143	117	40
3	142	112	43
4	125	119	23
5	136	109	42
6	126	125	32
7	132	121	16
8	132	119	37
9	129	124	37
10	134	116	36
11	144	115	44
12	130	111	45
Mean	125.76	107.83	35.08
S.D.	13.86	15.10	8.76

TABLE 14 : TABLE SHOWING THE DISTRIBUTION OF STUDENTS OF EXPERIMENTAL GROUP AT DIFFERENT LEVEL OF IQ, MOTIVATION LEVEL AND ATTITUDE

		IQ			
		High		Low	
		PA	NA	PA	NA
		37	43	29	
M		42	37	36	23
O	H	36	45	17	
T	I	26	44	25	
I	G	40	32	45	
V	H	16			
A					
T	L	21	30	44	21
I	O	24	20	22	29
O	W	18	30		23
N			37		15

P.A. = Positive attitude
N.A. = Negative attitude

Note: As mentioned in Chapter III two levels of IQ and two Motivation level are made, based on the mean score of IQ and Motivation of all students of experimental group. Students with score on IQ and Motivation lower than mean score belonged to lower group. While students with score on IQ and Motivation higher than mean score belonged to higher group.

TABLE 15 : ANALYSIS OF VARIANCE (2 x 2 x 2 FACTORIAL DESIGN)

Source of variation	Sum of squares	d.f.	Mean Square	'F' ratio
SS IQ	158.7	1	158.7	8.46**
SS MOT	473.1	1	473.1	25.24**
SS ATT	4.44	1	4.44	0.23
SS IQ x MOT	32.57	1	32.57	1.72
SS IQ x ATT	415.71	1	415.71	22.18**
SS MOT x ATT	117.68	1	117.68	6.27*
SS IQ x MOT x ATT	1099.01	1	1099.01	58.64**
SS within	412.36	22		

Table value of F with 1/22 d.f.

at 0.05 level 4.30

at 0.01 level 7.94

Note: * Significant at 0.05 level of significance

** Significant at 0.01 level of significance

SS IQ = Sum of squares Intelligent quotient

SS MOT = Sum of squares Motivation level

SS ATT = Sum of squares Attitude

It can be seen from Table 12 and 13 that IQ and Motivation level of students affect their Academic Achievement. The students of group-I with low level of IQ and Motivation had lower scores on post-test as indicated by the mean value on post-test i.e., 27.4. While the students of Group-II having higher level of IQ and Motivation had higher mean score on post-test, i.e. 35.08. Here it can be inferred

that IQ and Academic Motivation are such variables which affect the Academic Achievement of students.

Further, three-way ANOVA was applied in order to find out the interaction effects of the three variables i.e., IQ, Motivation level and Attitude on Academic Achievement of students. For this analysis the thirty students of the experimental group were distributed into eight groups based on their high and low IQ, Motivation and positive & negative attitude as shown in Table 14.

This tabulated data was analysed for 2 x 2 x 2 ANOVA. The results of the analysis of variance df 2 x 2 x 2 factorial design is presented in Table 15.

It can be seen from table 15 that values of SS IQ and SS MOT are significant at 0.01 level with 1/22 degrees of freedom while the value of SS ATT is insignificant at 0.05 level of significance. Hence, it can be interpreted that IQ and Motivation level have significant effect on Academic Achievement of students whereas Attitude has no effect on the Academic Achievement of students. The same findings were arrived at by the researcher as presented in Table 12 and 13 that students with high IQ and high Motivation level have higher scores of post-test compared to the students with low value of IQ and Motivation than the mean value.

Therefore, based on this interpretations the hypotheses No. 3 "There will be no significant difference in the

achievement of students in the experimental group with positive and negative attitude" is not rejected. This means although there was difference in attitude of students in experimental group but it's impact was not intense enough to cause significant difference in the academic achievement.

The hypotheses No. 4 "There will be no significant difference in the achievement of high intelligent and low intelligent students of experimental group", was rejected. As the CAI package was self-learning package the students with high IQ could learn easily and quickly as they could grasp the concepts at a faster rate. Therefore this enabled them to score higher than those with lower IQ.

