CHAPTER IV

This chapter presents the results of the analysis of the impact of alternative modes of CBT Programme in EE among the pre-service secondary teachers and Interpretation of the Findings.

The analyses of the results are provided under the following sections:

- Gain in the Competency Attainment of Pre-service teachers after alternative modes of CBT Programme
- Differential gain in the Competency Attainment of Pre-service teachers after alternative modes of CBT Programme
- Difference in the Competency attainment of Pre-service teachers between Peer group setting and Actual class room
- Difference in the Competency attainment of Pre-service teachers with different subject background.
- Relationship between Competency attainment of pre-service teachers and Attitude Towards EE.

4.1 Gain in the Competency Attainment of Pre-service teachers after alternative modes of CBT Programme

Hypothesis 1: There is significant gain in the competency attainment of pre-service teachers of the different experimental groups (Treatment groups) in the following categories of competencies after the intervention in terms of alternative modes of CBT:

1. Content Competencies: The three areas of content competencies viz.
   - d. Environmental knowledge (EK)
   - e. Environmental Awareness (EA)
   - f. Environmental Action Behaviour (EAB)

2. Pedagogical Competencies such as:
   - g. Indoor competencies (IC)
h. Outdoor Competencies (OD)
i. Preparing Additional Resource Materials
j. Making Environmental Pro- Decisions
k. Executing Action Projects
l. Constructing Evaluation Tools (RS, Ch. L, QR)

**CONTENT COMPETENCE:** This hypothesis was tested using t-test for paired group pre- test- post test. The analysis is made Competency-wise.

**Control group (CG):**

The analysis of the results of the pre- & post test results indicated that there is significant gain (Sig. = .000, .0001, .031 & .000 for EK, EA, EAB & Total of all respectively) in the attainment of Content Competencies. There is improvement in the gain from pre-test to post-test results. The details of the descriptive statistics, t-test, and the profile plot are given in the tables no-17, - and graph no-1

<table>
<thead>
<tr>
<th>Competency</th>
<th>Means</th>
<th>Standard deviation</th>
<th>Differences in Means</th>
<th>t</th>
<th>Sig. (2-tailed)&gt; change it</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test</td>
<td>Post-test</td>
<td>Pre-test</td>
<td>Post-test</td>
<td></td>
</tr>
<tr>
<td>EKT</td>
<td>16.0000</td>
<td>17.0833</td>
<td>4.9255</td>
<td>5.2247</td>
<td>-1.0833</td>
</tr>
<tr>
<td>EKT</td>
<td>17.8750</td>
<td>18.2500</td>
<td>3.2210</td>
<td>3.2737</td>
<td>-.3750</td>
</tr>
<tr>
<td>EABT</td>
<td>30.1667</td>
<td>30.9167</td>
<td>4.7518</td>
<td>5.0469</td>
<td>-.7500</td>
</tr>
<tr>
<td>TOTAL</td>
<td>64.0417</td>
<td>66.2500</td>
<td>11.5739</td>
<td>12.4385</td>
<td>-2.2083</td>
</tr>
</tbody>
</table>

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Experimental Group (EG1):

The results of the pre-test & post-tests indicated that there is significant gain (Sig.= .004, .0005, .043 & .000 for EK, EA, EAB & Total respectively). The details of the descriptive statistics, t-test results, & profile plot are given in the tables no 18 & Graph no-2

<table>
<thead>
<tr>
<th>Competency</th>
<th>Means</th>
<th>Standard deviation</th>
<th>Differences in Means</th>
<th>t</th>
<th>Sig.(2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test</td>
<td>Post-test</td>
<td>Pre-test</td>
<td>Post-test</td>
<td></td>
</tr>
<tr>
<td>EKT</td>
<td>16.4583</td>
<td>17.1667</td>
<td>4.5586</td>
<td>4.2495</td>
<td>-.7083</td>
</tr>
<tr>
<td>EAT</td>
<td>16.7083</td>
<td>17.1667</td>
<td>3.6413</td>
<td>3.7494</td>
<td>-.4583</td>
</tr>
<tr>
<td>EABT</td>
<td>29.5833</td>
<td>29.7500</td>
<td>4.7905</td>
<td>4.6555</td>
<td>-.1667</td>
</tr>
<tr>
<td>TOTAL</td>
<td>62.5833</td>
<td>64.0833</td>
<td>10.9422</td>
<td>10.9937</td>
<td>-1.5000</td>
</tr>
</tbody>
</table>
Experimental Group EG2:

