
CHAPTER - 4

RESULTS AND DISCUSSION

The obtained data was analysed statistically by making inferences and qualitative judgements were done accordingly after analysing the opinions given by the teachers and students on the package and its administration. The researcher used “descriptive statistics such as mean, median, mode, standard deviation etc. correlation analysis using Pearson’s product moment correlation r and inferential statistics such as student’s t - test and ANOVA” for statistically analysing the data. The present study is aimed at finding out the “effectiveness of experiential pedagogy in science process skills, scientific attitude and achievement in science of secondary school tribal students” belonging to particularly vulnerable tribal group population studying in Asram Schools in Kerala.

This chapter deals with the details of statistical findings and discussions. This chapter is developed further through the analysis of descriptive statistical techniques and inferential statistics

The details of the statistical analysis are presented under the following headings.

4.1 Preliminary Analysis

4.2 Major Analysis of the Data

4.3 Conclusion

4.1 Preliminary Analysis

As a preliminary step in the data analysis, the major statistical characteristics of the variables which were selected for the study were analysed in detail and concluded after discussions. “The mean, median, mode and standard deviation” were worked out for the variables.

Important statistical determinants of the variable “Science Process Skills”, “Scientific Attitude” and “Achievement in Science”, of secondary school tribal students studying in two different Asram Schools situated in two different districts, Palakkad and Malappuram of Kerala State are evaluated under descriptive statistics such as “N (Total Number), M (Mean) , Md (Median), Mo (Mode) and SD (Standard Deviation)” and the details are presented in Table 4.1

Table 4.1

Data and Results of the Preliminary Analysis of “Science Process Skills”, “Scientific Attitude”, and “Achievement in Science” of Secondary School Tribal Students studying in Malampuzha Asram School

| Variable | N | “Pre-Test” | | | | “Post-Test” | | | |
|--------------------------|----|------------|--------|------|-------|-------------|--------|-------|-------|
| | | Mean | Median | Mode | SD | Mean | Median | Mode | SD |
| “Science Process Skill” | 40 | 20.25 | 21.00 | 21 | 5.30 | 32.95 | 33.00 | 33 | 4.86 |
| Observation Skill | 40 | 2.95 | 3 | 3 | 1.39 | 5.68 | 6 | 6 | 1.59 |
| Comparison Skill | 40 | 5.425 | 5.5 | 7 | 1.77 | 7.95 | 8 | 8 | 1.85 |
| Classification Skill | 40 | 2.925 | 3 | 3 | 1.61 | 5.5 | 5 | 4 | 1.79 |
| Measurement Skill | 40 | 4.15 | 4 | 2 | 2.09 | 6.325 | 6 | 4 | 1.93 |
| Model Making Skill | 40 | 4.8 | 5 | 5 | 1.77 | 7.5 | 7 | 7 | 1.79 |
| “Scientific Attitude” | 40 | 190.70 | 187.00 | 185 | 14.92 | 200.03 | 200.00 | 194 | 12.97 |
| “Achievement in Science” | 40 | 21.90 | 22.00 | 22 | 4.46 | 43.40 | 43.40 | 44.00 | 5.46 |

Table 4.1 shows the preliminary analysis of the measures of central tendency of the scores of “Science Process Skills”, “Scientific Attitude” and “Achievement in Science” of the secondary school PVTG students studying in Class VIII of Malampuzha Asram School, Palakkad. From table 4.1 it is clear that all the variables, “Science Process Skill”, “Scientific Attitude” and “Achievement in Science” have higher “post-test” score values in comparison with the “pre-test” score values of the variables. The “pre-test” scores of the variable “Science Process Skill” has 20.25 as the mean value, 21.00 as the median, 21 as the mode and 5.30 as the SD value whereas the “post-test” scores of the variable is 32.95 as the mean value, 33.00 as the median, 33 as the mode and 4.86 as the SD value. The “pre-test” scores of the individual dimensions of “Science Process Skill” were recorded as Observation (M= 2.95, Md= 3, Mo= 3, SD= 1.39), Comparison (M= 5.425, Md= 5.5, Mo= 7, SD= 1.77), Classification (M= 2.925, Md= 3, Mo= 3, SD= 1.61), Measurement (M= 4.15, Md= 4, Mo= 2, SD= 2.09) and Model Making Skill (M= 4.8, Md= 5, Mo= 5, SD= 1.77) and the “post-test” scores of the individual dimensions of Science Process Skill were found out as Observation (M= 5.68, Md= 6, Mo= 6, SD= 1.59), Comparison (M= 7.95,

Md= 8, Mo= 8, SD= 1.85), Classification (M= 5.5, Md= 5, Mo= 4, SD= 1.79), Measurement (M= 6.325, Md= 6, Mo= 4, SD= 1.93) and Model Making Skill (M= 7.5, Md= 7, Mo= 7, SD= 1.79)

The “pre-test” scores of “Scientific Attitude” has 190.70 as the mean value, 187.00 as the median, 185 as the mode and 14.92 as the SD value whereas the “post-test” scores of the variable is 200.03 as the mean value, 200.00 as the median, 194 as the mode and 12.974 as the SD value.

The “pre-test” score value of “Achievement in Science” can be seen as 21.90 as the mean value, 22.00 as the median, 22 as the mode and 4.46 as the SD. The “post-test” score values of the “Achievement in Science” can be seen as 43.40 as the mean value, 44.00 as the median value, 46 as the mode and 5.46 as the SD.

The tabled values can be interpreted in the form of figures as shown below;

Figure 4.1

“Science Process Skill” Malampuzha Asram School “pre-test” and “post-test”

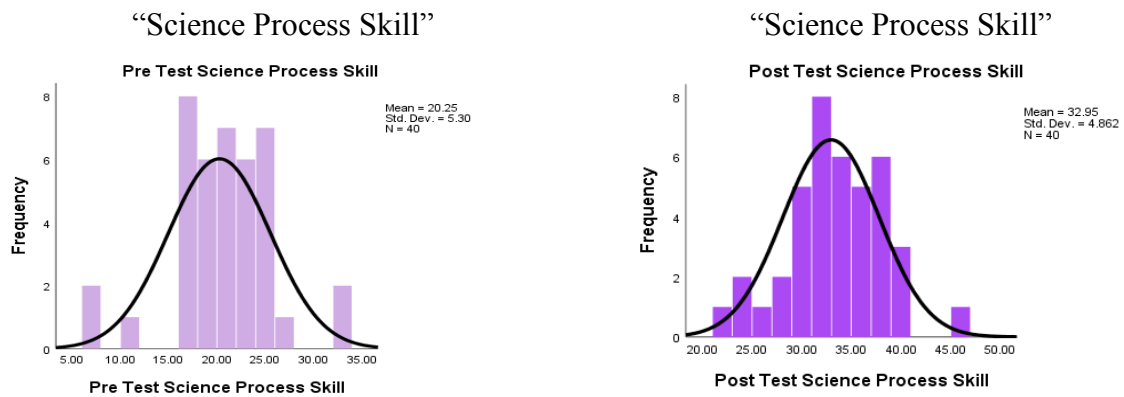


Figure 4.2:

“Scientific Attitude” Malampuzha Asram School “pre-test” and “post-test”

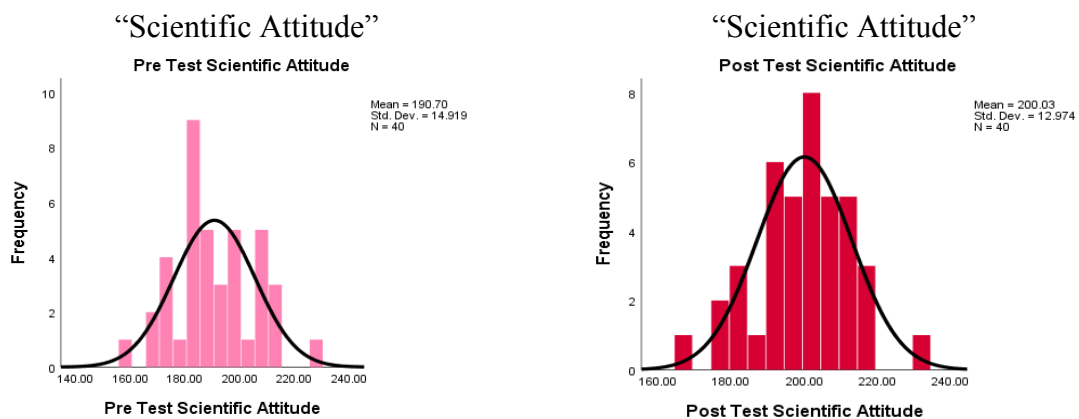
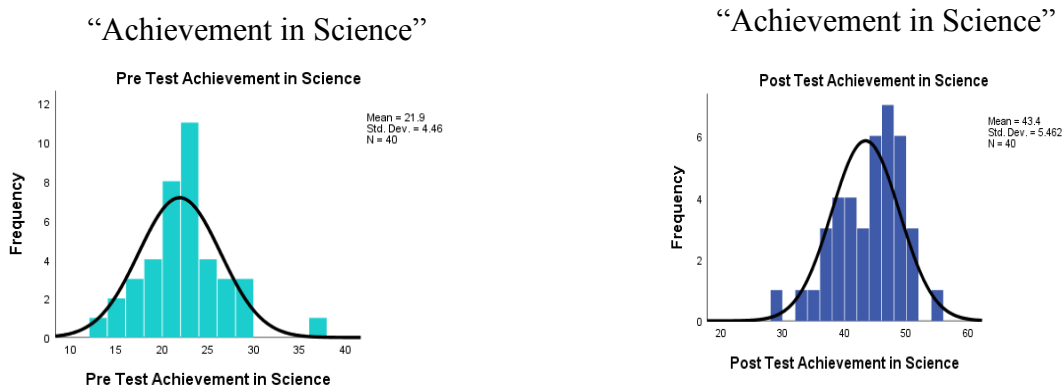


Figure 4.3

Achievement in Science Malampuzha Asram School “pre-test” and “post-test”



Discussion of the results

The analysis of the data obtained from the sample chosen in Malampuzha Asram School is preliminary analysed completely and the results are evident that the variables chosen have difference in the “pre-test” and the “post-test” scores as mentioned in the Table 4.1 and Figures 4.1,4.2 and 4.3. It has been found that the “post-test” score value of each variable is higher than the “pre-test” score value of the same. The preliminary analysis of the variables have been thus clearly defined and analysed in the statistical terms.

Table 4.2

Data and Results of the Preliminary Analysis of “Science Process skill”, “Scientific Attitude”, and “Achievement in Science” of Secondary School Tribal Students studying in Nilambur Asram School

| Variable | N | “Pre-Test” | | | | “Post- Test” | | | |
|------------------------|----|------------|--------|------|-------|--------------|--------|------|-------|
| | | Mean | Median | Mode | SD | Mean | Median | Mode | SD |
| Science Process Skill | 40 | 21.45 | 21.00 | 21 | 3.87 | 37.03 | 37.00 | 37 | 4.31 |
| Observation Skill | 40 | 3.825 | 4 | 3 | 1.65 | 6.975 | 7 | 9 | 1.90 |
| Comparison Skill | 40 | 4.325 | 4 | 6 | 1.72 | 7.65 | 8 | 8 | 1.42 |
| Classification Skill | 40 | 3.375 | 3 | 3 | 1.71 | 6.025 | 6 | 5 | 1.72 |
| Measurement Skill | 40 | 4.775 | 5 | 5 | 1.87 | 7.825 | 8 | 7 | 1.65 |
| Model Making Skill | 40 | 5.15 | 5 | 4 | 2.71 | 8.55 | 9 | 9 | 1.45 |
| Scientific Attitude | 40 | 207.73 | 205.00 | 199 | 13.21 | 220.85 | 219.00 | 219 | 11.66 |
| Achievement in Science | 40 | 24.33 | 23.00 | 23 | 4.96 | 44.60 | 44.00 | 46 | 6.95 |

Table 4.2 shows the preliminary analysis of the measures of central tendency of the scores of “Science Process Skills”, individual dimensions of “Science Process Skills”, “Scientific Attitude” and “Achievement in Science” of the secondary school PVTG students studying in Class VIII of Nilambur IGMMR Asram School, Malapuram. From Table 4.2 it is clear that all the variables, “Science Process Skill”, “Scientific Attitude” and “Achievement in Science” have higher “post-test” score values in comparison with the “pre-test” score values of the variables. The “pre-test” scores of the variable Science Process Skill has 21.45 as the mean value, 21.00 as the median, 21 as the mode and 3.87 as the SD value whereas the “post-test” scores of the variable is 37.03 as the mean value, 37.00 as the median, 37 as the mode and 4.31 as the SD value. The “pre-test” scores of the individual dimensions of “Science Process Skills” were found as Observation (M= 3.825, Md= 4, Mo= 3, SD= 1.65), Comparison (M= 4.325, Md= 4, Mo= 6, SD= 1.72), Classification (M= 3.375, Md= 3, Mo= 3, SD=1.71), Measurement (M= 4.775, Md= 5, Mo= 5, SD= 1.87) and Model Making Skill (M= 5.15, Md= 5, Mo= 4, SD= 2.71) and the post-test scores of the individual dimensions of Science Process Skill were found out as Observation (M= 6.975, Md= 7, Mo= 9, SD= 1.90), Comparison (M= 7.65, Md= 8, Mo= 8, SD= 1.42), Classification (M= 6.025, Md= 6, Mo= 5, SD= 1.72), Measurement (M= 7.825, Md= 8, Mo= 7, SD= 1.65) and Model Making Skill (M= 8.55, Md= 9, Mo= 9, SD= 1.45).

The “Scientific Attitude” “pre-test” scores has 207.73 as the mean value, 205.00 as the median, 199 as the mode and 13.21 as the SD value whereas the “post-test” scores of the variable is 220.85 as the mean value, 219.00 as the median, 219 as the mode and 11.66 as the SD value.

The “pre-test” score value of “Achievement in Science” can be seen as 24.33 as the mean value, 23.00 as the median, 23 as the mode and 4.96 as the SD. The “post-test” score values of the “achievement in science” can be seen as 44.60 as the mean value, 44.00 as the median value, 46 as the mode and 6.95 as the SD. The tabled values can be interpreted in the form of figures as shown below;

Figure 4.4

“Science Process Skill” Nilambur Asram School “pre-test” and “post-test”

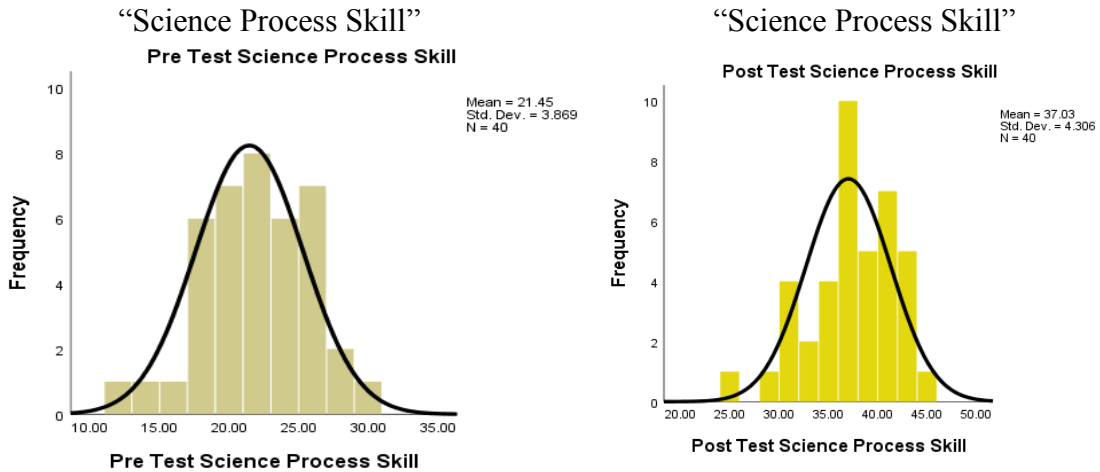


Figure 4.5

“Scientific Attitude” Niambur Asram School “pre-test” and “post-test”

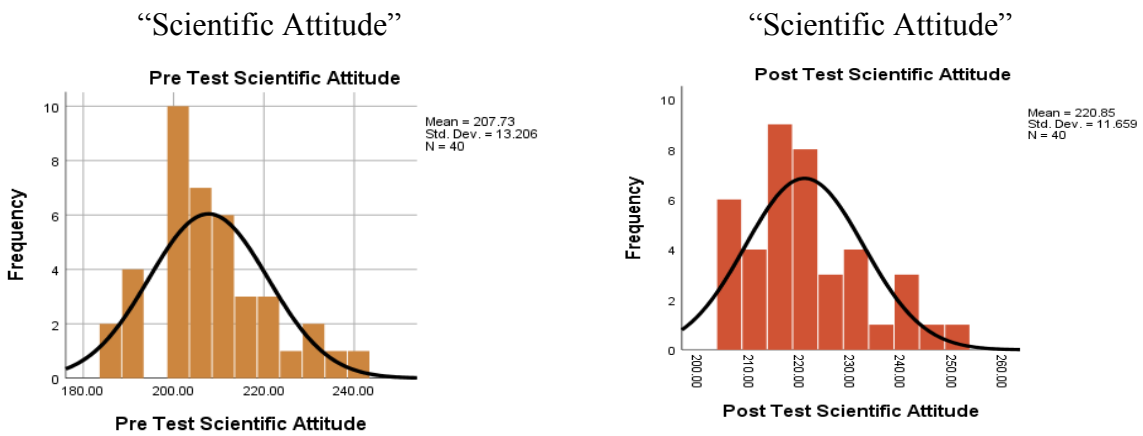
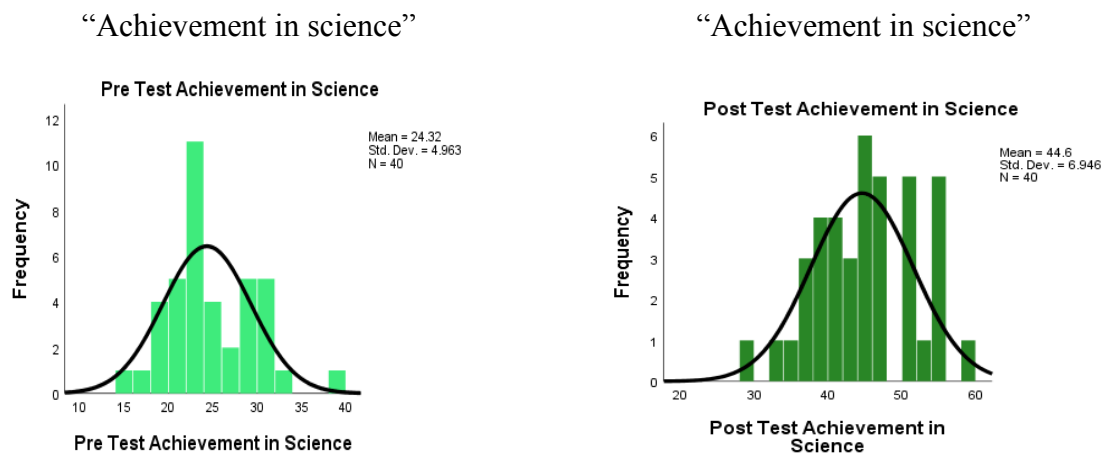


Figure 4.6

“Achievement in Science” Nilambur Asram School “pre-test” and “post-test”



Discussion of the results

The analysis of the data obtained from the sample chosen in Nilambur Asram School is preliminary analysed completely and the results are evident that the variables chosen have difference in the “pre-test” and the “post-test” scores as mentioned in the table 4.2 and figures 4.4, 4.5 and 4.6. It has been found that the “post-test” score value of each variable is higher than the “pre-test” score value of the same. The preliminary analysis of the variables have been thus clearly defined and analysed in the statistical terms.

