CHAPTER IV

DATA ANALYSIS AND INTERPRETATION

4.1.0 INTRODUCTION

Chapter 3 presented an outline of the research methodology used in present research that included population and sample, tools for data collection, developed strategy in the form of a model for experimentation and statistical techniques used for data analysis. Data collected using the particular tools provided raw data from which conclusion is difficult to be drawn. To draw the conclusion from raw data, data processing is needed i.e. analysis and interpretation of the data. The importance of data analysis and interpretation is evident as it provides meaning and significance to the data. This chapter presents data, its analysis and interpretation and thereby decision is made about hypothesis to achieve the set objectives.

An Integrated strategy in the form of a model to inculcate productive thinking among elementary school students was developed and implemented to teach the experimental group through science as the subject while control group was taught science through traditional classroom teaching. To study the effectiveness of the developed model in terms of productive thinking and reaction of students, productive thinking scale and reaction scale were developed and validated respectively. To study the effectiveness in terms of achievement of students, researcher used achievement scores provided by school authority. Productive thinking scale was administered on both the groups at the starting of the experiment as pretest and scores of this test were used to equate the groups. After experimentation, the same productive thinking scale was administered as posttest on both the groups and the reaction scale on the experimental group to study the effectiveness of developed model in terms of score of productive thinking and reaction of the students respectively.

As the present study used purposive sampling to draw the sample from population and quasi experimental design was used, parametric statistics will not work to analyze the data. Therefore, for the data analysis, descriptive statistics like mean, standard deviation and standard error of mean along with chi-square test and Mann-Whitney U test which is the non-parametric alternative of t-test were used to achieve objective 3 i.e. “To study the effectiveness of the developed integrated strategy in terms of productive thinking of elementary school students” and details of analysis are given in caption 4.2.1.0 and 4.2.2.0. To achieve objective

4 “To study the effectiveness of the developed integrated strategy in terms of achievement of elementary school students in Science” mean, standard deviation, standard error of mean and Mann-Whitney U test were used to analyse the data and details are given in caption 4.2.3.0. To achieve the objective 5 “To study the effectiveness of the developed model in terms of reaction of elementary school students” percentage and intensity index (II) are used and details are given in caption 4.2.4.0.

4.2.0 EFFECTIVENESS OF THE DEVELOPED INTEGRATED STRATEGY

Objective 1 of the present study i.e. “To develop an integrated strategy to inculcate productive thinking among elementary school students” led the researcher to develop a model to inculcate productive thinking among elementary school students. To achieve the objective 2 i.e. “To implement the developed integrated strategy to inculcate productive thinking among elementary school students” experimental group was taught science through the developed integrated strategy for one academic year and control group was taught through traditional classroom teaching.

Effectiveness of the developed integrated strategy was studied through the comparison of post-test scores of productive thinking of experimental and control group to achieve the objective 3 and to test hypothesis 1 i.e. “There will be no significant difference between the mean scores of productive thinking of the experimental and the control groups” and hypothesis 2 i.e. “There will be no significant difference between the average thinking pattern of experimental and control groups”.

To test $H_0$1, mean, standard deviation, standard error of mean and Mann-Whitney U test were used. For further analyzing post-test scores of productive thinking, researcher made 20 working hypothesis from $H_0$2.1 to $H_0$2.20 (for thinking pattern in specific task in productive thinking scale) for $H_0$2 as follows:

$H_0$2.1: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 1.

$H_0$2.2: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 2.

$H_0$2.3: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 3.

$H_0$2.4: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 4.

$H_0$2.5: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 5.

$H_0$2.6: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 6.

$H_0$2.7: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 7.

$H_0$2.8: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 8.

$H_0$2.9: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 9.

$H_0$2.10: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 10.

$H_0$2.11: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 11.

$H_0$2.12: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 12.

$H_0$2.13: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 13.

$H_0$2.14: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 14.

$H_0$2.15: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 15.

$H_0$2.16: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 16.

$H_0$2.17: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 17.

$H_0$2.18: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 18.

$H_0$2.19: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 19.

$H_0$2.20: There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 20.

To test the $H_0$2 and all the 20 working hypothesis, post-test scores of productive thinking were analysed by Chi-square analysis and descriptive statistics. Details of analysis of $H_0$2 are given in caption 4.2.2.0.

Effectiveness of developed model was also studied in terms of achievement of the students in science to achieve objective 4. Researcher made the null hypothesis $H_0$3 "There will be no significant difference between the achievement scores of experimental and control group". For this, data of science achievement were collected from the experimental group and control group schools. The data were analysed by mean, standard deviation, standard error of mean and Mann-Whitney U test. Details of analysis is given in caption 4.2.3.0.