The results of the pre-test & post-tests indicate that there is (overall) significant gain (Sig.= .0001, .007, .103, & .001 for EK, EA, EAB & Total respectively). The details of the descriptive statistics, t-test results & profile plot are given in the table nos-19 & Graph no-3.

<table>
<thead>
<tr>
<th>Competency</th>
<th>Means</th>
<th>Standard deviation</th>
<th>Differences in Means</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test</td>
<td>Post-test</td>
<td>Pre-test</td>
<td>Post-test</td>
<td></td>
</tr>
<tr>
<td>EKT</td>
<td>17.4167</td>
<td>19.0833</td>
<td>4.5586</td>
<td>4.2945</td>
<td>-1.6667</td>
</tr>
<tr>
<td>EAT</td>
<td>17.8750</td>
<td>18.3750</td>
<td>3.6413</td>
<td>3.7494</td>
<td>-0.5000</td>
</tr>
<tr>
<td>EABT</td>
<td>31.6667</td>
<td>31.8333</td>
<td>4.7905</td>
<td>4.6555</td>
<td>-0.1667</td>
</tr>
<tr>
<td>TOTAL</td>
<td>66.9583</td>
<td>69.2917</td>
<td>10.9422</td>
<td>10.9937</td>
<td>-2.3333</td>
</tr>
</tbody>
</table>
Experimental Group EG3:

The results of the pre-test & post-tests indicate that there is significant gain (Sig.= .000, .000, .000 & .000 for EK, EA, EAB & Total respectively). The details of the descriptive statistics, t-test results (1-tailed), & profile plot are given in the table nos-20, & Graph no-4.

Table no-20 details of Descriptive statistics and t-test for paired samples

<table>
<thead>
<tr>
<th>Competency</th>
<th>Means</th>
<th>Standard deviation</th>
<th>Differences in Means</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test</td>
<td>Post-test</td>
<td>Pre-test</td>
<td>Post-test</td>
<td></td>
</tr>
<tr>
<td>EKT</td>
<td>18.2083</td>
<td>26.9583</td>
<td>4.5586</td>
<td>4.2495</td>
<td>8.7500</td>
</tr>
<tr>
<td>EAT</td>
<td>18.5833</td>
<td>28.1667</td>
<td>3.6413</td>
<td>3.7494</td>
<td>9.5833</td>
</tr>
<tr>
<td>EABT</td>
<td>33.5417</td>
<td>106.2917</td>
<td>4.7905</td>
<td>4.6555</td>
<td>72.7500</td>
</tr>
<tr>
<td>TOTAL</td>
<td>70.3333</td>
<td>161.4167</td>
<td>10.9422</td>
<td>10.9937</td>
<td>91.0833</td>
</tr>
</tbody>
</table>

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Thus it is clear from the interpretation of the above analyses that there is significant gain in all Treatment Groups in the Attainment of Content Competency, from pre-test scores to post-test scores. The gain in the Content Competency Attainment is found to be significant among the pre-service teachers of CG also. This may be because, like all other Treatment Groups even the Pre-service teachers of CG were provided with the written material regarding the Content selected for the study & care was taken that they go through it, seek for clarification. The pre-service teachers of EG1 differed only in the fact that they received the list of identified Pedagogical Competencies as an increment gain in terms of Casual Approach to CBT. Although care was taken to motivate them to go through the written material provided, strangely their performance has resulted in lesser amount of gain (but significant) in the Content Competency Attainment than that of CG.