4.2 Major Analysis of the Data

4.2.1 To determine the levels of “Achievement in Science” and “Scientific Attitude” of the secondary school tribal students of Class VIII

The different levels of “Achievement in Science” and “Scientific Attitude” among the tribal student sample of both the Asram Schools are discussed below. The results are recorded in different tables 4.3 and 4.4 as shown below.

Table 4.3

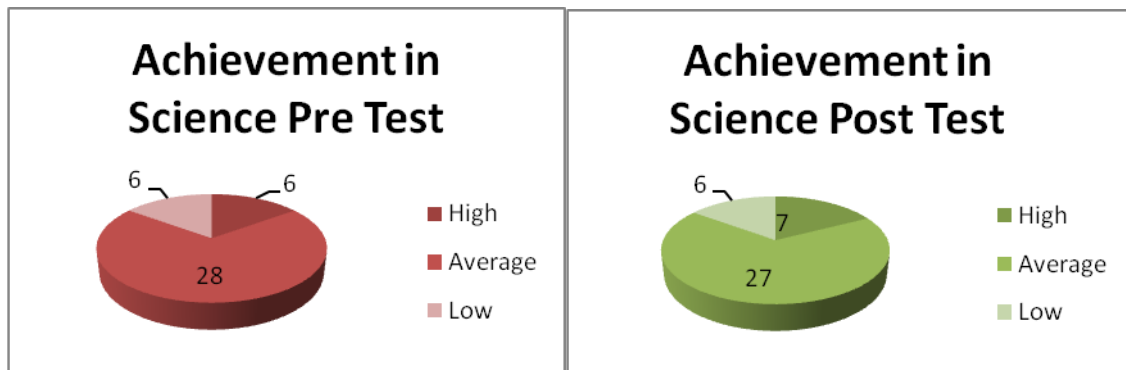
“Achievement in science”: Malampuzha Asram School

| TEST | High | Average | Low |
|-------------|------|---------|-----|
| “Pre-test” | 6 | 28 | 6 |
| “Post-test” | 7 | 27 | 6 |

Table 4.3 shows the different levels of the scores of “Achievement in Science” among the student sample studying in Malampuzha Asram School, Palakkad. The scores has been categorised into different levels viz; high, average and low after calculating the (M+SD) and (M-SD) in the sample. The high group students were recorded under (M+SD) and the low group students were recorded under (M-SD) and finally the average group students were found out as those coming in between (M+SD) and (M-SD). This calculation was carried out in the sample and it was found out that the “pre-test” scores has a group of 6 students in high, 28 students in average and 6 students in low group. After the administration of the module, “post-test” has been conducted and is also categorised in to three different groups as, 7 in the high group, 27 in the average group and 6 in the low group. It has been recorded that the data corresponds to a sample population wherein majority of the students fall under average group. The results discussed above can be diagrammatically represented in the form of a pie diagram in Figure 4.7

Figure 4.7

Different levels in “Pre-test” and “Post-test” of “Achievement in Science” Levels Malampuzha Asram School

**Table 4.4**

“Achievement in Science”: Nilambur Asram School

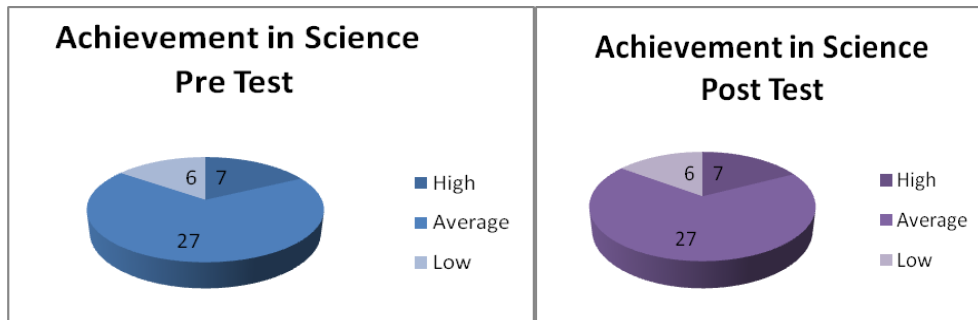
| TEST | High | Average | Low |
|-------------|------|---------|-----|
| “Pre-test” | 7 | 27 | 6 |
| “Post-test” | 7 | 27 | 6 |

Table 4.4 shows the different levels of the scores of “Achievement in Science” among the student sample studying in Nilambur IGMMR Asram School, Malapuram. The scores has been categorised into different levels viz; high, average and low. The scores has been categorised into different levels viz; high, average and low after calculating the $(M+SD)$ and $(M-SD)$ in the sample. The high group students were recorded under $(M+SD)$ and the low group students were recorded under $(M-SD)$ and finally the average group students were found out as those coming in between $(M+SD)$ and $(M-SD)$. This calculation was carried out in the sample and it was found out that the table values of “pre-test” scores has been categorised in a group of 7 students in high, 27 students in average and 6 students in low group. After the administration of the module, “post-test” has been conducted and also categorised in to three different groups as, 7 in the high group, 27 in the average group and 6 in the low group. It has been recorded that the data corresponds to a sample population wherein majority of the students fall under average group. The interpretation can be thus recorded that there exists three different groups as high, average and low which corresponds to a data that is equivalent to a normal distribution sample.

The results discussed above can be diagrammatically represented in the form of a pie diagram as shown below in Figure 4.8

Figure 4.8

“Different levels in “pre-test” and “post-test” of Achievement in Science” Nilambur Asram School

**Table 4.5**

“Scientific Attitude”: Malampuzha Asram School

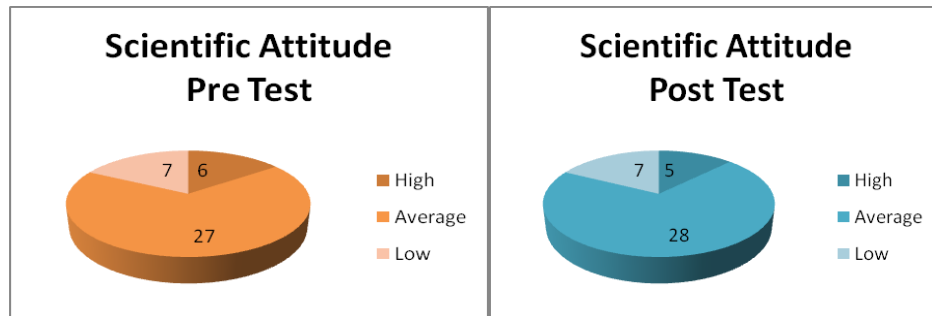
| TEST | High | Average | Low |
|-------------|------|---------|-----|
| “Pre-test” | 6 | 27 | 7 |
| “Post-test” | 5 | 28 | 7 |

Table 4.5 shows the different levels of the scores of “Scientific Attitude” among the student sample studying in Malampuzha Asram School, Palakkad. The scores has been categorised into different levels viz; high, average and low. The scores has been categorised into different levels viz; high, average and low after calculating the (M+SD) and (M-SD) in the sample. The high group students were recorded under (M+SD) and the low group students were recorded under (M-SD) and finally the average group students were found out as those coming in between (M+SD) and (M-SD). The calculation based on this showed that “pre-test” scores has been categorised in a group of 6 students in high, 27 students in average and 7 students in low group. After the administration of the module, “post-test” has been conducted which is also categorised in to three different groups as, 5 in the high group, 28 in the average group and 7 in the low group. It has been recorded that the data corresponds to a sample population wherein majority of the students fall under average group.

The results discussed above can be diagrammatically represented in the form of a pie diagram in Figure 4.9.

Figure 4.9

“Different levels in “Pre-test” and “Post-test” of Scientific Attitude” Malampuzha Asram School

**Table 4.6**

“Scientific Attitude”: Nilambur Asram School

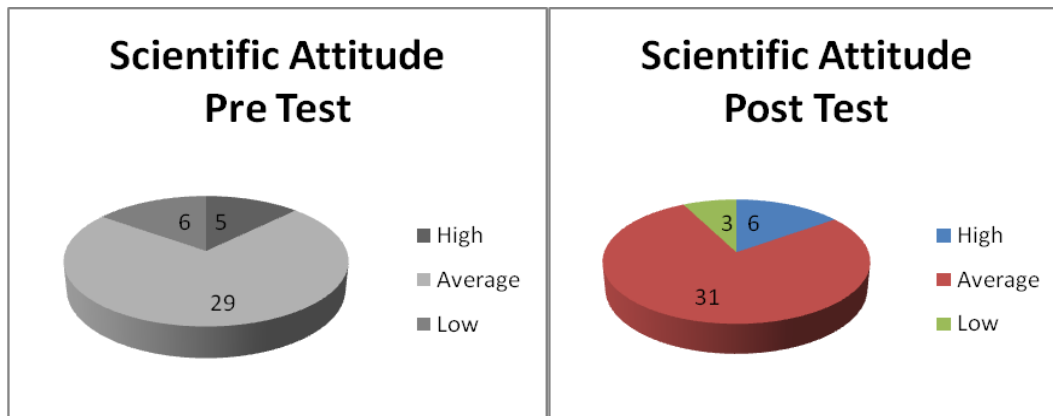
| TEST | High | Average | Low |
|-------------|------|---------|-----|
| “Pre-test” | 5 | 29 | 6 |
| “Post-test” | 6 | 31 | 3 |

Table 4.6 shows the different levels of the scores of “Scientific Attitude” among the student sample studying in Nilambur IGMMR Asram School, Malapuram. The scores has been categorised into different levels viz; high, average and low. The scores has been categorised into different levels viz; high, average and low after calculating the (M+SD) and (M-SD) in the sample. The high group students were recorded under (M+SD) and the low group students were recorded under (M-SD) and finally the average group students were found out as those coming in between (M+SD) and (M-SD). This calculation was carried out in the sample and it was found out that the table values of “pre-test” scores has been categorised in a group of 5 students in high, 29 students in average and 6 students in low group. After the administration of the module, “post-test” has been conducted and is also categorised in to three different groups as, 6 in the high group, 31 in the average group and 3 in the low group. It has been recorded that the data corresponds to a sample population wherein majority of the students fall under average group. The interpretation can be thus recorded that there exists three different groups as high, average and low which corresponds to a data that is equivalent to a normal distribution sample. Majority of the sample population has an average opinion on “Scientific Attitude”.

The results discussed above can be diagrammatically represented in the form of a pie diagram as shown in Figure 4.10

Figure 4.10

“Different levels in “Pre-test” and “Post-test” of Scientific Attitude” Nilambur Asram School



Discussion of the results

The hypothesis stated that there exist no distinct different levels of “Achievement in Science” and “Scientific Attitude” among the secondary school tribal students studying in Class VIII in Malampuzha and Nilambur Asram Schools of Kerala. The above recorded results suggest that there exists distinct and different levels of “Achievement in Science” and “Scientific Attitude” among the secondary school tribal students. There were distinct different levels which were grouped under high, average and low based on the number of students included. Thus the null hypothesis is rejected.

There exists distinct different level of “Achievement in Science” and “Scientific Attitude” among secondary school tribal students of class VIII.

4.2.2 CORRELATION ANALYSIS

4.2.2.1 To determine the relationship between “Science Process Skills”, “Scientific Attitude” and “Achievement in Science”, among secondary school tribal students in Malampuzha and Nilambur Asram Schools

Malampuzha Asram School

4.2.2.1.1 Correlation between “Achievement in Science” and “Scientific Attitude” of the students of Malampuzha Asram School, Palakkad

In order to analyse the correlation, the researcher employed Pearson’s product moment correlation. The result obtained is obtained in Table 4.7.

Table 4.7

Correlation between “Achievement in Science” and “Scientific Attitude” of the Students of Malampuzha Asram School

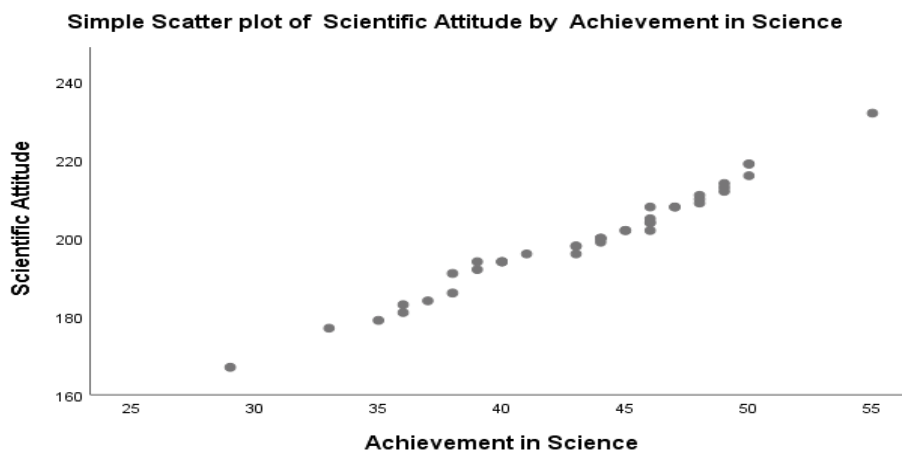
| Variables | “Achievement in Science” | “Scientific Attitude” |
|--------------------------|--------------------------|-----------------------|
| “Achievement in Science” | 1 | 0.987** |
| “Scientific Attitude” | 0.987** | 1 |

Note. $p < .01$, ** denotes the value is significant at 0.01 level.

Table 4.7 shows that the value of coefficient of correlation obtained for the test of the relation between “Achievement in Science” ($M = 43.40$, $SD = 5.462$) and “Scientific Attitude” ($M = 200.03$, $SD = 12.974$) is 0.987. The obtained value is significant at 0.01 level of confidence. The extent of the correlation between “Achievement in Science” and “Scientific Attitude” is represented in Figure 4.11.

Figure 4.11

Scatter plot between “Achievement in Science” and “Scientific Attitude” Malampuzha Asram School



Discussion of results

From the obtained value of r (0.987), it can be inferred that there exists a significant positive linear relationship between “Achievement in Science” and “Scientific Attitude” of the students of Malampuzha Asram School, Palakkad. The value of obtained r also denotes a high relationship between the two variables.

This suggests that there is a significant relationship between “Achievement in Science” and “Scientific Attitude” of the sample

4.2.2.1.2 Correlation between “Achievement in Science” and “Science Process Skills” of the students of Malampuzha Asram School, Palakkad

In order to analyse the correlation, the researcher employed Pearson’s product moment correlation. The result obtained is obtained in Table 4.8.

Table 4.8

Correlation between “Achievement in Science” and “Science Process Skill” of the Students of Malampuzha Asram School

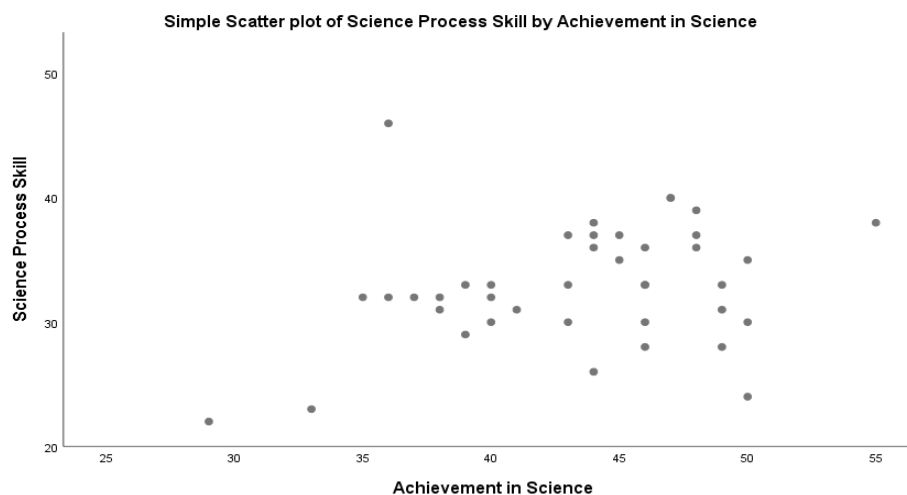
| Variables | “Achievement in Science” | “Science Process Skills” |
|--------------------------|--------------------------|--------------------------|
| “Achievement in Science” | 1 | 0.292 |
| “Science Process Skills” | 0.292 | 1 |

Table 4.8 shows that the value of coefficient of correlation obtained for the test of the relation between “Achievement in Science” ($M = 43.40$, $SD = 5.462$) and “Science Process Skill” ($M = 32.95$, $SD = 4.862$) is 0.292. The obtained value is 0.292 and is not significant at 0.01 level of confidence.

The extent of the correlation between “Achievement in Science” and “Science Process Skill” is represented in Figure 4.12.

Figure 4.12

Scatter plot between achievement in science and science process skill Malampuzha Asram School



Thus the hypothesis stated as there exists no correlation between the “Achievement in Science” and “Science Process Skills” of secondary school tribal school students is thus accepted

Table 4.9

Correlation between “Achievement in Science” and “Individual Science Process Skills” of the Students of Malampuzha Asram School

| Variables | “Achievement in Science” | “Observation Skill” | “Comparison Skill” | “Classification Skill” | “Measurement Skill” | “Model Making Skill” |
|--------------------------|--------------------------|---------------------|--------------------|------------------------|---------------------|----------------------|
| “Achievement in Science” | 1 | .334 | .035 | -.037 | .228 | .251 |
| “Observation Skill” | .334 | 1 | -.084 | -.031 | -.224 | .166 |
| “Comparison Skill” | .035 | -.084 | 1 | .154 | .084 | .477 |
| “Classification Skill” | -.037 | -.031 | .154 | 1 | .115 | .262 |
| “Measurement Skill” | .228 | -.224 | .084 | .115 | 1 | .188 |
| “Model Making Skill” | .251 | .166 | .477 | .262 | .188 | 1 |

Table 4.9 shows the individual dimension wise correlation coefficient between the “Achievement in Science” and the “Science Process Skill” dimensions. It can be seen that none of the values are significant at 0.01 level of confidence.

Thus the result can be recorded as there does not exist a significant correlation between the individual dimensions of Science Process Skills and Achievement in Science at the 0.01 level.

4.2.2.1.3 Correlation between “Science Process Skills” and “Scientific Attitude” of the students of Malampuzha Asram School, Palakkad

In order to analyse the correlation, the researcher employed Pearson’s product moment correlation. The result obtained is obtained in Table 4.10.