The hypotheses No. 5 "There will be no significant difference in the achievement of high and low Motivation level of students of experimental group" was also rejected. This may be due to the fact that students with high Motivation level took greater interest in learning the content through CAI package. Learning through CAI package being a self-learning approach high Motivation had significant impact on academic achievement of students.

From Table 15 the value of SS IQ x MOT was 1.72 which is insignificant at 0.05 level of significance. Hence the hypotheses No. 6 "There will be no interaction effect of Motivation and IQ level on student's achievement in the experimental group" was not rejected. Here, although IQ and Motivation as a separate variables had significant effect on

academic achievement but the interaction effect of these two variables did not have a significant effect on academic achievement. This could be due to the reason that students having high IQ might not have high Motivation and vice-versa which led to this result.

While the `F' values of SS IQ x ATT, SS MOT x ATT and SS IQ x MOT x ATT were found to be 22.18, 6.27 and 58.64 respectively and are significant at 0.05 level at significance with 1/22 degrees of freedom. The variables like Motivation and Attitude of student affect their Academic Achievement, and combined interaction of all the three variables also affect their Academic Achievement.

Therefore, the hypotheses No. 7, "There will be no interaction effect of Motivation level and Attitude on students' achievement in the experimental group" was rejected. This is probably due to the reason that those students who had high Motivation and as their Attitude was also positive has helped them to achieve higher compared to those who had low Motivation and negative Attitude. Hence the Motivation and IQ favourably could produce a combined effect on the Academic achievement of students.

The hypotheses No. 8 "There will be no interaction effect of IQ and attitude on students' achievement in the experimental group" was rejected. This means that those students with high IQ level and positive Attitude could score higher on post-test compared to the students with low IQ and

negative Attitude. Hence IQ and Attitude both these variables also have shown their interaction effect on students' Academic Achievement.

Hypotheses No. 9 "There will be no interaction effect of Motivation level, IQ and Attitude on students' achievement in the experimental group" was rejected.

This indicates that although IQ and Motivation together could not significantly affect the Academic Achievement but when it was combined with Attitude, the three variables affect the Academic Achievement significantly.

5.5 ATTITUDE OF THE STUDENTS REGARDING THE DIFFERENT ASPECTS OF THE PACKAGES :

The attitude scale was given to the thirty students of the experimental group. The attitude of these students was analysed with the help of percentage and interpretation is presented aspectwise.

A. CONTENT OF THE SOFTWARE :

TABLE 16 : DISTRIBUTION OF THE RESPONSES OF STUDENTS REGARDING THE CONTENT PRESENTED IN THE SOFTWARE.

Sr. No.	Statements	Disagree	Undecided	Agree
1.	Content covered in each unit of software is sufficient.	30% (9)	10% (3)	60% (18)
2.	Concepts are clarified properly.	36.67% (11)	13.33% (4)	50% (15)
3.	Teaching points given in each chapter are logically sequenced.	16.67% (5)	23.33% (7)	60% (18)
4.	Materials presented through software is interesting.	3.33% (1)	13.33% (4)	83.33% (25)
5.	Material provided in the package helps for self-study.	23.33% (7)	10% (3)	66.67% (20)
6.	The material provided has been prepared from different sources of information & is upto date.	13.33% (4)	33.33% (10%)	53.33% (16)
7.	The software package takes into consideration students' previous level of knowledge in this subject.	20% (6)	13.33% (4)	66.67% (20)
8.	The software package helps in concept concretization.	23.33% (7)	20% (6)	56.67% (17)

Eight statements were prepared related to the content of the software. The attitude of the students regarding the content of the software was analysed with the help of percentage and is presented in table no.16. From table 16, it can be seen that majority of the students had favourable

attitude regarding the content coverage in the software. Further with regard to the presentation of material, most of the students said that the presentation of the material was interesting and on further probing it was found that because of moving figures and contrast between text and background screen, the package was interesting. Regarding concept clarification, fifty percent of the students said that more clarification was needed. On further probing, it was revealed that examples provided were inadequate. However, on the whole, majority of the students agreed that the content coverage in software was of the satisfactory level.

B. **PRESENTATION :**

Attitude of the experimental group students was taken regarding the different aspects of presentation in the package. The questions asked were whether there was clarity in the presentation of figures/graphs ? Whether the text material was readable and the language used was simple/understandable ? Whether there was overload of information on one page.