In case of EG2, although the pre-service teachers indicated significant gain in both EK & EA, do not indicate the much the same in EAB. This may be because of the reason that just the knowledge related to Environment does not guarantee the Pro-Environmental Action Behaviour in an individual. This has been witnessed in cases of CG & EG1 also. Only the EG3 members have picked up the pre-action behaviour. This is very well because of the training they underwent with POA to CBT.
**Pedagogical Competency:**

**Indoor Competencies:**

There is very high gain in the Competency Attainment of Pre-service teachers in EG3 group from pre-test to post-test results. The Pre-service teachers of CG indicate zero gain (Sig.=1.000) from pre-to post results where as EG1 indicates very little gain and EG2 moderate gain. The t-test scores results indicated the significant gain in all the treatment groups (sig. = .110; .000 & .000 for EG1, EG2 & EG3 respectively). The details of descriptive statistics, t-test results and profile plot are given in the table no-21 and Graph no-5.

<table>
<thead>
<tr>
<th>groups</th>
<th>Means</th>
<th>Standard deviation</th>
<th>Differences in Means</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test</td>
<td>Post-test</td>
<td>Pre-test</td>
<td>Post-test</td>
<td></td>
</tr>
<tr>
<td>CG</td>
<td>10.125</td>
<td>10.125</td>
<td>1.0759</td>
<td>1.0347</td>
<td>.0000</td>
</tr>
<tr>
<td>EG1</td>
<td>10.000</td>
<td>10.291</td>
<td>.9325</td>
<td>1.1221</td>
<td>-.2917</td>
</tr>
<tr>
<td>EG3</td>
<td>11.375</td>
<td>47.500</td>
<td>1.7147</td>
<td>2.8284</td>
<td>-36.1250</td>
</tr>
</tbody>
</table>
Out Door Competencies:

The gain is not significant in the Competency Attainment of Pre-service teachers of CG (sig.=.162). There is significant gain in the Competency Attainment of all the treatment Groups (sig. = .043, .000 & .000 for EG1, EG2 & EG3 respectively). The gain In the Competency Attainment from pre-to post test results is meager in EG1, slightly better in EG2 & very high in EG3. The details of descriptive statistics, t-test results and profile plot are given in the tablesno-22, and Graph no-6

<table>
<thead>
<tr>
<th>Groups</th>
<th>Means</th>
<th>Standard deviation</th>
<th>Differences in Means</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test</td>
<td>Post-test</td>
<td>Pre-test</td>
<td>Post-test</td>
<td></td>
</tr>
<tr>
<td>CG</td>
<td>1.4167</td>
<td>1.5000</td>
<td>.8805</td>
<td>1.1034</td>
<td>-8.333E-02</td>
</tr>
<tr>
<td>EG1</td>
<td>1.3333</td>
<td>1.6667</td>
<td>.5647</td>
<td>.7614</td>
<td>-.3333</td>
</tr>
<tr>
<td>EG2</td>
<td>1.3750</td>
<td>3.2083</td>
<td>.5758</td>
<td>.9771</td>
<td>-1.8333</td>
</tr>
<tr>
<td>EG3</td>
<td>2.4167</td>
<td>16.1250</td>
<td>.9286</td>
<td>1.0347</td>
<td>-13.7083</td>
</tr>
</tbody>
</table>
Preparing Additional Resource Materials:

The analysis indicated that there is significant gain in the Competency Attainment of treatment Groups (Sig. = .000, .000, .000, .000 for CG, EG1, EG2, & EG3 respectively). The analysis of the pre- & post-test results indicated that EG3 has benefited highest gain & CG attained least gain. Where as EG1 & EG2 indicated moderate gain. The details of descriptive statistics, t-test results and profile plot are given in the tables no-23, and Graph no-7.