Table 4.10

Correlation between “Science Process Skills” and “Scientific Attitude” of the Students of Malampuzha Asram School, Palakkad

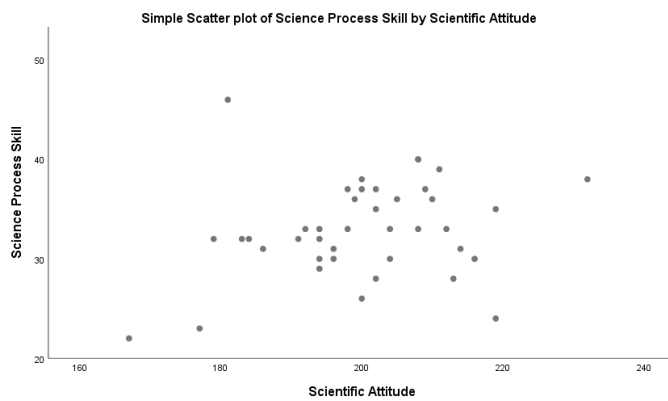
| Variables | “Science Process Skills” | “Scientific Attitude” |
|--------------------------|--------------------------|-----------------------|
| “Science Process Skills” | 1 | 0.256 |
| “Scientific Attitude” | 0.256 | 1 |

Table 4.10 shows that the value of coefficient of correlation obtained for the test of the relation between “Science Process Skill” ($M = 32.95, SD = 4.862$) and “Scientific Attitude” ($M = 200.03, SD = 12.974$) is 0.256. The obtained value is 0.256 and is not significant at 0.01 level of confidence.

The extent of the correlation between “Achievement in Science” and “Science Process Skills” is represented in Figure 4.13.

Figure 4.13

Scatter plot between “Science Process Skill” and “Scientific Attitude” Malampuzha Asram School



Thus the hypothesis stated as there exists no correlation between the “Science Process Skills” and “Scientific Attitude” of secondary school tribal school students is thus accepted.

Table 4.11

Correlation between “Scientific Attitude” and “Individual Science Process Skills” of the Students of Malampuzha Asram School

| Variables | “Scientific Attitude” | “Observation Skill” | “Comparison Skill” | “Classification Skill” | “Measurement Skill” | “Model Making Skill” |
|------------------------|-----------------------|---------------------|--------------------|------------------------|---------------------|----------------------|
| “Scientific Attitude” | 1 | .360 | .031 | -.095 | .213 | .207 |
| “Observation Skill” | .360 | 1 | -.084 | -.031 | -.224 | .165 |
| “Comparison Skill” | .031 | -.084 | 1 | .154 | .084 | .477 |
| “Classification Skill” | -.095 | -.031 | .154 | 1 | .115 | .262 |
| “Measurement Skill” | .213 | -.224 | .084 | .115 | 1 | .188 |
| “Model Making Skill” | .207 | .165 | .477 | .262 | .188 | 1 |

Table 4.11 shows the individual dimension wise correlation coefficient between the “Scientific Attitude” and the “Science Process Skill” dimensions. It can be seen that none of the values are significant at 0.01 level of confidence.

Thus the result can be recorded as there does not exist a significant correlation between the individual dimensions of “Science Process Skills” and “Scientific Attitude” at the 0.01 level.

Nilambur IGMMR Asram School, Malappuram

4.2.2.1.4 Correlation between “Achievement in Science” and “Scientific Attitude” of the students of Nilambur IGMMR Asram School, Malappuram

In order to analyse the correlation, the researcher employed Pearson’s product moment correlation. The result is obtained in Table 4.12.

Table 4.12

Correlation between “Achievement in Science” and “Scientific Attitude” of the Students of Nilambur IGMMR Asram School

| Variables | “Achievement in Science” | “Scientific Attitude” |
|--------------------------|--------------------------|-----------------------|
| “Achievement in Science” | 1 | 0.958** |
| “Scientific Attitude” | 0.958** | 1 |

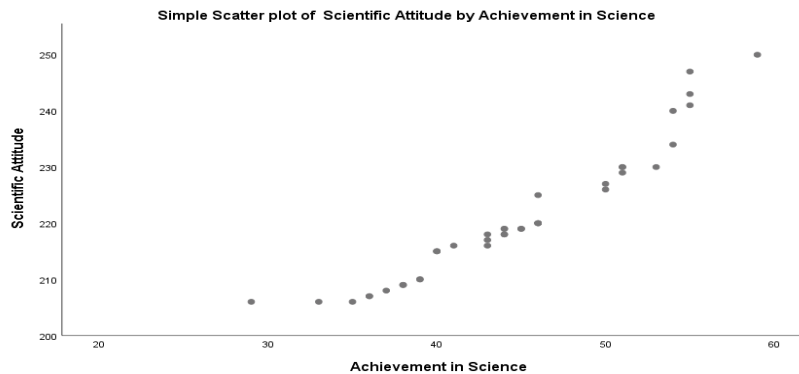
Note. $p < .01$, ** denotes the value is significant at 0.01 level.

Table 4.12 shows that the value of coefficient of correlation obtained for the test of the relation between “Achievement in Science” ($M = 44.60, SD = 6.946$) and “Scientific Attitude” ($M = 220.85, SD = 11.659$) is 0.958. The obtained value is significant at 0.01 level of confidence.

The extent of the correlation between “Achievement in Science” and “Scientific Attitude” is represented in Figure 4.14.

Figure 4.14

Scatter plot between “Achievement in Science” and “Scientific Attitude” Nilambur Asram School



Discussion of results

From the obtained value of r (0.958), it can be inferred that there exists a significant positive linear relationship between “Achievement in Science” and “Scientific Attitude” of the students of Nilambur IGMMR Asram School, Malappuram. The value of obtained r also denotes a high relationship between the two variables.

This suggests that there is a significant relationship between “Achievement in Science” and “Scientific Attitude” of the sample.

4.2.2.1.5 Correlation between “Achievement in Science” and “Science Process Skills” of the students of Nilambur IGMMR Asram School, Malappuram

In order to analyse the correlation, the researcher employed Pearson’s product moment correlation. The result is obtained in Table 4.13

Table 4.13

Correlation between “Achievement in Science” and Science Process Skill of the Students of Nilambur IGMMR Asram School

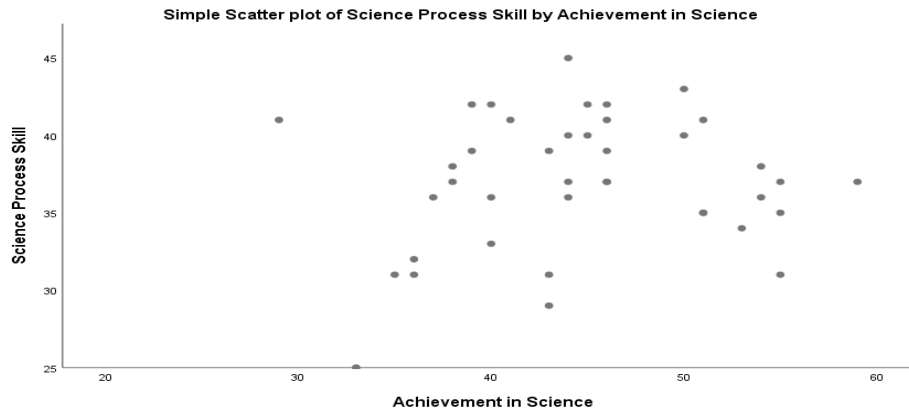
| Variables | “Achievement in Science” | “Scientific Attitude” |
|--------------------------|--------------------------|-----------------------|
| “Achievement in Science” | 1 | 0.127 |
| “Science Process Skills” | 0.127 | 1 |

Table 4.13 shows that the value of coefficient of correlation obtained for the test of the relation between “Achievement in Science” ($M = 44.60$, $SD = 6.946$) and “Science Process Skills” ($M = 37.03$, $SD = 4.306$) is 0.127. The obtained value is 0.127 and is not significant at 0.01 level of confidence.

The extent of the correlation between “Achievement in Science” and “Science Process Skills” is represented in Figure 4.15.

Figure 4.15:

Scatter plot between Science Process Skill and Achievement in Science Nilambur Asram School



Thus the hypothesis stated as there exist no correlation between the “Achievement in Science” and “Science Process Skills” of secondary school tribal school students is thus accepted.

Table 4.14

Correlation between “Achievement in Science” and “Individual Science Process Skills” of the Students of Nilambur IGMMR Asram School

| Variables | “Achievement in Science” | “Observation Skill” | “Comparison Skill” | “Classification Skill” | “Measurement Skill” | “Model Making Skill” |
|--------------------------|--------------------------|---------------------|--------------------|------------------------|---------------------|----------------------|
| “Achievement in Science” | 1 | -.007 | .138 | .476 | -.013 | -.033 |
| “Observation Skill” | -.007 | 1 | .337 | -.180 | .047 | .368 |
| “Comparison Skill” | -.138 | .337 | 1 | .0561 | .115 | .108 |
| “Classification Skill” | .476 | -.180 | .0561 | 1 | .264 | -.222 |
| “Measurement Skill” | -.013 | .047 | .115 | .264 | 1 | .105 |
| “Model Making Skill” | -.033 | .368 | .108 | -.222 | .105 | 1 |

Table 4.14 shows the dimension wise correlation coefficient values of the “Science Process Skills” to the “Achievement in Science” of the students in Nilambur IGMMR Asram School. It can be inferred that the correlation coefficients are having lesser values and these are not significant at the 0.01 level.

Thus the hypotheses that stated that there existed no correlation between the “Science Process Skill” and “Achievement in Science” can be rejected since the total score of the “Science Process Skill” showed a positive correlation with the “Achievement in Science” in the sample.

4.2.2.1.6 Correlation between “Science Process Skills” and “Scientific Attitude” of the secondary school tribal students of Nilambur IGMMR Asram School, Malappuram

In order to analyse the correlation, the researcher employed Pearson’s product moment correlation. The result obtained is obtained in Table 4.15.

Table 4.15

Correlation between “Science Process Skill” and “Scientific Attitude” of the Students of Nilambur IGMMR Asram School, Malappuram

| Variables | “Science Process Skills” | “Scientific Attitude” |
|--------------------------|--------------------------|-----------------------|
| “Science Process Skills” | 1 | 0.060 |
| “Scientific Attitude” | 0.060 | 1 |

Table 4.15 shows that the value of coefficient of correlation obtained for the test of the relation between “Science Process Skill” ($M = 37.03$, $SD = 4.306$) and “Scientific Attitude” ($M = 220.85$, $SD = 11.659$) is 0.060. The obtained value is 0.060 and is not significant at 0.01 level of confidence.

The extent of the correlation between “Scientific Attitude” and “Science Process Skill” is represented in Figure 4.16

Figure 4.16

Scatter plot between Science Process Skill and Scientific Attitude Nilambur Asram School



Thus the hypothesis stated as there exists no correlation between the “Science Process Skills” and “Scientific Attitude” of secondary school tribal school students is thus accepted.

Table 4.16

Correlation between “Scientific Attitude” and “Individual Science Process Skills” of the Students of Nilambur IGMMR Asram School

| Variables | “Scientific Attitude” | “Observation Skill” | “Comparison Skill” | “Classification Skill” | “Measurement Skill” | “Model Making Skill” |
|------------------------|-----------------------|---------------------|--------------------|------------------------|---------------------|----------------------|
| “Scientific Attitude” | 1 | -.094 | -.144 | .466 | -.053 | -.049 |
| “Observation Skill” | -.094 | 1 | .337 | -.180 | .047 | .368 |
| “Comparison Skill” | -.144 | .337 | 1 | .0561 | .115 | .108 |
| “Classification Skill” | .466 | -.180 | .0561 | 1 | .264 | -.222 |
| “Measurement Skill” | -.053 | .047 | .115 | .264 | 1 | .105 |
| “Model Making Skill” | -.049 | .368 | .108 | -.222 | .105 | 1 |

Table 4.16 shows the dimension wise correlation coefficient values of the “Science Process Skills” to the “Scientific Attitude” of the students in Nilambur IGMMR Asram School. It can be inferred that the correlation coefficients are having lesser values and these are not significant at the 0.01 level.

Thus the hypotheses that stated that there existed no correlation between the “Science Process Skills” and “Scientific Attitude” can be accepted.

4.2.3 INFERENCE STATISTICS

4.2.3.1 To determine the effect of experiential pedagogy on the “Science Process Skills”, “Scientific Attitude” and “Achievement in Science” of the tribal students

4.2.3.1.1 “Science Process Skills”

The major statistical analysis of the “pre-test” scores and the “post-test” scores of process skill for the two tribal groups belonging to two different schools are discussed below.

Analysis of significance in the mean pre-test scores and the “post-test” scores:

The test of significance of difference was conducted to find out the difference in the mean pre-test scores and the “post-test” scores of the students studying in Malampuzha Asram School, Palakkad. The data and result of analysis of the sample are given in the Table 9.

The analysis is being done for the Malampuzha Asram School first which is followed by the analysis and interpretations of Nilambur IGMMR Asram School.

Table 4.17 shows the data analysis of the Malampuzha Asram School and Table 4.18 shows the data analysis of the Nilambur IGMMR Asram School respectively.

Table 4.17

Science Process Skill: Malampuzha Asram School

| Science Process Skill | Group | Mean | SD | t-value | df |
|-----------------------------|-------------|--------|-------|----------|----|
| Observation Skill | “pre-test” | 2.950 | 1.395 | 15.873** | 39 |
| | “post-test” | 5.675 | 1.591 | | |
| Comparison Skill | “pre-test” | 5.425 | 1.767 | 11.442** | |
| | “post-test” | 7.950 | 1.853 | | |
| Classification Skill | “pre-test” | 2.925 | 1.607 | 10.856** | |
| | “post-test” | 5.500 | 1.797 | | |
| Measurement Skill | “pre-test” | 4.150 | 2.095 | 10.002** | |
| | “post-test” | 6.325 | 1.927 | | |
| Model Making Skill | “pre-test” | 4.800 | 1.772 | 15.021** | |
| | “post-test” | 7.500 | 1.797 | | |
| Science Process Skill Total | “pre-test” | 20.250 | 5.299 | 22.074** | |
| | “post-test” | 32.950 | 4.862 | | |

Note. ** $p < .01$. *SD*=Standard Deviation *df*=Degrees of Freedom

Table 4.17 interprets the “science process skills” in the dimensions of five corresponding dimensions.

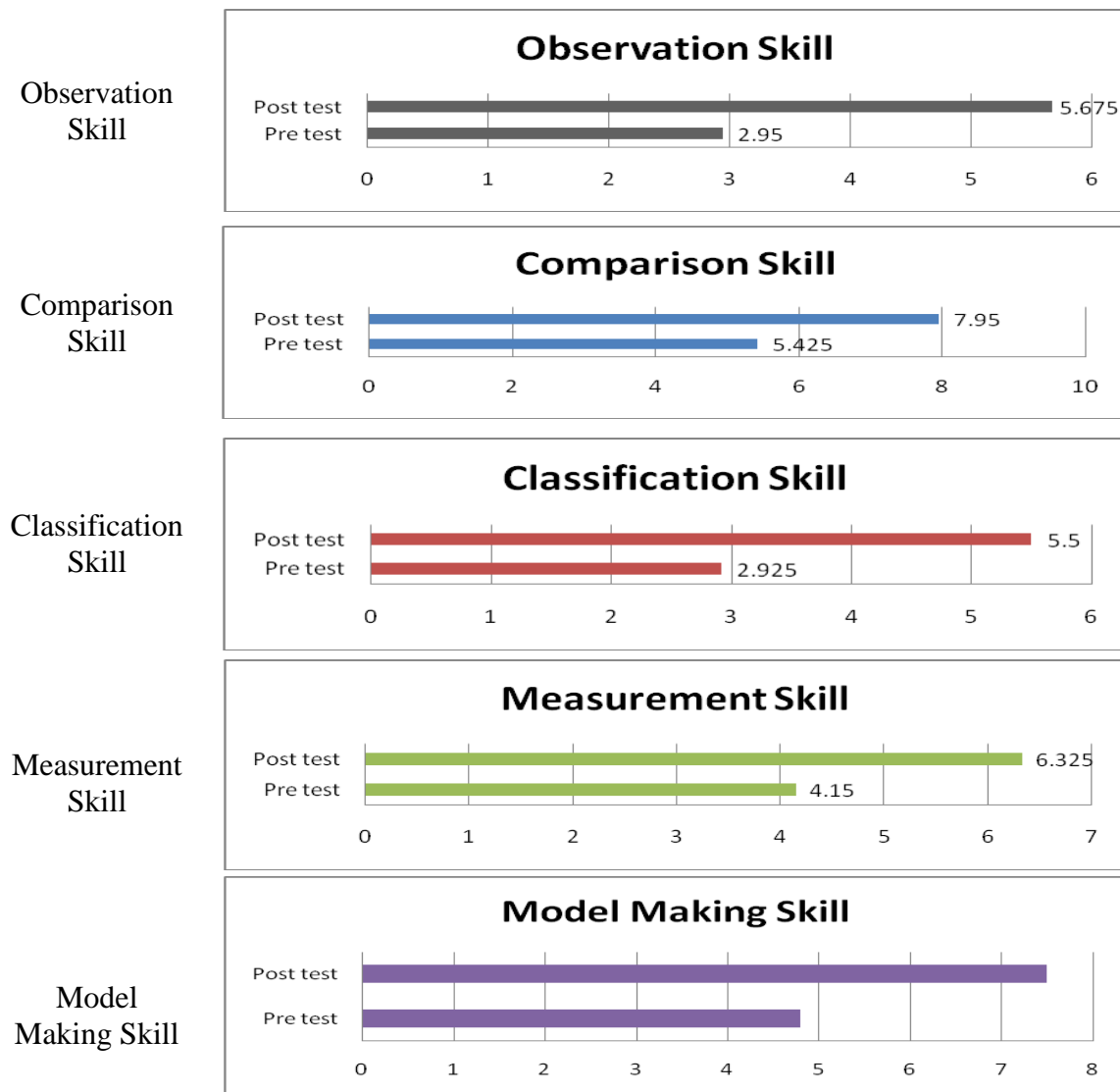
- The first dimension observation skill was found to have a mean “pre-test” score of 2.950 and a mean “post-test” score of 5.675. The SD value of the observation skill was found to be 1.395 and 1.591 respectively for the “pre-test” as well as the “post-test”. The obtained t value 15.873 was found to be greater than the tabled t value and hence the two mean scores are having significant difference in them on comparison.
- The second dimension comparison skill was found to have a mean “pre-test” score of 5.425 and a mean “post-test” score of 7.950. The SD value of the comparison skill was found to be 1.767 and 1.853 respectively for the “pre-test” as well as the “post-test”. The obtained t value 11.442 was found to be greater than the tabled t value and hence the two mean scores are having significant difference in them on comparison.
- The third dimension classification skill was found to have a mean “pre-test” score of 2.925 and a mean “post-test” score of 5.500. The SD value of the classification skill was found to be 1.607 and 1.797 respectively for the “pre-test” as well as the “post-test”. The obtained t value 10.856 was found to be greater than the tabled t value and hence the two mean scores are having significant difference in them on comparison.
- The fourth dimension measurement skill was found to have a mean “pre-test” score of 4.150 and a mean “post-test” score of 6.325. The SD value of the measurement skill was found to be 2.095 and 1.927 respectively for the “pre-test” as well as the “post-test”. The obtained t value 10.002 was found to be greater than the tabled t value and hence the two mean scores are having significant difference in them on comparison.
- The fifth dimension model making skill was found to have a mean “pre-test” score of 4.800 and a mean “post-test” score of 7.500. The SD value of the model making skill was found to be 1.772 and 1.797 respectively for the “pre-test” as well as the “post-test”. The obtained t value 15.021 was found to be greater than the tabled t value and hence the two mean scores are having significant difference in them on comparison.