TABLE 17 : DISTRIBUTION OF RESPONSES OF THE STUDENTS REGARDING THE PRESENTATION OF THE SOFTWARE.

Sr. No.	Statements	Disagree	Undecided	Agree
1.	Clarity in presentation of the concepts.	33.33% (10)	13.33% (4)	53.33% (16)
2.	Language used in the software is simple.	10% (3)	20% (6)	70% (21)

With regard to the above aspect, two statements were prepared and the analysis is presented in table 17. Table-17 revealed that almost three fourth of the respondents said that language used in the software was easy to understand. This must have helped them to understand the concepts taught. Further just little more than 33.33% of the students said that more clarity was needed for understanding some of the concepts. On further probing, it was found that it was due to lack of enough number of examples.

C. **EXAMPLES AND ILLUSTRATIONS :**

Examples and illustrations were provided in the software for clarifying the concepts and for enriching the content. Regarding this aspect following three statements were prepared and attitude of the students was analysed and is presented in Table 18.

TABLE 18 : DISTRIBUTION OF RESPONSES OF STUDENTS REGARDING THE EXAMPLES AND ILLUSTRATIONS PRESENTED IN THE SOFTWARE.

Sr. No.	Statements	Disagree	Undecided	Agree
1.	Illustrations and examples provided in the software are adequate for the purpose.	43.33% (13)	16.67% (5)	40% (12)
2.	Examples given in the software help in the concept clarity.	16.67% (5)	26.66% (8)	56.67% (17)
3.	Illustrations and examples are easy to understand	26.67% (8)	20% (6)	53.33% (16)

From Table 18, it can be interpreted that little more than 50%, students said that the examples given in the software were easy to understand and it helped them for concept clarity. While rest of the students believed that examples were inadequate in number. There should have been more number of examples for concretizing and clarifying the concepts.

D. FIGURES AND GRAPHS :

The software package contained certain figures and graphs for clarifying the concepts such as bond formation; increase in volume and decrease in volume during chemical reaction. Related to graphs and figures two statements were prepared. The analysis of responses of the students are presented in Table-19.

TABLE 19 : RESPONSES OF STUDENTS REGARDING THE FIGURES & GRAPHS PRESENTED IN THE SOFTWARE.

Sr. No.	Statements	Disagree	Undecided	Agree
1.	Figures and graphs in the software help in the clarity of concepts.	20% (6)	13.33% (4)	66.67% (20)
2.	Figures and graphs shown in the software are drawn clearly and are easy to understand.	3.33% (1)	13.33% (4)	83.3% (25)

From the above table it can be interpreted that a large majority of the students said that figures & graphs shown in the software were clearly drawn. These figures also helped them for clarifying the concept. This shows that figures and graphs were presented properly and clearly to understand the concepts presented in the software package.

E. EVALUATION :

The software package contained the evaluation items, after the presentation of each concept. To know about the clarity and objectivity of test items and also the pattern of evaluation, the following statements were prepared to know the attitude of the students. The analysis of which is presented in table 20.

TABLE 20 : STUDENTS RESPONSES REGARDING EVALUATION ITEMS PRESENTED IN THE SOFTWARE PACKAGE.

Sr. No.	Statements	Disagree	Undecided	Agree
1.	Pattern of evaluation is proper.	26.67% (8)	30.00% (9)	43.33% (13)
2.	Evaluation items are very clear.	20% (6)	20% (6)	60% (18)
3.	The number of evaluation items are adequate for providing feed back.	20% (6)	30% (9)	50% (15)
4.	Evaluation items covers the entire subject matter	30% (9)	16.67% (5)	53.33% (16)
5.	Evaluation items are objective in nature, and the evaluation done is very clear.	23.33% (7)	13.33% (4)	63.33% (19)
6.	Answer key given for each evaluation item helps in self-learning, and motivating the learners for study.	20% (6)	16.67% (5)	63.33% (19)

From the above table, it can be inferred that majority of the students were satisfied with the evaluation items given in the software. They also mentioned that evaluation was done very clearly and the answer keys provided helped them in self-learning and motivating themselves.

F. INSTRUCTIONS GIVEN IN THE MANUAL :

Students were provided with the instructional manual regarding the content, use, and precautions to be taken while

using the software. Therefore students' attitude was taken with regard to above aspects and analysis of responses is presented below in Table 21.

