Chapter Four

Data Analysis, Interpretation and Discussion

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DATA ANALYSIS, INTERPRETATION AND DISCUSSION

4.0 INRTODUCTION

This chapter presents the analysis of collected data. The data were analyzed with the help of appropriate statistical techniques. The collected data were analyzed through frequencies, percentage responses, ANCOVA and 't'test.

4.1 ANALYSIS OF DEMOGRAPHIC DATA

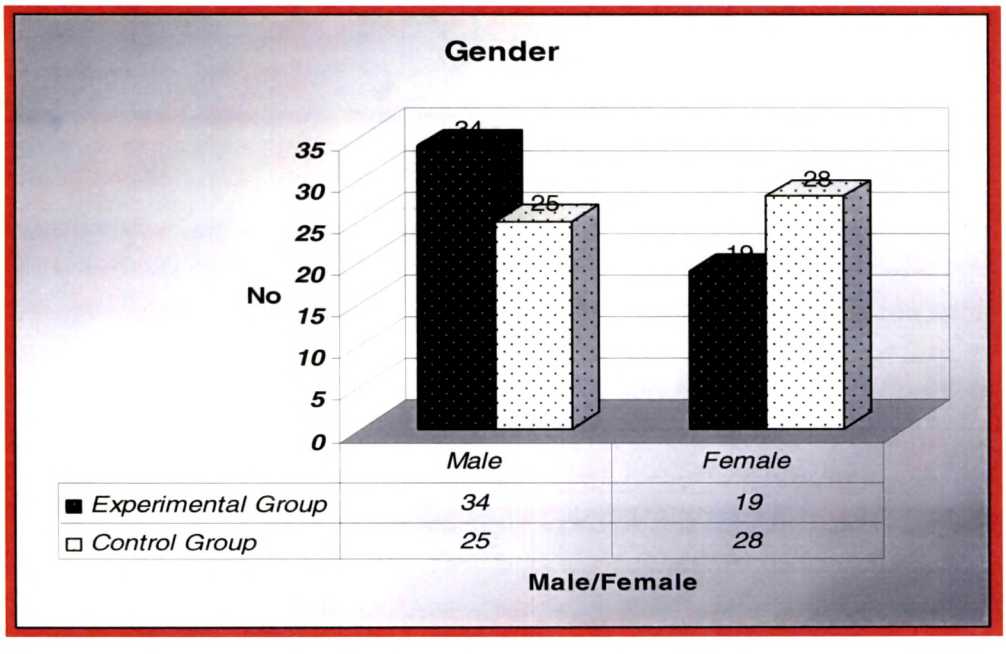
The present study was carried out to find out effectiveness of instructional strategies prepared to cater the learning styles of Std.VIII students in science subject. The investigator wanted to study the effectiveness in terms of achievement of the students and their attitude towards the subject. Here achievement is a dependent variable while prepared instructional strategies is an independent variable. The investigator found a few variables, which were likely to affect the dependent variable. It was not possible for the investigator to control all these variables, but all the background information of both experimental and control group was very important. The investigator used the demographic data sheet to collect the information. The following variables were identified by the investigator which were likely to affect the dependent variable

1) Gender 2) Tuition for science subject 3) One of the parent's literacy in science 4) Students achievement in science in Std. VII

For the present study the investigator used the two-group post-test design. Two classes of Std.VIII were taken as experimental and control groups. Still it was very necessary to compare the background data of both the groups. Student's achievement in science in Std.VIII was taken as a covariate in the ANCOVA. The following information was obtained using demographic data sheet.

Table: 4.1 Distribution of Gender in both the Groups

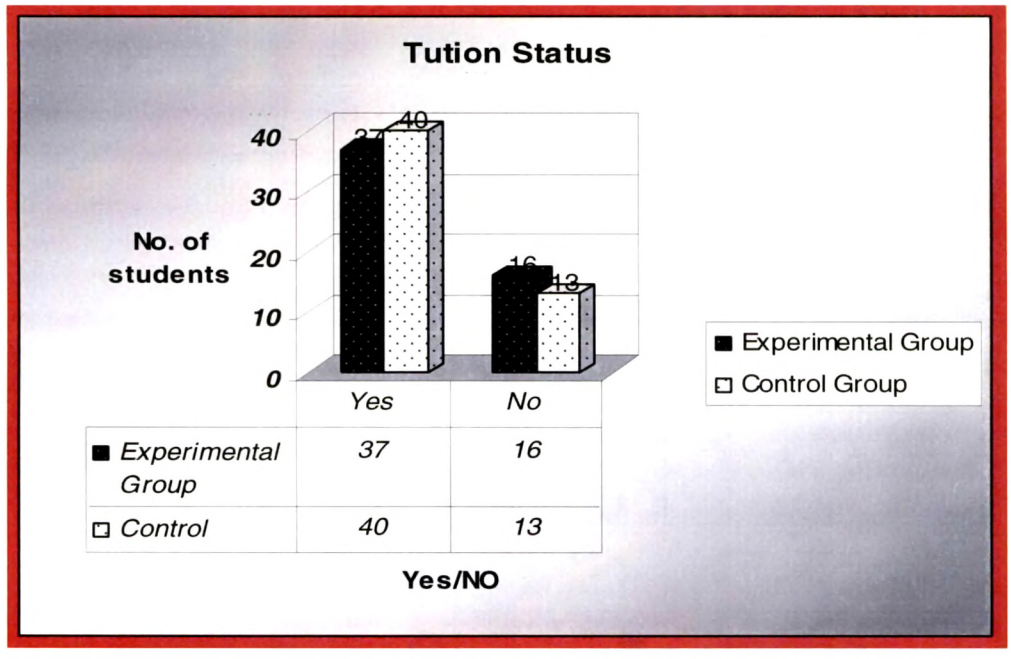
Group	Male	Female
Experimental Group	34 (65%)	19 (35%)
Control Group	25 (47%)	28 (53%)



From the Table 4.1 and Graph, it is clear that, the experimental group had more male members (65%) than the comparison group (47%). The control group had more female members (53%) than the experimental group (47%).