- The variable “science process skill” total value was found to have a mean “pre-test” score of 20.250 and a mean “post-test” score of 32.950. The SD value of the process skill was found to be 5.299 and 4.862 respectively for the “pre-test” as well as the “post-test”. The obtained t value 22.074 was found to be greater than the tabled t value and hence the two mean scores are having significant difference in them on comparison.

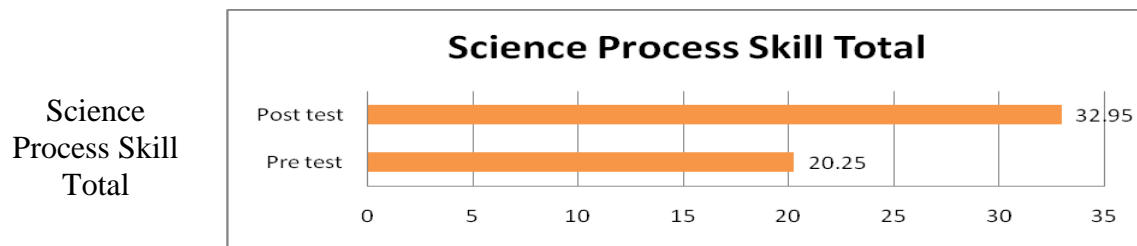
The tabled interpretations can be diagrammatically explained on the basis of bar diagrams.

Figure 4.17

Comparison of means of “Science Process Skills” and the individual dimensions of the variable Malampuzha Asram School.



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Discussion of Results

The results show that there is a significant difference between the mean “pre-test” and the “post-test” score of “science process skills” in the Malampuzha Asram School, Palakkad. The “pre-test” mean scores are lower than the “post-test” mean scores which mean that the module has been effective in increasing and improving the process skill of the sample. Each dimension of the process skill were found to be significant and the mean score of the “post-test” were higher than the “pre-test” score of the respective dimension.

Thus the hypothesis that has been stated as Experiential pedagogy has no significant effect in increasing the “Achievement in Science”, “Scientific Attitude” and “Science Process Skills” of the secondary school tribal students is thus partially rejected.

Table 4.18

Science Process Skill: Nilambur Asram School

| “Science Process Skill” | Group | Mean | SD | t-value | df |
|-----------------------------|-------------|--------|-------|----------|----|
| Observation Skill | “pre-test” | 3.825 | 1.647 | 12.136** | 39 |
| | “post-test” | 6.975 | 1.901 | | |
| Comparison Skill | “pre-test” | 4.325 | 1.716 | 12.258** | |
| | “post-test” | 7.650 | 1.424 | | |
| Classification Skill | “pre-test” | 3.375 | 1.705 | 9.434** | |
| | “post-test” | 6.025 | 1.717 | | |
| Measurement Skill | “pre-test” | 4.775 | 1.874 | 10.411** | |
| | “post-test” | 7.825 | 1.647 | | |
| Model Making Skill | “pre-test” | 5.150 | 2.713 | 8.676** | |
| | “post-test” | 8.550 | 1.449 | | |
| Science Process Skill Total | “pre-test” | 21.45 | 3.869 | 25.374** | |
| | “post-test” | 37.025 | 4.306 | | |

Note. ** $p < .01$. *SD*=Standard Deviation *df*=Degrees of Freedom

Table 4.18 interprets the “Science Process Skills” in the dimensions of five corresponding dimensions.

- The first dimension observation skill was found to have a mean “pre-test” score of 3.825 and a mean “post-test” score of 6.975. The SD value of the observation skill

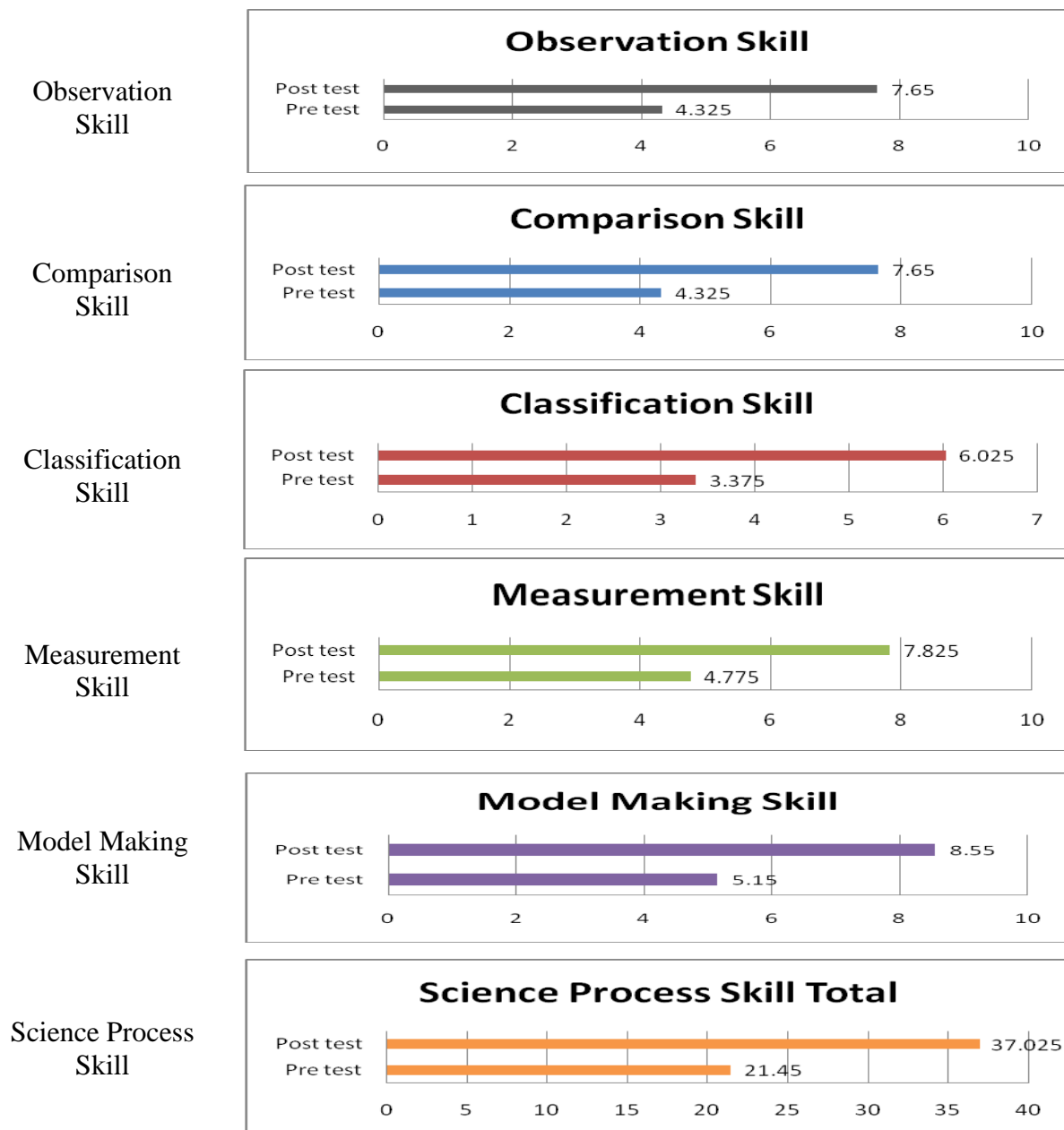
- was found to be 1.647 and 1.901 respectively for the “pre-test” as well as the “post-test”. The obtained t value 12.136 was found to be greater than the tabled t value and hence the two mean scores are having significant difference in them on comparison.
- The second dimension comparison skill was found to have a mean “pre-test” score of 4.325 and a mean “post-test” score of 7.650. The SD value of the comparison skill was found to be 1.716 and 1.424 respectively for the “pre-test” as well as the “post-test”. The obtained t value 12.258 was found to be greater than the tabled t value and hence the two mean scores are having significant difference in them on comparison.
 - The third dimension classification skill was found to have a mean “pre-test” score of 3.375 and a mean “post-test” score of 6.025. The SD value of the comparison skill was found to be 1.705 and 1.717 respectively for the “pre-test” as well as the “post-test”. The obtained t value 9.434 was found to be greater than the tabled t value and hence the two mean scores are having significant difference in them on comparison.
 - The fourth dimension measurement skill was found to have a mean “pre-test” score of 4.775 and a mean “post-test” score of 7.825. The SD value of the comparison skill was found to be 1.874 and 1.647 respectively for the “pre-test” as well as the “post-test”. The obtained t value 10.411 was found to be greater than the tabled t value and hence the two mean scores are having significant difference in them on comparison.
 - The fifth dimension model making skill was found to have a mean “pre-test” score of 5.150 and a mean “post-test” score of 8.550. The SD value of the comparison skill was found to be 2.713 and 1.449 respectively for the “pre-test” as well as the “post-test”. The obtained t value 8.676 was found to be greater than the tabled t value and hence the two mean scores are having significant difference in them on comparison.
 - The variable “science process skill” total value was found to have a mean “pre-test” score of 21.45 and a mean “post-test” score of 37.025. The SD value of the comparison skill was found to be 3.869 and 4.306 respectively for the “pre-test” as well as the “post-test”. The obtained t value 25.374 was found to be greater than

the tabled t value and hence the two mean scores are having significant difference in them on comparison.

The tabled interpretations can be diagrammatically explained on the basis of the bar diagrams.

Figure 4.18

Comparison of mean scores of “Science Process Skills” and the individual dimensions of the variable Nilambur Asram School



Discussion of results

The results show that there is a significant difference between the mean “pre-test” and the “post-test” score of process skill in both the schools of Malampuzha and Nilambur. The “pre-test” mean scores are lower than the “post-test” mean scores which mean that the module has been effective in increasing and improving the process skill of the sample. Each dimension of the process skill were found to be significant and the mean score of the “post-test” were higher than the “pre-test” score of the respective dimension.

Thus the hypothesis that has been stated as Experiential pedagogy has no significant effect in increasing the “science process skills” of the secondary school tribal students is thus rejected.

4.2.3.1.2 “Scientific Attitude”

The major statistical analysis of the “pre-test” scores and the “post-test” scores of “scientific attitude” for the two tribal groups belonging to two different schools are discussed below.

Analysis of significance in the mean “pre-test” scores and the “post-test” scores:

The test of significance of difference was conducted to find out the difference in the mean pre-test scores and the “post-test” scores of the students studying in Malampuzha Asram School, Palakkad. The data and result of analysis of the sample are given in the Table 4.19

Table 4.19

“Scientific Attitude”

| Sample | Group | <i>N</i> | <i>M</i> | <i>SD</i> | <i>t value</i> | <i>df</i> |
|------------|-------------|----------|----------|-----------|----------------|-----------|
| Malampuzha | “pre-test” | 40 | 190.700 | 14.919 | 18.537** | 39 |
| | “post-test” | 40 | 200.031 | 12.974 | | |
| Nilambur | “pre-test” | 40 | 207.732 | 13.206 | 32.004** | |
| | “post-test” | 40 | 220.851 | 11.659 | | |

Note. ** $p < .01$. *SD*=Standard Deviation *df*=Degrees of Freedom

Table 4.19 values describe the “scientific attitude” scores attained by the samples of both Nilambur and Malampuzha Asram Schools.

The “pre-test” scores of the Malampuzha Asram School were found to have a mean value of 190.70 and SD value of 14.919. The “post-test” scores of the same were

found to have a mean value of 200.03 and SD value of 12.974. The obtained t value was 18.537 which were found to be higher than the tabled t value and hence the “pre-test” and the “post-test” scores are significantly different from each other at 0.01 level of significance.

The “pre-test” scores of the Nilambur IGMMR Asram School were found to have a mean value of 207.73 and SD value of 13.206. The “post-test” scores of the same were found to have a mean value of 220.85 and SD value of 11.659. The obtained t value was 32.004 which was found to be higher than the tabled t value and hence the “pre-test” and the “post-test” scores are significantly different from each other at 0.01 level of significance.

The interpretation can be diagrammatically represented in the form of bar diagrams as shown.

Figure 4.19

Comparison of mean values of “Scientific Attitude” Malampuzha Asram School

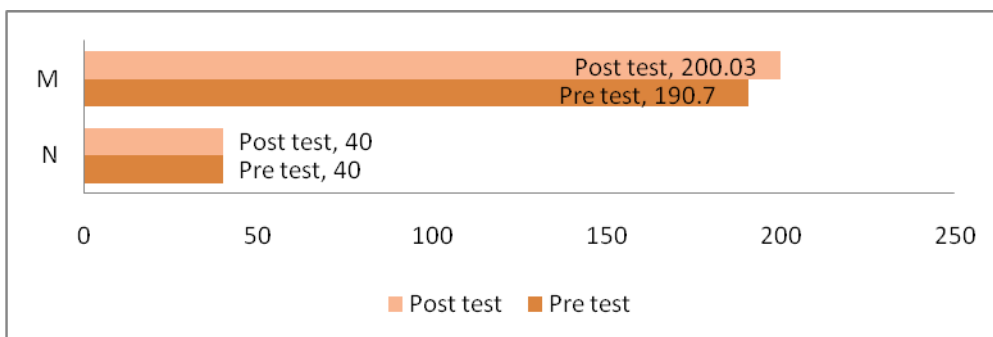
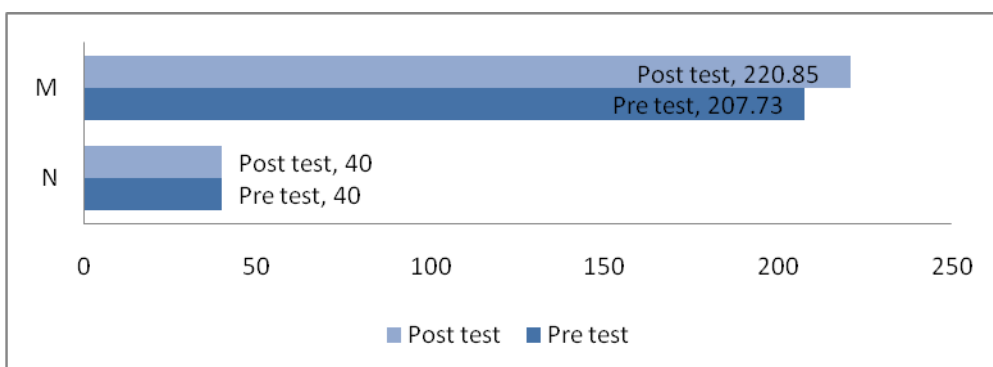


Figure 4.20

Comparison of mean values of “Scientific Attitude” Nilambur IGMMR Asram School



Discussion of results

The results show that there is a significant difference between the mean “pre-test” and the “post-test” score of “scientific attitude” in both the schools of Malampuzha and

Nilambur. The “pre-test” mean scores are lower than the “post-test” mean scores which mean that the module has been effective in increasing and improving the “scientific attitude” of the sample.

Thus the hypothesis that has been stated as Experiential pedagogy has no significant effect in enhancing the “scientific attitude” of the secondary school tribal students is rejected.

4.2.3.1.3 Achievement test

The major statistical analysis of the “pre-test” scores and the “post-test” scores of achievement test for the two tribal groups belonging to two different schools are discussed.

Analysis of significance in the mean pre-test scores and the “post-test” scores:

The test of significance of difference was conducted to find out the difference in the mean pre-test scores and the “post-test” scores of the students studying in Malampuzha Asram School, Palakkad. The data and result of analysis of the sample are given in the Table 4.20.

Table 4.20

“Achievement in Science”

| Sample | Group | <i>N</i> | <i>M</i> | <i>SD</i> | <i>t value</i> | <i>df</i> |
|------------|-------------|----------|----------|-----------|----------------|-----------|
| Malampuzha | “pre-test” | 40 | 21.90 | 4.460 | 80.240** | 39 |
| | “post-test” | 40 | 43.40 | 5.462 | | |
| Nilambur | “pre-test” | 40 | 24.33 | 4.963 | 56.629** | |
| | “post-test” | 40 | 44.60 | 6.946 | | |

Note. ** $p < .01$. *SD*=Standard Deviation *df*=Degrees of Freedom

Table 4.20 values describe the test of significance of difference in the mean “pre-test” and the “post-test” scores of Malampuzha Asram School, Palakkad and Nilambur IGMMR School, Malapuram.

The mean value of the “pre-test” conducted in Malampuzha Asram School is found out as 21.90 and the *SD* value is 4.460. The mean value of the “post-test” conducted in Malampuzha Asram School is found out as 43.40 and the *SD* value is 5.462. It can be seen that the *t*-value of the two means of the “pre-test” and the “post-test” is significantly different and that the tabled value of *t*-value is lower than the *t*-value obtained. The

obtained t-value is 80.240 which is higher than the tabled t-value which suggests that the result is highly significant at 0.01 level of significance.

The mean value of the “pre-test” conducted in Nilambur IGMMR Asram School is found out as 24.33 and the SD value is 4.963. The mean value of the “post-test” conducted in Nilambur IGMMR Asram School is found out as 44.60 and the SD value is 6.946. It can be seen that the t-value of the two means of the “pre-test” and the “post-test” is significantly different and that the tabled value of t-value is lower than the t-value obtained. The obtained t-value is 56.629 which is higher than the tabled t-value which suggests that the result is highly significant at 0.01 level of significance.

The tabled values can be described in the form of a figure shown below wherein the “pre-test” and the “post-test” means are plotted. The figure shows the comparison of mean values of the “pre-test” and “post-test” scores.

Figure 4.21:

Comparison of means of “Achievement in Science” in Malampuzha Asram School

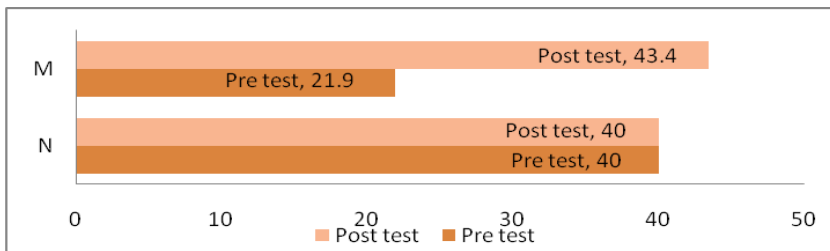
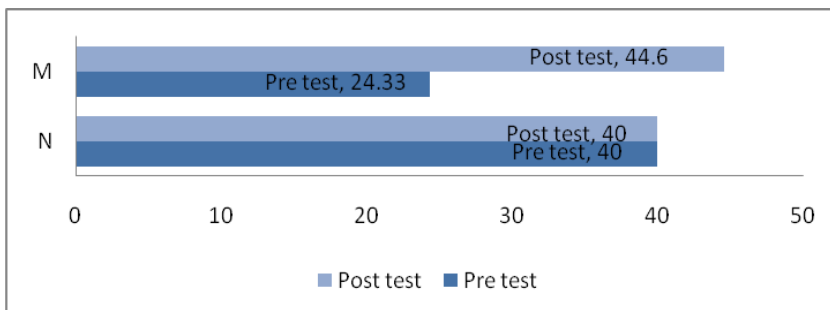


Figure 4.22:

Comparison of means of “Achievement in Science” in Nilambur Asram School



Discussion of the results

The results show that there is significant difference between the mean “pre-test” and the “post-test” score of science achievement in both the schools of Malampuzha and Nilambur. The “pre-test” mean scores are lower than the “post-test” mean scores which

means that the module has been effective in increasing the achievement in science of the sample.

