Therefore, ‘t’ is not significant. It was also concluded that there was no significant difference between pre-test scores of learning retention of these students in learning skill based topic.

Therefore, it was further concluded that both the groups were similar in understanding the contents of both the topics. It indicated that the students involved in F to F mode and TAL mode were similar in their prior knowledge about both the topics.

<table>
<thead>
<tr>
<th></th>
<th>F to F mode</th>
<th>6.25</th>
<th>189</th>
<th>2.00</th>
<th>0.81</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAL mode</td>
<td>6.07</td>
<td>189</td>
<td>2.45</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CHAPTER IV
DESCRIPTIVE AND INFERENTIAL ANALYSIS OF DATA

DESCRIPTIVE ANALYSIS OF DATA

Descriptive statistical analysis helps to study and understand the characteristics of a particular group of individuals. Once the data have been collected, the first step in data analysis is to describe or summarize data using descriptive statistics, which allows the researcher to meaningfully describe many scores with a small number of indices.
"Descriptive statistical analysis limits generalization to the particular group of individuals observed."  

In the present study, the Control Group (CG) used Face to Face mode of learning whereas Experimental Group (EG) used Technology Assisted Learning (TAL) mode for learning theory based topic (TBT) and skill based topic (SBT).

This chapter deals with the description of the following variables for TBT and SBT (abbreviations): 

1. Gain scores learning retention of total students of:
   a. F to F mode 
   b. TAL mode 

2. Gain scores of learning retention of students of F to F mode and TAL mode on the basis of social categories (SC, ST, OBC and Minority & Open) of students.

3. Gain scores of learning retention of students of F to F mode and TAL mode on the basis of locality (Rural and Urban) of students.

4. Gain scores of learning retention of students of F to F mode and TAL mode on the basis of gender (Male and Female) of students.

5. Gain scores of learning retention of students of F to F mode and TAL mode on the basis of medium of instruction (Marathi, Hindi & English) of students.

**Variables of the Study**

1. Independent Variable

---


33
a. Face to Face mode of learning
b. Technology Assisted Learning Package

2. Dependent Variable
   a. Learning retention of students

The personal data sheet was helpful to collect following information given in tables.

Table 4.1 shows gender distribution of total sample of the students.

<table>
<thead>
<tr>
<th>Data Collection</th>
<th>No. of Student</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of male students</td>
<td>134</td>
<td>35.45</td>
</tr>
<tr>
<td>No. of female students</td>
<td>244</td>
<td>64.55</td>
</tr>
<tr>
<td>Total</td>
<td>378</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Table 4.1 shows that proportion of female students is higher than that of male students.

Figure 4.1 is a graphical representation of the distribution of sample based on gender of the students.

**GRAPHICAL REPRESENTATION OF SAMPLE BASED ON GENDER OF THE STUDENTS**
FIGURE 4.1

The total sample comprised of 378 students including 169 students from Arts faculty, 73 students from commerce and 136 students from science faculty.

Table 4.2 shows distribution of total sample based on faculty of the graduation of the students’ viz. Arts, Commerce and Science in total sample of the present study.
DISTRIBUTION OF SAMPLE BASED ON FACULTY OF GRADUATION OF THE STUDENTS

<table>
<thead>
<tr>
<th>Data Collection</th>
<th>Students</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of students from arts faculty</td>
<td>169</td>
<td>44.71</td>
</tr>
<tr>
<td>No. of students from commerce faculty</td>
<td>73</td>
<td>19.31</td>
</tr>
<tr>
<td>No. of students from science faculty</td>
<td>136</td>
<td>35.98</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>378</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

Table 4.2 shows that proportion of students from arts faculty is higher than that of commerce and science faculty.

Figure 4.2 is a graphical representation of the distribution of sample based on faculty of the graduation of the students’ viz. Arts, Commerce and Science in total sample of the present study.

GRAPHICAL REPRESENTATION OF TOTAL SAMPLE BASED ON FACULTY OF GRADUATION OF THE STUDENTS
Table 4.3 shows distribution of total sample based on the social category of students in the present study.

TABLE 4.3

112
DISTRIBUTION OF SAMPLE BASED ON THE SOCIAL CATEGORY OF THE STUDENTS

<table>
<thead>
<tr>
<th>Category</th>
<th>No. of students</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC</td>
<td>50</td>
<td>13.22</td>
</tr>
<tr>
<td>ST</td>
<td>24</td>
<td>6.35</td>
</tr>
<tr>
<td>OBC</td>
<td>99</td>
<td>26.19</td>
</tr>
<tr>
<td>Minority</td>
<td>17</td>
<td>4.50</td>
</tr>
<tr>
<td>Open</td>
<td>188</td>
<td>49.74</td>
</tr>
<tr>
<td>Total</td>
<td>378</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Table 4.3 shows the proportion of the students in open category is higher than any other category included in the sample.

Figure 4.3 is a graphical representation of the distribution of sample based on the social category of students in the present study.

GRAPHICAL REPRESENTATION OF TOTAL SAMPLE BASED ON THE SOCIAL CATEGORY OF THE STUDENTS
FIGURE 4.3

Table 4.4 shows distribution of total sample in the groups based on the social category of students in the present study.

TABLE 4.4

<table>
<thead>
<tr>
<th>Social category of students</th>
<th>No. of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC</td>
<td>40</td>
</tr>
<tr>
<td>ST</td>
<td>20</td>
</tr>
<tr>
<td>OBC</td>
<td>180</td>
</tr>
<tr>
<td>Minority</td>
<td>10</td>
</tr>
<tr>
<td>Open</td>
<td>180</td>
</tr>
</tbody>
</table>
DISTRIBUTION OF SAMPLE BASED ON SOCIAL CATEGORY OF THE STUDENTS IN EACH MODE

<table>
<thead>
<tr>
<th>Group</th>
<th>Category wise distribution of sample</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SC</td>
<td>ST</td>
</tr>
<tr>
<td>(F to F mode)</td>
<td>28</td>
<td>10</td>
</tr>
<tr>
<td>(TAL mode)</td>
<td>22</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>24</td>
</tr>
</tbody>
</table>

Figure 4.4 is a graphical representation of the distribution of sample in the groups based on the social category of students in the present study.

GRAPHICAL REPRESENTATION OF TOTAL SAMPLE BASED ON THE SOCIAL CATEGORY OF THE STUDENTS IN EACH MODE
Table 4.5 shows distribution of total sample in the groups based on the medium of instruction of students in the present study.
DISTRIBUTION OF SAMPLE BASED ON MEDIUM OF INSTRUCTION OF THE STUDENTS

<table>
<thead>
<tr>
<th>Group</th>
<th>Marathi</th>
<th>Hindi</th>
<th>English</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>(F to F mode)</td>
<td>96</td>
<td>41</td>
<td>52</td>
<td>189</td>
</tr>
<tr>
<td>(TAL mode)</td>
<td>88</td>
<td>54</td>
<td>47</td>
<td>189</td>
</tr>
<tr>
<td>Total</td>
<td>184</td>
<td>95</td>
<td>99</td>
<td>378</td>
</tr>
<tr>
<td>Percentage</td>
<td>48.68</td>
<td>25.13</td>
<td>26.19</td>
<td>100</td>
</tr>
</tbody>
</table>

Figure 4.5 is a graphical representation of the distribution of sample in the groups based on medium of instruction of students in the present study.
Table 4.6 shows distribution of total sample in the groups based on the locality of students in the present study.

TABLE 4.6

118
## DISTRIBUTION OF SAMPLE BASED ON LOCALITY OF THE STUDENTS

<table>
<thead>
<tr>
<th>Group</th>
<th>Urban Male</th>
<th>Urban Female</th>
<th>Urban Total</th>
<th>Rural Male</th>
<th>Rural Female</th>
<th>Rural Total</th>
<th>Grand Total</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>(F to F mode)</td>
<td>28 (27%)</td>
<td>74 (73%)</td>
<td>102</td>
<td>33 (38%)</td>
<td>54 (62%)</td>
<td>87</td>
<td>189</td>
<td>61</td>
<td>128</td>
</tr>
<tr>
<td>(TAL mode)</td>
<td>54 (41%)</td>
<td>78 (59%)</td>
<td>132</td>
<td>19 (33%)</td>
<td>38 (67%)</td>
<td>57</td>
<td>189</td>
<td>73</td>
<td>116</td>
</tr>
<tr>
<td>Total</td>
<td>82</td>
<td>152</td>
<td>234</td>
<td>52</td>
<td>92</td>
<td>144</td>
<td>378</td>
<td>134</td>
<td>244</td>
</tr>
</tbody>
</table>

| %           | 35%        | 65%          | -           | 36%        | 64%          | -           | -           | 35%   | 65%     |

Figure 4.6 is a graphical representation of the distribution of sample in the groups based on locality of students in the present study.

## GRAPHICAL REPRESENTATION OF TOTAL SAMPLE IN BOTH THE MODES BASED ON LOCALITY OF THE STUDENTS
FIGURE 4.6

DESCRIPTIVE ANALYSIS OF PrSLR OF F TO F MODE

Table 4.7 shows the frequency distribution of PrSLR of F TO F mode for TBT.

TABLE 4.7
FREQUENCY DISTRIBUTION OF PrSLR OF F TO F MODE
120
Figure 4.7 shows the frequency polygons of PrSLR of F to F mode for TBT.

**Descriptive Statistics of PrSLR of F to F mode for TBT**

Table 4.8 shows the measures of central tendency and variability of the PrSLR of F to F mode for TBT.

**TABLE 4.8**

| The Measures of Central Tendency and Variability of the PrSLR of F to F Mode for TBT |
|---|---|---|---|---|---|---|
| Sample size | Mean | Median | Mode | SD | Skewness | Kurtosis |
| 189 | 6.33 | 6.00 | 4.00 | 2.89 | 0.71 | -0.12 |

The mode is lower than mean and median. The mean, median and mode are in descending order.

The skewness of the distribution is 0.71 i.e. the distribution is positively skewed. The kurtosis of the distribution is -0.12 which is less than 0.263. Hence the distribution curve is leptokurtic.

This indicates that the distribution of PrSLR is near normal. Thus the sample selected is representative of the population.
Table 4.9 shows the frequency distribution of PrSLR of TAL mode.

<table>
<thead>
<tr>
<th>Class Interval</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>1-5</td>
<td>71</td>
</tr>
<tr>
<td>6-10</td>
<td>54</td>
</tr>
</tbody>
</table>

122
Figure 4.8 shows the frequency polygons of PrSLR of TAL mode for TBT.

**Descriptive Statistics of PrSLR of TAL mode for TBT**

Table 4.10 shows the measures of central tendency and variability of the PrSLR of TAL mode for TBT.

<table>
<thead>
<tr>
<th>Sample size</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>189</td>
<td>6.14</td>
<td>5.00</td>
<td>4.00</td>
<td>2.46</td>
<td>0.76</td>
<td>-0.32</td>
</tr>
</tbody>
</table>

The mode is lower than mean and median. The mean, median and mode are in descending order.

The skewness of the distribution is 0.76 i.e. the distribution is positively skewed. The kurtosis of the distribution is -0.32 which is less than 0.263. Hence the distribution curve is leptokurtic.

This indicates that the distribution of PrSLR is near normal.
Thus the sample selected is representative of the population.

FREQUENCY POLYGONS OF PrSLR OF TAL MODE
FOR TBT
FIGURE 4.8

DESCRIPTIVE ANALYSIS OF PoSLR OF F to F MODE FOR TBT

Table 4.11 shows frequency distribution of PoSLR of F to
F mode for TBT.

TABLE 4.11
FREQUENCY DISTRIBUTION OF PoSLR OF F TO F MODE FOR TBT

<table>
<thead>
<tr>
<th>Class Interval</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1-5</td>
<td>02</td>
</tr>
<tr>
<td>6-10</td>
<td>45</td>
</tr>
<tr>
<td>11-15</td>
<td>96</td>
</tr>
<tr>
<td>16-20</td>
<td>41</td>
</tr>
<tr>
<td>21-25</td>
<td>05</td>
</tr>
<tr>
<td>Total</td>
<td>189</td>
</tr>
</tbody>
</table>

Figure 4.9 shows the frequency polygons for PoSLR of F to F mode for TBT.

Descriptive Statistics of PoSLR of F to F mode

Table 4.12 shows the measures of central tendency and variability of the PoSLR of F to F mode for TBT.

TABLE 4.12
MEASURES OF CENTRAL TENDENCY AND VARIABILITY OF PoSLR OF F TO F MODE FOR TBT

<table>
<thead>
<tr>
<th>Sample size</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>189</td>
<td>12.03</td>
<td>12.00</td>
<td>11</td>
<td>3.25</td>
<td>0.49</td>
<td>0.03</td>
</tr>
</tbody>
</table>
The mode is lower than mean and median. The mean, median and mode are in descending order.

The skewness of the distribution is 0.49 i.e. the distribution is positively skewed. The kurtosis of the distribution is 0.03 which is less than 0.263. Hence the distribution curve is leptokurtic.

This indicates that the distribution of PoSLR is near normal. Thus the sample selected is representative of the population.

FREQUENCY POLYGONS OF PoSLR OF F TO F MODE FOR TBT
Table 4.13 shows frequency distribution of PoSLR of TAL mode for TBT.

DESCRIPTIVE ANALYSIS OF PoSLR OF TAL MODE FOR TBT

Table 4.13 shows frequency distribution of PoSLR of TAL mode for TBT.
### TABLE 4.13
FREQUENCY DISTRIBUTION OF PoSLR OF TAL MODE FOR TBT

<table>
<thead>
<tr>
<th>Class Interval</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>--</td>
</tr>
<tr>
<td>1-5</td>
<td>00</td>
</tr>
<tr>
<td>6-10</td>
<td>01</td>
</tr>
<tr>
<td>11-15</td>
<td>34</td>
</tr>
<tr>
<td>16-20</td>
<td>99</td>
</tr>
<tr>
<td>21-25</td>
<td>55</td>
</tr>
<tr>
<td>Total</td>
<td>189</td>
</tr>
</tbody>
</table>

Figure 4.10 shows the frequency polygons of PoSLR of TAL mode for TBT.

**Descriptive Statistics of PoSLR of TAL mode for TBT**

Table 4.14 shows the measures of central tendency and measures of variability of the PoSLR of TAL mode for TBT.

### TABLE 4.14
MEASURES OF CENTRAL TENDENCY AND VARIABILITY OF PoSLR OF TAL MODE FOR TBT

<table>
<thead>
<tr>
<th>Sample size</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>189</td>
<td>16.03</td>
<td>17.00</td>
<td>17.00</td>
<td>3.47</td>
<td>-0.45</td>
<td>-0.24</td>
</tr>
</tbody>
</table>
The mode is higher than mean and median. The mean, median and mode are in ascending order.

The skewness of the distribution is -0.45 i.e. the distribution is negatively skewed. The kurtosis of the distribution is -0.24 which is less than 0.263. Hence the distribution curve is leptokurtic.

This data indicates that the distribution of PoSLR is near normal. Thus the sample selected is representative of the population.
DESCRIPTIVE ANALYSIS OF PrSLR OF F TO F MODE
FOR SBT
Table 4.15 shows the frequency distribution of PrSLR of F to F mode for SBT.

TABLE 4.15
FREQUENCY DISTRIBUTION OF PrSLR OF F TO F MODE FOR SBT

<table>
<thead>
<tr>
<th>Class Interval</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>1-5</td>
<td>96</td>
</tr>
<tr>
<td>6-10</td>
<td>80</td>
</tr>
<tr>
<td>11-15</td>
<td>13</td>
</tr>
<tr>
<td>16-20</td>
<td>00</td>
</tr>
<tr>
<td>21-25</td>
<td>00</td>
</tr>
<tr>
<td>Total</td>
<td>189</td>
</tr>
</tbody>
</table>

Figure 4.11 shows the frequency polygons of PrSLR of F to F mode for SBT.

Descriptive Statistics of PrSLR of F to F mode for SBT

Table 4.16 shows the measures of central tendency and variability of the PrSLR of F to F mode for SBT.

TABLE 4.16
THE MEASURES OF CENTRAL TENDENCY AND VARIABILITY OF THE PrSLR OF F TO F MODE FOR SBT

<table>
<thead>
<tr>
<th>Sample size</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>189</td>
<td>6.25</td>
<td>6.00</td>
<td>5.00</td>
<td>2.00</td>
<td>0.79</td>
<td>0.53</td>
</tr>
</tbody>
</table>

The mode is lower than mean and median. The mean, medi-
an and mode are in descending order.

The skewness of the distribution is 0.79 i.e. the distribution is positively skewed. The kurtosis of the distribution is 0.53 which is more than 0.263. Hence the distribution curve is platykurtic.

This indicates that the distribution of PrSLR is near normal. Thus the sample selected is representative of the population.

FREQUENCY POLYGONS OF PrSLR OF F TO F MODE FOR SBT
FIGURE 4.11

DESCRIPTIVE ANALYSIS OF PrSLR OF TAL MODE FOR SBT
Table 4.17 shows the frequency distribution of PrSLR of TAL mode.

TABLE 4.17
FREQUENCY DISTRIBUTION OF PrSLR OF TAL MODE
FOR SBT

<table>
<thead>
<tr>
<th>Class Interval</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>1-5</td>
<td>83</td>
</tr>
<tr>
<td>6-10</td>
<td>98</td>
</tr>
<tr>
<td>11-15</td>
<td>08</td>
</tr>
<tr>
<td>16-20</td>
<td>00</td>
</tr>
<tr>
<td>21-25</td>
<td>00</td>
</tr>
<tr>
<td>Total</td>
<td>189</td>
</tr>
</tbody>
</table>

Figure 4.12 shows the frequency polygons of PrSLR of TAL mode.