Effectiveness of developed model was also studied in terms of reaction of students towards developed model through the achievement of objective 5. For this, data were collected with the developed five point rating scale and analysed was done with the help of percentage and intensity index (II). Details of analysis is given in caption 4.2.4.0.

4.2.1.0 EFFECTIVENESS OF THE DEVELOPED INTEGRATED STRATEGY IN TERMS OF PRODUCTIVE THINKING OF THE STUDENTS

To achieve the objective 3 i.e. "To study the effectiveness of the developed integrated strategy in terms of productive thinking of elementary school students" and to test null hypothesis H_o1 i.e. "There will be no significant difference between the mean scores of productive thinking of

the experimental and control groups", post test data were collected through productive thinking scale from control group and experimental group. Table 4.1 gives details of descriptive statistics used for this purpose.

Table 4.1 : Mean, Standard Deviation (SD) and Standard Error of Mean (SE) wise Distribution Productive Thinking Score of Experimental Group and Control Group

Groups	N	Mean	SD	SE
Experimental group	26	57.19	7.206	1.413
Control group	26	43.42	5.508	1.080

From table 4.1, it can be seen that the mean score of productive thinking of experimental group which was taught through developed model was 57.19. Standard deviation (SD) from the mean for productive thinking was 7.206 with standard error of mean (SE) 1.413. Mean score of control group which was taught through traditional classroom teaching was 43.42 with standard deviation (SD) 5.508 and standard error of mean (SE) 1.080.

It can be seen that the mean score of productive thinking of experimental group is 57.19 which is higher than that of control group whose mean sore is 43.42. Standard deviation and standard error of the mean are found to be small in both the groups. To find whether this difference in mean score is significant statistically, we need to do further inferential analysis for the testing of null hypothesis "There will be no significant difference between the mean scores of productive thinking of the experimental and the control groups". To compare the mean score of post test data, Mann-Whitney U test was used and the results are given in the table 4.2.

Table 4.2: Distribution of Sum of the Ranks (SR), U-Value (U), Z-Value (Z) and Indicator of Significance of the Experimental Group and Control Group related to Productive Thinking.

Groups	N	SR	U	Z	Significance level (α)
Experimental group	26	981.5	45.5	5.34395	0.05
Control group	26	396.5			

From table 4.2, it can be seen that the sum of ranks (SR) of experimental group was found to be 981.5 and that of control group was 396.5 with 26 number of observations in each group. The calculated value of U was 45.5 and the respective Z-value was 5.34395 which was found significant at 0.05 level of significance. It shows that the mean scores of productive thinking of experimental group which was taught through developed integrated strategy and mean scores of productive thinking of control group which was taught through traditional classroom teaching differ significantly. Thus, the null hypothesis "There will be no significant difference between the mean scores of productive thinking of the experimental and the control groups" is rejected. It may therefore, be said that experimental group taught through developed integrated strategy and control group taught through traditional classroom teaching differed significantly in terms of productive thinking mean scores. Thus, it can be said that developed integrated was found significantly effective in inculcating productive thinking among elementary school students.

4.2.2.0 EFFECTIVENESS OF THE DEVELOPED INTEGRATED STRATEGY IN TERMS OF THINKING PATTERN OF THE STUDENTS

To achieve the objective 3, null hypothesis $H_0$2 i.e. "There will be no significant difference between the average thinking pattern of experimental and control groups" was tested. As developed productive thinking scale contains 20 thinking tasks, effectiveness of the developed integrated strategy was studied in terms of average frequency of responses in four categories of thinking from reproductive thinking, critical thinking, creative thinking and productive thinking for all 20 thinking task. Data were collected and analysed with the help of chi-square test as it is a useful method of comparing experimentally obtained result with those to be

expected theoretically on some hypothesis (Garrett & Woodworth, 2017). Biswal & Raipure (2020) assumed that in the absence of any experimental intervention (like in the present study, developed model is an experimental intervention) results of experimental group is expected same as that of control group. Hence the result of the control group is considered as the expected frequency (f_e) and the result of the experimental group is considered as the observed frequency (f_o). For analysis, reproductive thinking, critical thinking, creative thinking and productive thinking are taken in an increasing order where, productive thinking is considered highest order and reproductive thinking is considered as lowest order thinking. The details of analysis is given in table 4.3 and figure 4.1.

Table 4.3: Average Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Average of all Thinking Tasks.

Thinking Pattern ⇨ Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	4.25	5.05	6.5	10.15	26	9.20
Control **(fe)**	10.2	5.7	5.65	4.4	26	

It can be seen from Table 4.3 that the chi-square value for the frequency observed and frequency expected was found to be 9.20 which was greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the H_O2 i.e. "There will be no significant difference between the average thinking pattern of experimental and control groups" is rejected and it can be said that there is a true difference in the thinking pattern of experiment and control group in terms of the average frequency taking all the items together.