Table: 4.2 Comparison of Tuition Status of both the Groups

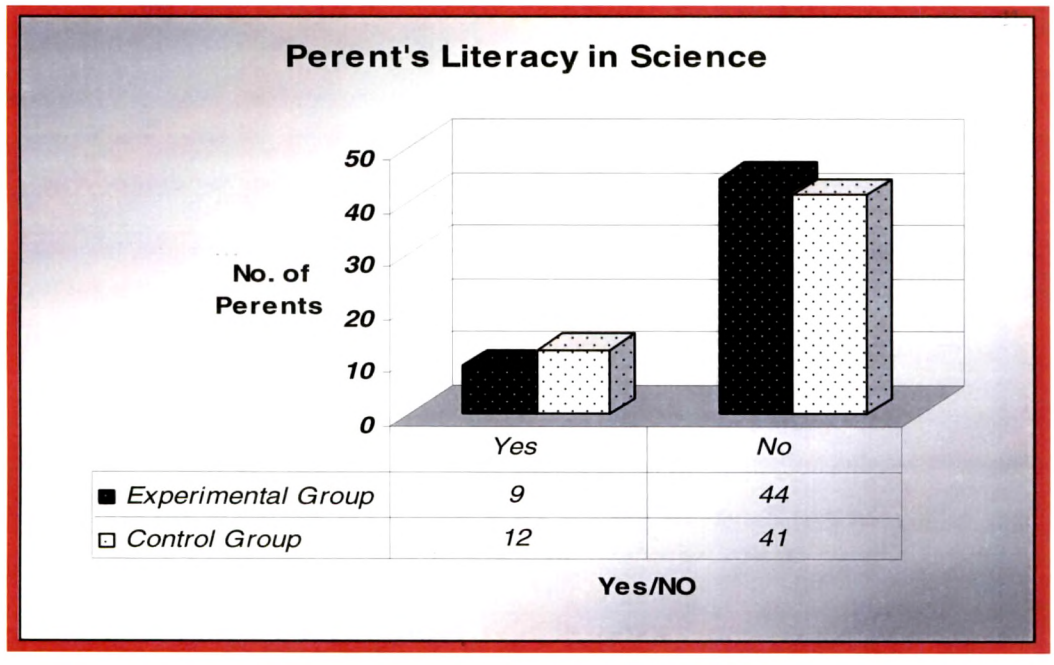
Group	Yes (Going)	No
Experimental Group	37 (70%)	16 (30%)
Control Group	40 (75%)	13 (25%)



From the shown table 4.2 and graph we can say that almost similar number of students from both the groups are going for tuition in Science subject. The percentage of tuition going students of the control group is slightly higher (75%) than the experimental group (70%).

Table: 4.3 Comparison of Parent's Literacy in Science of both the Groups

Group	Yes (Literate)	No
Experimental Group	9 (17%)	44 (83%)
Control Group	12 (22%)	41 (78%)



From the above table and graph, it is cleared that in both groups their parent's literacy in Science is very less. In the experimental group, it is 17% and in the control group 22%.

4.2 LEARNING STYLES OF THE STUDENTS

Following is the learning styles profile of the experimental group. The profile was found out using Index of Learning Styles (ILS) prepared by the investigator. In the following table Balance, Pref (Preference), S.Pref (Strong Preference) and V.S.Pref (Very Strong Preference) shows students preference of learning styles on the scale. While, in the bracket **S** (sensing), **I** (Intuitive), **Vs** (Visual), **Vb** (Verbal), **A** (Active), **R** (Reflective), **Sq** (Sequential)and **Gb** (Global) shows the learning styles dimensions.

Table: 4.4 Learning Styles Profile

No	Name	Sensing/ Intuitive	Visual/ Verbal	Active/ Reflective	Sequential Global
1	Pandya Darshit	Balance	Pref(Vs)	Balance	S.pref(Gb)
2	Soni Pratik	Balance	Balance	Pref(A)	Pref(Gb)
3	Patel Ankit.S	Balance	Pref(Vs)	Pref(A)	Pref(Gb)
4	Chuhan Rahul	Balance	S.Pre(Vb)	Balance	Pref(Gb)
5	Patel Ankit.M	Balance	Pref(Vs)	Pref(A)	Pref(Gb)
6	Joshi Hardik	Balance	Balance	Balance	Pref(Gb)
7	Patel Dhvani	Pref(s)	Pref(Vs)	Pref(A)	Pref(Gb)
8	Maheswari Nilesh	Balance	Pref(Vs)	S.Pre(A)	S.Pref(Gb)
9	Shah Monesh	Pre(I)	Pref(Vb)	Pref(Vs)	Pref(Gb)
10	Kothari Vatsal	Balance	Balance	Balance	Pref(Gb)
11	Patel Vivek	Pref(s)	Balance	S.Pre(A)	S.Pref(Gb)
12	Parmar Suraj	Balance	S.Pre(Vs)	Pref(R)	S.Pref(Gb)
13	Laddhad Arati	Balance	Balance	Balance	Pref(Gb)