Descriptive Statistics of PrSLR of TAL mode for SBT

Table 4.18 shows the measures of central tendency and variability of the PrSLR of TAL mode.

TABLE 4.18
THE MEASURES OF CENTRAL TENDENCY AND VARIABILITY OF PrSLR of TAL MODE FOR SBT

<table>
<thead>
<tr>
<th>Sample size</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>189</td>
<td>6.07</td>
<td>5.00</td>
<td>4.00</td>
<td>2.45</td>
<td>0.62</td>
<td>-0.25</td>
</tr>
</tbody>
</table>
The mode is lower than mean and median. The mean, median and mode are in descending order.

The skewness of the distribution is 0.62 i.e. the distribution is positively skewed. The kurtosis of the distribution is -0.25 which is less than 0.263. Hence the distribution curve is leptokurtic.

This data indicates that the distribution of PrSLR is near normal. Thus the sample selected is representative of the population.
Table 4.19 shows frequency distribution of PoSLR of F to
TABLE 4.19
FREQUENCY DISTRIBUTION OF PoSLR OF F TO F MODE FOR SBT

<table>
<thead>
<tr>
<th>Class Interval</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1-5</td>
<td>00</td>
</tr>
<tr>
<td>6-10</td>
<td>18</td>
</tr>
<tr>
<td>11-15</td>
<td>54</td>
</tr>
<tr>
<td>16-20</td>
<td>87</td>
</tr>
<tr>
<td>21-25</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>189</td>
</tr>
</tbody>
</table>

Figure 4.13 shows the frequency polygons for PoSLR of F to F mode for SBT.

Descriptive Statistics of PoSLR of F to F mode for SBT

Table 4.20 shows the measures of central tendency and variability of the PoSLR of F to F mode for SBT.

TABLE 4.20
MEASURES OF CENTRAL TENDENCY AND VARIABILITY OF PoSLR OF F TO F MODE FOR SBT

<table>
<thead>
<tr>
<th>Sample size</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>189</td>
<td>12.93</td>
<td>12.00</td>
<td>10.00</td>
<td>3.67</td>
<td>0.43</td>
<td>-0.26</td>
</tr>
</tbody>
</table>
The mode is lower than mean and median. The mean, median and mode are in descending order.

The skewness of the distribution is 0.43 i.e. the distribution is negatively skewed. The kurtosis of the distribution is -0.26 which is less than 0.263. Hence the distribution curve is slightly leptokurtic.

This indicates that the distribution of PoSLR is near normal. Thus the sample selected is representative of the population.

FREQUENCY POLYGONS OF PoSLR OF F TO F MODE
FOR SBT
Table 4.21 shows frequency distribution of PoSLR of TAL.

DESCRIPTIVE ANALYSIS OF PoSLR OF TAL MODE
FOR SBT

Table 4.21 shows frequency distribution of PoSLR of TAL.
mode.

TABLE 4.21
FREQUENCY DISTRIBUTION OF PoSLR OF TAL MODE FOR SBT

<table>
<thead>
<tr>
<th>Class Interval</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>--</td>
</tr>
<tr>
<td>1-5</td>
<td>02</td>
</tr>
<tr>
<td>6-10</td>
<td>45</td>
</tr>
<tr>
<td>11-15</td>
<td>96</td>
</tr>
<tr>
<td>16-20</td>
<td>40</td>
</tr>
<tr>
<td>21-25</td>
<td>06</td>
</tr>
<tr>
<td>Total</td>
<td>189</td>
</tr>
</tbody>
</table>

Figure 4.14 shows the frequency polygons of PoSLR of TAL mode.

Descriptive Statistics of PoSLR of TAL mode for SBT

Table 4.22 shows the measures of central tendency and measures of variability of the PoSLR of TAL mode.

TABLE 4.22
MEASURES OF CENTRAL TENDENCY AND VARIABILITY OF PoSLR OF TAL MODE FOR SBT

<table>
<thead>
<tr>
<th>Sample size</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>189</td>
<td>16.15</td>
<td>17.00</td>
<td>18.00</td>
<td>4.03</td>
<td>-0.25</td>
<td>-0.59</td>
</tr>
</tbody>
</table>
The mode is higher than mean and median. The mean, median and mode are in ascending order.

The skewness of the distribution is -0.25 i.e. the distribution is positively skewed. The kurtosis of the distribution is -0.59 which is less than 0.263. Hence the distribution curve is leptokurtic.

This data indicates that the distribution of PoSLR is near normal. Thus the sample selected is representative of the population.
INFERENTIAL ANALYSIS OF DATA

The purpose of research is the discovery of principles based upon observed relationships between the variables. To achieve this purpose, statistical analysis is done. Descriptive analysis helps in...
describing the characteristics of a specific sample under the study while inferential analysis is useful in making generalizations about the population from which the sample is drawn. Inferential statistical techniques are used to test the hypotheses and on that basis it is decided whether the hypotheses are accepted or rejected. The process of analysis that follows description of data to provide conclusive results is called inferential analysis.

HYPOTHESES

A hypothesis is a formal affirmative statement, a tentative explanation of the relationship between two or more variables predicting a single research outcome.\(^{34}\)

Koul defines a hypothesis as a tentative or working proposition suggested as a solution to a problem; and the theory as the final hypothesis, which is defensively supported by all the evidence.\(^{35}\) The final hypothesis, which fits all the evidence, becomes the chief conclusion inferred from the study. Thus it predicts and explains the relationship between variables.

Hypotheses are formed to study the existing conditions. Thus, hypothesis is individually tested statistically in order to decide whether it should be accepted or rejected.

For the purpose of the present study, research hypotheses have been formulated as they can be accepted or rejected on the basis of the findings.\(^{36}\)


\(^{36}\) Ibid, p.9
The following parametric statistical techniques have been used to test the research hypotheses for the present study:

1) 't' – test

The techniques have been described in detail in the following section:

1) 't' – test: This test is used when the means of the two sets are to be compared. The t-test is applied to test the separate differences between means of scores of F to F mode and TAL mode.

The formula for t-test is:

\[ t = \frac{|M_1 - M_2|}{\sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}} \]

Where,

- \( M_1 \) = is the mean of group 1
- \( M_2 \) = is the mean of group 2
- \( N_1 \) = is the sample size of group 1
- \( N_2 \) = is the sample size of group 2
- \( \sigma_1 \) = is the variance of group 1
- \( \sigma_2 \) = is the variance of group 2

**Interpretation of 't':** The critical ratio ‘t’ for N-1 df was found from Table D showing critical value of students distribution (t) at 0.05 and 0.01 levels. If the obtained ‘t’ is greater than the tabulated ‘t’ then the research hypothesis is accepted, otherwise rejected. In the present study, the ‘t’ test was used to ascertain the difference between,
1. Gain scores of learning retention of F to F mode and TAL mode on the basis of social categories (SC, ST, OBC and Minority & Open) of students.
2. Gain scores of learning retention of F to F mode and TAL mode on the basis of locality (Rural and Urban) of students.
3. Gain scores of learning retention of F to F mode and TAL mode on the basis of gender (Male and Female) of students.
4. Gain scores of learning retention of F to F mode and TAL mode on the basis of medium of instruction (Marathi, Hindi & English) of students.

   The gain scores were calculated as:
   
   \[\text{Gain score} = \text{Posttest scores} - \text{Pretest scores}\]

---

TESTING THE HYPOTHESES OF THE STUDY

COMPARISON BETWEEN FACE TO FACE AND TAL MODE ON THE BASIS OF GAIN SCORES OF LEARNING RETENTION

A. Following are the Hypotheses 1 and 1A comparing learning retention of students for TBT and SBT respectively.
(Comparison between F to F and TAL mode)

Testing Hypothesis 1

*The learning retention of students is higher in TAL mode than F to F mode for learning theory based topic (TBT).*

Table 4.23 shows the Mean differences of Gain scores of learning retention for TBT.

<table>
<thead>
<tr>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>F to F mode</td>
<td>9.17</td>
<td>2.51</td>
<td>189</td>
<td>2.95</td>
</tr>
<tr>
<td>TAL mode</td>
<td>9.88</td>
<td>3.25</td>
<td>189</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

It is concluded that the learning retention of students is higher in TAL mode than F to F mode for learning theory based topic (TBT).

Testing Hypothesis 1A

*The learning retention of students is higher in TAL mode than F to F mode for learning skill based topic (SBT).*

Table 4.24 shows the Mean differences of Gain scores of learning retention for SBT.
TABLE 4.24
MEAN DIFFERENCES OF GAIN SCORES OF LEARNING RETENTION FOR SBT

<table>
<thead>
<tr>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>F to F mode</td>
<td>6.68</td>
<td>3.5</td>
<td>189</td>
<td>9.16</td>
</tr>
<tr>
<td>TAL mode</td>
<td>10.07</td>
<td>3.6</td>
<td>189</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

It is concluded that the learning retention of students is higher in TAL mode than F to F mode for learning skill based topic (SBT).

Figure 4.15 is graphical representation of the mean differences of gain scores in F to F mode and TAL mode for theory based topic and skill based topic.

GRAPHICAL REPRESENTATION OF THE MEAN DIFFERENCES OF GAIN SCORES IN F TO F MODE AND TAL MODE FOR TBT AND SBT
Discussion:

- **F to F mode**: Figure 4.15 shows that the Mean of Gain scores of learning retention for TBT is higher than the scores of SBT for F to F mode. It indicates that these students performed better in TBT than SBT in F to F mode.

- **TAL mode**: Mean of Gain scores of learning retention for SBT is higher than TBT for TAL mode. It indicates that these students performed better in SBT than TBT in TAL mode.

It is concluded that the students performed better in TAL mode for both the topics. It indicated that the face to face mode of learning is less effective than TAL mode for both the topics for these students. In other words, learning of TAL mode is more suitable for these students as compared to F to F mode.
COMPARISON BETWEEN FACE TO FACE AND TAL MODE ON THE BASIS OF SOCIAL CATEGORY OF STUDENTS

B. Following are the Hypotheses 2 and 2A comparing learning retention of students of SC category for TBT and SBT respectively.

(Comparison between F to F and TAL mode.)

Testing Hypothesis 2

_The learning retention of students of SC category for theory based topic (TBT) is higher in TAL mode than F to F mode._

Table 4.25 shows the Mean differences of Gain scores between F to F mode and TAL mode for SC category in Theory Based Topic.

<table>
<thead>
<tr>
<th>TABLE 4.25</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEAN DIFFERENCES OF GAIN SCORES BETWEEN F TO F AND TAL MODE FOR SC CATEGORY IN TBT</td>
</tr>
<tr>
<td>Category</td>
</tr>
<tr>
<td>SC</td>
</tr>
<tr>
<td>TAL mode</td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

It is concluded that the learning retention of students of SC category for theory based topic (TBT) is higher in TAL mode than F to F mode.
Testing Hypothesis 2A

The learning retention of students of SC category for skill based topic (SBT) is higher in TAL mode than F to F mode.

Table 4.26 shows the Mean differences of Gain scores between F to F mode and TAL mode for SC category in Skill Based Topic.

<table>
<thead>
<tr>
<th>Category</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC</td>
<td>F to F mode</td>
<td>5.75</td>
<td>3.09</td>
<td>28</td>
<td>4.48</td>
</tr>
<tr>
<td>TAL mode</td>
<td></td>
<td>10.41</td>
<td>4.06</td>
<td>22</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

It is concluded that the learning retention of students of SC category for skill based topic (SBT) is higher in TAL mode than F to F mode.

Figure 4.16 is a graphical representation of Mean difference of Gain scores between F to F and TAL mode for SC category in Theory Based Topic and Skill Based Topic.
FIGURE 4.16

Discussion:

- **F to F mode**: Figure 4.16 shows that Mean of Gain scores of learning retention of SC category for TBT is higher than the scores of SBT for F to F mode. It indicates that these students performed better in TBT than SBT in F to F mode.

- **TAL mode**: Mean of Gain scores of learning retention of SC category for TBT is higher than the scores of SBT for TAL mode. It indicates that these students performed better in TBT than SBT in TAL mode.

It is concluded that the student of SC category performed better in TAL mode for both the topics. It indicated that the face to face mode of learning is less effective than TAL mode for both the topics for SC category students. In other words, learning of TAL
mode is more suitable for SC category students as compared to F to F mode.

C. Following are the Hypotheses 3 and 3A comparing learning retention of students of ST category for TBT and SBT respectively.

(Comparison between F to F and TAL mode.)

Testing Hypothesis 3

The learning retention of students of ST category for theory based topic (TBT) is higher in TAL mode than F to F mode.

Table 4.27 shows the Mean differences of Gain scores between F to F and TAL mode for ST category in Theory Based Topic.

<table>
<thead>
<tr>
<th>Category</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST</td>
<td>F to F mode</td>
<td>5.8</td>
<td>3.08</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>11.86</td>
<td>3.30</td>
<td>14</td>
<td>4.59</td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

It is concluded that the learning retention of students of ST category for theory based topic (TBT) is higher in TAL mode than F to F mode.
Testing Hypothesis 3A

*The learning retention of students of ST category for skill based topic (SBT) is higher in TAL mode than F to F mode.*

Table 4.28 shows the Mean differences of Gain scores between F to F and TAL mode for ST category in Skill Based Topic.

**TABLE 4.28**

**MEAN DIFFERENCES OF GAIN SCORES BETWEEN F TO F AND TAL MODE FOR ST CATEGORY IN SBT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST</td>
<td>F to F mode</td>
<td>5.2</td>
<td>3.16</td>
<td>10</td>
<td>5.04</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>12.21</td>
<td>3.60</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

It is concluded that the learning retention of students of ST category for skill based topic (SBT) is higher in TAL mode than F to F mode.

Figure 4.17 is a graphical representation of Mean differences of Gain scores between F to F and TAL mode for ST category in Theory Based Topic and Skill Based Topic.

**GRAPHICAL REPRESENTATION OF MEAN DIFFERENCES OF GAIN SCORES OF F TO F MODE AND TAL MODE FOR ST CATEGORY IN TBT AND SBT**
FIGURE 4.17

Discussion:

- **F to F mode**: Figure 4.17 shows that Mean of Gain scores of learning retention of ST category for SBT are less than the scores of TBT for F to F mode of learning. It indicates that learning with F to F is better for TBT rather than SBT for these students.

- **TAL mode**: Mean of Gain scores of learning retention of ST category for SBT is higher than the scores of TBT for TAL mode of learning. It indicates that learning with TAL mode is better for SBT rather than TBT for these students.

It is concluded that the face to face mode of learning is less effective than TAL mode for both the topics for ST category students. In other words, learning of TAL mode is more suitable for ST category students as compared to F to F mode.
D. Following are the Hypotheses 4 and 4A comparing learning retention of students of OBC category for TBT and SBT respectively.

(Comparison between F to F and TAL mode.)

Testing Hypothesis 4

The learning retention of students of OBC category for theory based topic (TBT) is higher in TAL mode than F to F mode.

Table 4.29 shows the Mean differences of Gain scores between control and TAL mode for OBC category in Theory Based Topic.

<table>
<thead>
<tr>
<th>Category</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBC</td>
<td>F to F mode</td>
<td>6.35</td>
<td>3.97</td>
<td>51</td>
<td>4.01</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>9.44</td>
<td>3.71</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

It is concluded that the learning retention of students of OBC category for theory based topic (TBT) is higher in TAL mode than F to F mode.

Testing Hypothesis 4A

The learning retention of students of OBC category for skill based topic (SBT) is higher in TAL mode than F to F mode.
Table 4.30 shows the Mean differences of Gain scores between control and TAL mode for OBC category in Theory Based Topic.

**TABLE 4.30**

**MEAN DIFFERENCES OF GAIN SCORES BETWEEN F TO F AND TAL MODE FOR OBC CATEGORY IN SBT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBC</td>
<td>F to F mode</td>
<td>6.78</td>
<td>3.32</td>
<td>51</td>
<td>3.07</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>8.96</td>
<td>3.73</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

It is concluded that the learning retention of students of OBC category for skill based topic (SBT) is higher in TAL mode than F to F mode.

Figure 4.18 is a graphical representation of Mean differences of Gain scores between F to F and TAL mode for OBC category in Theory Based Topic and Skill Based Topic.

**GRAPHICAL REPRESENTATION OF MEAN DIFFERENCES OF GAIN SCORES OF F TO F MODE AND TAL MODE FOR OBC CATEGORY IN TBT AND SBT**
**FIGURE 4.18**

**Discussion:**

- **F to F mode:** Figure 4.18 shows that Mean of Gain scores of learning retention of OBC category in F to F mode for TBT is less than the scores of SBT. It indicates that these students performed better in SBT than TBT in F to F mode.

- **TAL mode:** Mean of Gain scores of learning retention of OBC category in TAL mode for SBT is less than the scores of TBT. It indicates that OBC students performed better in TBT than SBT in TAL mode.

It is concluded that the face to face mode of learning is less effective than TAL mode for both the topics for OBC category students. In other words, the students of OBC category performed better in TAL than F to F mode for both the topics.
E. Following are the Hypotheses 5 and 5A comparing learning retention of students of Minority category for TBT and SBT respectively.

(Comparison between F to F and TAL mode.)

Testing Hypothesis 5

The learning retention of students of Minority category for theory based topic (TBT) is higher in TAL mode than F to F mode.

Table 4.31 shows the Mean differences of Gain scores between control and TAL mode for Minority category in Theory Based Topic.