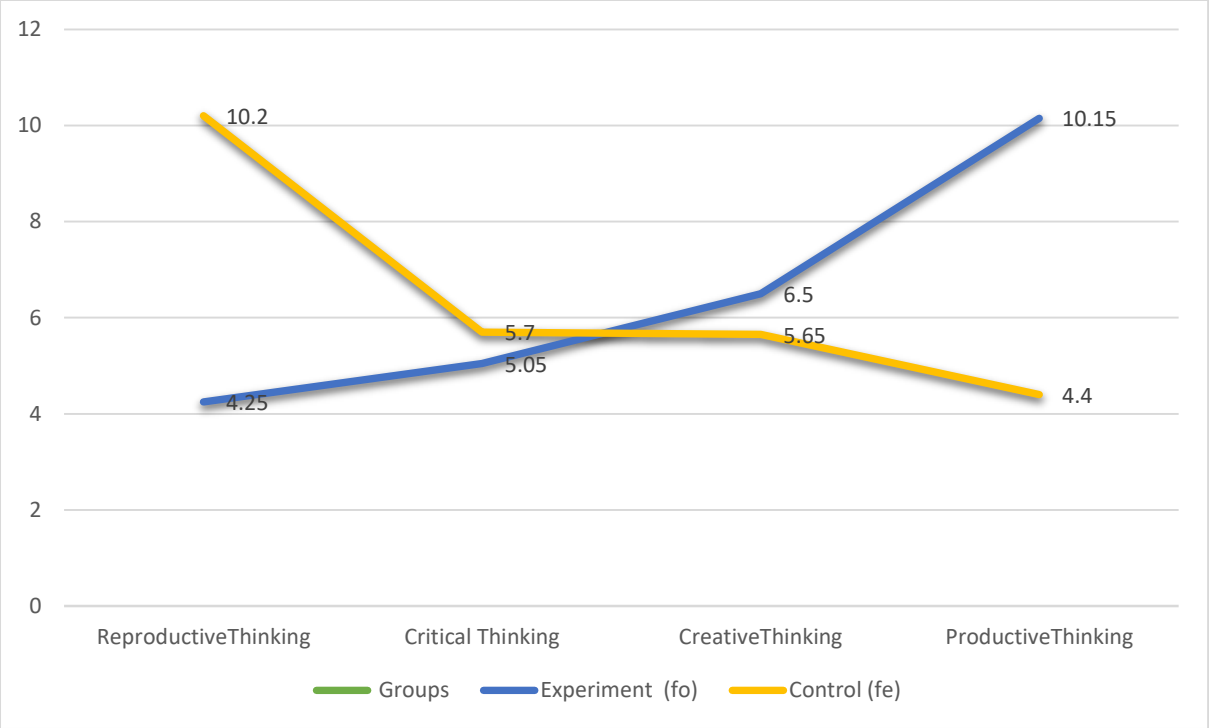

Figure 4.1: Frequency Distribution belonging to Experiment Group and Control Group Considering the Average Frequency for all the 20 Thinking Tasks of Productive Thinking Scale

It can be seen from table 4.3 and figure 4.1 that, more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed model and control group which was taught through traditional classroom teaching, may be because of teaching through developed integrated strategy.

As the developed productive thinking scale contained 20 thinking task from which average frequencies are drawn for experimental and control group. 20 working null hypotheses i.e.

$H_0$2.1 to $H_0$2.20 for 20 thinking task were framed to support null hypothesis 2 ($H_0$2) and details of analysis are given in table 4.4 to table 4.23.

To test null hypothesis ($H_0$2.1) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 1". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.4.

Table 4.4: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 1.

Thinking Pattern ⇨ Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	1	11	6	8	26	28.84
Control **(fe)**	11	6	7	2	26	

It can be noticed from Table 4.4 that the chi-square value for the frequency observed and frequency expected was found to be 28.84. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.1 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 1" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 1.

It can also be seen from table 4.4 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed model and control group which was taught through traditional classroom teaching in task 1 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.2) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 2". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.5.

Table 4.5: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 2.

Thinking Pattern ⇨ / Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	7	2	3	14	26	8.64
Control **(fe)**	7	2	9	8	26	

It can be noticed from Table 4.5 that the chi-square value for the frequency observed and frequency expected was found to be 8.64. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.2 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 2" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 2.

It can also be seen from table 4.5 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 2 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.3) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 3". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest

order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.6.

Table 4.6: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 3

Thinking Pattern ⇨ Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	6	3	2	15	26	8.02
Control **(fe)**	13	3	1	9	26	

It can be noticed from Table 4.6 that the chi-square value for the frequency observed and frequency expected was found to be 8.02. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.3 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 3" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 3.