Table no-23 details of Descriptive statistics and t-test for paired samples

<table>
<thead>
<tr>
<th>Groups</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Differences in Means</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CG</td>
<td>1.6250</td>
<td>2.5000</td>
<td>4.5586</td>
<td>4.2495</td>
<td>-0.8750</td>
<td>-5.376</td>
<td>.000</td>
</tr>
<tr>
<td>EG1</td>
<td>2.4583</td>
<td>6.0000</td>
<td>3.6413</td>
<td>3.7494</td>
<td>-3.5417</td>
<td>-11.773</td>
<td>.000</td>
</tr>
<tr>
<td>EG2</td>
<td>3.2500</td>
<td>6.1667</td>
<td>4.7905</td>
<td>4.6555</td>
<td>-2.9167</td>
<td>-14.037</td>
<td>.000</td>
</tr>
<tr>
<td>EG3</td>
<td>3.4583</td>
<td>12.4583</td>
<td>10.9422</td>
<td>10.9937</td>
<td>-9.0000</td>
<td>-27.298</td>
<td>.000</td>
</tr>
</tbody>
</table>
Generally the Teacher Education Programme makes provision for the pre-service teachers to prepare additional resource materials (although it is not stressed much) in order to use them during practice teaching sessions. This may be the reason for the significant gain (but the least gain) in this Competency attainment of pre-service teachers of CG. However to be effective at the secondary level this gain may not be sufficient.

**Making Environmental Pro-Decisions:**
The analysis indicated that there is significant gain in the Competency Attainment of all treatment Groups (Sig. = .000, .000 & .000 for EG1, EG2 & EG3 respectively). The pre-test & post-test scores indicated that the gain is not significant in the Competency Attainment of the Pre-service teachers of CG (Sig. = .162). The Pre-service teachers of EG3 group indicated highest gain. Even though the pre-test scores of CG & EG1 remained almost same, EG1 has benefited a better gain from pre- to post results than CG. EG2 has gained more gain than EG1 from pre-test scores to post test scores. The details are given in the table no-24 and Graph no-8.
Table no-24 Details of Descriptive statistics and t-test for paired samples

<table>
<thead>
<tr>
<th>Groups</th>
<th>Means</th>
<th>Standard deviation</th>
<th>Differences in Means</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test</td>
<td>Post-test</td>
<td>Pre-test</td>
<td>Post-test</td>
<td></td>
</tr>
<tr>
<td>CG</td>
<td>2.0000</td>
<td>2.0833</td>
<td>.0000</td>
<td>4.2495</td>
<td>-8.333E-02</td>
</tr>
<tr>
<td>EG1</td>
<td>2.2083</td>
<td>3.0833</td>
<td>.4149</td>
<td>.6539</td>
<td>-.8750</td>
</tr>
<tr>
<td>EG2</td>
<td>2.4167</td>
<td>3.4167</td>
<td>.5036</td>
<td>.5036</td>
<td>-1.0000</td>
</tr>
<tr>
<td>EG3</td>
<td>3.0417</td>
<td>7.8750</td>
<td>.7506</td>
<td>.4484</td>
<td>-4.8333</td>
</tr>
</tbody>
</table>

Constructing Evaluation Tools:

The analysis of the results indicated that there is significant gain in the competency Attainment of only EG2 & EG3 groups of the Treatment groups (Sig. =.000, .000 for EG2 & EG3 respectively). It is rather interesting to know that the analysis indicated significant gain in the Competency Attainment of Pre-service teacher of CG, Where as EG1 does not indicate any gain in the Competency Attainment(Sig.=.000, .357 for CG & EG1 respectively). The details of the analysis is given in the table no-25 and Graph no-9.
Thus the analysis of the pre-test and post-test indicate that there is significant gain in the treatment groups EG2 & EG3. But in EG1 there is not much gain from pretest scores to post test scores compared to the other two treatment groups. In competencies such as *Making Additional Resource Materials*, *Constructing Evaluation Tools*, the Pre-service
teachers of CG show a better gain than EG1. Even though EG1 is one of the treatment groups, it did not receive treatment, which is very much different from the conventional procedure followed in CG. The general training (conventional method) might have helped the pre-service teachers to show gain in the above said Competencies. But it is rather strange that EG1 gained less than that of CG.