14	Panchal Janki	Pref(s)	Balance	Balance	Pref(Gb)
15	Sadhu Dhaval	Pref(s)	Pref(Vs)	Balance	Pref(Gb)
16	Shah Prapti	Pre(I)	Pref(Vs)	Pref(A)	S.Pre(Gb)
17	Kachhiya Sanket	Pref(s)	Pref(Vs)	Balance	Pref(Gb)
18	Vyas Akshay	Balance	Pref(Vs)	Balance	Pref(Gb)
19	Mahida Apurav	Balance	Pref(Vs)	Pref(A)	Pref(Gb)
20	Patel Mitesh	Pre(I)	Balance	Pref(A)	Balance
21	Parmar Dixit	Balance	Balance	Pref(A)	Pref(Gb)
22	Pandya Dhvani	Pre(I)	Pref(Vs)	Pref(A)	Balance
23	Chuhan Dipen	Balance	Balance	Pref(R)	Pref(Gb)
24	Patel Nilay	Balance	S.Pre(Vs)	Pref(A)	Pref(Gb)
25	Jaiswal Khusal	Pre(I)	Pref(Vb)	Pref(A)	Pref(Gb)
26	Thakkar Kuldip	Balance	Balance	Pref(R)	Pref(Gb)
27	Upadhyay Himarshi	Balance	S.Pre(Vs)	S.Pre(A)	Pref(Gb)
28	Thakkar Komal	Balance	Pref(Vs)	Pref(A)	Pref(Gb)
29	Chuhan Jaimin	Balance	S.Pre(Vs)	Pref(A)	Pref(Gb)
30	Parmar Jitendra	Balance	Pref(Vs)	Pref(A)	V.S.Pre(Gb)
31	Patel Bhavin	Pref(s)	Pref(Vs)	Balance	Pref(Gb)
32	Parmar Alpesh	Balance	Pref(Vb)	Balance	Pref(Gb)
33	Dodla Indrajit	Balance	Pref(Vs)	Pref(A)	Pref(Gb)
34	Patel Bhumi	Pre(I)	Pref(Vb)	S.Pre(A)	S.Pref(Gb)
35	Patel Bindal	Pre(I)	Pref(Vs)	Pref(A)	Pref(Gb)
36	Sutaria Chirag	Pref(s)	Balance	Balance	Balance
37	Patel Dhvani	Pre(I)	Balance	Pref(A)	Pref(Gb)

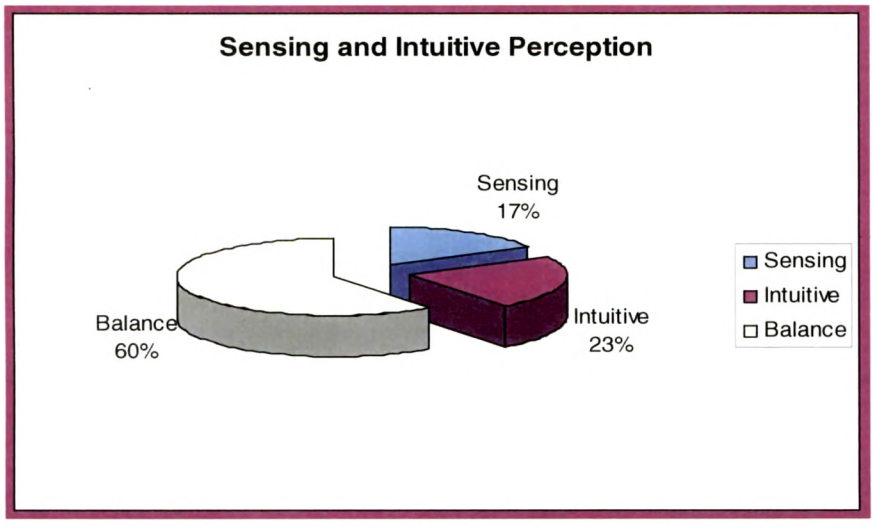
38	Vaishnav Tapan	Pre(I)	S.Pre(Vb)	Balance	Pref(Gb)
39	Pandya Dipali	Pre(I)	S.Pre(Vs)	Pref(A)	S.Pref(Gb)
40	Patel Snehal	Pre(I)	Pref(Vb)	S.Pre(R)	S.Pref(Gb)
41	Kothari Sneha	Balance	Balance	Pref(A)	Pref(Gb)
42	Patel Smit	Balance	S.Pre(Vs)	S.Pre(A)	S.Pref(Gb)
43	Mehta Simoni	Balance	Pref(Vs)	Pref(A)	Pref(Gb)
44	Patel Samarth	Balance	Pref(Vb)	Pref(A)	Balance
45	Parmar Sagar	Balance	Balance	Pref(A)	Pref(Sq)
46	Soni Rekha	Pref(s)	VS.Pre(Vs)	Pref(A)	Balance
47	Patel Pinkal	Balance	Pref(Vb)	Pref(A)	Pref(Sq)
48	Patel Payal	Balance	Balance	Balance	S.pref(Gb)
49	Suthar Pallavi	Balance	Balance	Pref(A)	S.pref(Gb)
50	Bhatt Nikita	Pre(I)	Pref(Vb)	Pref(A)	Balance
51	Rathva Nil	Balance	Pref(Vs)	Balance	S.pref(Gb)
52	Panchal Yagnik	Balance	Pref(Vb)	Balance	Balance
53	Panchal Vrushali	Pref(s)	Pref(Vs)	Balance	Balance