It can also be seen from table 4.6 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 3 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.4) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 4". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.7.

Table 4.7: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 4

Thinking Pattern ⇨ / Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	3	3	8	12	26	17.46
Control **(fe)**	11	5	3	7	26	

It can be noticed from Table 4.7 that the chi-square value for the frequency observed and frequency expected was found to be 17.46. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.4 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 4" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 4.

It can also be seen from table 4.7 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 4 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.5) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 5". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.8.

Table 4.8: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 5

Thinking Pattern ⇨ / Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	5	1	9	11	26	49.29
Control **(fe)**	12	7	5	2	26	

It can be noticed from Table 4.8 that the chi-square value for the frequency observed and frequency expected was found to be 49.29. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.5 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 5" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 5.

It can also be seen from table 4.8 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 5 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.6) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 6". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.9.

Table 4.9: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 6

Thinking Pattern ⇨ / Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	3	7	7	9	26	20.31
Control **(fe)**	7	3	13	3	26	

It can be noticed from Table 4.9 that the chi-square value for the frequency observed and frequency expected was found to be 20.31. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.6 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 6" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 6.

It can also be seen from table 4.9 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 6 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.7) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 7". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.10.

Table 4.10: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 7

Thinking Pattern ⇨ / Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	5	6	6	9	26	60.73
Control **(fe)**	11	7	7	1	26	

It can be noticed from Table 4.10 that the chi-square value for the frequency observed and frequency expected was found to be 60.73. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.7 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 7" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 7.

It can also be seen from table 4.10 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 7 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.8) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 8". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.11.

Table 4.11: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 8

Thinking Pattern ⇨ / Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	2	7	12	5	26	17.44
Control **(fe)**	11	7	5	3	26	

It can be noticed from Table 4.11 that the chi-square value for the frequency observed and frequency expected was found to be 17.44. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.8 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 8" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 8.

It can also be seen from table 4.11 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 8 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.9) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 9". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.12.

Table 4.12: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 9

Thinking Pattern ⇨ / Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	3	10	6	7	26	33.7
Control **(fe)**	7	12	6	1	26	

It can be noticed from Table 4.12 that the chi-square value for the frequency observed and frequency expected was found to be 33.7. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.9 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 9" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 9.

It can also be seen from table 4.12 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 9 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.10) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 10". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.13.

Table 4.13: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 10

Thinking Pattern ⇨ / Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	2	7	12	5	26	16.14
Control **(fe)**	9	9	5	3	26	

It can be noticed from Table 4.13 that the chi-square value for the frequency observed and frequency expected was found to be 16.14. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.10 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 10" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 10.

It can also be seen from table 4.13 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 10 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.11) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 11". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.14.

Table 4.14: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 11

Thinking Pattern ⇨ / Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	1	1	7	17	26	8.86
Control **(fe)**	3	3	11	9	26	

It can be noticed from Table 4.14 that the chi-square value for the frequency observed and frequency expected was found to be 8.86. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.11 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 11" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 11.

It can also be seen from table 4.14 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 11 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.12) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 12". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.15.

Table 4.15: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 12

Thinking Pattern ⇨ / Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	5	3	6	12	26	17.26
Control **(fe)**	15	3	2	6	26	

It can be noticed from Table 4.15 that the chi-square value for the frequency observed and frequency expected was found to be 17.26. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.12 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 12" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 12.

It can also be seen from table 4.15 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 12 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.13) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 13". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.16.

Table 4.16: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 13

Thinking Pattern ⇨ / Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	6	4	1	15	26	7.98
Control **(fe)**	12	4	2	8	26	

It can be noticed from Table 4.16 that the chi-square value for the frequency observed and frequency expected was found to be 7.98. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.13 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 13" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 13.

It can also be seen from table 4.16 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 13 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.14) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 14". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.17.

Table 4.17: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 14.

Thinking Pattern ⇨ / Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	3	6	13	4	26	15.56
Control **(fe)**	10	6	5	5	26	

It can be noticed from Table 4.17 that the chi-square value for the frequency observed and frequency expected was found to be 15.56. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.14 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 14" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 14.

It can also be seen from table 4.17 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 14 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.15) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 15". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.18.

Table 4.18: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 15

Thinking Pattern ⇨ / Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	2	4	4	16	26	40.74
Control **(fe)**	17	1	3	5	26	

It can be noticed from Table 4.18 that the chi-square value for the frequency observed and frequency expected was found to be 40.74. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.15 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 15" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 15.

It can also be seen from table 4.18 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 15 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.16) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 16". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.19.

Table 4.19: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 16

Thinking Pattern ⇨ / Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	5	5	4	12	26	28.27
Control **(fe)**	11	9	3	3	26	

It can be noticed from Table 4.19 that the chi-square value for the frequency observed and frequency expected was found to be 28.27. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.16 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 16" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 16.