TABLE 4.31
MEAN DIFFERENCES OF GAIN SCORES BETWEEN F TO F AND TAL MODE FOR MINORITY CATEGORY IN TBT

<table>
<thead>
<tr>
<th>Category</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minority</td>
<td>F to F mode</td>
<td>6.2</td>
<td>2.7</td>
<td>10</td>
<td>5.74</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>12.57</td>
<td>2.57</td>
<td>07</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

It is concluded that the learning retention of students of Minority category for theory based topic (TBT) is higher in TAL mode than F to F mode.

Testing Hypothesis 5A

The learning retention of students of Minority category for skill based topic (SBT) is higher in TAL mode than F to F mode.
Table 4.32 shows the Mean differences of Gain scores between control and TAL mode for Minority category in Skill Based Topic.

**TABLE 4.32**

**MEAN DIFFERENCES OF GAIN SCORES BETWEEN F TO F AND TAL MODE FOR MINORITY CATEGORY IN SBT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minority</td>
<td>F to F mode</td>
<td>7.1</td>
<td>3.31</td>
<td>10</td>
<td>1.78</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>9.71</td>
<td>2.75</td>
<td>07</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is not significant. Hence the research hypothesis is rejected.

It is concluded that the learning retention of students of Minority category for skill based topic (TBT) is higher in F to F mode than TAL mode.

Figure 4.19 is a graphical representation of Mean differences of Gain scores between F to F and TAL mode for Minority category in Theory Based Topic and Skill Based Topic.

**GRAPHICAL REPRESENTATION OF MEAN DIFFERENCES OF GAIN SCORES OF F TO F AND TAL MODE FOR MINORITY CATEGORY IN TBT AND SBT**
FIGURE 4.19

Discussion:

- **F to F mode**: Figure 4.19 shows that Mean of Gain scores of learning retention of Minority category of F to F mode for TBT is less than SBT. It indicates that these students performed better in SBT than TBT in F to F mode.

- **TAL mode**: Mean of Gain scores of learning retention of Minority category of TAL mode for TBT is higher than SBT. It indicates that Minority students performed better in TBT than SBT in TAL mode.

It is concluded that the face to face mode of learning is less effective than TAL mode for theory based topic and more effective for skill based topic for Minority category students. In other words, the students of Minority category performed better in TAL than F
to F mode in TBT whereas they performed better in F to F mode for SBT.

**F.** Following are the Hypotheses 6 and 6A comparing learning retention of students of **Open category** for TBT and SBT respectively.

(Comparison between F to F and TAL mode.)

**Testing Hypothesis 6**

_The learning retention of students of Open category for theory based topic (TBT) is higher in TAL mode than F to F mode._

Table 4.33 shows the Mean differences of Gain scores between F to F and TAL mode for Open category in Theory Based Topic.

<table>
<thead>
<tr>
<th>Category</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open</td>
<td>F to F mode</td>
<td>6.91</td>
<td>3.65</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>8.22</td>
<td>3.65</td>
<td>98</td>
<td><strong>2.43</strong></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant at 0.05 level. Hence the research hypothesis is accepted.
It is concluded that the learning retention of students of Open category for theory based topic (TBT) is higher in TAL mode than F to F mode.

**Testing Hypothesis 6A**

*The learning retention of students of Open category for skill based topic (SBT) is higher in TAL mode than F to F mode.*

Table 4.34 shows the Mean differences of Gain scores between F to F and TAL mode for Open category in Skill Based Topic.

**TABLE 4.34**

**MEAN DIFFERENCES OF GAIN SCORES OF F TO F AND TAL MODE FOR OPEN CATEGORY IN SBT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open</td>
<td>F to F mode</td>
<td>6.6</td>
<td>3.03</td>
<td>90</td>
<td>6.66</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>9.80</td>
<td>3.57</td>
<td>98</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

It is concluded that the learning retention of students of Open category for skill based topic (SBT) is higher in TAL mode than F to F mode.

Figure 4.20 is a graphical representation of Mean differences of Gain scores between F to F and TAL mode for Open category in Theory Based Topic and Skill Based Topic.
GRAPHICAL REPRESENTATION OF MEAN DIFFERENCES OF GAIN SCORES OF F TO F AND TAL MODE FOR OPEN CATEGORY IN TBT AND SBT

Discussion:

- **F to F mode**: Figure 4.20 shows that Mean of Gain scores of learning retention of Open category of F to F mode for TBT is higher than SBT. It indicates that these students performed better in TBT than SBT in F to F mode.

- **TAL mode**: Mean of Gain scores of learning retention of Open category of TAL mode for SBT is higher than TBT. It indicates
that Open category students performed better in SBT than TBT in TAL mode.

It is concluded that the face to face mode of learning is less effective than TAL mode for both the topic for Open category students. In other words, the students of Open category performed better in TAL than F to F mode for both the topics.

G. Following are the Hypotheses 7 (a to j) comparing learning retention of students of F to F mode for theory based topic (TBT) between following categories.

(Comparison between the social categories.)

Testing Hypothesis 7

a. SC and ST:

The learning retention of SC category students is higher than that of ST category students in the F to F mode for theory based topic (TBT).

b. SC and OBC:

The learning retention of SC category students is higher than that of OBC category students in the F to F mode for theory based topic (TBT).

c. SC and Minority:

The learning retention of SC category students is higher than that of Minority category students in the F to F mode for theory based topic (TBT).
d. SC and Open:

*The learning retention of SC category students is higher than that of Open category students in the F to F mode for theory based topic (TBT).*

e. ST and OBC:

*The learning retention of ST category students is higher than that of OBC category students in the F to F mode for theory based topic (TBT).*

f. ST and Minority:

*The learning retention of ST category students is higher than that of Minority category students in the F to F mode for theory based topic (TBT).*

g. ST and Open:

*The learning retention of ST category students is higher than that of Open category students in the F to F mode for theory based topic (TBT).*

h. OBC and Minority:

*The learning retention of OBC category students is higher than that of Minority category students in the F to F mode for theory based topic (TBT).*

i. OBC and Open:
The learning retention of OBC category students is higher than that of Open category students in the F to F mode for theory based topic (TBT).

j. Minority and Open:

The learning retention of Minority category students is higher than that of Open category students in the F to F mode for theory based topic (TBT).

Table 4.35 shows the relevant statistics for Gain scores of learning retention of students of F to F mode for theory based topic.

<table>
<thead>
<tr>
<th>TABLE 4.35</th>
<th>RELEVANT STATISTICS FOR GAIN SCORES OF LEARNING RETENTION OF STUDENTS OF F TO F MODE FOR TBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>N</td>
</tr>
<tr>
<td>SC</td>
<td>28</td>
</tr>
<tr>
<td>ST</td>
<td>10</td>
</tr>
<tr>
<td>OBC</td>
<td>51</td>
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<tr>
<td>Minority</td>
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<tr>
<td>Open</td>
<td>90</td>
</tr>
<tr>
<td>ST</td>
<td>10</td>
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### Table

<table>
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<tr>
<th></th>
<th>OBC</th>
<th>ST</th>
<th>Minority</th>
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</tr>
</thead>
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<td>g</td>
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<td>j</td>
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<td></td>
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<td>0.76</td>
</tr>
</tbody>
</table>

**Conclusion:** Since obtained ‘t’ mentioned against each of the sub group (from a to j) in F to F mode is not significant, the hypotheses are rejected and it is stated that there is no significant difference in gain scores of learning retention between the social categories in F to F mode for theory based topic.

**H.** Following are the Hypotheses 7A (k to t) comparing learning retention of students of TAL mode for theory based topic (TBT) between following categories.

(Comparison between the social categories.)

**Testing Hypothesis 7A**

k. SC and ST:

*The learning retention of SC category students is higher than that of ST category students in the TAL mode for theory based topic (TBT).*
1. SC and OBC:

The learning retention of SC category students is higher than that of OBC category students in the TAL mode for theory based topic (TBT).

m. SC and Minority:

The learning retention of SC category students is higher than that of Minority category students in the TAL mode for theory based topic (TBT).

n. SC and Open:

The learning retention of SC category students is higher than that of Open category students in the TAL mode for theory based topic (TBT).

o. ST and OBC:

The learning retention of ST category students is higher than that of OBC category students in the TAL mode for theory based topic (TBT).

p. ST and Minority:

The learning retention of ST category students is higher than that of Minority category students in the TAL mode for theory based topic (TBT).

q. ST and Open:
The learning retention of ST category students is higher than that of Open category students in the TAL mode for theory based topic (TBT).

r. OBC and Minority:

The learning retention of OBC category students is higher than that of Minority category students in the TAL mode for theory based topic (TBT).

s. OBC and Open:

The learning retention of OBC category students is higher than that of Open category students in the TAL mode for theory based topic (TBT).

t. Minority and Open:

The learning retention of Minority category students is higher than that of Open category students in the TAL mode for theory based topic (TBT).

Table 4.36 shows the relevant statistics for Gain scores of learning retention of students of TAL mode for TBT.
Table 4.36
Relevant statistics for gain scores of learning retention of B. Ed students of TAL mode for TBT

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC</td>
<td>22</td>
<td>11.36</td>
<td>3.06</td>
<td></td>
</tr>
<tr>
<td>ST</td>
<td>14</td>
<td>11.86</td>
<td>3.30</td>
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<tr>
<td>SC</td>
<td>22</td>
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<td>3.06</td>
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<tr>
<td>OBC</td>
<td>48</td>
<td>9.44</td>
<td>3.71</td>
<td>2.28</td>
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<tr>
<td>SC</td>
<td>22</td>
<td>11.36</td>
<td>3.06</td>
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<tr>
<td>Minority</td>
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<td>12.57</td>
<td>2.57</td>
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<td>Open</td>
<td>98</td>
<td>8.22</td>
<td>3.65</td>
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<tr>
<td>ST</td>
<td>14</td>
<td>11.86</td>
<td>3.30</td>
<td></td>
</tr>
<tr>
<td>OBC</td>
<td>48</td>
<td>9.44</td>
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<td>2.37</td>
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<td>ST</td>
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<td>11.86</td>
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<tr>
<td>Minority</td>
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<td>12.57</td>
<td>2.57</td>
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<td></td>
<td>Open</td>
<td>98</td>
<td>8.22</td>
<td>3.65</td>
</tr>
</tbody>
</table>

N.B.: Where ‘t’ is found significant, it is indicated in bold style above.

**Conclusion:** The obtained ‘t’ mentioned against the following sub group in TAL mode for TBT is not significant:

- SC and ST
- SC and Minority
- ST and Minority
- OBC and Open

The hypotheses are rejected in case of these groups stating that there is no significant difference in the gain scores of learning retention between these social categories in TAL mode for theory based topic.

Further, the hypotheses are accepted for following sub groups as obtained ‘t’ is significant:

- SC and OBC
- SC and Open
- ST and OBC
- ST and Open
- Minority and OBC
- Minority and Open
Figure 4.21 is a graphical representation of gain scores of learning retention of B. Ed students of TAL mode for TBT.

**Graphical Representation of Gain Scores of Learning Retention of B. Ed Students of TAL Mode for TBT**

**Discussion:**
• **SC and OBC**: Mean differences for the gain scores of SC are higher than that of OBC category. It indicates that SC category students performed better than OBC in TAL mode.

• **SC and Open**: Mean differences for the gain scores of SC are higher than that of Open category. It indicates that SC category students performed better than Open category in TAL mode.

• **ST and OBC**: Mean differences for the gain scores of ST are higher than that of OBC category. It indicates that ST category students performed better than OBC in TAL mode.

• **ST and Open**: Mean differences for the gain scores of ST are higher than that of Open category. It indicates that ST category students performed better than Open category in TAL mode.

• **Minority and OBC**: Mean differences for the gain scores of Minority are higher than that of OBC category. It indicates that Minority category students performed better than OBC in TAL mode.

• **Minority and Open**: Mean differences for the gain scores of Minority are higher than that of Open category. It indicates that Minority category students performed better than Open category in TAL mode.
Figure 4.21 indicates that Mean of Gain scores of Minority category are higher than any other category whereas Mean of Gain scores of Open category are lower than all other categories. It indicates that Minority category students performed better in learning theory based topic with TAL mode whereas Open category students performed lower in TAL mode for TBT.

It can be concluded that SC, ST and Minority students performed better than OBC and Open category students of TAL mode for theory based topic. They performed better with TAL mode.

1. Following are the Hypotheses 8 (a to j) comparing learning retention of students of F to F mode for skill based topic (SBT) between following categories.  

   (Comparison between the social categories.)

Testing Hypothesis 8

a. SC and ST:

   *The learning retention of SC category students is higher than that of ST category students in the F to F mode for skill based topic (SBT).*

b. SC and OBC:

   *The learning retention of SC category students is higher than that of OBC category students in the F to F mode for skill based topic (SBT).*

c. SC and Minority:
The learning retention of SC category students is higher than that of Minority category students in the F to F mode for skill based topic (SBT).

d. SC and Open:

The learning retention of SC category students is higher than that of Open category students in the F to F mode for skill based topic (SBT).

e. ST and OBC:

The learning retention of ST category students is higher than that of OBC category students in the F to F mode for skill based topic (SBT).

f. ST and Minority:

The learning retention of ST category students is higher than that of Minority category students in the F to F mode for skill based topic (SBT).

g. ST and Open:

The learning retention of ST category students is higher than that of Open category students in the F to F mode for skill based topic (SBT).

h. OBC and Minority:
The learning retention of OBC category students is higher than that of Minority category students in the F to F mode for skill based topic (SBT).

i. OBC and Open:

The learning retention of OBC category students is higher than that of Open category students in the F to F mode for skill based topic (SBT).

j. Minority and Open:

The learning retention of Minority category students is higher than that of Open category students in the F to F mode for skill based topic (SBT).

Table 4.36A shows the relevant statistics for Gain scores of learning retention of B. Ed students of F to F mode for skill based topic.
### TABLE 4.36A

RELEVANT STATISTICS FOR GAIN SCORES OF LEARNING RETENTION OF B. ED STUDENTS OF F TO F MODE FOR SBT

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>‘t’</th>
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<tr>
<td>SC</td>
<td>28</td>
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<td>SC</td>
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<td>1.30</td>
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<td>OBC</td>
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<td>3.32</td>
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<tr>
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<td>28</td>
<td>5.75</td>
<td>3.09</td>
<td>1.13</td>
</tr>
<tr>
<td>Minority</td>
<td>10</td>
<td>7.1</td>
<td>3.31</td>
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<td></td>
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<tr>
<td>SC</td>
<td>28</td>
<td>5.75</td>
<td>3.09</td>
<td>1.29</td>
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<tr>
<td>Open</td>
<td>90</td>
<td>6.6</td>
<td>3.03</td>
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<tr>
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<td>51</td>
<td>6.78</td>
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<td>ST</td>
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<td>3.16</td>
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<td>OBC</td>
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<td>6.78</td>
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<td>6.78</td>
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<tr>
<td></td>
<td>Open</td>
<td>90</td>
<td>6.6</td>
<td></td>
</tr>
</tbody>
</table>
**Conclusion:** Since obtained ‘t’ mentioned against each of the sub group (a to j) in F to F mode is not significant the hypotheses are rejected and it is stated that there is no significant difference in the gain scores of learning retention between the social categories in F to F mode for skill based topic.

**J.** Following are the Hypotheses 8A (k to t) comparing learning retention of students of TAL mode for skill based topic (SBT) between following categories.

*(Comparison between the social categories.)*

**Testing Hypothesis 8A**

The hypotheses were formulated to compare the learning retention of students of TAL mode for skill based topic (SBT) between following categories:

k. SC and ST:

*The learning retention of SC category students is higher than that of ST category students in the TAL mode for skill based topic (SBT).*

l. SC and OBC:

*The learning retention of SC category students is higher than that of OBC category students in the TAL mode for skill based topic (SBT).*

m. SC and Minority:
The learning retention of SC category students is higher than that of Minority category students in the TAL mode for skill based topic (SBT).

n. SC and Open:
The learning retention of SC category students is higher than that of Open category students in the TAL mode for skill based topic (SBT).

o. ST and OBC:
The learning retention of ST category students is higher than that of OBC category students in the TAL mode for skill based topic (SBT).

p. ST and Minority:
The learning retention of ST category students is higher than that of Minority category students in the TAL mode for skill based topic (SBT).

q. ST and Open:
The learning retention of ST category students is higher than that of Open category students in the TAL mode for skill based topic (SBT).

r. OBC and Minority:
The learning retention of OBC category students is higher than that of Minority category students in the TAL mode for skill based topic (SBT).

s. OBC and Open:

The learning retention of OBC category students is higher than that of Open category students in the TAL mode for skill based topic (SBT).

t. Minority and Open:

The learning retention of Minority category students is higher than that of Open category students in the TAL mode for skill based topic (SBT).

Table 4.37 shows the relevant statistics for Gain scores of learning retention of B. Ed students of TAL mode for skill based topic.

TABLE 4.37
RELEVANT STATISTICS FOR GAIN SCORES OF
<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>a SC</td>
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<td>4.06</td>
<td>1.38</td>
</tr>
<tr>
<td>ST</td>
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<td>b SC</td>
<td>22</td>
<td>10.41</td>
<td>4.06</td>
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<td></td>
<td>Open</td>
<td>98</td>
<td>3.57</td>
<td></td>
</tr>
</tbody>
</table>

**N.B.: Where ‘t’ is found significant, it is indicated in bold style above.**

**Conclusion:** The obtained ‘t’ mentioned against the following sub group in TAL mode for skill based topic is not significant:

- SC and ST
- SC and Minority
- SC and Open
- ST and Minority
• OBC and Minority
• Minority and Open

The hypotheses are rejected in case of these groups stating that there is no significant difference in the gain scores of learning retention between these social categories in TAL mode for skill based topic.