4.2.1 Summary and Interpretations of Learning Styles Profile of the Experimental Group

The discussion of the results of learning styles profile of the experimental group was carried out in the context of traditional lecture based method of teaching. Traditional lecture based method caters intuitive, verbal and sequential learners. On the other hand, sensing, visual, active, reflective and global learners have difficulties in lecture-based method of teaching.

Table: 4.5 Summary and Interpretations of Sensing and Intuitive Learning Styles

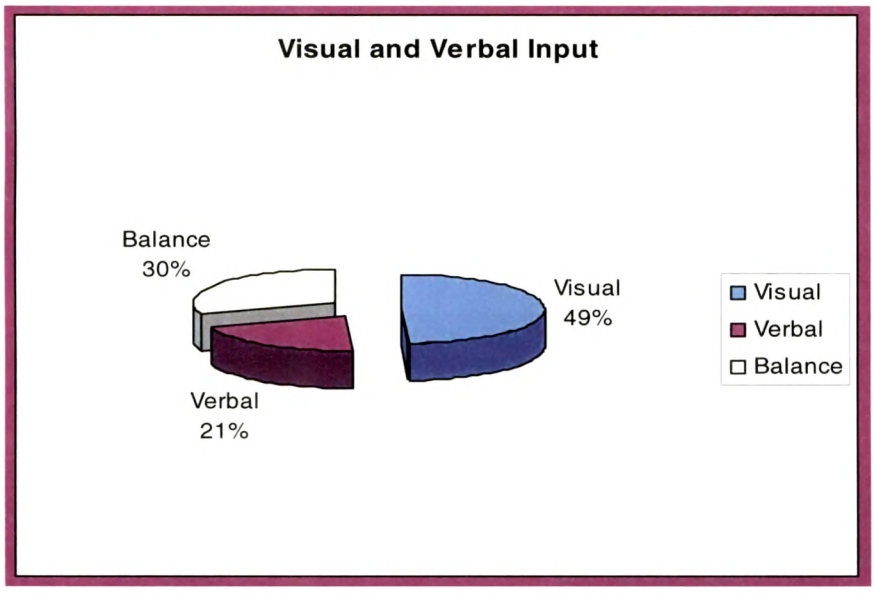
Dimension	Sensing	Intuitive
V. Strong Preference	-	-
Strong Preference	-	-
Preference	9(17%)	12(23%)
Balance	32(60%)	



It is evident from table 4.5 and corresponding graph that 17% of Std.VIII(A) students have a sensing preference. These students tend to perceive information in a concrete factual way, and are less comfortable with theories and abstraction. They are good with details and memorization. Most lecture courses however, are more intuitive in content and introducing concepts. Students with sensing preference can be helped during lectures by inclusion of concrete examples and by demonstration of direct applicability of material to life.

Table: 4.6 Summary and interpretation of Visual and Verbal Learning Styles

Dimension	Visual	Verbal
V. Strong Preference	1(2%)	-
Strong Preference	6(11%)	2(4%)
Preference	19(36%)	9(17%)
Balance	16 (30%)	

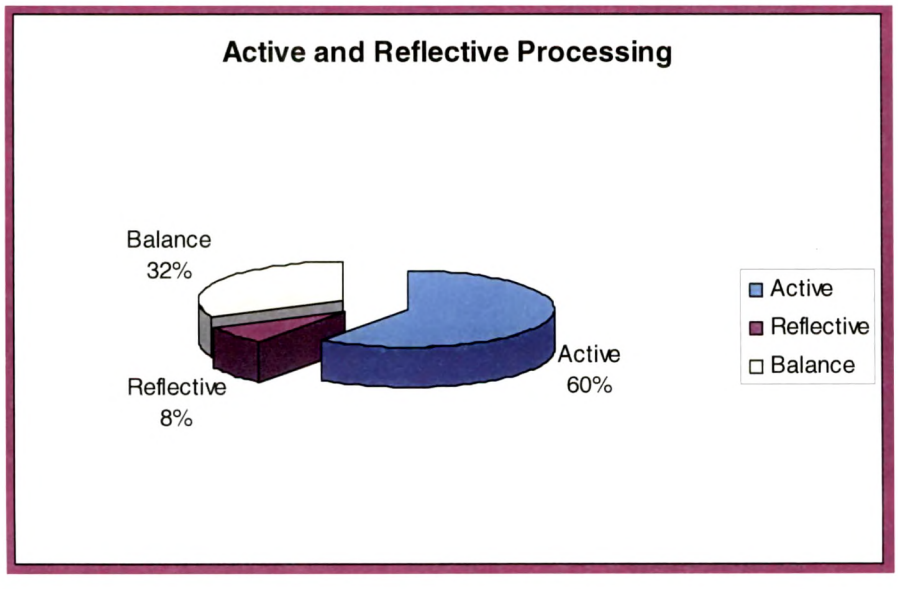


It is evident from table 4.6 and corresponding graph Most of us are visual learners. Approximately half of the students have preference of Visual Inputs. In which (13%) students have strong or very strong preference for Visual Inputs. The lecture format is exclusively a verbal means of communication. Therefore, many visual learners will be hindered from effective learning in class. This is compounded by textbook with negligible visual component in the form of charts, graphs, tables, maps and diagrams. Increasingly, Indian