It can also be seen from table 4.19 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 16 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.17) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 17". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.20.

Table 4.20: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 17

Thinking Pattern ⇨ / Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	8	3	7	8	26	43.56
Control **(fe)**	9	6	9	1	26	

It can be noticed from Table 4.20 that the chi-square value for the frequency observed and frequency expected was found to be 43.56. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.17 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 17" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 17.

It can also be seen from table 4.20 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 17 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.18) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 18". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.21.

Table 4.21: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 18

Thinking Pattern ⇨ Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	9	5	5	7	26	12.75
Control **(fe)**	12	9	3	2	26	

It can be noticed from Table 4.21 that the chi-square value for the frequency observed and frequency expected was found to be 12.75. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.18 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 18" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 18.

It can also be seen from table 4.21 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 18 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.19) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 19". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.22.

Table 4.22: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 19

Thinking Pattern ⇨ Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	8	3	5	10	26	16.64
Control **(fe)**	8	7	8	3	26	

It can be noticed from Table 4.22 that the chi-square value for the frequency observed and frequency expected was found to be 16.64. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.19 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 19" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 19.

It can also be seen from table 4.22 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 19 was found significant may be because of teaching through the developed integrated strategy.

To test null hypothesis ($H_0$2.20) i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 20". Chi-square test was used where reproductive thinking was taken at lowest order and productive thinking at highest order through critical and creative thinking in the increasing order. Details of the analysis and results are given in table 4.23.

Table 4.23: Frequency wise Distribution of Students in Experiment Group (fo) and Control Group (fe) in Different Pattern of Thinking for Thinking Task 20

Thinking Pattern ⇨ / Groups ⇩	Reproductive Thinking	Critical Thinking	Creative Thinking	Productive Thinking	Total	Chi-Square Value
Experiment **(fo)**	1	10	8	7	26	9.74
Control **(fe)**	8	5	6	7	26	

It can be noticed from Table 4.23 that the chi-square value for the frequency observed and frequency expected was found to be 9.74. The obtained value was found greater than the table value (7.815) at 0.05 level of significance with df of 3. Hence, the obtained value was found significant at 0.05 level of significance. So, the H_O2.20 i.e. "There will be no significant difference between the thinking pattern of students of experimental and control groups for thinking task 20" is rejected and it can be said that there is a true difference in the thinking pattern of experimental and control group in terms of thinking task 20.

It can also be seen from table 4.23 that more number of students were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in task 20 was found significant may be because of teaching through the developed integrated strategy.

It can be seen from the testing of H_O2.1 to H_O2.20 and H_O2 i.e. "There will be no significant difference between the average thinking pattern of experimental and control groups" there is true difference between thinking pattern of experimental and control group and it may be because of developed integrated strategy.

From the analysis of tables 4.3 to 4.23, true and significant difference were observed in the thinking pattern of experiment and control group students in terms of all the 20 thinking tasks and in terms of the average of all the thinking tasks taking them together. It was also observed for all these 20 thinking tasks individually and taking together that more number of students

were found in the experimental group towards higher order productive thinking through critical and creative thinking, whereas, more number of students were observed in the control group towards the lower order reproductive thinking. This difference in the thinking pattern of experimental group which was taught through developed integrated strategy and control group which was taught through traditional classroom teaching in all the thinking tasks were found significant may be because of teaching through the developed integrated strategy. Hence, it can be said that the developed integrated strategy was found effective in taking the thinking of students towards productive thinking through critical and creative thinking and away from reproductive thinking.

4.2.3.0 EFFECTIVENESS OF THE DEVELOPED INTEGRATED STRATEGY IN TERMS OF ACIEVEMENT OF THE STUDENTS IN SCIENCE

To achieve the objective 4 i.e. "To study the effectiveness of the developed integrated strategy in terms of achievement of elementary school students in Science", null hypothesis H_o3 i.e. "There will be no significant difference between the mean scores of achievement of the experimental and the control groups" was tested. For this, post test data of achievement test were collected from the respective schools. Table 4.24 gives details of descriptive statistics applied on experimental and control group related to achievement in science.

Table 4.24: Mean, Standard Deviation (SD) and Standard Error of Mean (SE) wise Distribution of Science Achievement of Experimental Group and Control Group.

Groups	N	Mean	SD	SE
Experimental group	26	157.40	35.38	6.93
Control group	26	157.41	36.26	7.11

From table 4.24, it can be seen that the mean score of science achievement of experimental group which was taught through developed model was 157.40. Standard deviation (SD) from the mean for science achievement was found to be 35.38 with standard error of mean (SE) 6.93. Mean score of science achievement of control group which was taught through traditional

classroom teaching was found to be 157.41 with standard deviation (SD) 36.26 and standard error of mean (SE) 7.11.