4.2. DIFFERENTIAL GAIN IN THE COMPETENCY ATTAINMENT OF PRE-SERVICE TEACHERS AFTER TREATMENT WITH ALTERNATIVE MODES OF CBT PROGRAMME

**Hypothesis 2:** There is no significant differential gain in the Competency Attainment of pre-service teachers between the treatment groups (experimental groups) and the control group in the following categories of Competencies after the treatment with Alternative modes of CBT:

1. **Content Competencies:** the three areas of content competencies viz.
   - g. Environmental knowledge
   - h. Environmental Awareness
   - i. Environmental Action Behaviour

2. **Pedagogical Competencies** such as:
   - m. Indoor competencies
   - n. Outdoor Competencies
   - o. Preparing Additional Resource Materials
   - p. Making Environmental Pro-Decisions
   - q. Executing Action Projects
   - r. Constructing Evaluation Tools

This hypothesis was tested using Repeated Measures ANOVA (General Linear Model). This demands homogeneity in the different groups at the initial stage. In order to establish the homogeneity in the different groups (CG, EG1, EG2 & EG3), on all the three variables-EK, EA & EAB, one-way ANOVA for pre-test scores was adopted. The results of this are given in the table no.-26:
Table no- 26 Results of one-way ANOVA on pre-test scores of the variables

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>844.875</td>
<td>3</td>
<td>281.625</td>
<td>2.482</td>
<td>.066</td>
</tr>
<tr>
<td>Within Groups</td>
<td>10437.083</td>
<td>92</td>
<td>113.447</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>11281.958</td>
<td>95</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Since the obtained ‘F’ value (F=2.482 & Sig.=.066) for pre-test scores for different groups were found to be not significant, it is assumed that all groups are randomized for post-test.

The results of the Content Competencies are analysed as follows:

4.2.1 Content Competencies-Environmental Knowledge (EK), Environmental Awareness(EA) & Environmental Action Behaviour(EAB):

The analysis of pre-test results indicated that, the pre-service teachers from all the four groups (CG, EG1, EG2 & EG3) were reasonably equipped with Content Competencies-Environmental Knowledge, Environmental Awareness & Environmental Action Behaviour. Though, all the four groups exhibit gain in the competency attainment but the gains are not equal. The results indicate that there is significant differential gain over Content Competencies taken together. The extent of gain is in descending order from EG3 to EG2 and EG1. Further it is interesting to note that the gain in the CG (not so significant) is slightly better than that of EG1. But this may be due to negligence on the part of EG1. EG3 & EG1 are found to have exhibited highest and lowest gain respectively. Although CG & EG2 have shown more gain than EG1, it is found to be very less compared to EG3. The details of the descriptive statistics, ANOVA and the Profile plot of the means in all the Content Competence areas together are shown in the tables no-27, 28 & Graph no-10.
The detailed analyses of the scores individually under EK, EA & EAB are as given below:

a. **Environmental Knowledge**: The details of the descriptive statistics (Mean & Standard Deviation scores) of all the four different groups on the EK are presented in the table no-. Table indicated that there is vast improvement in the post-test means (compared
to pre-test means) of the pre-service teachers of EG3, moderate improvement in EG2
and mild improvement in EG1 & CG groups (the improvement of CG is slightly better
than that of the EG1). The ‘F’ is found to be significant (F=60.462 and Sig.=0.000)
indicating the significant differential gain in the competency attainment of pre-service
teachers of experimental groups in EK. It is clear from the table nos-28, 29 that the
gain in the competency attainment by the experimental groups EG1 & EG2 are not
much as compared to that of the experimental group EG3, which exhibited the highest
gain.