Further, the hypotheses are accepted for following sub groups as obtained ‘t’ is significant:
• OBC and SC
• OBC and ST
• ST and Open
• OBC and Open

Figure 4.22 is a graphical representation of gain scores of learning retention between the social categories in TAL mode for skill based topic.

GRAPHICAL REPRESENTATION OF GAIN SCORES OF LEARNING RETENTION BETWEEN THE SOCIAL CATEGORIES IN TAL MODE FOR SBT
Discussion:

- **OBC and SC**: Mean difference for the gain scores of SC is higher than that of OBC category. It indicates that SC category students performed better than OBC in TAL mode for skill based topic.

- **OBC and ST**: Mean difference for the gain scores of ST is higher than that of OBC category. It indicates that ST category students performed better than OBC in TAL mode for skill based topic.

- **ST and Open**: Mean difference for the gain scores of ST is higher than that of Open category. It indicates that ST category students performed better than Open category in TAL mode for skill based topic.
• **OBC and Open**: Mean difference for the gain scores of Open is higher than that of OBC category. It indicates that Open category students performed better than OBC category in TAL mode for skill based topic.

It can be concluded that SC and ST students performed better than OBC, Minority and Open category students of TAL mode for skill based topic. In all the categories, the Mean difference of ST category is higher. It indicates that students of ST category performed better than all the categories whereas the performance of students of OBC category is lower than all the other categories as mean of Gain scores is very low in learning skill based topic in TAL mode.

It indicates that SC and ST students performed better in TAL mode for both the topics which means that they performed better in TAL mode of learning both the topics than any other category.

**COMPARISON BETWEEN FACE TO FACE AND TAL MODE ON THE BASIS OF MEDIUM OF INSTRUCTION**

K. Following are the Hypotheses 9 and 9A comparing learning retention of students of Marathi Medium for TBT and SBT respectively.
Testing Hypothesis 9

The learning retention of students of Marathi medium for theory based topic (TBT) is higher in TAL mode than F to F mode.

Table 4.38 shows the Mean differences of Gain scores between F to F and TAL mode for Marathi medium students in Theory Based Topic.

<table>
<thead>
<tr>
<th>Medium</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marathi</td>
<td>F to F mode</td>
<td>5.93</td>
<td>3.52</td>
<td>96</td>
<td>8.83</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>10.52</td>
<td>3.57</td>
<td>88</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

It is concluded that the learning retention of students of Marathi Medium for theory based topic (TBT) is higher in TAL mode than F to F mode.

Testing Hypothesis 9A

The learning retention of students of Marathi medium for skill based topic (SBT) is higher in TAL mode than F to F mode.
Table 4.39 shows the Mean differences of Gain scores between F to F and TAL mode for Marathi medium students in Skill Based Topic.

**TABLE 4.39**

MEAN DIFFERENCES OF GAIN SCORES BETWEEN F TO F MODE AND TAL MODE OF MARATHI MEDIUM STUDENTS IN SBT

<table>
<thead>
<tr>
<th>Medium</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained 't'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marathi</td>
<td>F to F mode</td>
<td>6.16</td>
<td>3.33</td>
<td>96</td>
<td>5.97</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>9.32</td>
<td>3.79</td>
<td>88</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

It is concluded that the learning retention of students of Marathi Medium for skill based topic (SBT) is higher in TAL mode than F to F mode.

Figure 4.23 is a graphical representation of Mean differences of Gain scores between F to F and TAL mode of Marathi Medium in Theory Based Topic and Skill Based Topic.

**MEAN DIFFERENCES OF GAIN SCORES BETWEEN F TO F MODE AND TAL MODE OF MARATHI MEDIUM FOR TBT AND SBT**
Discussion:

- **F to F mode**: Figure 4.23 shows that Mean of Gain scores of learning retention of Marathi medium students of F to F mode for SBT is more than TBT. It indicates that students performed better in SBT than TBT in F to F mode.

- **TAL mode**: Mean of Gain scores of learning retention of Marathi medium students of TAL mode for TBT is more than SBT. It indicates that these students performed better in TBT than SBT in TAL mode.

Conclusion:

It is concluded that the face to face mode of learning is less effective than TAL mode for both the topics for Marathi medium students. In other words, the Marathi medium students performed better in TAL mode than F to F mode for both the topics though
these packages were prepared in English language. So the language did not affect the learning retention in case of Marathi medium students.

L. Following are the Hypotheses 10 and 10A comparing learning retention of students of Hindi Medium for TBT and SBT respectively.

(Comparison between F to F and TAL mode.)

Testing Hypothesis 10

*The learning retention of students of Hindi medium for theory based topic (TBT) is higher in TAL mode than F to F mode.*

Table 4.40 shows the Mean differences of Gain scores between F to F and TAL mode for Hindi medium students in Theory Based Topic.

<table>
<thead>
<tr>
<th>Medium</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hindi</td>
<td>F to F mode</td>
<td>6.98</td>
<td>2.44</td>
<td>41</td>
<td>2.83</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>8.85</td>
<td>3.97</td>
<td>54</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.
It is concluded that the learning retention of students of Hindi Medium for theory based topic (TBT) is higher in TAL mode than F to F mode.

Testing Hypothesis 10A

The learning retention of students of Hindi medium for skill based topic (SBT) is higher in TAL mode than F to F mode.

Table 4.41 shows the Mean differences of Gain scores between F to F and TAL mode for Hindi medium students in Skill Based Topic.

<table>
<thead>
<tr>
<th>Medium</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hindi</td>
<td>F to F mode</td>
<td>6.98</td>
<td>2.94</td>
<td>41</td>
<td>4.35</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>9.94</td>
<td>3.68</td>
<td>54</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

It is concluded that the learning retention of students of Hindi Medium for skill based topic (SBT) is higher in TAL mode than F to F mode.

Figure 4.24 is a graphical representation of Mean differences of Gain scores of F to F and TAL mode of Hindi Medium in Theory Based Topic and Skill Based Topic.
MEAN DIFFERENCES OF GAIN SCORES BETWEEN F TO F MODE AND TAL MODE OF HINDI MEDIUM FOR TBT AND SBT

![Bar Chart](chart.png)

**FIGURE 4.24**

Discussion:

- **F to F mode**: Figure 4.24 shows that Mean of Gain scores of learning retention of Hindi medium students of F to F mode for SBT is equal to TBT. It indicates that the performance of students of Hindi medium is similar in TBT and SBT in F to F mode. Hence, F to F mode has similar impact on Hindi medium students for TBT and SBT.

- **TAL mode**: Mean of Gain scores of learning retention of Hindi medium students of TAL mode for TBT is less than SBT. It in-
dictates that these students performed better in SBT than TBT in TAL mode.

**Conclusion**

It is concluded that the face to face mode of learning is less effective than TAL mode for both the topics for Hindi medium students. In other words, the Hindi medium students performed better in TAL mode than F to F mode for both the topics though these packages were prepared in English language. So the language did not affect the learning retention in case of Marathi medium students.

**M.** Following are the Hypotheses 11 and 11A comparing learning retention of students of English Medium for TBT and SBT respectively.

*(Comparison between F to F and TAL mode.)*

**Testing Hypothesis 11**

*The learning retention of students of English medium for theory based topic (TBT) is higher in TAL mode than F to F mode.*

Table 4.42 shows the Mean difference of Gain scores between F to F and TAL mode for English medium students in Theory Based Topic.

**TABLE 4.42**

192
MEAN DIFFERENCES OF GAIN SCORES OF F TO F AND TAL MODE OF ENGLISH MEDIUM STUDENTS IN TBT

<table>
<thead>
<tr>
<th>Medium</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>F to F mode</td>
<td>7.35</td>
<td>2.87</td>
<td>52</td>
<td>0.48</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>7.64</td>
<td>3.08</td>
<td>47</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is not significant. Hence the research hypothesis is rejected.

It is concluded that the learning retention of students of English Medium for theory based topic (TBT) is higher in F to F mode than TAL mode.

**Testing Hypothesis 11A**

*The learning retention of students of English medium for skill based topic (SBT) is higher in TAL mode than F to F mode.*

Table 4.43 shows the Mean difference of Gain scores between F to F and TAL mode for English medium students in Skill Based Topic.

**TABLE 4.43**

MEAN DIFFERENCES OF GAIN SCORES OF F TO F AND TAL MODE OF ENGLISH MEDIUM STUDENTS IN SBT

<table>
<thead>
<tr>
<th>Medium</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>F to F mode</td>
<td>6.21</td>
<td>2.68</td>
<td>52</td>
<td>5.09</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>9.70</td>
<td>3.84</td>
<td>47</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.
It is concluded that the learning retention of students of English Medium for skill based topic (SBT) is higher in TAL mode than F to F mode.

Figure 4.25 is a graphical representation of Mean differences of Gain scores between F to F and TAL mode of English Medium in Theory Based Topic and Skill Based Topic.
FIGURE 4.25

Discussion:

- **F to F mode**: Figure 4.25 shows that Mean of Gain scores of learning retention of English medium students of F to F mode for TBT is more than SBT. It indicates that students performed better in TBT than SBT in F to F mode.

- **TAL mode**: Mean of Gain scores of learning retention of English medium students of TAL mode for SBT is more than TBT. It indicates that these students performed better in SBT than TBT in TAL mode.

It is concluded that the face to face mode of learning is less effective than TAL mode for both the topic for English medium students. In other words, the English medium students performed better in TAL than F to F mode for both the topics.

**COMPARISON BETWEEN FACE TO FACE AND TAL MODE ON THE BASIS OF LOCALITY**

**N.** Following are the Hypotheses 12 and 12A comparing learning retention of students of *Urban locality* for TBT and SBT respectively.

*(Comparison between F to F and TAL mode.)*

**Testing Hypothesis 12**

*The learning retention of students of Urban locality for theory based topic (TBT) is higher in TAL mode than F to F mode.*
Table 4.44 shows the Mean difference of Gain scores of learning retention of students of Urban locality in F to F mode and TAL mode for Theory Based Topic.

TABLE 4.44
MEAN DIFFERENCE OF GAIN SCORES OF STUDENTS OF URBAN LOCALITY IN F TO F AND TAL MODE FOR TBT

<table>
<thead>
<tr>
<th>Locality</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>F to F mode</td>
<td>8.89</td>
<td>3.25</td>
<td>102</td>
<td>5.05</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>11.01</td>
<td>3.22</td>
<td>132</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

It is concluded that the learning retention of students of Urban locality for theory based topic (TBT) is higher in TAL mode than F to F mode.

Testing Hypothesis 12A

*The learning retention of students of Urban locality for skill based topic (SBT) is higher in TAL mode than F to F mode.*

Table 4.45 shows the Mean difference of Gain scores of learning retention of students of Urban locality in F to F mode and TAL mode for Skill Based Topic.

TABLE 4.45
MEAN DIFFERENCE OF GAIN SCORES OF STUDENTS OF URBAN LOCALITY IN F TO F AND TAL MODE FOR SBT

<table>
<thead>
<tr>
<th>Locality</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
</table>

196
Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

It is concluded that the learning retention of students of Urban locality for skill based topic (SBT) is higher in TAL mode than F to F mode.

Figure 4.26 is a graphical representation of Mean differences of Gain scores of the students in Urban locality between F to F and TAL mode in Theory Based Topic and Skill Based Topic.

**MEAN DIFFERENCES OF GAIN SCORES OF THE STUDENTS IN URBAN LOCALITY BETWEEN F TO F MODE AND TAL MODE FOR TBT AND SBT**

<table>
<thead>
<tr>
<th>Topic</th>
<th>F to F mode</th>
<th>TAL mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBT</td>
<td>10.61</td>
<td>7.16</td>
</tr>
<tr>
<td>SBT</td>
<td>3.89</td>
<td>3.54</td>
</tr>
<tr>
<td></td>
<td>102</td>
<td>132</td>
</tr>
</tbody>
</table>

**FIGURE 4.26**
Discussion:

- **F to F mode**: Figure 4.26 shows that Mean of Gain scores of learning retention of students in Urban locality using F to F mode for SBT is more than TBT. It indicates that students performed better in SBT than TBT in F to F mode.

- **TAL mode**: Mean of Gain scores of learning retention of students in Urban locality using TAL mode for TBT is more than SBT. It indicates that these students performed better in TBT than SBT in TAL mode.

  It is concluded that the face to face mode of learning is more effective than TAL mode for learning SBT whereas TAL mode of learning is more effective than F to F mode for learning TBT. In other words, the students of Urban locality performed better in TAL than F to F mode for learning TBT whereas they performed better in F to F mode for learning SBT.

O. Following are the Hypotheses 13 and 13A comparing learning retention of students of **Rural locality** for TBT and SBT respectively.

  (Comparison between F to F and TAL mode.)

**Testing Hypothesis 13**

*The learning retention of students of Rural locality for theory based topic (TBT) is higher in TAL mode than F to F mode.*

Table 4.46 shows the Mean difference of Gain scores of learning retention of students of Rural locality in F to F mode and TAL mode for Theory Based Topic.
TABLE 4.46
MEAN DIFFERENCE OF GAIN SCORES OF STUDENTS OF RURAL LOCALITY IN F TO F AND TAL MODE FOR TBT

<table>
<thead>
<tr>
<th>Locality</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>F to F mode</td>
<td>6.46</td>
<td>2.99</td>
<td>87</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>6.95</td>
<td>3.27</td>
<td>57</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is not significant. Hence the research hypothesis is rejected.

It is concluded that the learning retention of students of Rural locality for theory based topic (TBT) is higher in F to F mode than TAL mode.

**Testing Hypothesis 13A**

*The learning retention of students of Rural locality for skill based topic (SBT) is higher in TAL mode than F to F mode.*

Table 4.47 shows the Mean difference of Gain scores of learning retention of students of Rural locality in F to F mode and TAL mode for Skill Based Topic.

TABLE 4.47
MEAN DIFFERENCE OF GAIN SCORES OF STUDENTS OF RURAL LOCALITY IN F TO F MODE AND TAL MODE FOR SBT

<table>
<thead>
<tr>
<th>Locality</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Rural

<table>
<thead>
<tr>
<th></th>
<th>F to F mode</th>
<th>TAL mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (Gain scores)</td>
<td>7.02</td>
<td>6.33</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>2.09</td>
<td>2.11</td>
</tr>
<tr>
<td>N</td>
<td>87</td>
<td>57</td>
</tr>
<tr>
<td>t</td>
<td>1.97</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is not significant. Hence the research hypothesis is rejected.

It is concluded that the learning retention of students of Rural locality for skill based topic (SBT) is higher in F to F mode than TAL mode.

Figure 4.27 is a graphical representation of Mean differences of Gain scores of the students in Rural locality between F to F and TAL mode in Theory Based Topic and Skill Based Topic.

MEAN DIFFERENCES OF GAIN SCORES OF THE STUDENTS IN RURAL LOCALITY BETWEEN F TO F MODE AND TAL MODE FOR TBT AND SBT

FIGURE 4.27

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Discussion:

- **F to F mode**: Figure 4.27 shows that Mean of Gain scores of learning retention of students in Rural locality using F to F mode for SBT is more than TBT. It indicates that students performed better in SBT than TBT in F to F mode.

- **TAL mode**: Mean of Gain scores of learning retention of students in Rural locality using TAL mode for TBT is more than SBT. It indicates that these students performed better in TBT than SBT in TAL mode.

  It is concluded that the face to face mode of learning is more effective than TAL mode for learning SBT whereas TAL mode of learning is more effective than F to F mode for learning TBT. In other words, the students of Urban locality performed better in TAL than F to F mode for learning TBT whereas they performed better in F to F mode for learning SBT.

**COMPARISON ON THE BASIS OF LOCALITY**

<table>
<thead>
<tr>
<th>P. Following are the Hypotheses 14 (F to F mode) and 14A (TAL mode) comparing learning retention of students for TBT.</th>
<th>(Comparison between Urban and Rural locality.)</th>
</tr>
</thead>
</table>

**Testing Hypothesis 14**

_The learning retention of students of F to F mode for theory based topic (TBT) is higher in Urban locality than Rural locality_
Table 4.48 shows the Mean difference of Gain scores of learning retention between Urban and Rural locality for students of F to F mode in Theory Based Topic.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Locality</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBT</td>
<td>Urban</td>
<td>8.89</td>
<td>3.25</td>
<td>102</td>
<td>5.4</td>
</tr>
<tr>
<td></td>
<td>Rural</td>
<td>6.46</td>
<td>2.99</td>
<td>87</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, ‘t’ is significant, the research hypothesis is accepted.

**Conclusion:** The mean of Gain scores of the students of Urban locality is higher than that of the Rural locality. It indicates that the student from Urban locality who used F to F mode of learning for TBT performed better than Rural locality.

**Testing Hypothesis 14A**

*The learning retention of students of TAL mode for theory based topic (TBT) is higher in Urban locality than Rural locality.*
Table 4.49 shows the Mean difference of Gain scores of learning retention between Urban and Rural locality for students of TAL mode in Theory Based Topic.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Locality</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBT</td>
<td>Urban</td>
<td>11.01</td>
<td>3.22</td>
<td>132</td>
<td>9.73</td>
</tr>
<tr>
<td></td>
<td>Rural</td>
<td>5.95</td>
<td>3.27</td>
<td>57</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, ‘t’ is significant, the research hypothesis is accepted.

**Conclusion:** The Mean of the Gain scores of learning retention of Urban students in TAL mode for theory based topic (TBT) is higher than the students of Rural locality.

It indicates that the student from Urban locality who used TAL mode of learning for TBT performed better than Rural locality students.