It can be seen that, there exist no or very negligible difference between mean scores of both the groups. Standard deviation and standard error of the mean are also found equivalent to each other in both the groups. Hence the null hypothesis "There will be no significant difference between the mean scores of achievement of the experimental and the control groups" is retained. It can therefore be said that experimental group taught through developed model and control group taught through traditional classroom teaching were found equivalent in terms of science achievement of students. In the other words, it can be said that the developed integrated strategy for the development of productive thinking was found without any negative impact on the achievement of students in science and is able to enhance the science achievement of students in the same manner as the traditional method.

4.2.4.0 EFFECTIVENESS OF THE DEVELOPED INTEGRATED STRATEGY IN TERMS OF REACTION OF THE OF THE STUDENTS

To achieve the objective 5 of the present study i.e. "To study the effectiveness of developed integrated strategy in terms of reaction of elementary school students" data was collected from experimental group which was taught science through the developed integrated strategy. Data were collected through a Likert type five point reaction scale in which responses were ranging from strongly agree (SA), agree (A), undecided (UD), disagree (DA) and strongly disagree (SDA). Collected data was analysed using percentage (%) and intensity index (II). Analysis is presented in table 4.25.

Table 4.25: Summary of the Reactions of the Students towards the Statements Related to the Developed Integrated Strategy to Inculcate Productive Thinking among Elementary School Students in Terms of Percentage Response (%) and Intensity Index (II)

No.	Statement	SA	A	UD	DA	SDA	II
1	I liked teaching of science through the productive thinking model.	81	15	4	0	0	4.76
2	Teaching through this model is quite interesting than regular classroom teaching.	77	19	4	0	0	4.73

3	Teaching through this model helped me to understand science better.	85	15	0	0	0	4.84
4	Working in group during brainstorming was interesting.	77	19	4	0	0	4.73
5	SCAMPER questions helped me a lot to think out of the box.	65	27	8	0	0	4.57
6	I liked the videos used to make better understanding of science concept.	65	23	12	0	0	4.53
7	Evaluation of generated ideas was good to test feasibility of the ideas.	62	35	4	0	0	4.57
8	We can have variety of ideas for a problem when we work in the group	65	27	8	0	0	4.57
9	I liked the way in which we relate creative ideas to solve real life problems.	65	35	0	0	0	4.65
10	Presentation of ideas in front of the class improved my communication skill.	54	38	8	0	0	4.46
11	I liked the way in which text-book is connecting to the real-life problems in this model.	46	46	4	4	0	4.34
12	In this model all the generated ideas are welcomed by the teacher without criticism.	69	23	8	0	0	4.61
13	This model helped us to be cooperative while working in the group.	54	42	4	0	0	4.50
14	This model helped us to think creatively.	81	19	0	0	0	4.80
15	We are encouraged to share our experience related to concerned topic in the classroom.	65	35	0	0	0	4.65
16	Concept mapping is a good way to summarize and conclude the concept.	46	54	0	0	0	4.46
17	Sufficient time was provided to think in the group.	58	35	8	0	0	4.50
18	I am now able to think productively whenever I have to solve a problem.	54	42	4	0	0	4.50

19	Teachers should use this model while teaching other subjects.	65	31	4	0	0	4.61
20	I liked the teaching of science through activities in the classroom	81	19	0	0	0	4.80
21	I liked the discussion to choose one productive idea from the list of generated ideas.	42	46	12	0	0	4.30
22	This model help me to think differently while solving a problem.	69	23	8	0	0	4.61
23	We were always encouraged to think beyond the text-book while teaching through this model.	69	27	4	0	0	4.65
24	Evaluative discussion after each brainstorming was good to enhance critical thinking.	42	58	0	0	0	4.42
25	It created a creative environment in the class.	42	54	4	0	0	4.38
OVERALL REACTION							4.58

For reaction of students towards statement 1, i.e. “I liked teaching of science through the productive thinking model”, 81 percent students reacted as strongly agree, 15 percent students reacted as agree and 4 percent reacted as undecided. Intensity Index (II) of 4.76 showed strongly favorable reaction of students towards statement 1 which showed that they liked teaching of science through productive thinking model.

In terms of reaction of students towards statement 2 i.e. “Teaching through this model is quite interesting than regular classroom teaching”, 77 percent students reacted strongly agree, 19 percent reacted as agree and 4 percent students reacted as undecided. Intensity Index (II) of 4.73 portrayed strongly favorable reaction towards statement 2 which showed that the developed model brought interest in science learning. It showed that the use of different techniques to teach science developed interest among students towards science.