Thus the hypothesis that has been stated as Experiential pedagogy has no significant effect in increasing the “Achievement in Science” of the secondary school tribal students is rejected.

4.2.3.2 To find out the significant difference in the “post-test” and the delayed “post-test” in “science process skills”, “scientific attitude” and the “achievement in science” in tribal students.

The major statistical analysis of the “post-test” scores and the delayed “post-test” scores of achievement test for the two tribal groups belonging to two different schools are discussed.

Analysis of significance in the mean “post-test” scores and the “delayed post-test” scores:

The test of significance of difference was conducted to find out the difference in the mean “post-test” scores and the “delayed post-test” scores of the students studying in Malampuzha Asram School, Palakkad and Nilambur IGMMR Asram School, Malappuram. The data and result of analysis of the sample are given in the Table 4.21.

4.2.3.2.1 Science Process Skill

The major statistical analysis of the “post-test” scores and the “delayed post-test” scores of “Science Process Skill” for the two tribal groups belonging to two different schools are discussed below.

Analysis of significance in the mean “post-test” scores and the delayed “post-test” scores:

The test of significance of difference was conducted to find out the difference in the mean “post-test” scores and the “delayed post-test” scores of the students studying in Malampuzha Asram School, Palakkad. The data and result of analysis of the sample are given in the Table 4.21. The analysis is being done for the Malampuzha Asram School first which is followed by the analysis and interpretations of Nilambur IGMMR Asram School. Table 4.21 shows the data analysis of the Malampuzha Asram School and the Table 22 shows the data analysis of the Nilambur IGMMR Asram School respectively.

Table 4.21*Retention test Science Process Skill: Malampuzha Asram School*

| Skill | Group | Mean | SD | t-value | df |
|-----------------------|---------------------|--------|-------|---------|----|
| Observation Skill | “post-test” | 5.675 | 1.591 | 5.448** | 39 |
| | “Delayed post-test” | 6.225 | 1.230 | | |
| Comparison Skill | “post-test” | 7.950 | 1.853 | 0.240 | |
| | “Delayed post-test” | 7.975 | 1.732 | | |
| Classification Skill | “post-test” | 5.500 | 1.797 | 5.152** | |
| | “Delayed post-test” | 6.175 | 1.357 | | |
| Measurement Skill | “post-test” | 6.325 | 1.927 | 2.876** | |
| | “Delayed post-test” | 6.675 | 1.575 | | |
| Model Making Skill | “post-test” | 7.500 | 1.797 | 1.361 | |
| | “Delayed post-test” | 7.675 | 1.623 | | |
| Science Process Skill | “post-test” | 32.950 | 4.862 | 7.517** | |
| Total | “Delayed post-test” | 34.725 | 4.332 | | |

Note. ** $p < .01$. *SD*=Standard Deviation *df*=Degrees of Freedom

Table 4.21 interprets the “science process skill” in the dimensions of five corresponding dimensions. The first dimension observation skill was found to have a mean “post-test” score of 5.675 and a mean “delayed post-test” score of 6.225. The SD value of the observation skill was found to be 1.591 and 1.230 respectively for the “post-test” as well as the delayed “post-test”. The obtained t value 5.448 was found to be greater than the tabled t value and hence the two mean scores are having significant difference in them on comparison.

The second dimension comparison skill was found to have a mean “post-test” score of 7.950 and a mean “delayed post-test” score of 7.975. The SD value of the comparison skill was found to be 1.853 and 1.732 respectively for the “pre-test” as well as the “post-test”. The obtained t value 0.240 was found to be lower than the tabled t value and hence the two mean scores are having no significant difference in them on comparison.

The third dimension classification skill was found to have a mean “post-test” score of 5.500 and a mean “delayed post-test” score of 6.175. The SD value of the classification skill was found to be 1.797 and 1.357 respectively for the “post-test” as well as the “delayed post-test”. The obtained t value 5.152 was found to be greater than the tabled t value and hence the two mean scores are having significant difference in them on comparison.

The fourth dimension measurement skill was found to have a mean “post-test” score of 6.325 and a mean “delayed post-test” score of 6.675. The SD value of the measurement skill was found to be 1.927 and 1.575 respectively for the “pre-test” as well

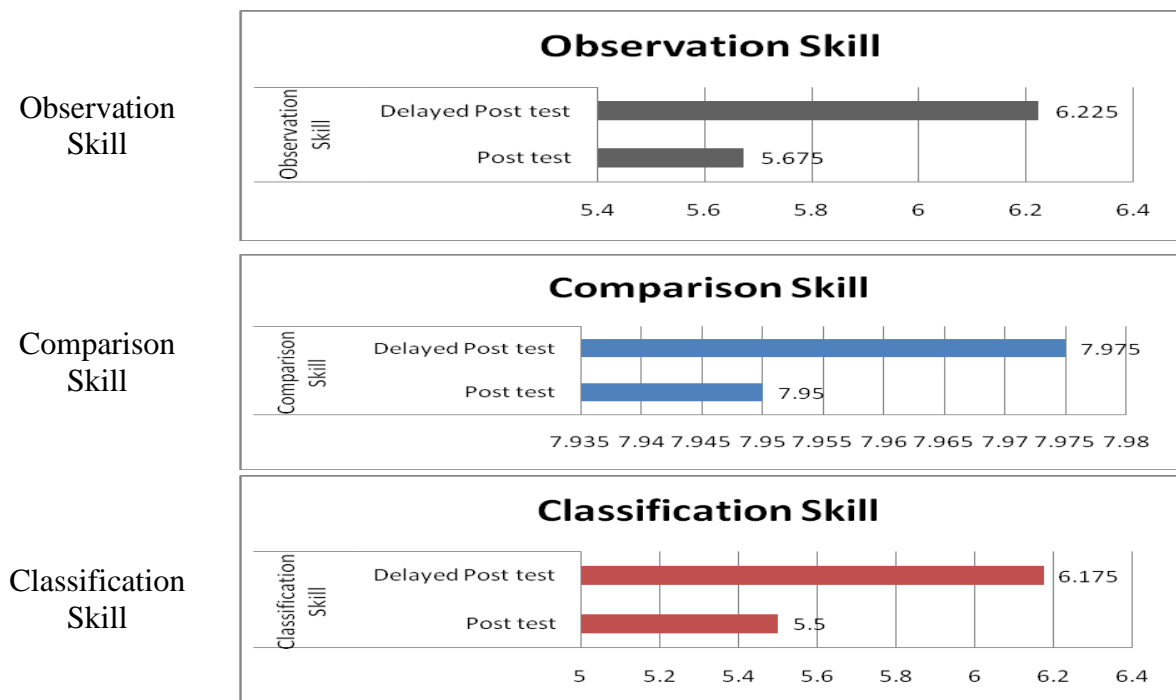
as the “post-test”. The obtained t value 2.876 was found to be greater than the tabled t value and hence the two mean scores are having significant difference in them on comparison.

The fifth dimension model making skill was found to have a mean “post-test” score of 7.500 and a mean “delayed post-test” score of 7.675. The SD value of the model making skill was found to be 1.797 and 1.623 respectively for the “post-test” as well as the “delayed post-test”. The obtained t value 1.361 was found to be lower than the tabled t value and hence the two mean scores are having no significant difference in them on comparison.

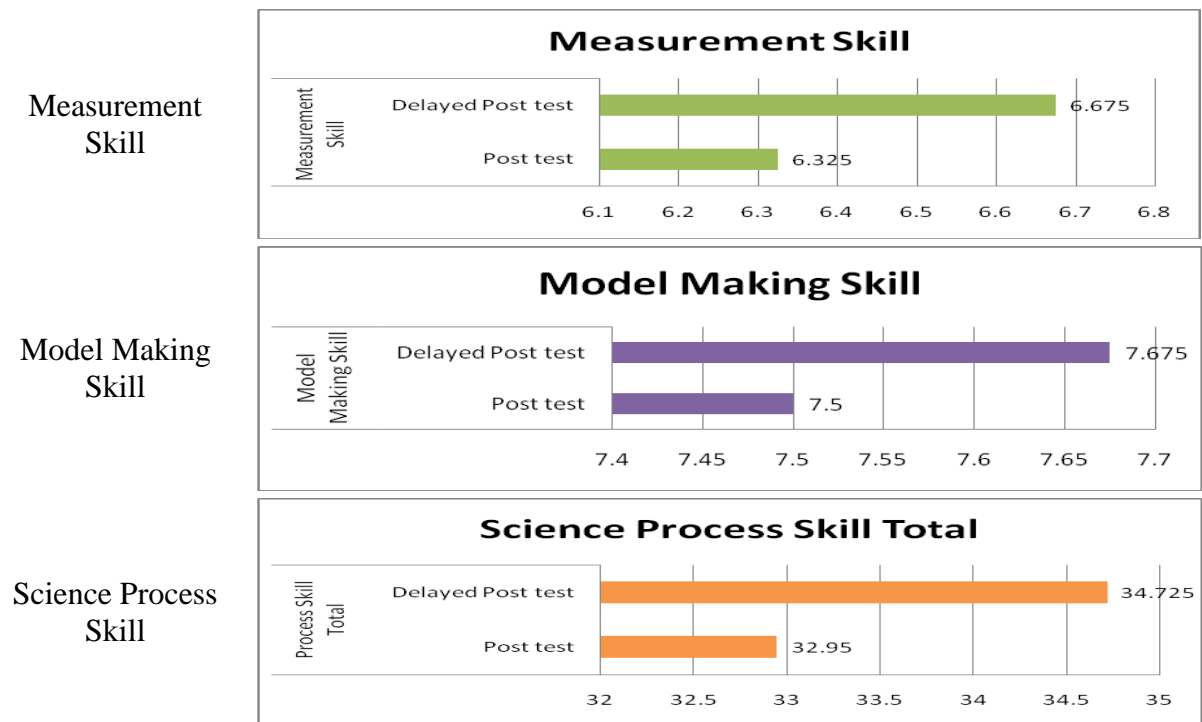
The variable “science process skill” total value was found to have a mean “post-test” score of 32.950 and a mean “delayed post-test” score of 34.725. The SD value of the “science process skill” was found to be 4.862 and 4.332 respectively for the “post-test” as well as the “delayed post-test”. The obtained t value 7.517 was found to be greater than the tabled t value and hence the two mean scores are having significant difference in them on comparison. The tabled interpretations can be diagrammatically explained on the basis of the following bar diagrams.

Figure 4.23

Comparison of means of “Science Process Skill” and the individual dimensions Malampuzha Asram School Retention test



Contd...



Discussion of Results

The results show that there is a significant difference between the mean “post-test” and the “delayed post-test” score of science process skill in the Malampuzha Asram School, Palakkad. The “post-test” mean scores are lower than the “delayed post-test” mean scores for all the three dimensions viz; observation, classification, measurement and process skill total score except the remaining two dimensions viz; comparison and model making skill which mean that the module has been effective in increasing and improving the total process skill of the sample. Each dimension of the process skill except the two dimensions viz; comparison and model making skill were found to be significant and the mean score of the “delayed post-test” were higher than the “post-test” score of all the respective dimensions. Thus it can be interpreted that the science process skill has a desirable enhancement by the administration of the module in experiential learning irrespective of the time lapse of two weeks in the administration of the delayed “post-test” in the sample.

Thus the hypothesis that has been stated as there exists no significant difference in the “post-test” and the “delayed post-test” in “science process skills” in tribal students is thus accepted for comparison and model making skill and rejected for observation, classification, measurement and total science process skill for Malapuram Asram school.

Table 4.22*Retention test Science Process Skill: Nilambur Asram School*

| Skill | Group | Mean | SD | t-value | df |
|----------------------|---------------------|--------|--------|---------|----|
| Observation Skill | “post-test” | 6.975 | 1.901 | 2.504** | 39 |
| | “Delayed post-test” | 7.275 | 1.502 | | |
| Comparison Skill | “post-test” | 7.650 | 1.424 | 0.552 | |
| | “Delayed post-test” | 7.725 | 1.176 | | |
| Classification Skill | “post-test” | 6.025 | 1.717 | 3.356** | |
| | “Delayed post-test” | 6.575 | 1.412 | | |
| Measurement Skill | “post-test” | 7.825 | 1.647 | 1.125 | |
| | “Delayed post-test” | 8.000 | 1.502 | | |
| Model Making Skill | “post-test” | 8.550 | 1.4491 | 1.125 | |
| | “Delayed post-test” | 8.725 | 1.4498 | | |
| Process Skill Total | “post-test” | 37.025 | 4.306 | 5.088** | |
| | “Delayed post-test” | 38.300 | 4.127 | | |

Note. ** $p < .01$. SD=Standard Deviation df=Degrees of Freedom

Table 4.22 interprets the science process skill in the dimensions of five corresponding dimensions. The first dimension observation skill was found to have a mean “post-test” score of 6.975 and a mean “delayed post-test” score of 7.275. The SD value of the observation skill was found to be 1.901 and 1.502 respectively for the “post-test” as well as the “delayed post-test”. The obtained t value 2.504 was found to be greater than the tabled t value and hence the two mean scores are having significant difference in them on comparison.

The second dimension comparison skill was found to have a mean “post-test” score of 7.650 and a mean “delayed post-test” score of 7.725. The SD value of the comparison skill was found to be 1.424 and 1.176 respectively for the “post-test” as well as the “delayed post-test”. The obtained t value 0.552 was found to be lower than the tabled t value and hence the two mean scores are having no significant difference in them on comparison.

The third dimension classification skill was found to have a mean “post-test” score of 6.025 and a mean “delayed post-test” score of 6.575. The SD value of the classification skill was found to be 1.717 and 1.412 respectively for the “post-test” as well as the “delayed post-test”. The obtained t value 3.356 was found to be greater than the tabled t value and hence the two mean scores are having significant difference in them on comparison.

The fourth dimension measurement skill was found to have a mean “post-test” score of 7.825 and a mean “delayed post-test” score of 8.000. The SD value of the measurement skill was found to be 1.647 and 1.502 respectively for the “post-test” as well as the “delayed post-test”. The obtained t value 1.125 was found to be greater than the tabled t value and hence the two mean scores are having no significant difference in them on comparison.

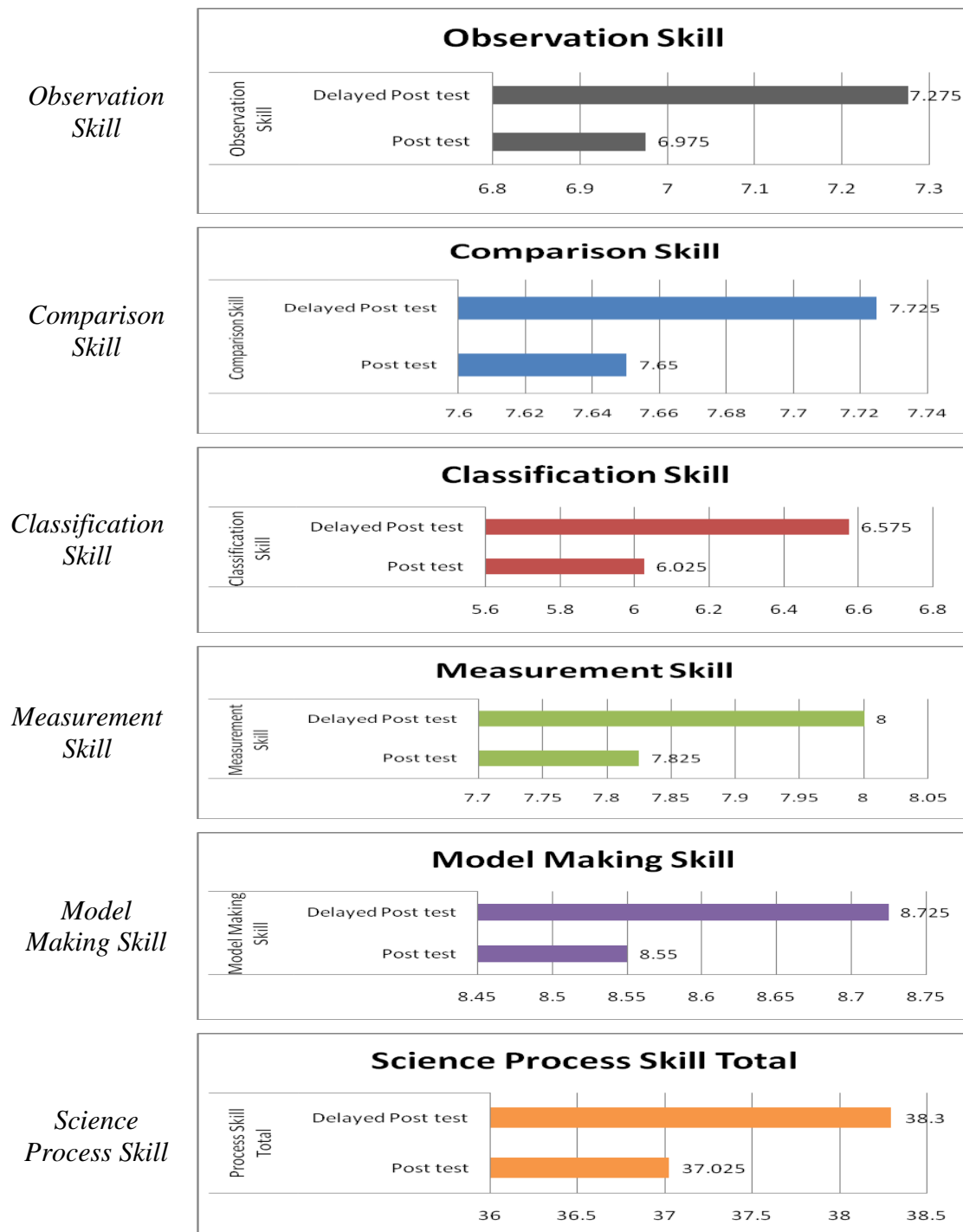
The fifth dimension model making skill was found to have a mean “post-test” score of 8.550 and a mean “delayed post-test” score of 8.725. The SD value of the model making skill was found to be 1.4491 and 1.4498 respectively for the “post-test” as well as the delayed “post-test”. The obtained t value 1.125 was found to be lower than the tabled t value and hence the two mean scores are having no significant difference in them on comparison.

The variable “science process skill” total value was found to have a mean “post-test” score of 37.025 and a mean “delayed post-test” score of 38.300. The SD value of the process skill was found to be 4.306 and 4.127 respectively for the “post-test” as well as the “delayed post-test”. The obtained t value 5.088 was found to be greater than the tabled t value and hence the two mean scores are having significant difference in them on comparison.