middle class children are growing up watching hours of TV, and interacting with complex visual imagery in computer game animations. Their visual bias is thus further accentuated. For these types of learners, more and more visual aids (OHP, LCD Projector with Multimedia computer, charts, pictures, and graphs) should be used during the class.

Table: 4.7 Summary and interpretation of Active and Reflective Learning Styles

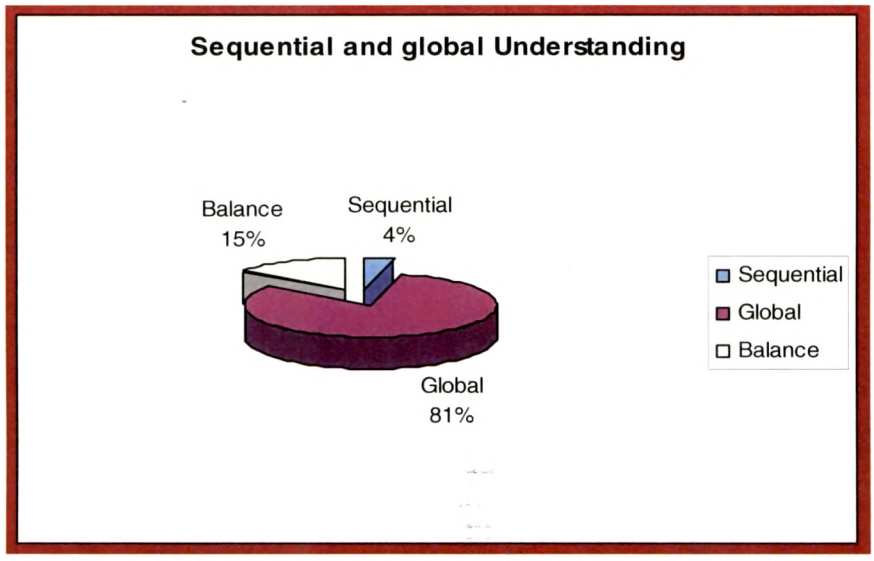
Dimension	Active	Reflective
V. Strong Preference	-	-
Strong Preference	5(10%)	1(2%)
Preference	27(51%)	3(6%)
Balance	17 (32%)	



From the above table and graph, it is cleared that 61% of students process new information in an active manner. In which (10%) of students have a strong preference. Therefore, more than a half of the class will find it particularly hard to learn through the lecture method, as they need to actively process new material. To help to compensate and ensure that active learners remain attentive in class, the use of buzz sessions, group discussion and students participation in the class will help. Group homework and project work will particularly enhance the learning experiences of active learners. Some students also have reflective processing preference, which are also not catered in traditional way of teaching. This type of learners should be encouraged in the class to give the reflections.

Table: 4.8 Summary and interpretation of Sequential and Global Learning Styles

Dimension	Sequential	Global
V. Strong Preference	-	1(2%)
Strong Preference	-	12(23%)
Preference	2(4%)	30(56%)
Balance	8(15%)	



The majority of the students (81%) demonstrated a global preference in understanding new material. 13% of them have strong or very strong preference for global understanding. They need to get big picture before the detail can fit into the place. The majority of lecture courses are taught in a sequential step-by-step manner; logically and linearly, the course will lead the students sequentially through new material. To assist the learning of the globalists we need to present the 'big picture' to them at the introduction of the course. We need to facilitate the ongoing integration of

the course we are teaching with the overall curriculum, rather than teaching our course in 'isolation'.

4.3 EFFECTIVENESS OF DESIGNED INSTRUCTIONAL SRATEGIES IN TERMS OF STUDENTS ACHIEVEMENT

Hypothesis: There will be no significant difference in the mean achievement scores of experimental group and control group.

The following data were collected using posttest. The scores of previous year were taken as covariate in ANCOVA.

Table 4.9 Achievement of Experimental Group in Post Test and Marks of Science subject in Std. VII

No	Std. VIII (A) Name of students	Post Test (Achievement) Marks out of 50	Marks of Science Std.VII (Covariate) Out of 100
1	Pandya Darshit	36	76
2	Soni Pratik	40	88
3	Patel Ankita.S	35	92
4	Chuhan Rahul	40	81
5	Patel Ankit.M	30	60
6	Joshi Hardik	41	71
7	Patel Dhvani	30	47
8	Maheswari Nilesh	32	45
9	Shah Monesh	42	97