For reaction of students towards statement 3, i.e. “Teaching through this model helped me to understand science better”, 85 percent students reacted as strongly agree and 15 percent students reacted as agree. Intensity Index (II) of 4.84 showed strongly favorable reaction towards statement 3 which showed that the developed model provide opportunity to understand science in a better way through multiple examples that connect classroom learning with the real life.

In terms of reaction of students towards statement 4 i.e. “Working in group during brainstorming was interesting”, 77 percent students reacted strongly agree, 19 percent reacted as agree and 4 percent students reacted as undecided. Intensity Index (II) of 4.73 portrayed strongly favorable reaction towards statement 4 which showed that brainstorming activities performed in group were effective and interesting.

In terms of reaction of students towards statement 5 i.e. “SCAMPER questions helped me a lot to think out of the box”, 65 percent students reacted strongly agree, 27 percent reacted as agree and 8 percent students reacted as undecided. Intensity Index (II) of 4.57 portrayed strongly favorable reaction towards statement 5 which showed effectiveness of SCAMPER technique in thinking divergently and thereby helpful in producing a wide variety of ideas.

For reaction of students towards statement 6 i.e. “I liked the videos used to make better understanding of science concept”, 65 percent students reacted strongly agree, 23 percent reacted as agree and 12 percent students reacted as undecided. Intensity Index (II) of 4.53 portrayed strongly favorable reaction towards statement 6 which showed use of videos and audio visual aids were helpful in better understanding of scientific concepts in the classroom.

In terms of reaction of students towards statement 7 i.e. “Evaluation of generated ideas was good to test feasibility of the ideas.” 62 percent students reacted strongly agree, 35 percent reacted as agree and 4 percent students reacted as undecided. Intensity Index (II) of 4.57 reflected strongly favorable reaction towards statement 7 which showed that the use of evaluative thinking at last was good to select best ideas out of many immature ideas.

For reaction of students towards statement 8 i.e. “We can have variety of ideas for a problem when we work in the group”, 65 percent students reacted strongly agree, 27 percent reacted as agree and 8 percent students reacted as undecided. Intensity Index (II) of 4.57 portrayed strongly favorable reaction towards statement 8 which showed that working in the group allow students to consider multiple dimension of the problem and they can have variety of ideas for a problem.

In terms of reaction of students towards statement 9 i.e. “I liked the way in which we relate creative ideas to solve real life problems”, 65 percent students reacted strongly agree and 35 percent reacted as agree. Intensity Index (II) of 4.65 reflected strongly favorable reaction towards statement 9 which portrayed effective way of connecting classroom teaching learning with real life examples creatively.

In terms of reaction of students towards statement 10 i.e. “Presentation of ideas in front of the class improved my communication skill”, 54 percent students reacted strongly agree, 38 percent reacted as agree and 8 percent reacted as undecided. Intensity Index (II) of 4.46 reflected favorable reaction towards statement 10 which showed involvement of evaluative discussion was good to improve communication skills.

For reaction of students towards statement 11 i.e. “I liked the way in which text-book is connecting to the real-life problems in this model”, 46 percent students reacted strongly agree, 46 percent reacted as agree, 4 percent students reacted as undecided and 4 percent students reacted as disagree. Intensity Index (II) of 4.34 portrayed favorable reaction towards statement 11 which showed effective ways of connecting textbook with real life situation.

In terms of reaction of students towards statement 12, i.e. “In this model all the generated ideas are welcomed by the teacher without criticism”, 69 percent students reacted strongly agree, 23 percent reacted as agree and 8 percent reacted as undecided. Intensity Index (II) of 4.61 reflected strongly favorable reaction towards statement 12 which showed that the free flow of ideas was encouraged in this model without the use of restrictive criticism.

In terms of reaction of students towards statement 13, i.e. “This model helped us to be cooperative while working in the group”, 54 percent students reacted strongly agree, 42 percent reacted as agree and 4 percent reacted as undecided. Intensity Index (II) of 4.50 reflected strongly favorable reaction towards statement 13 which conveyed effectiveness and importance of cooperative learning strategy and team work in the used model.

In terms of reaction of students towards statement 14, i.e. “This model helped us to think creatively”, 81 percent students reacted strongly agree and 19 percent reacted as agree. Intensity Index (II) of 4.80 reflected strongly favorable reaction towards statement 14 which showed that the effectiveness of developed model in developing creative endeavor of the students by creating opportunities to think creatively.

In terms of reaction of students towards statement 15, i.e. “We are encouraged to share our experience related to concerned topic in the classroom”, 65 percent students reacted strongly agree and 35 percent reacted as agree. Intensity Index (II) of 4.65 reflected strongly favorable reaction towards statement 15 which showed teacher’s positive behavior for accepting students’ responses without any restrictive criticism and judgment which encourage students to share their extraordinary ideas.