Figure 4.28 shows the mean difference of gain scores between F to F mode of Urban and Rural locality in TBT.
MEAN DIFFERENCE OF GAIN SCORES BETWEEN F TO F MODE AND TAL MODE OF URBAN AND RURAL LOCALITY FOR TBT

![Bar Chart: Mean Difference of Gain Scores]

**FIGURE 4.28**

**Conclusion:**

**FOR THEORY BASED TOPIC (TBT)**

*On the basis of Hypothesis 14 and 14A:*

1. **Comparison of learning retention on the basis of the modes of learning**

   1. Figure 4.28 shows that the learning retention of Urban students...
is higher in TAL mode than F to F mode. In the other words, Urban students performed better in TAL mode than F to F mode in learning TBT.

2. The learning retention of Rural students is higher in F to F mode than TAL mode. In other words, Rural students performed better in F to F mode than TAL mode in learning TBT.

b. Comparison of learning retention on the basis of locality -

1. The learning retention of Urban students is higher than Rural students in F to F mode. In the other words, Urban students performed better than Rural students in F to F mode in learning TBT.

2. The learning retention of Urban students is higher than Rural students in TAL mode. In the other words, Urban students performed better than Rural students in TAL mode in learning TBT.

It is concluded that, Urban students performed better than Rural students in TAL mode and F to F mode as well in learning theory based topic.

Q. Following are the Hypotheses 15 (F to F mode) and 15A (TAL mode) comparing learning retention of students for SBT. (Comparison between Urban and Rural locality.)

Testing Hypothesis 15

*The learning retention of students of F to F mode for skill based topic (SBT) is higher in Urban locality than Rural locality*
Table 4.50 shows the Mean difference of Gain scores of learning retention between Urban and Rural locality for students of F to F mode in Skill Based Topic.

### TABLE 4.50
MEAN DIFFERENCE OF GAIN SCORES BETWEEN F TO F MODE OF URBAN AND RURAL LOCALITY IN SBT

<table>
<thead>
<tr>
<th>Topic</th>
<th>Locality</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBT</td>
<td>Urban</td>
<td>10.61</td>
<td>3.89</td>
<td>102</td>
<td>7.98</td>
</tr>
<tr>
<td></td>
<td>Rural</td>
<td>7.02</td>
<td>2.09</td>
<td>87</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, ‘t’ is significant, the research hypothesis is accepted.

**Conclusion:** The mean of Gain scores of the students of Urban locality is higher than that of the Rural locality. It indicates that the student from Urban locality who used F to F mode of learning for SBT performed better than Rural locality.

**Testing Hypothesis 15A**

*The learning retention of students of TAL mode for skill based topic (SBT) is higher in Urban locality than Rural locality*

Table 4.51 shows the Mean difference of Gain scores of learning retention between Urban and Rural locality for students of TAL mode in Skill Based Topic.

### TABLE 4.51
MEAN DIFFERENCE OF GAIN SCORES IN TAL MODE OF URBAN AND RURAL LOCALITY IN SBT

206
<table>
<thead>
<tr>
<th>Topic</th>
<th>Locality</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBT</td>
<td>Urban</td>
<td>7.16</td>
<td>3.53</td>
<td>132</td>
<td>2.02</td>
</tr>
<tr>
<td></td>
<td>Rural</td>
<td>6.33</td>
<td>2.11</td>
<td>57</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, ‘t’ is significant at 0.05 level, the research hypothesis is accepted.

**Conclusion:** The mean of Gain scores of the students of Urban locality is higher than that of the Rural locality. It indicates that the student from Urban locality who used TAL mode of learning for SBT performed better than Rural locality.

Figure 4.29 shows the mean difference of gain scores between F to F mode of Urban and Rural locality in SBT.

**MEAN DIFFERENCE OF GAIN SCORES BETWEEN F TO F MODE AND TAL MODE OF URBAN AND RURAL LOCALITY FOR SBT**

![Figure 4.29](image-url)
Conclusion:

FOR SKILL BASED TOPIC (SBT)

On the basis of Hypothesis 15 and 15A:

a. **Comparison of learning retention on the basis of the modes of learning.**

1. Figure 4.29 shows that the learning retention of Urban students is higher in TAL mode than F to F mode. In the other words, Urban students performed better in TAL mode than F to F mode in learning SBT.

2. The learning retention of Rural students is higher in F to F mode than TAL mode. In other words, Rural students performed better in F to F mode than TAL mode in learning SBT.

b. **Comparison of learning retention on the basis of locality** -

1. The learning retention of Urban students is higher than Rural students in F to F mode. In the other words, Urban students performed better than Rural students in F to F mode in learning SBT.

2. The learning retention of Urban students is higher than Rural students in TAL mode. In the other words, Urban students performed better than Rural students in TAL mode in learning SBT.

   It is concluded that, Urban students performed better than Rural students in TAL mode and F to F mode as well in learning skill based topic (SBT).
COMPARISON BETWEEN FACE TO FACE AND TAL MODE ON THE BASIS OF GENDER

R. Following are the Hypotheses 16 (Male students) and 16A (Female students) comparing learning retention of students for TBT.

(Comparison between F to F mode and TAL mode.)

Testing Hypothesis 16

*The learning retention of Male students for theory based topic (TBT) is higher in TAL mode than F to F mode.*

Table 4.52 shows the Mean differences of Gain scores of male students between F to F and TAL mode in Theory Based Topic.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>F to F mode</td>
<td>5.85</td>
<td>2.99</td>
<td>61</td>
<td>8.74</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>10.83</td>
<td>3.58</td>
<td>73</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

It is concluded that the learning retention of Male for theory based topic (TBT) is higher in TAL mode than F to F mode.
Testing Hypothesis 16A

*The learning retention of Female students for theory based topic (TBT) is higher in TAL mode than F to F mode.*

Table 4.53 shows the Mean differences of Gain scores of female students between F to F and TAL mode in Theory Based Topic.

**TABLE 4.53**
MEAN DIFFERENCES OF GAIN SCORES OF FEMALE STUDENTS BETWEEN F TO F AND TAL MODE IN TBT

<table>
<thead>
<tr>
<th>Gender</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>F to F mode</td>
<td>6.87</td>
<td>3.27</td>
<td>128</td>
<td>1.92</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>7.68</td>
<td>3.42</td>
<td>116</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is not significant. Hence the research hypothesis is rejected.

It is concluded that the learning retention of Female students for theory based topic (TBT) is higher in F to F mode than TAL mode.

S. Following are the Hypotheses 16B (F to F mode) and 16C (TAL mode) comparing learning retention of students of TBT.

(Comparison between Male and Female students.)

Testing Hypothesis 16B

*The learning retention of Male students is higher than Female students in F to F mode for theory based topic (TBT)*
Table 4.54 shows the Mean difference of Gain scores of learning retention between Male and Female students in F to F mode for Theory Based Topic.

**TABLE 4.54**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Gender</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBT</td>
<td>Male</td>
<td>5.85</td>
<td>2.99</td>
<td>61</td>
<td>2.12</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>6.87</td>
<td>3.27</td>
<td>128</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, ‘t’ is significant, the research hypothesis is accepted.

**Conclusion:** The learning retention of male students is higher than female students in learning theory based topic. It indicates that the male student performed better than female students in learning theory based topic in F to F mode.

**Testing Hypothesis 16C**

*The learning retention of Male students is higher than Female students in TAL mode for theory based topic (TBT)*

Table 4.55 shows the Mean difference of Gain scores of learning retention between Male and Female students in TAL mode for Theory Based Topic.

**TABLE 4.55**

211
MEAN DIFFERENCE OF GAIN SCORES OF MALE AND FEMALE STUDENTS IN TAL MODE FOR TBT

<table>
<thead>
<tr>
<th>Topic</th>
<th>Gender</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBT</td>
<td>Male</td>
<td>10.83</td>
<td>3.58</td>
<td>73</td>
<td>5.92</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>7.69</td>
<td>3.43</td>
<td>116</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, ‘t’ is significant, the research hypothesis is accepted.

**Conclusion:** The learning retention of male students is higher than female students in learning theory based topic. It indicates that the male student performed better than female students in learning theory based topic in TAL mode.

**Discussion:**

**For Theory Based Topic**

*On the basis of Hypothesis 16, 16A, 16B and 16C:*

**a. Comparison of learning retention on the basis of the modes of learning**

1. The learning retention of Male students is higher in TAL mode than F to F mode. In the other words, Male students performed better in TAL mode than F to F mode in learning TBT.
2. The learning retention of Female students is higher in F to F mode than TAL mode. In other words, Female students performed better in F to F mode than TAL mode in learning TBT.

**b. Comparison of learning retention on the basis of Gender -**
1. The learning retention of Male students is higher than Female students in F to F mode. In the other words, Male students performed better than Female students in F to F mode in learning TBT.

2. The learning retention of Male students is higher than Female students in TAL mode. In the other words, Male students performed better than Female students in TAL mode in learning TBT.

It is concluded that, Male students performed better than Female students in TAL mode and F to F mode as well in learning theory based topic.

T. Following are the Hypotheses 17 (Male students) and 17A (Female students) comparing learning retention of students for SBT.

(Comparison between F to F mode and TAL mode.)

Testing Hypothesis 17

The learning retention of Male students for skill based topic (SBT) is higher in TAL mode than F to F mode.

Table 4.56 shows the Mean differences of Gain scores of male students between F to F and TAL mode in Skill Based Topic.
MEAN DIFFERENCES OF GAIN SCORES OF MALE STUDENTS BETWEEN F TO F AND TAL MODE IN SBT

<table>
<thead>
<tr>
<th>Gender</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>F to F mode</td>
<td>10.20</td>
<td>3.79</td>
<td>61</td>
<td>7.31</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>5.89</td>
<td>2.93</td>
<td>73</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

It is concluded that the learning retention of Male for skill based topic (SBT) is higher in TAL mode than F to F mode.

Testing Hypothesis 17A

The learning retention of Female students for skill based topic (SBT) is higher in TAL mode than F to F mode.

Table 4.57 shows the Mean differences of Gain scores of female students between F to F and TAL mode in Skill Based Topic.

TABLE 4.57
MEAN DIFFERENCES OF GAIN SCORES OF FEMALE STUDENTS BETWEEN F TO F AND TAL MODE IN SBT

<table>
<thead>
<tr>
<th>Gender</th>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>F to F mode</td>
<td>9.24</td>
<td>3.34</td>
<td>128</td>
<td>1.58</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>8.59</td>
<td>3.10</td>
<td>116</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, obtained, ‘t’ is not significant. Hence the research hypothesis is rejected.

It is concluded that the learning retention of Female students for theory based topic (TBT) is higher in F to F mode than TAL mode.
Following are the Hypotheses 17B (F to F mode) and 17C (TAL mode) comparing learning retention of students for SBT. (Comparison between Male and Female students.)

Testing Hypothesis 17B

The learning retention of Male students is higher than Female students in F to F mode for skill based topic (SBT)

Table 4.58 shows the Mean difference of Gain scores of learning retention between Male and Female students in F to F mode for Skill Based Topic.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Gender</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBT</td>
<td>Male</td>
<td>10.20</td>
<td>3.79</td>
<td>61</td>
<td>1.68</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>9.24</td>
<td>3.34</td>
<td>128</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, ‘t’ is not significant, the research hypothesis is rejected.

Conclusion: The learning retention of female students is higher than male students in learning skill based topic. It indicates that the female student performed better than male students in learning skill based topic in F to F mode.

Testing Hypothesis 17C
The learning retention of Male students is higher than Female students in TAL mode for skill based topic (SBT)

Table 4.59 shows the Mean difference of Gain scores of learning retention between Male and Female students in TAL mode for Skill Based Topic.

**TABLE 4.59**
MEAN DIFFERENCE OF GAIN SCORES OF MALE AND FEMALE STUDENTS IN TAL MODE FOR SBT

<table>
<thead>
<tr>
<th>Topic</th>
<th>Gender</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBT</td>
<td>Male</td>
<td>5.89</td>
<td>2.93</td>
<td>73</td>
<td>6.13</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>8.59</td>
<td>3.10</td>
<td>116</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, ‘t’ is significant, the research hypothesis is accepted.

**Conclusion:** The learning retention of male students is higher than female students in learning skill based topic. It indicates that the male student performed better than female students in learning skill based topic in TAL mode.

**Discussion:**
FOR SKILL BASED TOPIC

*On the basis of Hypothesis 17, 17A, 17B and 17C:*

a. Comparison of learning retention on the basis of the modes of learning
1. The learning retention of Male students is higher in TAL mode than F to F mode. In the other words, Male students performed better in TAL mode than F to F mode in learning SBT.

2. The learning retention of Female students is higher in F to F mode than TAL mode. In other words, Female students performed better in F to F mode than TAL mode in learning SBT.

b. **Comparison of learning retention on the basis of Gender** -

1. The learning retention of Female students is higher than Male students in F to F mode. In the other words, Female students performed better than Male students in F to F mode in learning SBT.

2. The learning retention of Male students is higher than Female students in TAL mode. In the other words, Male students performed better than Female students in TAL mode in learning TBT.

   It is concluded that, Female students performed better than Male students in F to F mode whereas Male students performed better than Female students in TAL mode in learning skill based topic.

**Discussion:**

On the basis of Hypotheses 16, 16A, 16B and 16C for Theory Based Topic and Hypotheses 17, 17A, 17B and 17C for Skill Based Topic:

a. **Comparison of learning retention on the basis of the modes of learning**
1. The Male students performed better in TAL mode than F to F mode whereas Female students performed better in F to F mode than TAL mode in learning TBT and SBT as well.

b. **Comparison of learning retention on the basis of Gender** -

1. The Male students performed better than Female students in learning TBT whereas Female students performed better than Male students in learning SBT in F to F mode.
2. The Male students performed better than Female students in learning TBT and SBT as well in TAL mode.

V. Following is the Hypothesis 18 comparing the satisfaction of the students between F to F mode and TAL mode while learning.

(Comparison between F to F mode and TAL mode.)

**Testing Hypothesis 18**

_The students are more satisfied with TAL mode than F to F mode for learning contents._

Table 4.60 shows the relevant statistics of ‘t’ test to measure satisfaction of mode of learning among the students.

<table>
<thead>
<tr>
<th>Mode of Learning</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>F to F mode</td>
<td>72.60</td>
<td>9.02</td>
<td>189</td>
<td>2.20</td>
</tr>
<tr>
<td>TAL mode</td>
<td>74.51</td>
<td>7.75</td>
<td>189</td>
<td></td>
</tr>
</tbody>
</table>

TABLE 4.60
RELEVANT STATISTICS TO MEASURE SATISFACTION OF MODE OF LEARNING AMONG THE STUDENTS
The technique used to test this hypothesis is ‘t’ test. The obtained ‘t’ ratio is significant. Hence, the research hypothesis is accepted. The Mean of scores of satisfaction is higher in TAL mode than F to F mode. It indicates that the student’s satisfaction in learning through TAL mode is higher than F to F mode.

To summarize,

1. Overall, it was found that the students who were administered TAL mode for learning performed better than those who were taught in the F to F mode. Overall student's satisfaction of learning the contents is higher with TAL mode than F to F mode.

2. However, when compared between TBT and SBT,

   In TAL mode,
   - ST and Open category students performed better in SBT rather than TBT.
   - Hindi and English medium students performed better in SBT rather than TBT.
   - Male students performed better than Females in SBT rather than TBT.

   In F to F mode,
   - Marathi medium students performed better in SBT rather than TBT.
   - OBC and Minority category students performed better in SBT rather than TBT.
   - Urban and rural locality students performed better SBT in rather than TBT.
Female students performed better than Male students in SBT.

Overall, it was found that students performed better for theory based topic than the skill based topic.

3. Overall SC, ST and Minority students had higher learning retention in the TAL mode than in F to F mode for both TBT as well as SBT.
4. Students of Marathi medium had higher learning retention when taught TBT through TAL mode whereas Hindi and English Medium students performed better in SBT when taught through TAL. (The packages were prepared in English.)
5. Urban students performed better than rural students in both the modes of learning.
6. In comparison between the two modes of learning, Male urban students performed better than Female rural students in both the modes learning.
7. The students are very satisfied with the TAL mode of learning that F to F mode.

CHAPTER V
SUMMARY AND CONCLUSIONS

This chapter provides a broad summary of the research.

Introduction

Education is defined as the process of receiving knowledge and experiences through purposeful teaching learning method. It
also means the development of inbuilt skills, capacity, maturity and attitude which help a human being to maintain their personality and live reputed life.

Indian Education system is one of the largest educational systems in the world. The Indian Universities like Nalanda and Takshshila were some of the oldest and premier universities where the disciples from all over the world used to visit for learning basic principles of life, spirituality, disciplines and medical education. The knowledge was imparted through face to face mode of learning. In ancient India, the Rishis and Maha-Rishis used to follow face to face mode for teaching. In the system like Gurukul, disciples lived together with the teacher and acquired knowledge under face to face teaching-learning mode. It was also supported by hands on experience kind of learning where disciple used to learn many skills together including knowledge of pure science, disciplines and grass-roots knowledge related to day-to-day living. Today, we follow this traditional method of teaching-learning but in the form of classroom teaching with innovations as many changes occurred time to time.

The two fundamental learning theories of behaviorism and constructivism are widely used and found to be the most applicable in day to day learning in formal and non formal learning processes. These two learning theories have impacted the educationists and education advancements today. It is on the basis of these theories that the Face to Face mode and Technology Assisted Learning (TAL) mode are being used. In the Face to Face mode, a single teacher is found teaching a large number of learners irrespective of their learning styles, pace, capacity to learn and study habits. In
TAL, it is the computer that plays a critical part in accomplishing pedagogical functions with graphics, pictures, animation and sound.