10	Kothari Vatsal	45	93
11	Patel Vivek	34	50
12	Parmar Suraj	34	95
13	Laddhad Arati	41	61
14	Panchal Janki	44	85
15	Sadhu Dhaval	29	50
16	Shah Prapti	45	99
17	Kachhiya Sanket	46	78
18	Vyas Akshay	42	75
19	Mahida Apurav	39	83
20	Patel Mitesh	33	60
21	Parmar Dixit	35	65
22	Pandya Dhvani	48	79
23	Chuhan Dipen	47	77
24	Patl Nilay	35	85
25	Jaiswal Khusal	41	94
26	Thakkar Kuldip	31	88
27	Upadhyay Himarshi	49	100
28	Thakkar Komal	28	98
29	Chuhan Jaimin	25	60

30	Parmar Jitendra	48	85
31	Patel Bhavin	35	43
32	Parmar Alpesh	35	68
33	Dodoya Indrajit	47	73
34	Patel Bhumi	25	44
35	Patel Bindal	36	56
36	Sutarai Chirag	42	83
37	Patel Dhvani	32	47
38	Vaishnav Tapan	40	63
39	Pandya Dipali	40	57
40	Patel Snehal	42	77
41	Kothari Sneha	33	65
42	Patel Smit	22	38
43	Mehta Simoni	43	74
44	Patel Samarth	48	86
45	Parmar Sagar	28	53
46	Soni Rekha	34	63
47	Patel Pinkal	37	60
48	Patel Payal	38	80
49	Suthar Pallavi	42	87

50	Bhatt Nikita	32	85
51	Rathva Nil	29	70
52	Panchal Yagnik	32	78
53	Panchal Vrushali	31	49

Table 4.10 Achievement of Control Group in Post-test and Marks of Science in Std. VII

No	Std. VIII (B) Name	Marks out of 50 (Post test) (Achievement)	Marks Out of 100 Marks of Std. VII (Covariate)
1	Pathak Aena	33	76
2	Prajapati Ankit	34	88
3	Tuver Apexa	33	92
4	Shah Dharvi	32	81
5	Shah Jalpa	27	60
6	Patel Kaushal	35	71
7	Sharma Khyati	32	47
8	Joshi Komal	40	45
9	Shah Krunal.G	36	97

10	Patel Krunal.K	34	93
11	Barot Meet	24	50
12	Rao Nidhi	33	95
13	Shah Parin	30	61
14	Rathva Parul	41	85
15	Luhar Parvez	30	50
16	Pateliya Pinal	34	99
17	Rao Prem	28	78
18	Patel Priyal	35	75
19	Patel Priyank	29	83
20	Patel Priyanka	30	60
21	Solanki Rajrndra	28	65
22	Patel Sanket	32	79
23	Vaghela Shatish	34	77
24	Parmar Shaini	40	85
25	Zala Shreya	41	94
26	Valand Sonal	28	88
27	Suthar Tejasvi	43	100
28	Bhabhor Vaishali	34	98
29	Katara Vaishali	32	60

30	Barot Viraj	30	85
31	Jaiswal Vivek	32	43
32	Patel Ankit.M	29	94
33	Shah Apurva.S	26	64
34	Trivedi Bansari.P	31	90
35	Chudhari Chirag	43	82
36	Patel Chirg	32	78
37	Pandya Parita	31	57
38	Patel Disha	26	75
39	Sevak Divya	30	46
40	Baria Dharmistha	32	67
41	Vyas Disha	27	69
42	Soni Dhruvish	30	59
43	Panchal Dhruv	27	61
44	Sharma Dhruv	32	99
45	Vyas Harsh	32	76
46	Soni Hemangi	28	62
47	Vyas Hiral	40	99
48	Parmar Hitesh	35	73
49	Jaiswal Jaimin	32	61

50	Soni Juhi	25	76
51	Panchal Kajal	24	81
52	Kachhiya Mithil	42	96
53	Panchal Mona	26	59

Table 4.11 Summary of ANCOVA for Achievement on the Selected Topics in Std.VIII Science and Technology of the Experimental and Control Group

Source of variances	df	SSyx	MSSyx	Fyx
Among Means	1	1048.58	1048.58	
Within Means	103	3122.15	30.31	34.59
Total	104	4170.745		

Table F Value 0.05 ⟶ 3.94

0.01 ⟶ 6.90

The computed F-value of 34.59 is higher than table F- value, which is 6.90 at 0.01 levels for (1/103) degree of freedom. So the null hypothesis is rejected and there is a significant difference in the adjusted mean achievement scores of the experimental group and control group.

Table 4.12 Significance of Difference between the Adjusted Mean Scores of Experimental Group and Control Group