In terms of reaction of students towards statement 16, i.e. “Concept mapping is a good way to summarize and conclude the concept”, 46 percent students reacted strongly agree and 54 percent reacted as agree. Intensity Index (II) of 4.46 reflected favorable reaction towards statement 16 which showed that effectiveness of concept mapping for stabilizing the concept and to retain the concept for longer time used in the model.

In terms of reaction of students towards statement 17, i.e. “Sufficient time was provided to think in the group”, 58 percent students reacted strongly agree, 35 percent reacted as agree and 8 percent reacted as undecided. Intensity Index (II) of 4.50 reflected strongly favorable reaction towards statement 17 which reflected about sufficient time allotted for brainstorming and thinking divergently to think out of the box while teaching through the developed model.

In terms of reaction of students towards statement 18, i.e. “I am now able to think productively whenever I have to solve a problem”, 54 percent students reacted strongly agree, 42 percent reacted as agree and 4 percent reacted as undecided. Intensity Index (II) of 4.50 reflected strongly favorable reaction towards statement 18 which reflected the developed ability in the students to solve problems productively.

In terms of reaction of students towards statement 19, i.e. “Teachers should use this model while teaching other subjects”, 65 percent students reacted strongly agree, 31 percent reacted as agree and 4 percent reacted as undecided. Intensity Index (II) of 4.61 reflected strongly favorable reaction towards statement 19 which showed generic nature of the developed model that can be used while teaching subjects other than science.

In terms of reaction of students towards statement 20, i.e. “I liked the teaching of science through activities in the classroom”, 81 percent students reacted strongly agree and 19 percent reacted as agree. Intensity Index (II) of 4.80 reflected strongly favorable reaction towards statement 20 which showed that the use of activities while teaching through the said model make science learning interesting and effective.

In terms of reaction of students towards statement 21, i.e. “I liked the discussion to choose one productive idea from the list of generated ideas”, 42 percent students reacted strongly agree, 46 percent reacted as agree and 12 percent reacted as undecided. Intensity Index (II) of 4.30 reflected favorable reaction towards statement 21 which showed effectiveness of constructive judgment while working in the group to improve the quality of ideas and thereby selecting the best promising idea.

In terms of reaction of students towards statement 22, i.e. “This model help me to think differently while solving a problem”, 69 percent students reacted strongly agree, 23 percent reacted as agree and 8 percent reacted as undecided. Intensity Index (II) of 4.61 reflected strongly favorable reaction towards statement 22 which reflected the use of creative problem solving by solving a problem with a different and unique way used in the model.

In terms of reaction of students towards statement 23, i.e. “We were always encouraged to think beyond the text-book while teaching through this model”, 69 percent students reacted strongly agree, 27 percent reacted as agree and 4 percent reacted as undecided. Intensity Index (II) of 4.65 reflected strongly favorable reaction towards statement 23 which showed that students are always encouraged and appreciated by teachers to think beyond text-book and also beyond memory level.

In terms of reaction of students towards statement 24, i.e. “Evaluative discussion after each brainstorming was good to enhance critical thinking”, 42 percent students reacted strongly agree and 58 percent reacted as agree. Intensity Index (II) of 4.42 reflected favorable reaction towards statement 24 which showed that critical judgment and evaluative thinking helped students to improve their critical thinking abilities.

In terms of reaction of students towards statement 25, i.e. “It created a creative environment in the class”, 42 percent students reacted strongly agree, 54 percent reacted as agree and 4 percent reacted as undecided. Intensity Index (II) of 4.38 reflected favorable reaction towards statement 25 which showed effectiveness of developed model in creating environment that facilitate creative thinking where free flow of ideas are encouraged and welcomed by teacher without criticism.

In terms of overall reaction of the students towards developed model, average Intensity Index (II) was found to be 4.58 which reflected strongly favorable reaction of the students towards developed model through which experimental group was taught science as a subject of teaching. Out of 25 statements, 19 got strongly favorable reaction and 6 got favorable reaction towards developed model. It showed overall strongly favorable reaction towards developed model that indicates that developed model was found effective in inculcating productive thinking among elementary school students through teaching science. It also indicates the generic nature of developed model. Students also showed strongly favorable reaction towards techniques used in the model.

4.3.0 CONCLUSION

In this chapter analysis of the data for the particular hypothesis were conducted to study the effectiveness of integrated strategy in terms of productive thinking, achievement and reaction of the students. Analysis and interpretation of the data suggested that the developed integrated strategy was found effective in inculcating productive thinking among students. Along with productive thinking the developed integrated strategy was also found effective in inculcating creative and critical thinking as well. This strategy is helpful in inculcating productive thinking through the subject content in an integrated manner as it was found that it is not affecting achievement of the students negatively.