The aim of the present research was to compare the impact of these two modes of learning namely Face to Face (F to F) and Technology Assisted Learning (TAL) on B. Ed. Students. A theory based topic (TBT) namely ‘Motivation’ and a skill based topic (SBT) namely ‘Unit Test Plan’ was selected for developing the learning package. Both the topics ‘Motivation and Unit Test Plan’ are selected from the regular B. Ed. syllabus. A learning package is developed which allows the learners to learn at their own pace, capacity to absorb and in keeping with their learning style. The only necessity is that the student should be technology friendly and be able to learn from the package.

**Face to Face (F to F) Learning:**

According to Kumar (2008)\(^{37}\), “Face to Face learning refers to learning that occurs in a traditional classroom setting where a faculty member delivers instruction to a group of learners. This could include lectures, workshops, presentations, tutoring, conference and much more”.

The Face to Face sessions are useful for exchange and thoughts, suggestions and ideas between participants. It maintains direct contact with the instructor to understand the concept being taught. It is helpful for sharing of knowledge and experience. Facial expressions, eye-contact, praise, body language and the tone of voice of the instructor are helpful for effective communication. The important points can be explained well and participants get

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\(^{37}\)Kumar, R. (2008)."Convergence of ICT and Education." *Proceedings of World Academy of Science, Engineering and Technology* Volume 30
immediate feedback during the session. It is also helpful to the participants to communicate and share their views with each other.

In a traditional Face to Face methodology of learning, a teacher teaches and students inactively listen and try to acquire knowledge. All the learners must follow the teacher and often the effective methodology for teaching is not taken into consideration while teaching. The teacher does not think about that the methodology of teaching which is suitable to teach one topic of syllabus may not be suitable for another topic. Further, the teacher decides the lesson to be learnt, teaches as per his pace and teaching style. The learners face difficulties in learning the contents who do not adjust their learning pace with the teacher.

**Shift from Face to Face to Technology Assisted Learning:**

The gradual use of technology in education has compelled education systems to shift its focus from Face to Face mode to Technology Assisted Learning (TAL). Since the computers have variety of multimedia properties, they are helpful to make abstract concepts easy to understand. They are useful in self-learning mode rather than face to face where a single teacher is trying to teach a number of learners together irrespective to their learning styles, pace, capacity and study habits. In Technology Assisted Learning (TAL), the computer plays a crucial role in performing many academic functions such as supplementary teaching, witnessing activities and performances of students, evaluation and assessment of knowledge, record keeping and preserving data, giving feedback and supporting instructions with graphics, pictures, animation and sound. It allows the learners to learn at their own pace, leisure and learning styles.
The changing nature of learning method compels the teachers to adopt the TAL model as an alternative to traditional face-to-face mode. Now, it is necessary for the teachers to change themselves, gain new information and skills and apply these in the classrooms in accordance with changes in educational perspectives.

Technology Assisted Learning (TAL): Technology Assisted Learning is a computer assisted interactive instructional method that uses a computer to present learning material in audio-visual form, allow the learner to drill and practice, track and assess learning by the learner and direct the use to additional material which meet the learner’s need.

Rationale of the study

The researches (Pandya, S.C. & Chaudhary J. 2000, Patel 2012)\(^{38}\) in this direction showed that there is a necessity to use innovative methods of teaching by the teacher to keep the students attentive in teaching learning process. The syllabus of B. Ed program is full of variety where separate compulsory subjects namely "Educational Psychology", "Educational Technology" and "Educational Evaluation" have also been introduced. The subjects like "Educational Psychology" and "Educational Evaluation" have content variety which includes various abstract topics. Technology

Assisted Learning Package (TALP) may help the students for learning these abstract topics more effectively. Learning through TAL package is helpful to the students of B. Ed. program to increase their level of motivation while learning. These students were satisfied through this innovative method of learning. Colorful graphics also influenced them and made them possible to visualize and to grasp the concepts well rather than passive listening to the teacher at their own pace.

**Statement of the Problem**

A Comparative Study of the Impact of Face To Face And Technology Assisted Learning on Students of the B. Ed Program.

**Need of the study**

The literature review (Nabah, A. et al 2009) showed that, only using traditional method of teaching, the students are not able to get adequate clarification of concepts in the subject of science, geography, mathematics etc.

There are various reasons that make subject and learning difficult for learners and for the teachers well. The B. Ed syllabus for the subject of ‘Educational Psychology’ consisted of various educational and learning theories such as Pavlov’s Classical Conditioning Theory, Skinner’s Operant Conditioning Theory, Bandura’s Social Learning Theory, Bruner’s Discovery Learning Theory, Ausubel’s

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Theory of Meaningful Verbal Learning and Vygotsky’s Socio-Cultural & Socio-Cognitive Theory. It also includes cognitive & constructivist perspectives of learning e.g. Memory, Thinking, Metacognition etc. in the subject of ‘Psychology’. These theories and learning perspectives are challenging in nature to teach or learn without proper understanding of concepts and personal experience in some extent for the terms like memory, fatigue etc. The teacher may find it difficult to make the students understand the concepts like conditioning learning or verbal learning, amnesia theories or metacognition. Such concepts can be easily explained with the help of TAL.

There are minimum 80 students in the class of B. Ed. on an average. So the teacher is not able to interact with the students individually and effectively. If the nature of the subject is abstract, the learners do not understand the concepts well and therefore not able to score maximum marks in the examination. Sometimes, they fail to understand the difference between various concepts and its examples which are abstract in nature. Some abstract concepts cannot be explained through lecture or chalk and talk method. The teacher also cannot tutor each student individually but must teach diverse students simultaneously. The students from urban or rural areas are enrolled together for B. Ed. Program. The teacher with eighty students on an average has to try to accommodate his or her teaching to variety of different levels of ability. Brighter students can quickly grasp the lesson while slower students will struggle to understand. Sometimes, higher authorities decide how much to be taught in the classroom with fixed span of duration.

At present, B. Ed colleges in Thane District are mostly are unaided and hence not receiving any financial support from the
Government. So the management of unaided B. Ed colleges tries to appoint less number of teachers as compared to aided colleges. They tend to share full workload of B. Ed. program in only 4 to 5 teachers where actually minimum 8 to 10 teachers are required. So each teacher has to teach an additional subject with additional responsibility of co-curricular activities in most of the un-aided B. Ed. colleges. It increases the workload which is doubled than actual and salary is often not paid as per their expectation or according to pay scales for teachers. It affects the quality of teaching and teachers tend to avoid extra hours of teaching. They tend to provide printed notes to the students and ask them to prepare. The lecture method or sometimes presentation with power point is used by them for teaching. This method will not be so effective for explaining abstract concept in most of the subjects. There is a need of using different media like audio, video, and information technology, etc. for providing effective instruction. As the teachers are over burdened due to a variety of reasons, all the objectives may not be achieved to the expected level. The subject of 'Educational Psychology' and 'Educational Evaluation' of B.Ed. syllabus deals with different types of content which includes various abstract topics. To make the students understand these topics well, the teacher has to take the help of educational technology.

Therefore, the researcher has attempted to prepare TAL package for the subject of 'Educational Psychology' for the psychological topic of ‘Motivation’ which has abstract theories in intention to make these abstract concepts easier to learn by the students.

The researcher also prepared TAL package for another skill based topic namely 'Unit Test Plan' from the subject of 'Educational
Evaluation' of B. Ed. syllabus in University of Mumbai in intention to teach this topic more effectively with the help of technology where the students are trained to acquire the skill of preparing unit test plan.

The researcher took help of computer experts having expertise in computer programming to prepare TAL package. The researcher himself also took training from the experts to develop TAL package with various commands and programs to run the software and to make the frames of presenting the learning material with the assistance of a computer.

**Mode of presentation:** The programmed learning based tutorial mode of presentation is employed in the program similar to the teachers’ classroom instruction on the topic. The methodology involves self-administered and self-paced learning, in which the student is presented with information in small steps often referred to as "frames". Each frame contains a small segment of the information to be learned and a question which the student must answer. After each frame the student is directed to, additional information based on an incorrect answer, or positive feedback for a correct answer⁴⁰. On this ground, the unfamiliar terms and concepts are explained through additional slides containing data to enrich learning. Multiple choice questions are asked and feedback has been provided on the basis of answers given by the learner so that students may keep track of their own learning.

The weightage to the contents and learning skills was decided as per requirement of the study. Necessary procedure for

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validity of tools, test development, item analysis was followed. Achievement test was administered to both the experimental and the control groups. Gain scores of learning retention of students for both the groups were used to compare the student learning through TAL mode and traditional Face to Face method of instruction.

**Broad objective of the study**

The broad objective of the present research is to compare the impact of two modes of learning namely Face to Face (F to F) learning and Technology Assisted Learning (TAL) on B. Ed. students in learning theory based topic and skill based topic from the regular B. Ed. syllabus.

**Specific Objectives of the Study:**

1. To develop a Technology Assisted Learning Package (TALP) to learn a theory based topic namely 'Motivation'.
2. To develop a Technology Assisted Learning Package (TALP) to learn a skill based topic namely 'Unit Test Plan'.
3. To explore the relationship between:
   a. social background and learning retention while using F to F or TAL mode
   b. medium of instruction and learning retention while using F to F or TAL mode
   c. geographical locations (urban / rural) and learning retention while using F to F or TAL mode
   d. gender and learning retention while using F to F or TAL mode
4. To determine the extent of learning retention while learning the topic of 'Motivation' through F to F and TAL mode.
5. To determine the extent of learning retention while learning the topic of 'Unit Test Plan' through F to F and TAL mode.
6. To compare whether student's satisfaction is higher or lower with F to F mode or TAL mode.
7. To make suggestions for curriculum planners of B. Ed. program on how to adopt either mode in the most beneficial manner.

Research Hypotheses of the study

The following research hypotheses have been formulated for this study:

COMPARING F TO F V/S TAL MODE

Hypothesis 1 
(Comparing F to F v/s TAL mode for Theory Based Topic - TBT)

The learning retention of students is higher in TAL mode than F to F mode for learning theory based topic (TBT).

Hypothesis 1A 
(Comparing F to F v/s TAL mode for Skill Based Topic - SBT)

The learning retention of students is higher in TAL mode than F to F mode for learning skill based topic (SBT).

COMPARISON ON THE BASIS OF SOCIAL CATEGORY – 
(among the categories of SC/ST/OBC/Minority and Open)

For SC category - Hypotheses 2 & 2A
Hypothesis 2

The learning retention of students of SC category for theory based topic (TBT) is higher in TAL mode than F to F mode.

Hypothesis 2A

The learning retention of students of SC category for skill based topic (SBT) is higher in TAL mode than F to F mode.

For ST category - Hypotheses 3 & 3A

Hypothesis 3

The learning retention of students of ST category for theory based topic (TBT) is higher in TAL mode than F to F mode.

Hypothesis 3A

The learning retention of students of ST category for skill based topic (SBT) is higher in TAL mode than F to F mode.

For OBC category - Hypotheses 4 & 4A

Testing Hypothesis 4

The learning retention of students of OBC category for theory based topic (TBT) is higher in TAL mode than F to F mode.

Hypothesis 4A

The learning retention of students of OBC category for skill based topic (SBT) is higher in TAL mode than F to F mode.

For Minority category - Hypotheses 5 & 5A

Hypothesis 5
The learning retention of students of Minority category for theory based topic (TBT) is higher in TAL mode than F to F mode.

Hypothesis 5A

The learning retention of students of Minority category for skill based topic (SBT) is higher in TAL mode than F to F mode.

For Open category - Hypotheses 6 & 6A

Hypothesis 6

The learning retention of students of Open category for theory based topic (TBT) is higher in TAL mode than F to F mode.

Hypothesis 6A

The learning retention of students of Open category for skill based topic (SBT) is higher in TAL mode than F to F mode.

COMPARISON ON THE BASIS OF SOCIAL CATEGORY – (between the categories of SC/ST/OBC/Minority and Open)

For Theory Based Topic (Hypotheses 7 & 7A)

Hypothesis 7

The hypotheses were formulated to compare the learning retention of students of F to F mode for theory based topic (TBT) between following categories:

a. SC and ST:
The learning retention of SC category students is higher than that of ST category students in the F to F mode for theory based topic (TBT).

b. SC and OBC:

The learning retention of SC category students is higher than that of OBC category students in the F to F mode for theory based topic (TBT).

c. SC and Minority:

The learning retention of SC category students is higher than that of Minority category students in the F to F mode for theory based topic (TBT).

d. SC and Open:

The learning retention of SC category students is higher than that of Open category students in the F to F mode for theory based topic (TBT).

e. ST and OBC:

The learning retention of ST category students is higher than that of OBC category students in the F to F mode for theory based topic (TBT).

f. ST and Minority:

The learning retention of ST category students is higher than that of Minority category students in the F to F mode for theory based topic (TBT).

g. ST and Open:
The learning retention of ST category students is higher than that of Open category students in the F to F mode for theory based topic (TBT).

h. OBC and Minority:

The learning retention of OBC category students is higher than that of Minority category students in the F to F mode for theory based topic (TBT).

i. OBC and Open:

The learning retention of OBC category students is higher than that of Open category students in the F to F mode for theory based topic (TBT).

j. Minority and Open:

The learning retention of Minority category students is higher than that of Open category students in the F to F mode for theory based topic (TBT).

Hypothesis 7A

The hypotheses were formulated to compare the learning retention of students of TAL mode for theory based topic (TBT) between following categories:

k. SC and ST:
The learning retention of SC category students is higher than that of ST category students in the TAL mode for theory based topic (TBT).

1. SC and OBC:

The learning retention of SC category students is higher than that of OBC category students in the TAL mode for theory based topic (TBT).

m. SC and Minority:

The learning retention of SC category students is higher than that of Minority category students in the TAL mode for theory based topic (TBT).

n. SC and Open:

The learning retention of SC category students is higher than that of Open category students in the TAL mode for theory based topic (TBT).

o. ST and OBC:

The learning retention of ST category students is higher than that of OBC category students in the TAL mode for theory based topic (TBT).

p. ST and Minority:
The learning retention of ST category students is higher than that of Minority category students in the TAL mode for theory based topic (TBT).

q. ST and Open:

*The learning retention of ST category students is higher than that of Open category students in the TAL mode for theory based topic (TBT).*

r. OBC and Minority:

*The learning retention of OBC category students is higher than that of Minority category students in the TAL mode for theory based topic (TBT).*

s. OBC and Open:

*The learning retention of OBC category students is higher than that of Open category students in the TAL mode for theory based topic (TBT).*

t. Minority and Open:

*The learning retention of Minority category students is higher than that of Open category students in the TAL mode for theory based topic (TBT).*

For Skill Based Topic (Hypotheses 8 & 8A)

Hypothesis 8
The hypotheses were formulated to compare the learning retention of students of F to F mode for skill based topic (SBT) between following categories:

a. SC and ST:
   
   The learning retention of SC category students is higher than that of ST category students in the F to F mode for skill based topic (SBT).

b. SC and OBC:
   
   The learning retention of SC category students is higher than that of OBC category students in the F to F mode for skill based topic (SBT).

c. SC and Minority:
   
   The learning retention of SC category students is higher than that of Minority category students in the F to F mode for skill based topic (SBT).

d. SC and Open:
   
   The learning retention of SC category students is higher than that of Open category students in the F to F mode for skill based topic (SBT).

e. ST and OBC:
The learning retention of ST category students is higher than that of OBC category students in the F to F mode for skill based topic (SBT).

f. ST and Minority:

The learning retention of ST category students is higher than that of Minority category students in the F to F mode for skill based topic (SBT).

g. ST and Open:

The learning retention of ST category students is higher than that of Open category students in the F to F mode for skill based topic (SBT).

h. OBC and Minority:

The learning retention of OBC category students is higher than that of Minority category students in the F to F mode for skill based topic (SBT).

i. OBC and Open:

The learning retention of OBC category students is higher than that of Open category students in the F to F mode for skill based topic (SBT).

j. Minority and Open:
The learning retention of Minority category students is higher than that of Open category students in the F to F mode for skill based topic (SBT).

Hypothesis 8A

The hypotheses were formulated to compare the learning retention of students of TAL mode for skill based topic (SBT) between the following categories:

k. SC and ST:

The learning retention of SC category students is higher than that of ST category students in the TAL mode for skill based topic (SBT).

l. SC and OBC:

The learning retention of SC category students is higher than that of OBC category students in the TAL mode for skill based topic (SBT).

m. SC and Minority:

The learning retention of SC category students is higher than that of Minority category students in the TAL mode for skill based topic (SBT).

n. SC and Open:
The learning retention of SC category students is higher than that of Open category students in the TAL mode for skill based topic (SBT).

o. ST and OBC:

The learning retention of ST category students is higher than that of OBC category students in the TAL mode for skill based topic (SBT).

p. ST and Minority:

The learning retention of ST category students is higher than that of Minority category students in the TAL mode for skill based topic (SBT).

q. ST and Open:

The learning retention of ST category students is higher than that of Open category students in the TAL mode for skill based topic (SBT).

r. OBC and Minority:

The learning retention of OBC category students is higher than that of Minority category students in the TAL mode for skill based topic (SBT).

s. OBC and Open:
The learning retention of OBC category students is higher than that of Open category students in the TAL mode for skill based topic (SBT).

t. Minority and Open:
   The learning retention of Minority category students is higher than that of Open category students in the TAL mode for skill based topic (SBT).

COMPARISON ON THE BASIS OF MEDIUM OF INSTRUCTION - (Marathi/Hindi/English)

For Marathi Medium-Hypotheses 9 & 9A
Hypothesis 9
The learning retention of students of Marathi medium for theory based topic (TBT) is higher in TAL mode than F to F mode.

Hypothesis 9A
The learning retention of students of Marathi medium for skill based topic (SBT) is higher in TAL mode than F to F mode.