Groups	Adjusted Mean Scores	F- value
Experimental	38.24	34.59
Control	31.92	

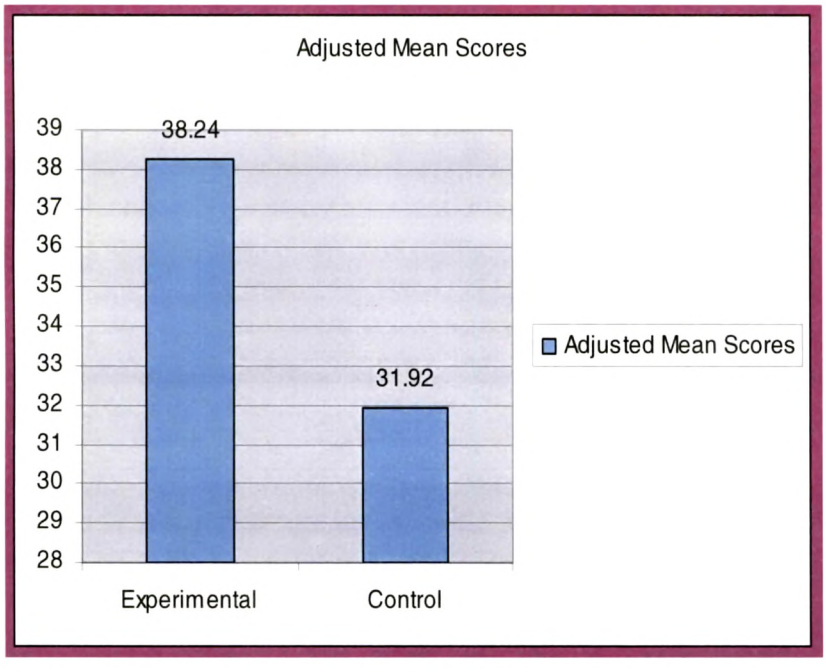


Table Value 0.05 ⟶ 3.94

0.01 ⟶ 6.90

The F-value of 34.59 has been found significant at 0.01 level. The adjusted mean achievement score 38.24 of the experimental group has been found

significantly higher than the adjusted mean achievement score 31.92 of the control group. It means that the treatment was significantly effective.

Therefore, the null hypothesis "there will be no significant difference in the adjusted mean achievement scores of experimental group and control group" stands rejected.

4.4 EFECTIVENESS OF INSTRUCTIONAL SRATEGIES IN TERMS OF STUDENTS ATTITUDE TOWARD THE SCIENCE SUBJECT

Objective: To study the attitude of students towards the subject after the implementation of designed instructional strategies.

Hypothesis: There will be no significant difference in the attitudes of experimental group and control group towards Science subject after the implementation of designed instructional strategies.

For above objective the data analysis was done using 't-test'

Table 4.13 Attitude Scores of Experimental Group

No	Name	Attitude Test Score out of 250
1	Pandya Darshit	235
2	Soni Pratik	230
3	Patel Ankita.S	222
4	Chuhan Rahul	224
5	Patel Ankit.M	231

6	Joshi Hardik	220
7	Patel Dhvani	218
8	Maheswari Nilesh	214
9	Shah Monesh	231
10	Kothari Vatsal	241
11	Patel Vivek	200
12	Parmar Suraj	189
13	Laddhad Arati	231
14	Panchal Janki	212
15	Sadhu Dhaval	235
16	Shah Prapti	240
17	Kachhiya Sanket	234
18	Vyas Akshay	233
19	Mahida Apurav	204
20	Patel Mitesh	222
21	Parmar Dixit	212
22	Pandya Dhvani	191
23	Chuhan Dipen	199
24	Patl Nilay	231
25	Jaiswal Khusal	242

26	Thakkar Kuldip	214
27	Upadhyay Himarshi	215
28	Thakkar Komal	232
29	Chuhan Jaimin	233
30	Parmar Jitendra	180
31	Patel Bhavin	235
32	Parmar Alpesh	239
33	Dodoya Indrajit	240
34	Patel Bhumi	214
35	Patel Bindal	231
36	Sutarai Chirag	217
37	Patel Dhvani	200
38	Vaishnav Tapan	215
39	Pandya Dipali	217
40	Patel Snehal	218
41	Kothari Sneha	231
42	Patel Smit	217
43	Mehta Simoni	214
44	Patel Samarth	229
45	Parmar Sagar	205

46	Soni Rekha	203
47	Patel Pinkal	231
48	Patel Payal	230
49	Suthar Pallavi	212
50	Bhatt Nikita	234
51	Rathva Nil	234
52	Panchal Yagnik	238
53	Panchal Vrushali	222

Table 4.14 Attitude Scores of Control Group

No	Name	Attitude test Scores out of 250
1	Pathak Aena	168
2	Prajapati Ankit	184
3	Tuver Apexa	214
4	Shah Dharvi	200
5	Shah Jalpa	180
6	Patel Kaushal	184
7	Sharma Khyati	174
8	Joshi Komal	178