TABLE 21 : RESPONSES OF STUDENTS REGARDING INSTRUCTIONS GIVEN IN THE MANUAL

Sr. No.	Statements	Disagree	Undecided	Agree
1.	Instructions given in the manual are clear.	6.66% (2)	16.67% (5)	76.67% (23)
2.	Instructional manual contains all the information about the software	20% (6)	10% (3)	70% (21)

From the above table, it can be interpreted that a very large majority of the students were satisfied with the instructions given in the manual in terms of clarity as well as coverage of all the required information in it.

Students were also asked to tell about the way they experienced learning of content through software. From table 22, one can say that most of the students agreed that learning through software was interesting as it differed from usual classroom instructions.

TABLE 22 : RESPONSES OF STUDENTS REGARDING THE USE OF COMPUTER SOFTWARE

Sr. No.	Statements	Disagree	Undecided	Agree
1.	Learning through software was very interesting	13.33% (4)	16.67% (5)	70% (21)

Moreover, students were actively involved in the learning process due to which they were interested in learning through software.

On the whole, one can say that most of the students liked this new method of learning through software. They liked it because the students could take their own time for learning and that helped them in self-learning and self-evaluation.

The teachers were also asked to give their observations and remarks about the software package.

The attitude of Chemistry teacher was analysed qualitatively. With regard to the presentation of the content in the software, the teacher said that the content was presented in a nice manner. The terms were explained very clearly to enable learners for better learning.

With regard to examples and illustrations, the teacher expressed that although the examples were appropriate for the purpose, they could have been more in number to give students more practice and to clarify some basic concepts. Regarding the language used in the software, it was found easy to comprehend by the teacher. Regarding the change in the behaviour of students for learning Chemistry the teacher said that she could find change in the behaviour of the student with regard to learning of chemistry. She found that students liked the software and they started taking more interest in

the subject through self learning as it could enhance their confidence. Thus, on the whole teacher found that the package was quite useful and effective for the students and preparation of such software would reduce teacher's work load. While some of the teachers were of the view that it can be given as an additional input to the students for improving their academic performance in the subject. Some teachers also said that with the help of such software packages, students would develop interest in the subject because the software involves the element of self-learning and self-evaluation.

Thus, overall presentation of the software including content coverage, examples, illustration, graphics & figures, evaluation items was interesting and the students were also stimulated for learning through it.

The major findings of the study based on analysis and interpretation of data presented in this chapter is discussed in the next chapter.

CONCLUSION :

From the analysis and interpretation of the data collected, following findings have emerged.

The findings are reported over here objectivewise.

(i) For objective no.2, it was found that the mean instruction time taken by the students of experimental group was less than the mean instructional time taken by control group students to learn three chapters of

Std. XI Chemistry textbook. As far as achievement of students on achievement tests was concerned, it was found that the achievement of the experimental group students was significantly higher than the control group students.

Both these findings clearly shows the effectiveness of software package for students to learn three chapters of standard XI Chemistry textbooks prepared by GSTB.

(ii) For objective No. 3, it was found that variables like IQ, Motivation and Attitude affect the Academic Achievement of student. IQ and Motivation as separate variables did have some effect on Academic Achievement of student, but there was no significant interaction effect of IQ and Motivation taken together. Attitude as a separate variable was found to be ineffective to make significant difference in Academic Achievement of students, but Attitude taken with either IQ or Motivation indicated a significant difference in students' Academic Achievement. The three variables together showed an interaction effect on Academic Achievement of students'.

(iii) For objective no. 4, the findings were related to Attitude of students as well as teachers towards the software package.

With regard to the students' attitude, it was found that the students liked learning through this package. This package helped them to learn quicker as well as to score better on achievement test. Further, they expressed that learning was more interesting because they could learn on their own. They were satisfied with the presentation of content in logical sequence; the level of language used in the software package and adequacy of illustrations, graphs and figures. However, they felt that there could have been some variation in evaluation items with regard to their nature.

Standard XI Chemistry teacher of the school said that he was satisfied with the quality of software package in terms of organization of different content units and it's clear presentation. Teacher was also satisfied with the level of language used in the software package and graphs & illustrations used. But the teacher said that the nature of the evaluation items could have been little different than what it was in the package.