The tabled interpretations can be diagrammatically explained on the basis of the following bar diagrams are drawn.

Figure 4.24

Comparison of means of Science Process Skill and the individual dimensions Nilambur Asram School Retention Test



Discussion of Results

The results show that there is a significant difference between the mean “post-test” and the “delayed post-test” score of “science process skill” in the IGM MR Asram School Nilambur, Malappuram for three dimensions comparison, measurement and model making

skill and that the “post-test” mean scores are lower than the “delayed post-test” mean scores for the all the dimensions which mean that the module has been effective in increasing and improving the total “science process skill” of the sample. Each dimension of the “science process skill” except the three dimensions viz; comparison, measurement and model making skill were found to be significant and the mean score of the “post-test” were lower than the “delayed post-test” score for all the respective dimensions. Thus it can be interpreted that the “science process skill” has a desirable increase and enhancement by the administration of the module in experiential learning irrespective of the time lapse of two weeks in the administration of the “delayed post-test” in the sample.

Thus the hypothesis that has been stated as there exists no significant difference in the “post-test” and the “delayed post-test” in “science process skills” in tribal students is thus accepted for comparison, measurement and model making skill and rejected for observation, classification and total science process skill for Nilambur Asram school.

4.2.3.2.2 “Scientific Attitude”

The major statistical analysis of the “post-test” scores and the “delayed post-test” scores of “Scientific Attitude” for the two tribal groups belonging to two different schools are discussed.

Analysis of significance in the mean “post-test” scores and the “delayed post-test” scores:

The test of significance of difference was conducted to find out the difference in the mean “post-test” scores and the “delayed post-test” scores of the students studying in Malampuzha Asram School, Palakkad. The data and result of analysis of the sample are given in the Table 4.23

Table 4.23

Retention test “Scientific Attitude”

| Sample | N | Group | M | SD | t value | df |
|------------|----|---------------------|--------|--------|----------|----|
| Malampuzha | 40 | “post-test” | 200.03 | 12.974 | 15.004** | 39 |
| | | Delayed “post-test” | 246.95 | 20.554 | | |
| Nilambur | 40 | “post-test” | 220.85 | 11.659 | 9.760** | |
| | | Delayed “post-test” | 246.33 | 17.320 | | |

Note. ** p< .01. SD=Standard Deviation df=Degrees of Freedom

Table 4.23 values describe the “Scientific Attitude” scores attained by the samples of both Nilambur and Malampuzha Asram Schools.

The “post-test” scores of the Malampuzha Asram School were found to have a mean value of 200.03 and SD value of 12.974. The delayed “post-test” scores of the same were found to have a mean value of 246.95 and SD value of 20.554. The obtained t value was 15.004 which was found to be higher than the tabled t value and hence the “post-test” and the “delayed post-test” scores are significantly different from each other at 0.01 level of significance.

The “post-test” scores of the Nilambur IGMMR Asram School were found to have a mean value of 220.85 and SD value of 11.659. The “delayed post-test” scores of the same were found to have a mean value of 246.33 and SD value of 17.320. The obtained t value was 9.760 which was found to be higher than the tabled t value and hence the “post-test” and the “delayed post-test” scores were significantly different from each other at 0.01 level of significance.

The interpretation can be diagrammatically represented in the form of bar diagrams as shown below in Figure 4.25.

Figure 4.25

Comparison of mean values of “Scientific Attitude” Malampuzha Asram School Retention Test

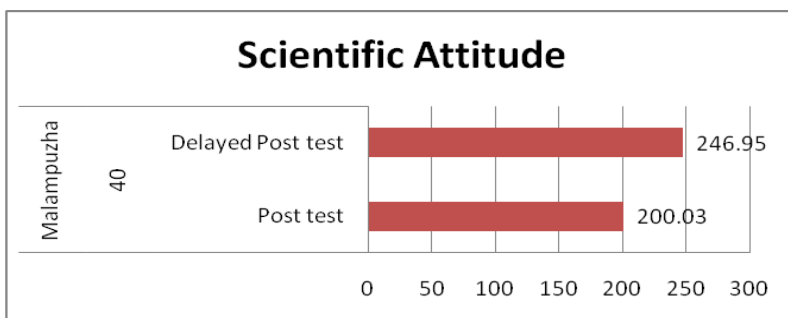
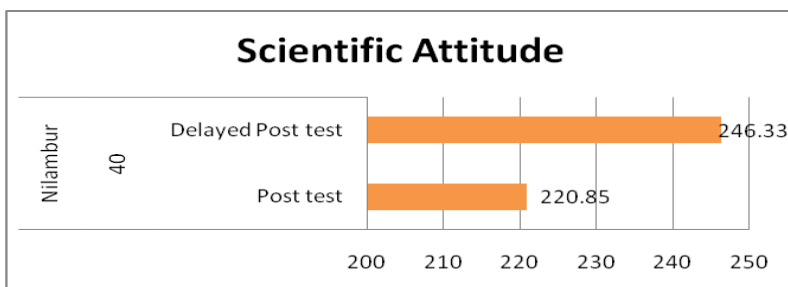


Figure 4.26

Comparison of mean values of “Scientific Attitude” Nilambur Asram School Retention Test



Discussion of results

The results show that there is a significant difference between the mean “post-test” and the “delayed post-test” score of “Scientific Attitude” in both the schools of Malampuzha and Nilambur. The “post-test” mean scores are lower than the “delayed post-test” mean scores which mean that the module has been effective in increasing and improving the “Scientific Attitude” of the sample irrespective of the time lapse of two weeks for conducting the “delayed post-test”. Thus the module was effective enough in enhancing the attitude of the sample towards science and its practical applications in daily lives.

Thus the hypothesis that has been stated as there exists no significant difference in the “post-test” and the “delayed post-test” in “Achievement in Science”, “Scientific Attitude” and “Science Process Skills” in tribal students is partially rejected.

4.2.3.2.3 “Achievement in Science”

The major statistical analysis of the “post-test” scores and the “delayed post-test” scores of “Scientific Attitude” for the two tribal groups belonging to two different schools are discussed.

Analysis of significance in the mean post-test scores and the “delayed post-test” scores:

The test of significance of difference was conducted to find out the difference in the mean post-test scores and the “delayed post-test” scores of the students studying in Malampuzha Asram School, Palakkad and Nilambur Asram School, Malappuram. The data and result of analysis of the sample are given in the Table 4.24

Table 4.24

Retention test “Achievement in science”

| Sample | N | Group | M | SD | t value | df |
|------------|----|---------------------|-------|-------|----------|----|
| Malampuzha | 40 | “post-test” | 43.40 | 5.462 | 13.549** | 39 |
| | | “Delayed post-test” | 34.90 | 5.995 | | |
| Nilambur | 40 | “post-test” | 44.60 | 6.946 | 10.491** | |
| | | “Delayed post-test” | 37.05 | 5.791 | | |

Note. ** $p < .01$. SD=Standard Deviation df=Degrees of Freedom

Table 4.24 values describe the test of significance of difference in the mean “post-test” and the mean delayed “post-test” scores of Malampuzha Asram School, Palakkad and Nilambur IGMMR School, Malapuram.

The mean value of the “post-test” conducted in Malampuzha Asram School is found out as 43.40 and the SD value is 5.462. The mean value of the delayed “post-test” conducted in Malampuzha Asram School is found out as 34.90 and the SD value is 5.995. It can be seen that the t-value of the two means of the “post-test” and the delayed “post-test” is significantly different and that the tabled value of t-value is lower than the t-value obtained. The obtained t-value is 13.549 which is higher than the tabled t-value which suggests that the result is significant at 0.01 level of significance.

The mean value of the “post-test” conducted in Nilambur IGMMR Asram School is found out as 44.60 and the SD value is 6.946. The mean value of the “post-test” conducted in Nilambur IGMMR Asram School is found out as 37.05 and the SD value is 5.791. It can be seen that the t-value of the two means of the “post-test” and the “delayed post-test” is significantly different and that the tabled value of t-value is lower than the t-value obtained. The obtained t-value is 10.491 which is higher than the tabled t-value which suggests that the result is significant at 0.01 level of significance.

The table values can be described in the form of a figure 4.27 and 4.28 wherein the “post-test” and the “delayed post-test” means are plotted. The figure shows the comparison of mean values of the “post-test” and “ delayed post-test” scores.

Figure 4.27

Comparison of means in Malampuzha Asram School Retention Test

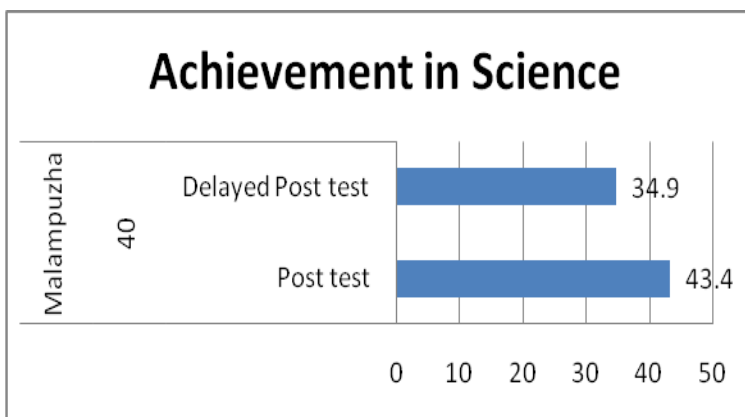
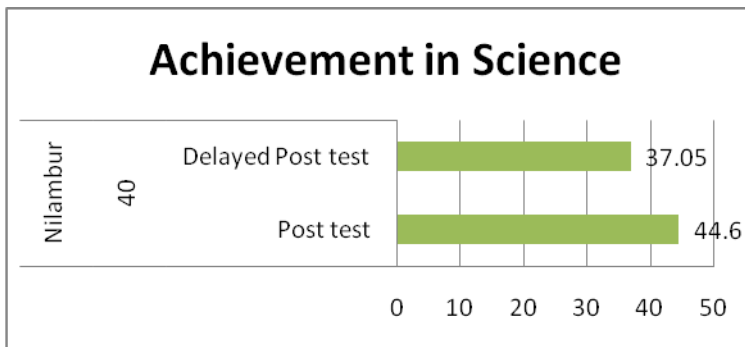


Figure 4.28

Comparison of means in Nilambur Asram School Retention Test



Discussion of the results

The results show that there is significant difference between the mean “post-test” and the delayed “post-test” score of science achievement in both the schools of Malampuzha and Nilambur. The “post-test” mean scores are higher than the delayed “post-test” mean scores which means that the memory retention has slightly decreased when compared with the “pre-test” and the “post-test” comparison. The module was effective in increasing the achievement score of the sample in both the schools in the “post-test”. The “delayed post-test” results suggest a decrease in the mean score of achievement. The “delayed post-test” was conducted two weeks after administration of the “post-test”. The researcher find that the achievement test results that was administered in the “delayed post-test” show that the memory retention capacity of the sample has slightly decreased when compared with the “post-test” results.

Thus the hypothesis that has been stated as there exists no significant difference in the “post-test” and the delayed “post-test” in “achievement in science”, “scientific attitude” and “science process skills” in tribal students is rejected.

Thus the hypothesis that has been stated as there exists no significant difference in the “post-test” and the delayed “post-test” in “achievement in science”, “scientific attitude” and “science process skills” in tribal students is thus fully rejected.

4.2.3.3 To classify the different types of learners according to Kolb’s Experiential Learning Style and to find out the effectiveness of Experiential Learning module on the “achievement in science”, “science process skills” and “scientific attitude” of the secondary school tribal students based on their learning style

The different types of learners identified as per the Kolb’s Learning Style Inventory among the tribal student sample of both the Asram Schools are discussed below.

The results are recorded in different tables shown below for both the “pre and the post-test”.

4.2.3.3.1 Kolb’s Learning Style: Asram School Malampuzha

Table 4.25 discusses the different types of learners in the pre and the “post-test” conducted in Malampuzha Asram School, Palakkad. Table 26 discusses the achievement test scores of the learners in the “pre and the post-test” conducted in Malampuzha Asram School.

Table 4.25

Kolb’s Learning Style Malampuzha Asram School, Palakkad

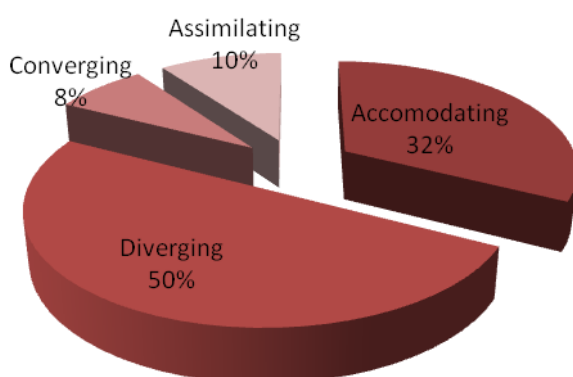
| Types of Learners | N | Accomodating | Diverging | Converging | Assimilating |
|--------------------------------|----|--------------|-----------|------------|--------------|
| <i>Malampuzha Asram School</i> | 40 | 13 | 20 | 3 | 4 |

The administration of the Kolb’s Learning Style Inventory finds that out of the total sample of 40 students, thirteen of them fall under accommodating group, twenty fall under diverging group, three under converging group and four under assimilating type.

The learning styles of the students can be interpreted diagrammatically with the help of pie diagram in Figure 4.29.

Figure 4.29

Pie diagram showing the percentage of types of learning style in Malampuzha Asram School



The analysis of the test of significance of difference between the mean scores of “achievement in science”, “science process skills” and the “scientific attitude” of the secondary school tribal students studying in Class VIII of Asram School Malampuzha can be found out using ANOVA. Data and results of the test of significance of difference between the mean scores of “achievement in science”, “science process skills” and the

“scientific attitude” of the secondary school tribal students studying in Class VIII of Asram School Malampuzha based on their learning styles is shown in the table 4.26.

Table 4.26

Data and results of the test of significance of difference between mean score of “science process skills”, “scientific attitude” and “achievement in science” of the secondary school tribal students studying in Asram School Malampuzha based on their learning styles

| Variable | Groups | Sum of squares | df | Mean squares | F |
|--------------------------|----------------|----------------|----|--------------|-------|
| “Science process skills” | Between groups | 8.360 | 3 | 2.787 | 0.110 |
| | Within groups | 913.540 | 36 | 25.376 | |
| | TOTAL | 921.900 | 39 | | |
| “Scientific attitude” | Between groups | 282.585 | 3 | 94.195 | 0.540 |
| | Within groups | 6282.390 | 36 | 174.511 | |
| | TOTAL | 6564.975 | 39 | | |
| “Achievement in science” | Between groups | 44.973 | 3 | 14.991 | 0.482 |
| | Within groups | 1118.627 | 36 | 31.073 | |
| | TOTAL | 1163.600 | 39 | | |

Note. df=Degrees of Freedom

From Table 4.26 it can be seen that the calculated value of F (3,36) of each of the mean scores of “Achievement in Science”, “Scientific attitude” and “Science process skills” is lesser than the table value at 0.05 level of significance. It means that there exists no significant difference in the mean scores of “achievement in science”, “science process skills” and “scientific attitude” of the secondary school tribal student studying in Class VIII of Asram School Malampuzha based on their respective learning styles.

Discussion of results

The Learning style of the sample has been identified to be falling in more of diverging type in the sample according to Kolb’s Learning Style Inventory. It can be seen that the percentage of the diverging learning style learners comprises of 50 percent of the sample and the accommodating learning style learners amounts to 32 percent of the sample. The rest two learning style learners are comparatively lesser in terms of number and percentage. Thus it can be seen that it is the module administration that has helped the students to enhance their mean scores of “achievement in science”, “science process skills” and the “scientific attitude” rather than their respective learning styles. It is through their respective learning styles the students attend each activity and involve in every

practical session. It has no significant effect in enhancing their mean scores while the involvement in the module makes the difference.

4.2.3.3.2 Kolb’s Learning Style: Nilambur IGMMR Asram School Malappuram

The Table 4.27 discusses the learning style of the sample in the Nilambur IGMMR Asram School, Malappuram and discusses the different types of learners in the pre and the “post-test” conducted in Nilambur IGMMR Asram School, Malappuram.

Table 4.27

Kolb’s Learning Style: Nilambur IGMMR Asram School, Malappuram

| Types of Learners | N | Accomodating | Diverging | Converging | Assimilating |
|--|----|--------------|-----------|------------|--------------|
| <i>Nilambur IGMMR Asram School, Malappuram</i> | 40 | 10 | 19 | 5 | 6 |

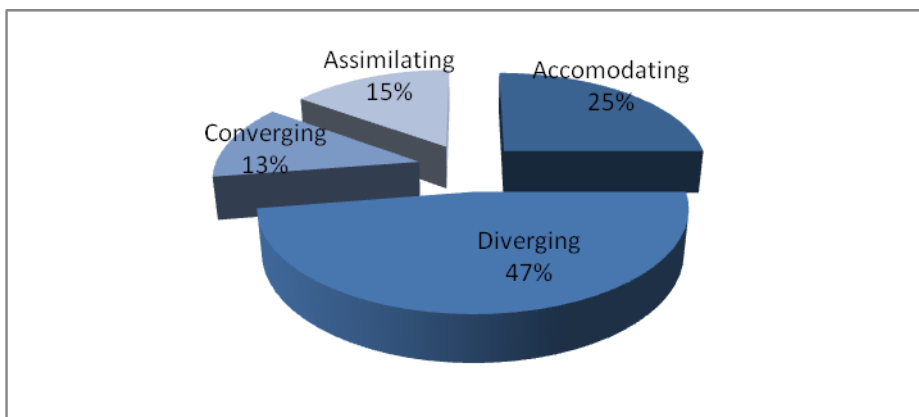
Table 4.27 results can be interpreted as follows:

The “pre-test” administration of the Kolb’s Learning Style Inventory finds that out of the total sample of 40, 10 of them fall under accommodating group, 19 fall under diverging group, 5 under converging group and 6 under assimilating group.

The tabular results can be interpreted diagrammatically with the help of pie diagrams in Figure 4.30.

Figure 4.30

Pie diagram showing the percentage of types of learning style in Nilambur IGMMR School, Malappuram



The analysis of the test of significance of difference between the mean scores of “Science process skills”, “Scientific attitude” and the “Achievement in science”, based on their learning styles of the secondary school tribal students studying in Class VIII of

IGMMR Asram School Nilambur, Malappuram can be found out using ANOVA and the results are given in Table 4.28

Table 4.28:

Data and results of the test of significance of difference between mean score of “science process skills”, “scientific attitude” and the “achievement in science”, of the secondary school tribal students studying in Asram School Nilambur based on their learning styles

| Variable | Groups | Sum of squares | df | Mean squares | F |
|--------------------------|----------------|----------------|----|--------------|-------|
| “science process skills” | Between groups | 23.636 | 3 | 7.879 | |
| | Within groups | 699.339 | 36 | 19.426 | 0.310 |
| | TOTAL | 722.975 | 39 | | |
| “scientific attitude” | Between groups | 133.374 | 3 | 44.458 | |
| | Within groups | 5167.726 | 36 | 143.548 | 0.406 |
| | TOTAL | 5301.100 | 39 | | |
| “achievement in science” | Between groups | 15.967 | 3 | 5.322 | |
| | Within groups | 1865.633 | 36 | 51.823 | 0.103 |
| | TOTAL | 1881.600 | 39 | | |

Note. df=Degrees of Freedom

From table 4.28 it can be seen that the calculated value of F (3,36) of each of the mean scores of “achievement in science”, “scientific attitude” and “science process skills” is lesser than the table value at 0.05 level of significance. It means that there exists no significant difference in the mean scores of “achievement in science”, “science process skills” and “scientific attitude” of the secondary school tribal students studying in Class VIII of IGMMR Asram School Nilambur, based on their respective learning styles. Since there is no significant difference in the total scores calculated, there is no need of calculating the post hoc tests to determine the within groups significance.