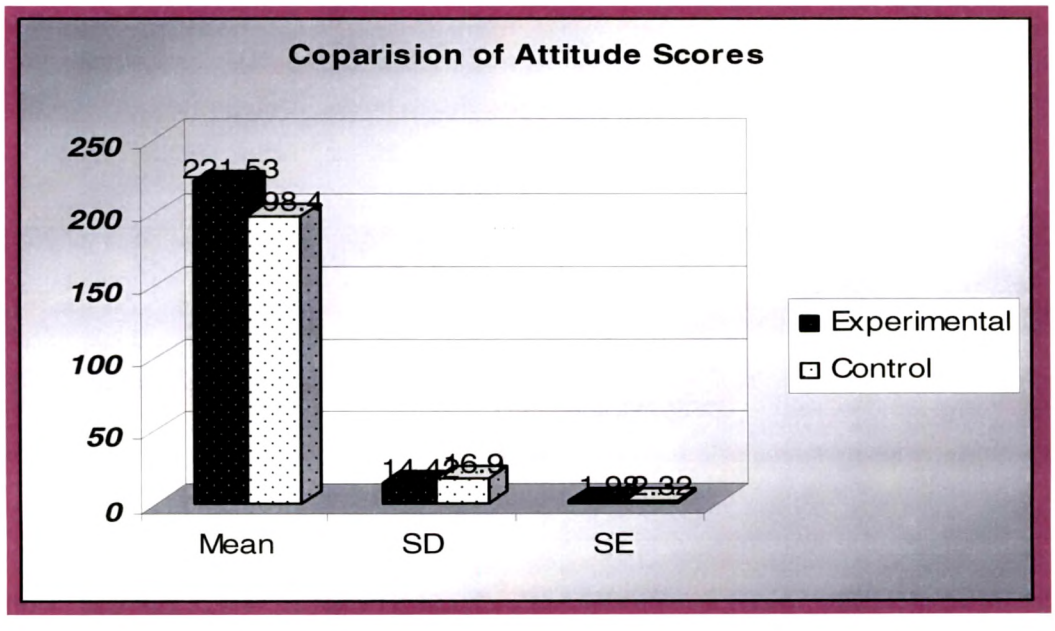
9	Shah Krunal.G	200
10	Patel Krunal.K	215
11	Barot Meet	230
12	Rao Nidhi	220
13	Shah Parin	201
14	Rathva Parul	194
15	Luhar Parvez	183
16	Pateliya Pinal	182
17	Rao Prem	188
18	Patel Priyal	200
19	Patel Priyank	214
20	Patel Priyanka	230
21	Solanki Rajrndra	176
22	Patel Sanket	179
23	Vaghela Shatish	184
24	Parmar Shaini	186
25	Zala Shreya	188
26	Valand Sonal	213
27	Suthar Tejasvi	204
28	Bhabhor Vaishali	203

29	Katara Vaishali	189
30	Barot Viraj	190
31	Jaiswal Vivek	234
32	Patel Ankit.M	231
33	Shah Apurva.S	200
34	Trivedi Bansari.P	214
35	Chudhari Chirag	217
36	Patel Chirg	204
37	Pandya Parita	201
38	Patel Disha	203
39	Sevak Divya	180
40	Baria Dharmistha	184
41	Vyas Disha	179
42	Soni Dhruvish	193
43	Panchal Dhruv	192
44	Sharma Dhruv	184
45	Vyas Harsh	213
46	Soni Hemangi	211
47	Vyas Hiral	231
48	Parmar Hitesh	210

49	Jaiswal Jaimin	211
50	Soni Juhi	204
51	Panchal Kajal	199
52	Kachhiya Mithil	200
53	Panchal Mona	169

Table 4.15 Significance of Difference between the Attitude Scores of Experimental Group and Control Group towards the Science Subject

Groups	Mean	SD	SE	T-Value
Experimental	221.53	14.42	1.98	**7.579**
Control	198.40	16.90	2.32	



df= 53+53-2

= 104

Calculated 't' Value= 7.579

Table 't' Value 0.05 ⟶ 1.98

0.01 ⟶ 2.63

The calculated "t-value" of 7.579 is higher than table value 2.63 at 0.01 level. Therefore, the null hypothesis "There will be no significant difference in the attitudes of experimental group and control group towards the Science subject after the implementation of designed instructional strategies" was rejected. It means there is a difference in the attitude of experimental and control group towards the science subject. Experimental group demonstrated more positive attitude towards the science subject

4.5 DISCUSSION

In this section, the investigator has discussed the findings of the study supported by the previous research studies and other official documents.

The investigator found that students have different learning styles in the multivariate setting of classroom. Therefore, it is very necessary to identify their learning styles profile before designing instructional material for them. The investigator found that 17% students have sensing preference, 50% have visual preference, 61% processes information actively, while 80% are global learners. All these learners are not catered to by the traditional lecture based instruction. It was supported by Rathod. S.J (2004), he found that 46% students differed significantly with respect to their science teacher's teaching styles.

The investigator revealed that better results could be obtained, if students and teachers are at same wavelength. It was supported by Keffe (1979), Cronbach and Snow (1977), Munford and Honey (1996) and Pat wayman (2003). Peters meclean (2001) further concluded hat every child could succeed if the child learns in its own way.

The investigator found that designed instructional strategies catering to students learning styles were effective. Students performance and achievement increased in science subject. It was supported by Richard Felder (1990), through the finding of his longitudinal study. He concluded that experimental group out performed comparison group in achievement. Foriska (1992) also found that overall classroom achievement increased using instructional strategies catering to students learning styles.

Attitude towards the subject is one of the most significant aspects for deep learning of any subject. Negative attitude towards the science often results in dropout form the school or change over to the other subject. Same thing was revealed by Richard Felder and Tobia Sheila (1993).

The investigator found that designined instructional strategies catering to learning styles of the students increased the attitude of experimental group towards the science subject. It was supported by Keefe (1979), Richard Felder (1990), and Richard Felder (1993).

To design instructional strategies the investigator used the computer with multimedia softwares, hypermedia and other technological aids like O.H.P, charts and filmstrips. It was supported by Rathod. S. J (2004). Similar results were obtained from the studies of S.Montgomery (1994), Graff (1999) and N. Bergktarvic (2002). They concluded that hypermedia, computer softwares and ICT should be used in multivariate classroom to cater to different learning styles.

The investigator observed that students of experimental group developed the communication skills, presentation skills and group working ability. It was supported by Felder (1990). Almost whole class favored this new approach of teaching. They found this method of teaching very joyful and interesting.