For Hindi Medium - Hypotheses 10 and 10A
Hypothesis 10
The learning retention of students of Hindi medium for theory based topic (TBT) is higher in TAL mode than F to F mode.
Hypothesis 10A
The learning retention of students of Hindi medium for skill based topic (SBT) is higher in TAL mode than F to F mode.

For English Medium - Hypotheses 11 and 11A
Hypothesis 11
The learning retention of students of English medium for theory based topic (TBT) is higher in TAL mode than F to F mode.
Hypothesis 11A
The learning retention of students of English medium for skill based topic (SBT) is higher in TAL mode than F to F mode.

COMPARISON ON THE BASIS OF LOCALITY – (URBAN/RURAL)

For Theory Based Topic (TBT) - Hypotheses 12 & 12 A
Hypothesis 12
The learning retention of students of Urban locality for theory based topic (TBT) is higher in TAL mode than F to F mode.

Hypothesis 12A
The learning retention of students of Urban locality for skill based topic (SBT) is higher in TAL mode than F to F mode.
COMPARISON ON THE BASIS OF LOCALITY – (URBAN/RURAL)

For Skill Based Topic (SBT) - Hypotheses 13 & 13A

Hypothesis 13

The learning retention of students of Rural locality for theory based topic (TBT) is higher in TAL mode than F to F mode.

Hypothesis 13A

The learning retention of students of Rural locality for skill based topic (SBT) is higher in TAL mode than F to F mode.

COMPARISON ON THE BASIS OF LOCALITY

A. (Urban v/s Rural for TBT - Hypotheses 14 and 14A)

Hypothesis 14

The learning retention of students of F to F mode for theory based topic (TBT) is higher in Urban locality than Rural locality.

Hypothesis 14A

The learning retention of students of TAL mode for theory based topic (TBT) is higher in Urban locality than Rural locality.

B. (Urban v/s Rural for SBT- Hypotheses 15 and 15A)

Hypothesis 15

The learning retention of students of F to F mode for skill based topic (SBT) is higher in Urban locality than Rural locality.
Hypothesis 15A

*The learning retention of students of TAL mode for skill based topic (SBT) is higher in Urban locality than Rural locality*

**COMPARISON ON THE BASIS OF GENDER – (MALE / FEMALE)**

A. F to F v/s TAL Mode For Theory Based Topic (TBT) -
   *Hypotheses 16 (for Males) to 16A (for Females)*

Hypothesis 16

*The learning retention of Male students for theory based topic (TBT) is higher in TAL mode than F to F mode.*

Hypothesis 16A

*The learning retention of Female students for theory based topic (TBT) is higher in TAL mode than F to F mode.*

B. Male v/s Female students For Theory Based Topic (TBT) -
   *Hypotheses 16B (for F to F mode) to 16C (for TAL mode)*

Hypothesis 16B

*The learning retention of Male students is higher than Female students in F to F mode for theory based topic (TBT)*

Hypothesis 16C

*The learning retention of Male students is higher than Female students in TAL mode for theory based topic (TBT)*

**COMPARISON ON THE BASIS OF GENDER –**
(MALE / FEMALE)

A. F to F v/s TAL Mode For Skill Based Topic (SBT) - Hypotheses 17 (for Males) to 17A (for Females)

Hypothesis 17

The learning retention of Male students for skill based topic (SBT) is higher in TAL mode than F to F mode.

Hypothesis 17A

The learning retention of Female students for skill based topic (SBT) is higher in TAL mode than F to F mode.

B. Male v/s Female students For Skill Based Topic (SBT) - Hypotheses 17B (for F to F mode) to 17C (for TAL mode)

Hypothesis 17B

The learning retention of Male students is higher than Female students in F to F mode for skill based topic (SBT)

Hypothesis 17C

The learning retention of Male students is higher than Female students in TAL mode for skill based topic (SBT)

Testing Hypothesis 18

The students are more satisfied with TAL mode than F to F mode for learning contents.

Scope and limitations of the study
Past researches from the review (Pandya, S.C. & Chaudhary J. 2000)\(^4\) of related literature suggested that the teaching with TALP has higher positive effect on achievement of students in learning. In these researches, students' achievement scores indicated that the retention of content learned using TALP is superior to retention following traditional instruction. It is also seen that TALP is an effective way to teach. It is found beneficial in achieving desirable educational goals for students.

This study is significant to students to get alternative method of learning. The study is expected to be further extended to other subjects and other generations and such program be developed for the entire B. Ed. degree course.

Thane district is selected for research study due to following reasons:

a. As per Census 2011, average literacy rate of Thane city is 91.36% percent. The male and female literacy rate is 94.19 and 88.14 % respectively.

b. Thane city is a part of Mumbai Metropolitan Region and very close to Mumbai city. The Mumbai city culturally impacted the Thane city.

c. Thane city is linked with and surrounded by suburbs through Central and Trans-Harbour Line Suburban railway network. It is a railway junction for the Thane-Vashi Harbour Line and Central Line too. So it is well connected with urban and rural parts of the district.

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d. The people of Thane largely influenced by Maharashtrian culture and a cosmopolitan culture as well like Mumbai city. The population of Thane city is increased since last five years and experienced huge residential boom. Due to its close location to Mumbai and low rates of land as compared to Mumbai, a large number of immigrants shifted from Mumbai city and other regions of the country.

e. The city is full of multi culture and variety of people. Besides Marathi, the people from all regions of the country with different languages such as Mallyali, Sindhis, Punjabis and Gujaratis from different regions live in Thane. It has language, regions and religious diversity. In other words, Thane district is inhabited with socio-cultural diversity including SC, ST, OBC and Minorities people.

f. A number of B. Ed. colleges located in Thane district are more than any other district of Maharashtra under the jurisdiction of University of Mumbai.

g. The Thane district is selected for sample of the research because, the students taking admissions to B. Ed. colleges located in Thane districts are belonged to this diversity which is one of the requirements of sample for research purpose.

2. The regular B. Ed. class students of all the six unaided B.Ed. colleges open to all category students & affiliated to University of Mumbai in Thane district of Maharashtra who have been admitted through passing the Common Entrance Test (CET) for B.Ed. program conducted by the Government of Maharashtra.

There are total 63 B. Ed. colleges in the jurisdiction of University of Mumbai spread over Mumbai, Thane, Raigad,
Ratnagiri and Sindhudurg districts among which the medium of instruction of 30 colleges is English whereas the medium of instruction of 33 colleges is Marathi. Among 25 colleges in Thane district, there are 12 colleges follow English language as medium of instruction and conduct admission to B. Ed. program through Common Entrance Test (CET) of Government of Maharashtra. These 12 colleges are further divided in aided and unaided category as 3 + 9 respectively. From these 9 unaided colleges, only 3 colleges have minority status and 6 colleges follow open status for admission to all. The researcher has chosen these 6 colleges as the sample of study.

3. This study has selected one theory based topic namely, ‘motivation’ from the subject of 'Educational Psychology' and another skill based topic of 'Unit Test Plan' from the subject of 'Educational Evaluation' of the B. Ed. syllabus. The researcher found these topics more complex in nature among all the topics from the syllabus and students are not able to understand them well.

**Significance of the study**

TAL packages are currently used in all over the world giving the opportunities to the learners for learning through TAL mode. In India, it is being used in many Universities, Colleges, Private Institutions and International schools also. But the need, impact and utility of these packages are not studied at large. The review of related literature (Yang and Chen 2007)\(^{42}\) revealed that very few studies have been conducted in the subject of 'Educational Psychology' and 'Educational Evaluation' at B. Ed. level. Very few

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researchers concentrated on the academic achievement of college students under face to face learning or technology assisted learning. But the impact of TAL package on B. Ed. students was not studied so far. Hence it was necessary to prepare TALP which can be utilized for the research purpose. Many of the software companies have already developed software packages that can teach and simultaneously evaluate the performance of the student with its audio-visual properties. But they alone cannot satisfy the various needs of the real classroom for B. Ed purpose and hence did not suitable for B. Ed program. Thus, software that particularly satisfies all the requirement of teaching and present research was needed. The present TALP is an attempt towards in this direction.

In the present study, the TAL Package is prepared in a CD format in which the program may be displayed offline and on line and as and when required. At any point, one may stop, go back and go forward according to the demands of the classroom situation. This TALP is capable of teaching, drilling, evaluating, giving assignment and revising the contents. It is beneficial to teachers and students as well. It saves time and energy of the teacher in teaching the contents.

**Methodology of the study**

The experimental method of research was used to achieve the specific objectives. The research aimed at comparing the impact of two modes of learning namely Face to Face (F to F) learning and the Technology Assisted Learning (TAL) on B. Ed. students in learning theory based topic and skill based topic from the regular B. Ed. syllabus. The researcher prepared two similar groups of students on the basis of their CET scores obtained by the students. The student were divided into 5 ranges of score obtained by them in
B. Ed. CET from 20-24, 25-29, 30-34, 35-40 and 41 & above. The numbers of students from above ranges were divided equally into both the Groups.

A pre-test for both the groups with the same test paper was conducted. One group was taught the theory based topic namely 'Motivation' with F to F mode whereas another group learnt the same topic by TAL mode. Finally a post-test was conducted for both the groups with same test paper. The marks obtained by the students were considered as test scores. The difference between pre-test and post-test scores were considered as Gain scores which were used for further analysis and conclusion after applying 't' test. Same method was followed for the skill based topic namely' Unit Test Plan'.

**Sample**

In the present study, all the colleges were selected from Thane district. The sample of the study includes all the students enrolled from six un-aided B. Ed colleges in Thane district. Currently more than 400 students were enrolled for B. Ed. program for this academic year across all these six unaided B.Ed. colleges. But, those who have responded to tools of data collection are selected as a sample.

As these colleges are affiliated to University of Mumbai, they are expected to follow reservation policy as stipulated by the Government. Further they are admitted through passing the CET conducted by the Government of Maharashtra. The table below presents the breakup of students across the six colleges.

**Sampling Table**

250
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>College 1</th>
<th>College 2</th>
<th>College 3</th>
<th>College 4</th>
<th>College 5</th>
<th>College 6</th>
<th>Total</th>
<th>Mode of learning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of students</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 1</td>
<td>32</td>
<td>32</td>
<td>28</td>
<td>35</td>
<td>36</td>
<td>26</td>
<td>189</td>
<td>Face to Face</td>
</tr>
<tr>
<td>Group 2</td>
<td>31</td>
<td>31</td>
<td>28</td>
<td>36</td>
<td>36</td>
<td>27</td>
<td>189</td>
<td>Technology Assisted Learning</td>
</tr>
<tr>
<td>Total</td>
<td>63</td>
<td>63</td>
<td>56</td>
<td>71</td>
<td>72</td>
<td>53</td>
<td>378</td>
<td></td>
</tr>
</tbody>
</table>

The total sample consisted of 378 students both boys and girls from unaided B. Ed. Colleges affiliated to University of Mumbai and situated in Thane district.

This study has selected one theory based topic namely, ‘motivation’ from the subject of 'Educational Psychology' and another skill based topic namely 'Unit Test Plan' from the subject of 'Educational Evaluation' of the B. Ed. syllabus.

**Tools of data collection:**

The four tools developed for data collection include:

1. Personal data sheet
2. Technology Assisted Learning Package (TALP) developed for theory and skill based topic.
3. Test prepared by the researcher to measure learning retention for both the topics
4. Questionnaire for students on satisfaction regarding mode of learning.
Techniques of data analysis

The descriptive methods used for present study include Measures of Central Tendency including Mean, Median and Mode, Measures of Variability including Standard Deviation, Skewness and Kurtosis and graphical representation of data including bar diagrams and pie chart. The inferential methods used for testing of hypothesis for the present study were t-test. The researcher analyzed the Gain scores to study whether learning with F to F mode or TAL mode is better for theory based topic or skill based topic. The researcher compared the gain scores between the groups to find out whether overall students had better learning retention in F to F mode or TAL mode on the basis of medium of instruction, gender, locality and social category.

MAJOR FINDINGS OF THE STUDY

These are as follows:

Testing Hypothesis 1

The learning retention of students is higher in TAL mode than F to F mode for learning theory based topic (TBT).

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

Testing Hypothesis 1A
The learning retention of students is higher in TAL mode than F to F mode for learning skill based topic (SBT).

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

Conclusion:

It is concluded that the students performed better in TAL mode for both the topics. It indicated that the face to face mode of learning is less effective than TAL mode for both the topics for these students. In other words, learning of TAL mode is more suitable for these students as compared to F to F mode.

COMPARISON BETWEEN FACE TO FACE AND TAL MODE ON THE BASIS OF SOCIAL CATEGORY OF STUDENTS

Testing Hypothesis 2

The learning retention of students of SC category for theory based topic (TBT) is higher in TAL mode than F to F mode.

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

Testing Hypothesis 2A
The learning retention of students of SC category for skill based topic (SBT) is higher in TAL mode than F to F mode.

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

Conclusion:

It is concluded that the student of SC category performed better in TAL mode for both the topics. It indicated that the face to face mode of learning is less effective than TAL mode for both the topics for SC category students. In other words, learning of TAL mode is more suitable for SC category students as compared to F to F mode.

Testing Hypothesis 3

The learning retention of students of ST category for theory based topic (TBT) is higher in TAL mode than F to F mode.

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

Testing Hypothesis 3A

The learning retention of students of ST category for skill based topic (SBT) is higher in TAL mode than F to F mode.

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

Conclusion:

It is concluded that the face to face mode of learning is less effective than TAL mode for both the topics for ST category stu-
dents. In other words, learning of TAL mode is more suitable for ST category students as compared to F to F mode.

Testing Hypothesis 4

*The learning retention of students of OBC category for theory based topic (TBT) is higher in TAL mode than F to F mode.*

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

Testing Hypothesis 4A

*The learning retention of students of OBC category for skill based topic (SBT) is higher in TAL mode than F to F mode.*

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

Conclusion:

It is concluded that the face to face mode of learning is less effective than TAL mode for both the topics for OBC category students. In other words, the students of OBC category performed better in TAL than F to F mode for both the topics.

Testing Hypothesis 5

*The learning retention of students of Minority category for theory based topic (TBT) is higher in TAL mode than F to F mode.*

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.
Testing Hypothesis 5A

*The learning retention of students of Minority category for skill based topic (SBT) is higher in TAL mode than F to F mode.*

The obtained, ‘t’ is not significant. Hence the research hypothesis is rejected.

Conclusion:

It is concluded that the face to face mode of learning is less effective than TAL mode for theory based topic and more effective for skill based topic for Minority category students. In other words, the students of Minority category performed better in TAL than F to F mode in TBT whereas they performed better in F to F mode for SBT.

Testing Hypothesis 6

*The learning retention of students of Open category for theory based topic (TBT) is higher in TAL mode than F to F mode.*

The obtained, ‘t’ is significant at 0.05 level. Hence the research hypothesis is accepted.

Testing Hypothesis 6A

*The learning retention of students of Open category for skill based topic (SBT) is higher in TAL mode than F to F mode.*

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

Conclusion:
It is concluded that the face to face mode of learning is less effective than TAL mode for both the topic for Open category students. In other words, the students of Open category performed better in TAL than F to F mode for both the topics.

Testing Hypothesis 7

a. SC and ST:

*The learning retention of SC category students is higher than that of ST category students in the F to F mode for theory based topic (TBT).*

b. SC and OBC:

*The learning retention of SC category students is higher than that of OBC category students in the F to F mode for theory based topic (TBT).*

c. SC and Minority:

*The learning retention of SC category students is higher than that of Minority category students in the F to F mode for theory based topic (TBT).*

d. SC and Open:

*The learning retention of SC category students is higher than that of Open category students in the F to F mode for theory based topic (TBT).*
e. ST and OBC:

The learning retention of ST category students is higher than that of OBC category students in the F to F mode for theory based topic (TBT).

f. ST and Minority:

The learning retention of ST category students is higher than that of Minority category students in the F to F mode for theory based topic (TBT).

g. ST and Open:

The learning retention of ST category students is higher than that of Open category students in the F to F mode for theory based topic (TBT).

h. OBC and Minority:

The learning retention of OBC category students is higher than that of Minority category students in the F to F mode for theory based topic (TBT).

i. OBC and Open:

The learning retention of OBC category students is higher than that of Open category students in the F to F mode for theory based topic (TBT).

j. Minority and Open:
The learning retention of Minority category students is higher than that of Open category students in the F to F mode for theory based topic (TBT).

Conclusion: Since obtained ‘t’ mentioned against each of the sub group (from a to j) in F to F mode is not significant, the hypotheses are rejected and it is stated that there is no significant difference in gain scores of learning retention between the social categories in F to F mode for theory based topic.

Testing Hypothesis 7A

k. SC and ST:

The learning retention of SC category students is higher than that of ST category students in the TAL mode for theory based topic (TBT).

l. SC and OBC:

The learning retention of SC category students is higher than that of OBC category students in the TAL mode for theory based topic (TBT).

m. SC and Minority:

The learning retention of SC category students is higher than that of Minority category students in the TAL mode for theory based topic (TBT).
n. SC and Open:

*The learning retention of SC category students is higher than that of Open category students in the TAL mode for theory based topic (TBT).*

o. ST and OBC:

*The learning retention of ST category students is higher than that of OBC category students in the TAL mode for theory based topic (TBT).*

p. ST and Minority:

*The learning retention of ST category students is higher than that of Minority category students in the TAL mode for theory based topic (TBT).*

q. ST and Open:

*The learning retention of ST category students is higher than that of Open category students in the TAL mode for theory based topic (TBT).*

r. OBC and Minority:

*The learning retention of OBC category students is higher than that of Minority category students in the TAL mode for theory based topic (TBT).*

s. OBC and Open:
The learning retention of OBC category students is higher than that of Open category students in the TAL mode for theory based topic (TBT).