Discussion of results

The Learning style of the sample has been identified to be falling in more of diverging type in the sample according to Kolb’s Learning Style Inventory. It can be seen that the percentage of the diverging learning style learners comprises of 47 percent of the sample and the accommodating learning style learners amounts to 25 percent of the

sample. The rest two learning style learners are comparatively lesser in terms of number and percentage. Thus it can be seen that it is the module administration that has helped the students to enhance their mean scores of “Achievement in Science”, “Science Process Skills” and the “Scientific Attitude” rather than their respective learning styles. It is through their respective learning styles the students attend each activity and involve in every practical session. It has no significant effect in enhancing their mean scores while the involvement in the module makes the difference.

Learning style and the achievement of the sample in both Asram Schools

According to Kolb, there are four different types of learners classified according to the different learning styles. They are convergers, divergers, accommodators and assimilators. It can be clearly seen from the analysis that the Learning style of the sample in both the Asram Schools are mainly falling under the diverging type and after the administration of the module in experiential learning it can be seen that the mean scores of “Achievement in Science”, “Science Process Skills” and the “Scientific Attitude” of the sample is significantly differing in the “post-test” in comparison to the “pre-test” administered earlier on the sample. Thus it can be seen that the module administration when properly done with planned activities that suits the learning styles of the majority of the sample, it has a significant effect in enhancing the achievement of the sample. Each of the learners adopts their own respective learning style to attend the activities and involve in the module. The experiential learning package suits the different types of learners in the sample and hence there is an evident and significant increase in the dependent variables after the administration of the package. Learning style alone cannot make a considerable significant change in their mean scores and that it should be matched up with the package for effective results. Thus the hypothesis is partially substantiated.

4.3 TENABILITY OF HYPOTHESES

Hypothesis 1: There exists no distinct different level of “Scientific Attitude and Achievement in Science” among secondary school tribal students.

The hypothesis stated that there exist no distinct different levels of “Achievement in Science” and “Scientific Attitude” among the secondary school tribal students studying in Class VIII in Malampuzha and Nilambur Asram Schools of Kerala. The results suggest that there exist distinct and different levels of “Achievement in Science” and “Scientific

Attitude” among the secondary school tribal students as “high group”, “low group” and “average group”. Thus the null hypothesis is rejected.

Hypothesis 2: There exists no correlation between the “Science Process Skills, Scientific Attitude and Achievement in Science” of secondary school tribal students.

From the obtained value of r (0.987), it can be inferred that there exists a significant positive linear relationship between “Achievement in Science and Scientific Attitude” of the students of Malampuzha Asram School, Palakkad. The value of obtained r also denotes a high relationship between the two variables. From the obtained value of r (0.958), it can be inferred that there exists a significant positive linear relationship between “Achievement in Science and Scientific Attitude” of the students of Nilambur IGMMR Asram School, Malappuram. The value of obtained r also denotes a high relationship between the two variables. This suggests that there is a significant relationship between “Achievement in Science” and “Scientific Attitude” of the sample.

The results on correlation between “Science Process Skills”, “Scientific Attitude” and “Achievement in Science” also concludes that there don’t exist a significant positive correlation between “Science Process Skills” and “Achievement in Science” of $r(0.292)$ in Malampuzha Asram School and $r(0.127)$ in Nilambur Asram School and a similar significant positive correlation between “Science Process Skills” and “Scientific Attitude” of $r(0.256)$ in Malampuzha Asram School and $r(0.060)$ in Nilambur Asram School respectively.

The hypothesis stated as, there exists no correlation between the “Achievement in Science”, “Scientific Attitude” and “Science Process Skills” of secondary school tribal school students is thus rejected for the correlation between “Achievement in Science and Scientific Attitude” while accepted for the correlation between “Science Process Skills and Scientific Attitude” and “Science Process Skills and Achievement in Science”.

Hypothesis 3: Experiential pedagogy has no significant effect in increasing the “Science Process Skills”, “Scientific Attitude” and “Achievement in Science” of the secondary school tribal students.

The results show that there is a significant difference of t (25.374, 32.004, 80.240) between the mean “pre-test” ($M= 20.250, 190.70, 21.90$) and the “post-test”(32.950, 200.03, 44.60) score of “Science Process Skill, Scientific Attitude and Achievement in

Science” of both the schools in Malampuzha and Nilambur. The mean pre-test scores and the post-test scores of the dependent variables, “Science Process Skill, Scientific Attitude and Achievement in Science” (M= 21.45,207.73,24.33) and (M=37.025,220.85,44.60) which also showed a significant t value of (25.374,32.004,56.629). The “pre-test” mean scores are comparatively lower than the “post-test” mean scores which mean that the module has been significantly effective in increasing and enhancing the mean scores of “Achievement in Science”, “Scientific Attitude” and the “Science Process Skills” of the sample. Each dimension of the “Science Process Skills” was found to be significant and the mean score of the “post-test” were higher than the “pre-test” score of the respective dimension.

Thus the hypothesis that has been stated as Experiential pedagogy has no significant effect in increasing the, “Science Process Skills” “Scientific Attitude” and the “Achievement in Science” of the secondary school tribal students is thus rejected.

Hypothesis 4: There exists no significant difference in the post-test and the delayed post-test in “Science Process Skills, Scientific Attitude and Achievement in Science” in secondary school tribal students.

The results show that there is a significant difference between the mean “post-test” and the “delayed post-test” score of “Achievement in Science” (t=13.549, 10.491) and “Scientific Attitude” (t=15.004, 9.760) in both the schools of Malampuzha and Nilambur. The “post-test” (M= 200.03, 220.85) mean scores are lower than the “delayed post-test” (M=246.95,246.33) mean scores in “Scientific Attitude” which mean that the module has been effective in increasing and improving the “Scientific Attitude” of the sample irrespective of the time lapse of two weeks for conducting the “delayed post-test”. The “post-test”(M=43.40, 34.90) mean score was higher than the “delayed post-test” (M=44.60, 37.05) mean score for the “Achievement in Science” which means that the time lapse had a significant impact on “Achievement in Science”. Thus the practice of the pedagogical instruction should be made continuous for getting successful results in enhancing the achievement of the sample but the module was effective enough in enhancing the attitude of the sample towards science and its practical applications in daily lives.

The “post-test” mean scores(M=5.675,5.500,6.325,32.950) are lower than the “delayed post-test” mean scores(M=6.225,6.175,6.675,34.725) for all the three dimensions

viz; observation, classification, measurement and science process skill total score except the remaining two dimensions viz; comparison and model making skill in the Govt. Asram School, Malampuzha which mean that the module has been effective in increasing and improving the total “Science Process Skills” of the sample with a significant t value of ($t=5.448, 5.152, 2.876, 7.517$). Each dimension of the “Science Process Skill” except the two dimensions viz; comparison and model making skill were found not to be significant though the mean score ($M=7.950, 7.500$) of the “post-test” were slightly higher than the “delayed post-test” score ($M=7.975, 7.675$) of the respective dimension. The “post-test” mean scores ($M=6.975, 6.025, 37.025$) are lower than the “delayed post-test” mean scores ($M=7.275, 6.575, 38.300$) for the two dimensions viz; observation, classification and science process skill total score except the remaining three dimensions viz; comparison, measurement and model making skill in IGMMR Asram School, Nilambur, Malappuram which mean that the module has been effective in increasing and improving the total science process skill of the sample with a significant t value of ($2.504, 3.506, 5.088$). Each dimension of the “Science Process Skill” except the three dimensions viz; comparison, measurement and model making skill were found not to be significant and the mean score of the “post-test” ($M=7.650, 7.825, 8.550$) were higher than the “delayed post-test” score ($M=7.725, 8.000, 8.725$) of the respective dimension.

Thus in both the schools, it can be interpreted that the “Science Process Skills” has a desirable increase and enhancement by the administration of the module in experiential learning irrespective of the time lapse of two weeks in the administration of the delayed “post-test” in the sample. The science process skill of the sample had an improvement irrespective of the time lapse of three weeks in administering the “delayed post-test”. Thus the hypothesis that has been stated as there exists no significant difference in the “post-test” and the “delayed post-test” in “Science Process Skills”, “Scientific Attitude” and “Achievement in Science” in tribal students is thus fully rejected.

Hypothesis 5: There exists no distinct and different types of learners based on learning styles.

The Learning style of the sample has been identified to be falling in more of diverging type in the sample according to Kolb’s Learning Style Inventory. It can be seen that in Asram School Malampuzha, Palakkad the percentage of the diverging learning style learners comprises of 50 percent of the sample and the accommodating learning style

learners amounts to 32 percent of the sample. The rest two learning style learners are comparatively lesser in terms of number and percentage. It can be seen that in IGMMR Asram School, Nilambur, Malappuram the percentage of the diverging learning style learners comprises of 47 percent of the sample and the accommodating learning style learners amounts to 25 percent of the sample. The rest two learning style learners are comparatively lesser in terms of number and percentage.

Thus the hypothesis as, there exists no distinct and different types of learners based on learning styles is thus rejected.

Hypothesis 6: There exists no significant difference in “Science Process Skills, Scientific Attitude and Achievement in Science” of secondary school tribal students based on their learning style.

It can be seen from the results that it is the module administration that has helped the students to enhance their mean scores of “Science Process Skills”, “Scientific Attitude” and “Achievement in Science” based on their respective learning styles. It is through their respective learning styles the students attend each activity and involve in every practical session. It has no significant effect in enhancing their mean scores while the involvement in the module makes the difference since the F value for both the schools for the dependent variables “Science Process Skills, Scientific Attitude and Achievement in Science” were found to be $F(0.110,0.540,0.482)$ in Malampuzha Asram School and $F(0.310,0.406,0.103)$ in Nilambur Asram School which is lower than the tabled value of 2.87 at 0.05 level of confidence for $F(3.36)$ in both the schools.

Thus the hypothesis stated as, there exists no significant difference in “Science Process Skills”, “Scientific Attitude” and “Achievement in Science”, of secondary school tribal students based on their learning style is thus accepted.

4.4 Qualitative Interpretations

4.4.1 Focus Group Interview Schedule Analysis on ELPSS Package and Administration

After the intervention, the researcher decided to get the feedback on ELPSS package from the students and teachers. The focus group methodology was administered in the sample and teachers for collection of qualitative data about ELPSS effectiveness. The researcher prepared eleven open ended questions for teachers and sixteen open ended questions for the students. All the students were provided with written format of the

qualitative questions, and they were provided with paper and pencil to write any notes if needed. The teachers also were given sufficient time to write and record their opinions. Sufficient time given to them thus helped them to think over each question, prepare notes and to provide good and elaborate answers before each question got complete. Before making they write answers, the researcher read out each question loudly and the respondents were provided with four to six minutes for writing answers which was then followed by a thirty minute discussion by all the students in the focus group. The asking of questions alone was done by the researcher and there was no purposeful intention from the part of researcher to intervene in any form or kind that moderated the discussed in any means. The teachers were included in a separate interview discussion where they were welcomed for their suggestions and opinions on the ELPSS package. The focus groups were conducted in the Malayalam language as all the participants were comfortable with that language. The researcher audio-recorded, transcribed and then translated the Malayalam focus group discussions into English and then was qualitatively analyzed. No images or video recordings were made during the focus groups. After the transcripts were analyzed, all audio recordings were deleted and no personal information was recorded. The responses from the students and the teachers are analysed and presented in Table 29 and Table 30 respectively.

The analysis of the students' responses to the questions used in the focus groups are analysed and presented in Table 4.29

Table 4.29

Analysis of students' response towards ELPSS

| Sl.No: | Question | Responses | Number of responses | Percentage |
|--------|--|---|---------------------|------------|
| 1. | What were the difficulties that you felt during the activity involvement ? | Difficulty in conceiving the concepts | 28 | 70 |
| | | Difficulty in drawing models | 6 | 15 |
| | | Difficulty in answering the questions that followed after each activity | 4 | 10 |
| | | Difficulty in participating in the activities | 2 | 5 |
| 2. | Which were the activities that were not completed on time? | Indoor activities | 4 | 10 |
| | | Outdoor activities | 36 | 90 |

| | | | | |
|----|---|---|----|----|
| 3. | What were the reasons for not completing those activities on time? | Time for generalising the findings | 24 | 60 |
| | | Time for relating the learning experience with the activities | 6 | 15 |
| | | Time for arriving at conclusions | 8 | 20 |
| | | Time for comprehending the meaning of each questions to be answered | 2 | 5 |
| 4. | What are the advantages that you appreciate in the ELPSS package? | Has helped in enhancing the basic “science process skills” | 34 | 85 |
| | | Has helped in making the teaching learning process an easy and a fun filled one | 4 | 10 |
| | | Has helped in generating an interest towards the subject science | 2 | 5 |
| 5. | What are the limitations that you felt in the ELPSS package? | Takes more time than traditional method | 30 | 75 |
| | | Certain topics alone is suitable in this method | 4 | 10 |
| | | More resources and practical knowledge is required for transaction | 6 | 15 |
| 6. | Whether the activities and the experiences provided in the ELPSS package interesting? | Very interesting activities and motivating learning experiences | 38 | 95 |
| | | The practical aspects like interviewing, surveying and dramatising methods of the ELPSS package were more interesting rather than the theoretical ones like drawing | 2 | 5 |
| 7. | Is it interesting to learn when you are taught science using locally available materials? | Yes, it is very much interesting and thrilling | 34 | 85 |
| | | It is interesting and even an exhibition of the learning materials can be conducted | 6 | 15 |
| 8. | Whether the materials used for the activity suited the learning objectives? | Yes, all the materials used in the activities were directly related to the learning objective. | 32 | 80 |

| | | | | |
|-----|---|---|----|----|
| | | Yes, all the materials were suited to the learning objective but some of them like studying electrical connections were demanding the facilitator's help to complete properly | 8 | 20 |
| 9. | Did you involve seriously in the extended learning activities? | Extra time was required to complete the extended learning activities as concept clarity need to be attained | 28 | 70 |
| | | All such activities should be discussed in detail in the class | 6 | 15 |
| | | Notes on the extended learning activities should be supplied. | 4 | 10 |
| | | The extended learning activity completion depended upon the learner speed in conceiving the concepts. | 2 | 5 |
| 10. | What did you enjoy in ELPSS, an indoor experience or an outdoor experience? | Indoor experiences | 36 | 90 |
| | | Outdoor experiences | 4 | 10 |
| 11. | What is your opinion about the methods used by the researcher in sparking curiosity in you? | Practical methods that invoked curiosity among the learners | 38 | 95 |
| | | Burden free learning methods | 2 | 5 |
| 12. | Did you enjoy the activities and experiences in the package? | Yes, it was really enjoyable and interesting | 38 | 95 |
| | | Not that much | 2 | 5 |
| 13. | Do you think that the teaching using package like ELPSS will help you score good marks? | Yes, it has helped to improve the grades in the subject | 36 | 90 |
| | | Neutral opinion. Not sure whether this package alone has helped to achieve good grades | 4 | 10 |
| 14. | Do you think that the teaching using package like ELPSS will help you gain practical knowledge? | Yes, they have become more aware of the connection between the concepts and the daily life situations | 36 | 90 |

| | | | | |
|-----|---|---|----|----|
| | | Neutral opinion, not sure about the gain in practical knowledge | 4 | 10 |
| 15. | How well can you relate the activities with the daily life? | Yes, all the activities are directly related with the daily life activities. | 36 | 90 |
| | | No, all the activities were not directly related with the daily life activities | 4 | 10 |
| 16. | What are your suggestions for improvement of the ELPSS package? | Including more practical examples and more project works. | 36 | 90 |
| | | The package can be extended to all the subjects | 4 | 10 |

The analysis of data revealed that, seventy percent of the students had difficulty in understanding the concept of capacitors and the storage of electric charges. The activities or the experiences related to the concept was easy to perform while the concept was little tricky for them to comprehend. They were assisted by the facilitator to do the follow up activities. They found it interesting to perform the activities but a little hard to comprehend the concepts behind the same. The percentage of students who were having difficulty in drawing models and interpreting the questions following that were coming to 15 percent. Similarly 10 percent of the students were depending upon their group members and then performed the assigned activities. They told that they were having difficulty in answering the questions under each activity. Precisely, 5 percent were getting the help of the facilitator but they made sure that they completed the activities and participated in the group discussions on time.

Ninety percent of the students were of the opinion that the activity that took most of the time was the outdoor activities. They were of the opinion that they took so much time to take the data on the number of earth pits and then to understand how the earth pits are dug and what is the reason for providing good earth for all the electrical connections. It was found that 10 percent of the students had an opinion that the static electricity activities were a little difficult and time consuming than the activities in the sound chapter.

The results showed that sixty percent of the students had an opinion that the reason for not completing the activities on time was that they were experimenting with more and more cases so that they were able to generalise their findings on a particular concept. It

was also seen that 15 percent of the students were of the opinion that they took time in comprehending the experience that was given to them prior to the activities and experiments. They took time to relate that with the experiments on a particular topic. Other 20 percent of the students had an opinion that they were taking time to arrive at common discussions in their group. They were repeating the activities and the experiments to arrive at common discussions in their group. Finally the 5 percent students had an opinion that they were having difficulties in understanding the questions that the researcher asked during the activities and that they were confused in their discussions. They were able to sum up their discussions only after hearing a sample and hence they had to take more time to interpret an activity or an experiment result.

It can be seen that eighty five percent students replied that the ELPSS package has helped them in improving their basic “science process skills” like observation, comparison, classification, measurement and model making skills and that they enjoyed the outdoor learning experiences but 10 percent of the students had an opinion that the outdoor learning was more fun filled and that they enjoyed the teaching learning process in the EPSS package. The final 5 percent students were of the opinion that they were enjoying the whole teaching learning process and the package has made them have more interest towards the subject.

It was analysed that seventy five percent of the students told that they were finding it more suitable to science subjects and also the learning time is more than the traditional method. Another 10 percent of the students remarked that the only limitation with ELPSS was the selection of the topics in the ELPSS. They were of the opinion that all the chapters in the subjects cannot be practised in this manner like ELPSS. It was also found that 15 percent of the students were of the view that ELPSS need so many resources and teaching learning materials and that skill in making these materials is very much necessary for the successful use of this method.

The next question was about the nature of the activities and the experiences provided in the ELPSS package. To that, 95 percent of the students replied that the activities and the learning experiences provided were super interesting and motivating. The rest 5 percent commented that they were more involved into survey type activities rather than classroom activities. The survey type activities and the experiences provided

more exposure for them with the public and that they could understand the practical side of each concept that they are learning.

It was found that eighty five percent of the students replied that they were very much interested in getting the resources or the materials used in the ELPSS administration. Though the materials provided by the researcher are available locally, it helped in invoking the interest of the students toward the concept attainment in the subject science. Rest 15 percent of the students were interested in making the articles and they suggested that they are very much interested in conducting an exhibition of their articles so that it can be later used by them.

The ELPSS had clear learning objectives set in each module. The students were made aware of each learning objective before the commencement of each module in the ELPSS. To the question on the compatibility of the ELPSS modules to learning objectives, 80 percent had a clear cut opinion that it is very well suited and related to the learning objectives provided in each of the modules. Finally, 20 percent of the students replied that the learning objectives matched really with the ELPSS activities but the researcher help and support was required in involving in each of the activity in the package.

The question on extended learning activities was answered by 70 percent students in a manner that they could participate only after the concept clarity was attained by continuous practice and that it took time to complete the extended learning activities for some concepts such as capacitors and electroscope. Another 15 percent of the students were of the view that the extended learning activities should also be discussed in detail in the class and that the process should be mentioned to them. Other 10 percent students had a view that the notes of the extended learning activities be provided to them that it will be easy for them to construct knowledge and involve in the extended learning experiences. Finally, the rest 5 percent of the students answered that the extended learning activities were completed with the help of their group members and that some students were fast in recording the results and involving in the extended learning activities while some were dependent on these fast learners.

The sparking experiences that were given prior to the lesson introduction were rated as interesting and thrilling by 90 percent of the students. All these students were of the opinion that the outdoor learning experiences fascinated them and they felt motivated to learn the concepts after those experiences. They were of the opinion that the outdoor

learning experiences made them practically more interested towards learning the further concepts of the lesson. The rest 10 percent of the students had an opinion that they enjoyed the indoor experiences as well specially the sound experiences that were provided to them as making of musical instruments and opportunities to form a music club.

The methods to introduce the lesson included in supplying learning experiences through relevant activities and models that invoked the curiosity of the learners. According to 95 percent of the students the activities were interesting like installing a swing outside, visiting a river side, mountain, survey among people to but the lighting myths etc. They remarked that these activities made them involve in the learning process and hence they were able to enjoy the learning process. The rest 5 percent of the students were of the opinion that they had enough time to understand the concepts and that such a learning by involving the curiosity of the students can be adapted to all other subjects so that there happens a burden free learning. All the methods adopted by the researcher to invoke the curiosity of the learner were related to the practical life oriented situations and that the teaching learning process became very easy.

It could be seen that ninety five percent of the students replied that all the activities provided in the ELPSS package were very much enjoyable and interesting. The activities really had local relevance and helped in enhancing their interest towards science as a subject. Further, the rest five percent students replied that, they can't comment on enjoyment in the learning package as they frequently depended on their group members or the researcher to understand and complete an activity in ELPSS package. So they chose to answer as not that much enjoyable.

The results showed that 90 percent of the students commented that the ELPSS package has helped them achieve good score in the achievement test conducted by the researcher. They were able to solve the questions without any pressure or tension and they were confident that their answers were correct. The module thus not only helped them achieve good grades but also helped in increasing their confidence level in those chapters. The rest 10 percent of the students commented that they were not sure whether they had a noticeable change in their achievement score after the administration of ELPSS. They commented that they could sense a good improvement in their practical knowledge. Till the administration of the ELPSS they tend to memorise the concepts and the ELPSS has

taught them to learn the concepts practically and thus they could relate the concepts with the daily life situations very easily.

ELPSS activities were related to the daily life situations and that 90 percent of the students agreed to this opinion. The learning experiences and the activities provided in the ELPSS package were having local relevance and practical adaptability. The activities were clearly in tune with the concept connection in practical life whereas the rest 10 percent had an opinion that the ELPSS package were directly involving with the environment concerns and it was just like an awareness program. The actual achievement test demand more theoretical knowledge than the practical relevance of the concepts.

Again ninety percent of the students enjoyed the ELPSS package and its administration to improve their critical thinking abilities and reasoning. They were of the opinion that more such project works and locally relevant practical examples be provided in the package so that a meaningful learning is attained. Ten percent had an opinion that such packages be extended to all the subjects of study and thus the teaching learning process becomes an enjoyable process.

The analysis of the teachers' responses to the questions used in the focus groups are analysed and presented in Table 4.30

Table 4.30

Analysis of teachers' response towards ELPSS

| Sl. No: | Questions | Responses | No: of responses | Percentage |
|---------|--|---|------------------|------------|
| 1. | How effective is ELPSS to the students? | Very much effective | 14 | 90 |
| | | Not at all effective | 1 | 5 |
| | | Not effective for secondary school children | 1 | 5 |
| 2. | How do you rate the activities and experiences in the ELPSS? | Excellent | 12 | 80 |
| | | Average | 2 | 10 |
| | | Below average | 2 | 10 |
| 3. | Do you find any activities in the ELPSS | No, it was fun filled and interesting | 14 | 90 |

| | | | | |
|----|---|--|----|----|
| | as boring and uninteresting? | Yes, some activities like outdoor visits may make the students deviate from the subject. | 2 | 10 |
| 4. | Have you got any comment on the time frame of the ELPSS package? | Time consuming activities | 9 | 60 |
| | | Time should be compatible with the traditional method of teaching | 2 | 10 |
| | | The individual attention gets distracted due to large time frame | 3 | 20 |
| | | Reduce the portions so as to fit into ELPSS model | 2 | 10 |
| 5. | Can you tell any appreciable change has happened in your students after the ELPSS administration? | Yes, students became more creative and practical in the subject. | 12 | 80 |
| | | No, there is no change | 4 | 20 |
| 6. | Will there be any difficulties in transacting the curriculum if the ELPSS package is to be taught by you? | Yes, it's really challenging as all the concepts cannot be explained using ELPSS | 8 | 55 |
| | | No, curriculum restructuring is essential for a change to happen for the betterment of the students | 2 | 15 |
| | | Yes, it can create unnecessary bias among the students since the differently abled needs individual attention. | 6 | 30 |
| 7. | According to you, are the activities and experiences given in the ELPSS package student centric? | Yes, it is student centric and intellectually and emotionally supporting material for them | 12 | 75 |
| | | No, it is student centric to some extent but they need more hands on practical training. | 2 | 15 |
| | | No, it is not student centric. | 2 | 10 |
| 8. | How do you rate the | Very good performance | 14 | 90 |

| | | | | |
|-----|--|--|----|----|
| | student progress in science achievement before and after the ELPSS package administration? | Neutral opinion, no observable difference | 2 | 10 |
| 9. | Do you find the students more active and curious after the ELPSS package administration? | Yes, more active, curious and logical | 15 | 95 |
| | | Not that much, they became lazy | 1 | 5 |
| 10. | Which method do you prefer to teach, the experiential learning method or the traditional method? Why do you think that way? Please give your opinions. | ELPSS is most convenient and interesting method provided the time frame and the curriculum should be re structured | 13 | 85 |
| | | Need extra time for training and making resources for ELPSS model | 2 | 10 |
| | | No, traditional method is enough as the ELPSS model demands more time and resources | 1 | 5 |
| 11. | Do you have any suggestions or opinions that can help improve the effectiveness of ELPSS package | More hands on training in all the contents which is transacted using this model | 15 | 95 |
| | | More training in time management of ELPSS | 1 | 5 |

The tabulated data can be analysed as:

It was found that 90 percent of the teachers answered ELPSS package is very much effective and the rest 5 percent of the teachers answered that they were not interested in teaching in the model of ELPSS and the last 5 percent answered ELPSS as not an effective method to teach secondary school students.

The analysis showed that eighty percent of the teachers rated the ELPSS activities as very good and 10 percent rated it as average and the rest 10 percent rated it as below average

ELPSS activities were interesting and fun filled ones and it has played a good role in enhancing the curiosity of the children was the reply of the 90 percentage of the teachers. Other 10 percent of the teachers had a reply that the activities which included

outdoor visits could be avoided since that can create subject deviation in students and they tend to become playful since they are secondary school children.

The time frame of the ELPSS was a major limitation as an opinion put forward by 60 percent of the teachers and 10 percent of the teachers suggested that ELPSS time frame should be matched up with the traditional teaching timing. Another 20 percentage of the teachers commented that the students may get distracted in between the ELPSS administration due to the large time frame. Then the final 10 percentage of the teacher were of the opinion that the portions can be adjusted so that the students can study effectively and whatever they learn it gets permanent.

It was noted that eighty percentage of the teachers commented that the students had an appreciable change in studying and understanding the scientific concepts after they participated in ELPSS and the rest 20 percentage of the teachers commented that the students had no appreciable change rather they were interested in going outdoors and playing.

According to the opinion of 55 percent of the teachers, ELPSS can never be taught to all the concepts in the curriculum and that some topics in the curriculum demands the chalk and talk method. Other 15 percent of the teachers were of the view that the curriculum must be restructured to include more of practical oriented lessons like that included in ELPSS so that it is beneficial for the students in their future lives. Finally, 30 percent of the teachers were of the view that students cannot get along with other students who study in the traditional manner. So it should not be adopted as it can generate bias among the students.

Among the participated teachers, 75 percent of the teachers had their opinion that the activities and the experiences included in the ELPSS were according to the student standards of intellect and emotional maturity. Rest, 15 percentage of the teachers were of the opinion that the students must be practically trained other than such experiences analysis and that they must be trained to solve mathematical and conceptual problems in order to excel in their achievement score. 10 percentage of the teachers stood by the idea that the students should be demonstrated each and every activity by the facilitator so that time of administration of the package can be reduced to a great extent.

It was found that ninety percentage of the teachers rated the performance of the students after the administration of ELPSS as very good and that the students scored and answered very well in the achievement test conducted by the teachers and the facilitator. Only ten percentage of the teachers commented that the students answered well but they were mainly focussing n the lessons that were that in the ELPSSs and they were having interest that the other lessons also be taught in the same manner.

Majority of the teachers were of the opinion that the students were having high interest to get involved in the practical experiences and then relate the experiences with the concepts in the curriculum. They were curious to get involved in the experiments and study the underlying concepts in such an experience oriented method. This was the opinion of 95 percentage of the teachers while the rest 5 percent commented that the students had no much great interest in learning by such a doing method and that they have an opinion that the learning they acquire in this manner may not become permanent.

Teachers were satisfied with the performance of the students but the majority was in a doubt whether they can effectively complete the curriculum on time using the experiential method. It was the doubt of 85 percent of the teachers and they were having the opinion that the curriculum be re structured so that the experiential learning can be introduced among the students which help in making the learning permanent and hence very much beneficial to the students. Another 10 percent had an opinion that they need to get special training to transact each of the chapters in the syllabus through the experiential method as it advocates extra time and resources for teaching and learning. Finally, 5 percent of the teachers preferred traditional method over experiential method as they were very much involved in completing the lessons and providing revision series for the students rather than render practical knowledge.

All the teachers had an opinion that ELPSS were very much effective in enhancing the student practical skills and that the students were actively involving in the knowledge construction. The student achievement in the particular topic increased and also the student interest in the particular subject increased through such series of practical experiences and activities. The teachers had an opinion that the time of the teachers need to get adjusted when they are transacting the curriculum through ELPSS since it required more time and practical knowledge. Teaching learning resources must be selected

judiciously and correctly so that it can aptly relate the content to the experiences given by the facilitator. Among the participant teachers, 95 percent replied that definitely ELPSS is a good and an effective method in promoting the curiosity and the interest of the learner but the 5 percent had an opinion on one and only thing that is to be kept in mind about transacting through ELPSS is time and practical knowledge of the facilitator or teacher.

The focus group interview for the teachers were thus effectively analysed by the researcher and it is concluded that 90 percent of the teachers is having an opinion that the package is helpful in enhancing the attitude of the students towards the subject science and that it can be suggested for the overall progress of the students if implemented effectively.

4.4.2 Reflection of the Researcher on ELPSS

| Year of study | School | Date of the study | Names of students included | Assisting teachers |
|---------------|---|-------------------------------|----------------------------|--|
| 2018 | Government Asram School, Malampuzha, Palakkad | October 1 to October 31, 2018 | 40 | Mrs. Sajitha, Science teacher, Asram School, Malampuzha, Palakkad |
| 2019 | IGMMRS Asram School, Nilambur, Malappuram | August 31 to October 31, 2019 | 40 | Mrs. Sanubiya, Science teacher, IGMMR Asram School, Nilambur, Malappuram |

a. Activities that the students were very much interested to participate and complete:

1. Ektara making
2. Toy telephone
3. Tuning forks and pith ball
4. Balloon horn
5. PVC drum
6. Rubber band guitar
7. Swing making
8. Simple pendulum making
9. Poster presentation
10. Sound silent club
11. Mime
12. Balloon flannel activity
13. Postman game

14. Bangles beads atom model
 15. Electroscope model
 16. Earth pits locating
 17. Differentiating conductors and insulators
 18. Ironing competition
 19. Capacitor modelling
 20. Radio listening
 21. Interview with the locals on lightning and thunder myths
 22. Survey on lightning myths and bursting the myths
- b. Activities that the students lacked interest and took time in completing
1. Pan flute making
 2. Drawing human ear
 3. Stethoscope making
 4. Hacksaw blade vibrations and calculation of frequency
 5. Describing the sound limits audibility chart
 6. Calculation of frequency
 7. Finding out the frequency of sitar or veena
 8. Experimenting with electroscope
 9. Understanding the concept of earthing
 10. Understanding the concept of lightning rescue conductor
- c. Activities that cannot be completed on time
1. Dancing light experiment
 2. Frequency of different musical instruments
 3. Sound echo inspection
 4. Types of charge transfer
 5. Earth pits inspection and differentiating between phase, neutral and earth wires.
 6. Identifying the parts of electrical appliances
- d. The science process skills of the students those are noteworthy after the completion of ELPSS
1. Observing
 2. Comparing
 3. Classifying
 4. Experimenting

5. Inferring
 6. Measuring
 7. Model making
 8. Communicating
- e. The difficulties faced by the researcher on the successful implementation of ELPSS
1. Time is a major setback for the successful implementation of ELPSS
 2. The setting up of curiosity takes more time than doing activities
 3. Visiting places with the students
 4. Interviewing people for data collection
 5. Coping with accidents that can happen during the outdoor activities
 6. Completing the curriculum on time and evaluating the activities
 7. Preparation of the students for activities
 8. Writing difficulties of the students
 9. Communication problems
 10. Cooperation of the other subject teachers
- f. Contents completed successfully and effectively during the ELPSS
1. Natural frequencies
 2. Sound characteristics
 3. Sound propagation
 4. Sound pollution
 5. Types of charges
 6. Charge transfer
 7. Conducting surfaces
 8. Lightning
- g. Contents that took time in completing
1. Limits of audibility
 2. Hearing and hearing aid
 3. Static electricity
 4. Electroscope
 5. Earthing
 6. Capacitors

All the objectives of the modules were completed effectively by the researcher with the help of assisting teachers and with the whole hearted involvement of the students.

The package in ELPSS was meant to promote experiential learning methods and practices that will help the students to learn the syllabus in a realistic and interesting manner. The students were actively involved in the outdoor activities that included the field visits and surveys. Though there existed practical difficulties in the conduction of outdoor field visits and surveys, the students enjoyed the activities and could get practical life oriented lessons. The experiential learning helped them to achieve the concepts clearly and practically. The knowledge construction was actively done by the students themselves and was consolidated by the facilitator at the end of each activity. Students got ample opportunities to explore the practical side of the concepts that was taught in the package. The evaluation of the activities was done time to time after each and every activity. The notable science process skills observed during the ELPSS were observation, classification experimentation, measuring, model making and comparing.

Considering the “pre-test” scores and the “post-test” scores of “science process skills”, “scientific attitude” and “achievement in science” the module on ELPSS was very much effective in improving the score of the students in both achievement in science and in enhancing their scientific attitude and science process skills. The science process skills of the students were monitored during the procedure of doing activities and also in the “post-test” score.

The module was thus proved to be helpful in enhancing the student’s “achievement in science” covering the topics dealt in the module and developing the “science process skills” of the students. It also has helped in improving the “scientific attitude” of the students. The module based on the experiential learning principles was carried out in an interesting manner and the students enjoyed the learning process thus making the learning an enjoyable experience both to the researcher and to the students.

4.5 Discussion and Interpretation

The present study emphasized that there is no significant difference in the achievement in science, science process skills and scientific attitude based on the learning styles of the sample. The study also revealed that there is a significant positive relationship between achievement in science and scientific attitude. More over the present study also says that the experiential learning package based on the principles of experiential

pedagogy is very effective to enhance science process skills, scientific attitude and achievement in science among secondary school tribal students.

It is very much essential that the science learning should enhance the science process skills and scientific attitude of the learner. One of the most important aspects of science learning is that it should make the learner scientifically sound and practical. The learner should develop an open minded attitude towards science and the scientific advancements happening around him. The development of Science Process Skills begins right from the learning happening at the cradle stage and which continues till adulthood. Reflective thinking, Discovery learning, Spirit of Inquiry are all being encouraged through the development of science process skills since it serves as an instrument that changes the outlook of traditional science learning. This in turn motivates the learner to do different kinds of methods and tasks that help in the practical aspect of science learning. Through these processes, a learner acquires an efficient and effective scientific character which becomes the heart and soul of modern science learning and teaching. The method by which scientists pursue a scientific research is through scientific method, which is actually a process of testing and generating conclusions based on evidences in nature. The general goal or aims of education can be attained via the broad and successful development of science process skills in students. The achievement in science shows the progress of the learner in his cognitive domain. The scientific attitude serves the affective domain whereas the achievement in science serves the cognitive domain. The science process skills involve the psycho motor domain. Hence the study tried to address the three major domains of the learner.

The experiential pedagogy adapted here in the study helped to understand the importance of experience in the teaching learning process. Learning through experience makes the learning permanent and concrete. David A Kolb has perfectly said the four stages in experiential learning concrete experience, reflective observation, active experimentation and abstract conceptualization. The study has focused the importance of experiential pedagogy on science process skills, scientific attitude and achievement in science. It has been found that experiential pedagogy has significant effect in enhancing the science process skills, scientific attitude and achievement in science. It has also been found that achievement in science is significantly related to scientific attitude.

4.6 Summary and Conclusions

The analysis of the different objectives was done by the researcher and it has been interpreted with sufficient tables and diagrams. The analysis shows that the module in experiential learning as prescribed by David A Kolb's Experiential Learning has been successful in enhancing the "science process skill", "scientific attitude" and "achievement in science" of the sample selected in Malampuzha as well as Nilambur Asram Schools. The different learning styles of the sample were analyzed and differentiated into 4 groups as suggested by David A Kolb. It was found that after the administration of the learning style inventory it has been found that the diverging style learners account to almost half of the sample. Then the accommodating learning style comes with a higher majority than the other two. The assimilating and the converging type learning style learners are falling into a very small number in the selected sample.

Thus all the hypotheses that have been stated have been individually analyzed and are statistically interpreted in order to check the effectiveness of the instruction in experiential learning.