Minority and Open:

The learning retention of Minority category students is higher than that of Open category students in the TAL mode for theory based topic (TBT).

Conclusion: The obtained ‘t’ mentioned against the following sub group in TAL mode for TBT is not significant:

- SC and ST
- SC and Minority
- ST and Minority
- OBC and Open

The hypotheses are rejected in case of these groups stating that there is no significant difference in the gain scores of learning retention between these social categories in TAL mode for theory based topic.

Further, the hypotheses are accepted for following sub groups as obtained ‘t’ is significant:

- SC and OBC
- SC and Open
- ST and OBC
• ST and Open
• Minority and OBC
• Minority and Open

Conclusion:
• **SC and OBC**: Mean differences for the gain scores of SC are higher than that of OBC category. It indicates that SC category students performed better than OBC in TAL mode.

• **SC and Open**: Mean differences for the gain scores of SC are higher than that of Open category. It indicates that SC category students performed better than Open category in TAL mode.

• **ST and OBC**: Mean differences for the gain scores of ST are higher than that of OBC category. It indicates that ST category students performed better than OBC in TAL mode.

• **ST and Open**: Mean differences for the gain scores of ST are higher than that of Open category. It indicates that ST category students performed better than Open category in TAL mode.

• **Minority and OBC**: Mean differences for the gain scores of Minority are higher than that of OBC category. It indicates that Minority category students performed better than OBC in TAL mode.
• **Minority and Open**: Mean differences for the gain scores of Minority are higher than that of Open category. It indicates that Minority category students performed better than Open category in TAL mode.

It can be concluded that SC, ST and Minority students performed better than OBC and Open category students of TAL mode for theory based topic. They performed better with TAL mode.

**Testing Hypothesis 8**

a. SC and ST:

_The learning retention of SC category students is higher than that of ST category students in the F to F mode for skill based topic (SBT)._ 

b. SC and OBC:

_The learning retention of SC category students is higher than that of OBC category students in the F to F mode for skill based topic (SBT)._ 

c. SC and Minority:

_The learning retention of SC category students is higher than that of Minority category students in the F to F mode for skill based topic (SBT)._ 

d. SC and Open:
The learning retention of SC category students is higher than that of Open category students in the F to F mode for skill based topic (SBT).

e. ST and OBC:

The learning retention of ST category students is higher than that of OBC category students in the F to F mode for skill based topic (SBT).

f. ST and Minority:

The learning retention of ST category students is higher than that of Minority category students in the F to F mode for skill based topic (SBT).

g. ST and Open:

The learning retention of ST category students is higher than that of Open category students in the F to F mode for skill based topic (SBT).

h. OBC and Minority:

The learning retention of OBC category students is higher than that of Minority category students in the F to F mode for skill based topic (SBT).

i. OBC and Open: 264
The learning retention of OBC category students is higher than that of Open category students in the F to F mode for skill based topic (SBT).

j. Minority and Open:

The learning retention of Minority category students is higher than that of Open category students in the F to F mode for skill based topic (SBT).

Conclusion: Since obtained ‘t’ mentioned against each of the sub group (a to j) in F to F mode is not significant the hypotheses are rejected and it is stated that there is no significant difference in the gain scores of learning retention between the social categories in F to F mode for skill based topic.

Testing Hypothesis 8A

The hypotheses were formulated to compare the learning retention of students of TAL mode for skill based topic (SBT) between following categories:

k. SC and ST:

The learning retention of SC category students is higher than that of ST category students in the TAL mode for skill based topic (SBT).

l. SC and OBC:
The learning retention of SC category students is higher than that of OBC category students in the TAL mode for skill based topic (SBT).

m. SC and Minority:

The learning retention of SC category students is higher than that of Minority category students in the TAL mode for skill based topic (SBT).

n. SC and Open:

The learning retention of SC category students is higher than that of Open category students in the TAL mode for skill based topic (SBT).

o. ST and OBC:

The learning retention of ST category students is higher than that of OBC category students in the TAL mode for skill based topic (SBT).

p. ST and Minority:

The learning retention of ST category students is higher than that of Minority category students in the TAL mode for skill based topic (SBT).

q. ST and Open:
The learning retention of ST category students is higher than that of Open category students in the TAL mode for skill based topic (SBT).

r. OBC and Minority:

The learning retention of OBC category students is higher than that of Minority category students in the TAL mode for skill based topic (SBT).

s. OBC and Open:

The learning retention of OBC category students is higher than that of Open category students in the TAL mode for skill based topic (SBT).

t. Minority and Open:

The learning retention of Minority category students is higher than that of Open category students in the TAL mode for skill based topic (SBT).

Conclusion: The obtained ‘t’ mentioned against the following subgroup in TAL mode for skill based topic is not significant:

- SC and ST
- SC and Minority
- SC and Open
- ST and Minority
- OBC and Minority
- Minority and Open
The hypotheses are rejected in case of these groups stating that there is no significant difference in the gain scores of learning retention between these social categories in TAL mode for skill based topic.

Further, the hypotheses are accepted for following sub groups as obtained ‘t’ is significant:

- OBC and SC
- OBC and ST
- ST and Open
- OBC and Open

**Conclusion:**

- **OBC and SC:** Mean difference for the gain scores of SC is higher than that of OBC category. It indicates that SC category students performed better than OBC in TAL mode for skill based topic.

- **OBC and ST:** Mean difference for the gain scores of ST is higher than that of OBC category. It indicates that ST category students performed better than OBC in TAL mode for skill based topic.

- **ST and Open:** Mean difference for the gain scores of ST is higher than that of Open category. It indicates that ST category students performed better than Open category in TAL mode for skill based topic.
*OBC and Open*: Mean difference for the gain scores of Open is higher than that of OBC category. It indicates that Open category students performed better than OBC category in TAL mode for skill based topic.

It can be concluded that SC and ST students performed better than OBC, Minority and Open category students of TAL mode for skill based topic. In all the categories, the Mean difference of ST category is higher. It indicates that students of ST category performed better than all the categories whereas the performance of students of OBC category is lower than all the other categories as mean of Gain scores is very low in learning skill based topic in TAL mode.

It indicates that SC and ST students performed better in TAL mode for both the topics which means that they performed better in TAL mode of learning both the topics than any other category.

**COMPARISON BETWEEN FACE TO FACE AND TAL MODE ON THE BASIS OF MEDIUM OF INSTRUCTION**

**Testing Hypothesis 9**

*The learning retention of students of Marathi medium for theory based topic (TBT) is higher in TAL mode than F to F mode.*

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

**Testing Hypothesis 9A**
The learning retention of students of Marathi medium for skill based topic (SBT) is higher in TAL mode than F to F mode.

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

Conclusion:

It is concluded that the face to face mode of learning is less effective than TAL mode for both the topics for Marathi medium students. In other words, the Marathi medium students performed better in TAL mode than F to F mode for both the topics though these packages were prepared in English language. So the language did not affect the learning retention in case of Marathi medium students.

Testing Hypothesis 10

The learning retention of students of Hindi medium for theory based topic (TBT) is higher in TAL mode than F to F mode.

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

Testing Hypothesis 10A

The learning retention of students of Hindi medium for skill based topic (SBT) is higher in TAL mode than F to F mode.

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

Conclusion:
It is concluded that the face to face mode of learning is less effective than TAL mode for both the topics for Hindi medium students. In other words, the Hindi medium students performed better in TAL mode than F to F mode for both the topics though these packages were prepared in English language. So the language did not affect the learning retention in case of Marathi medium students.

**Testing Hypothesis 11**

*The learning retention of students of English medium for theory based topic (TBT) is higher in TAL mode than F to F mode.*

The obtained, ‘t’ is not significant. Hence the research hypothesis is rejected.

**Testing Hypothesis 11A**

*The learning retention of students of English medium for skill based topic (SBT) is higher in TAL mode than F to F mode.*

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

**Conclusion:**

It is concluded that the face to face mode of learning is less effective than TAL mode for both the topic for English medium students. In other words, the English medium students performed better in TAL than F to F mode for both the topics.
COMPARISON BETWEEN FACE TO FACE AND TAL MODE ON THE BASIS OF LOCALITY

For Urban locality (Hypotheses 12 and 12A)

Testing Hypothesis 12

The learning retention of students of Urban locality for theory based topic (TBT) is higher in TAL mode than F to F mode.

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

Testing Hypothesis 12A

The learning retention of students of Urban locality for skill based topic (SBT) is higher in TAL mode than F to F mode.

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

Conclusion:

It is concluded that the face to face mode of learning is more effective than TAL mode for learning SBT whereas TAL mode of learning is more effective than F to F mode for learning TBT. In other words, the students of Urban locality performed better in TAL than F to F mode for learning TBT whereas they performed better in F to F mode for learning SBT.

For Rural locality (Hypotheses 13 and 13A)

Testing Hypothesis 13

The learning retention of students of Rural locality for theory based topic (TBT) is higher in TAL mode than F to F mode.
The obtained, ‘t’ is not significant. Hence the research hypothesis is rejected.

Testing Hypothesis 13A

The learning retention of students of Rural locality for skill based topic (SBT) is higher in TAL mode than F to F mode.

The obtained, ‘t’ is not significant. Hence the research hypothesis is rejected.

Conclusion:
It is concluded that the face to face mode of learning is more effective than TAL mode for learning SBT whereas TAL mode of learning is more effective than F to F mode for learning TBT. In other words, the students of Urban locality performed better in TAL than F to F mode for learning TBT whereas they performed better in F to F mode for learning SBT.

COMPARISON ON THE BASIS OF LOCALITY

Testing Hypothesis 14

The learning retention of students of F to F mode for theory based topic (TBT) is higher in Urban locality than Rural locality

The ‘t’ is significant, the research hypothesis is accepted.

Testing Hypothesis 14A

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The learning retention of students of TAL mode for theory based topic (TBT) is higher in Urban locality than Rural locality. The ‘t’ is significant, the research hypothesis is accepted.

Conclusion: The Mean of the Gain scores of learning retention of Urban students in TAL mode for theory based topic (TBT) is higher than the students of Rural locality.

Conclusion:

FOR THEORY BASED TOPIC (TBT)

On the basis of Hypothesis 14 and 14A:

a. Comparison of learning retention on the basis of the modes of learning

1. Figure 4.28 shows that the learning retention of Urban students is higher in TAL mode than F to F mode. In the other words, Urban students performed better in TAL mode than F to F mode in learning TBT.

2. The learning retention of Rural students is higher in F to F mode than TAL mode. In other words, Rural students performed better in F to F mode than TAL mode in learning TBT.

b. Comparison of learning retention on the basis of locality -

1. The learning retention of Urban students is higher than Rural students in F to F mode. In the other words, Urban students performed better than Rural students in F to F mode in learning TBT.

2. The learning retention of Urban students is higher than Rural students in TAL mode. In the other words, Urban students per-
formed better than Rural students in TAL mode in learning TBT.

It is concluded that, Urban students performed better than Rural students in TAL mode and F to F mode as well in learning theory based topic.

**Testing Hypothesis 15**

*The learning retention of students of F to F mode for skill based topic (SBT) is higher in Urban locality than Rural locality*

The ‘t’ is significant, the research hypothesis is accepted.

**Testing Hypothesis 15A**

*The learning retention of students of TAL mode for skill based topic (SBT) is higher in Urban locality than Rural locality*

The ‘t’ is significant at 0.05 level, the research hypothesis is accepted.

**Conclusion:**

**FOR SKILL BASED TOPIC (SBT)**

*On the basis of Hypothesis 15 and 15A:*

a. **Comparison of learning retention on the basis of the modes of learning.**

1. Figure 4.29 shows that the learning retention of Urban students is higher in TAL mode than F to F mode. In the other words, Urban students performed better in TAL mode than F to F mode in learning SBT.

2. The learning retention of Rural students is higher in F to F mode than TAL mode. In other words, Rural students performed better in F to F mode than TAL mode in
b. **Comparison of learning retention on the basis of locality** -

1. The learning retention of Urban students is higher than Rural students in F to F mode. In the other words, Urban students performed better than Rural students in F to F mode in learning SBT.

2. The learning retention of Urban students is higher than Rural students in TAL mode. In the other words, Urban students performed better than Rural students in TAL mode in learning SBT.

It is concluded that, Urban students performed better than Rural students in TAL mode and F to F mode as well in learning skill based topic (SBT).

**COMPARISON BETWEEN FACE TO FACE AND TAL MODE ON THE BASIS OF GENDER**

**Testing Hypothesis 16**

*The learning retention of Male students for theory based topic (TBT) is higher in TAL mode than F to F mode.*

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

**Testing Hypothesis 16A**

*The learning retention of Female students for theory based topic (TBT) is higher in TAL mode than F to F mode.*

The obtained, ‘t’ is not significant. Hence the research hypothesis is rejected.
Testing Hypothesis 16B

The learning retention of Male students is higher than Female students in F to F mode for theory based topic (TBT)

The ‘t’ is significant, the research hypothesis is accepted.

Testing Hypothesis 16C

The learning retention of Male students is higher than Female students in TAL mode for theory based topic (TBT)

The ‘t’ is significant, the research hypothesis is accepted.

Conclusion:

FOR THEORY BASED TOPIC

On the basis of Hypothesis 16, 16A, 16B and 16C:

a. Comparison of learning retention on the basis of the modes of learning

1. The learning retention of Male students is higher in TAL mode than F to F mode. In the other words, Male students performed better in TAL mode than F to F mode in learning TBT.
2. The learning retention of Female students is higher in F to F mode than TAL mode. In other words, Female students performed better in F to F mode than TAL mode in learning TBT.

b. Comparison of learning retention on the basis of Gender -

1. The learning retention of Male students is higher than Female students in F to F mode. In the other words, Male students performed better than Female students in F to F mode in learning TBT.
2. The learning retention of Male students is higher than Female students in TAL mode. In the other words, Male students per-
formed better than Female students in TAL mode in learning TBT.

It is concluded that, Male students performed better than Female students in TAL mode and F to F mode as well in learning theory based topic.

**Testing Hypothesis 17**

*The learning retention of Male students for skill based topic (SBT) is higher in TAL mode than F to F mode.*

The obtained, ‘t’ is significant. Hence the research hypothesis is accepted.

**Testing Hypothesis 17A**

*The learning retention of Female students for skill based topic (SBT) is higher in TAL mode than F to F mode.*

The obtained, ‘t’ is not significant. Hence the research hypothesis is rejected.

**Testing Hypothesis 17B**

*The learning retention of Male students is higher than Female students in F to F mode for skill based topic (SBT)*

The ‘t’ is not significant, the research hypothesis is rejected.

**Testing Hypothesis 17C**

*The learning retention of Male students is higher than Female students in TAL mode for skill based topic (SBT)*

The ‘t’ is significant, the research hypothesis is accepted.

**Conclusion:**
FOR SKILL BASED TOPIC

On the basis of Hypothesis 17, 17A, 17B and 17C:

a. Comparison of learning retention on the basis of the modes of learning

1. The learning retention of Male students is higher in TAL mode than F to F mode. In the other words, Male students performed better in TAL mode than F to F mode in learning SBT.

2. The learning retention of Female students is higher in F to F mode than TAL mode. In other words, Female students performed better in F to F mode than TAL mode in learning SBT.

b. Comparison of learning retention on the basis of Gender -

1. The learning retention of Female students is higher than Male students in F to F mode. In the other words, Female students performed better than Male students in F to F mode in learning SBT.

2. The learning retention of Male students is higher than Female students in TAL mode. In the other words, Male students performed better than Female students in TAL mode in learning TBT.

It is concluded that, Female students performed better than Male students in F to F mode whereas Male students performed better than Female students in TAL mode in learning skill based topic.

Conclusion:
On the basis of Hypotheses 16, 16A, 16B and 16C for Theory Based Topic and Hypotheses 17, 17A, 17B and 17C for Skill Based Topic:

a. Comparison of learning retention on the basis of the modes of learning

1. The Male students performed better in TAL mode than F to F mode whereas Female students performed better in F to F mode than TAL mode in learning TBT and SBT as well.

b. Comparison of learning retention on the basis of Gender -

1. The Male students performed better than Female students in learning TBT whereas Female students performed better than Male students in learning SBT in F to F mode.
2. The Male students performed better than Female students in learning TBT and SBT as well in TAL mode.

Testing Hypothesis 18

The students are more satisfied with TAL mode than F to F mode for learning contents.

The obtained ‘t’ ratio is significant. Hence, the research hypothesis is accepted. It indicates that the student’s satisfaction in learning through TAL mode is higher than F to F mode.

Discussion: The students are very satisfied with the TAL mode of learning. This could be due to the following reasons:

- TAL package prepared by the researcher had the facilities to present the text along with colorful graphics which helped the learners in understanding different concepts together.
• TAL was capable of providing remedial coaching when learners particularly do not have the clarity of basic concepts.

• TAL had provided three dimensional effects in colorful graphics which could have sustained interest and may have developed curiosity among the students.

• The TAL package included an audio commentary for guidance and motivation. The student learnt the contents by reading the text material and observing the graphic information which was displayed in sequence. The students may have found it very interesting.

• Feedback on response was provided by TALP immediately. When the learners gave correct responses, the frame appeared on the screen and motivated them by praising their efforts.

• Similarly, when the learners gave incorrect response to the question, they were advised by another frame to study the content again.

• The learner was able to study the slide for any number of times till he / she understood it well.

• After the evaluation process for particular content is over, the learner could see his / her achievement score in the next frame.

• The TAL package could have helped the learners for self-pace and self-control learning of the subject.

• It provided one to one interaction in teaching learning process through reading, writing, listening, and speaking skills. It provides colorful figures, graphics, 3-D text, animation and also sound which make learning process interesting.