Table no-28 Details of Descriptive Statistics of EKT

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREEKT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CG</td>
<td>16.0000</td>
<td>4.9255</td>
<td>24</td>
</tr>
<tr>
<td>EG 1</td>
<td>16.4583</td>
<td>4.5586</td>
<td>24</td>
</tr>
<tr>
<td>EG 2</td>
<td>17.4167</td>
<td>2.8880</td>
<td>24</td>
</tr>
<tr>
<td>EG 3</td>
<td>18.2083</td>
<td>4.0106</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>17.0208</td>
<td>4.1902</td>
<td>96</td>
</tr>
<tr>
<td>PSTEKT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CG</td>
<td>17.0833</td>
<td>5.2247</td>
<td>24</td>
</tr>
<tr>
<td>EG 1</td>
<td>17.1667</td>
<td>4.2495</td>
<td>24</td>
</tr>
<tr>
<td>EG 2</td>
<td>19.0833</td>
<td>3.5253</td>
<td>24</td>
</tr>
<tr>
<td>EG 3</td>
<td>26.9583</td>
<td>1.5174</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>20.0729</td>
<td>5.5824</td>
<td>96</td>
</tr>
</tbody>
</table>

Table no-29 ANOVA details for EKT

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>FACTOR1</td>
<td>447.130</td>
<td>1</td>
<td>447.130</td>
<td>154.465</td>
<td>.000</td>
</tr>
<tr>
<td>FACTOR1 * GROUPS</td>
<td>525.057</td>
<td>3</td>
<td>175.019</td>
<td>60.462</td>
<td>.000</td>
</tr>
<tr>
<td>Error(FACTOR1)</td>
<td>266.312</td>
<td>92</td>
<td>2.895</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. **Environmental Awareness**: The details of the descriptive statistics (Mean & Standard
Deviation scores) of all the four different groups on the EA are presented in the table
nos-28, 29. The post test results indicate that there is vast difference between the means of
EG3 and the other experimental groups (EG2 being the least). Moderate improvement
in EG2 and mild improvement in EG1 & CG groups (the improvement of CG is slightly
better than that of the EG1). The 'F' is found to be significant (F=96.176 and Sig.=0.000) indicating the significant differential gain of pre-service teachers of experimental groups in EA. It is clear from the tables’ nos-30,31 the gain in the competency attainment by the experimental groups EG1 & EG2 is not much as compared to that of the experimental group EG3, which exhibited the highest gain.

Table no-30 details of Descriptive Statistics of EAT

<table>
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<tr>
<th>GROUPS</th>
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<tbody>
<tr>
<td>PREEAT CG</td>
<td>17.8750</td>
<td>3.2210</td>
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</tr>
<tr>
<td>EG 1</td>
<td>16.7083</td>
<td>3.6413</td>
<td>24</td>
</tr>
<tr>
<td>EG 2</td>
<td>17.8750</td>
<td>3.3273</td>
<td>24</td>
</tr>
<tr>
<td>EG 3</td>
<td>18.5833</td>
<td>4.5865</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>17.7604</td>
<td>3.7353</td>
<td>96</td>
</tr>
<tr>
<td>PSTEAT CG</td>
<td>18.2500</td>
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</tr>
<tr>
<td>EG 1</td>
<td>17.1667</td>
<td>3.7494</td>
<td>24</td>
</tr>
<tr>
<td>EG 2</td>
<td>18.3750</td>
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<td>24</td>
</tr>
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<td>EG 3</td>
<td>28.1667</td>
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<tr>
<td>Total</td>
<td>20.4896</td>
<td>5.3842</td>
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Table no-31 ANOVA details on EAT

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</table>

c. Environmental Action Behavior: The post-test results indicate that there is vast difference between the means of EG3 and the other two experimental groups. EG1 exhibited the least gain, EG2 showed slightly higher gain & EG3 shows the highest gain in the competency attainment. Thus it is concluded that there is significant differential gain in the EAB of the pre-service teachers of the experimental groups. The control group CG shows not much gain from the pre- to post-test results. This is indicated by the value of ‘F’ (F=2520.532 and Sig. =0.000) shown in the table nos-32,33.
### Table no-32 Details of Descriptive Statistics of EABT

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<tr>
<td>EG 1</td>
<td>29.5833</td>
<td>4.7905</td>
<td>24</td>
</tr>
<tr>
<td>EG 2</td>
<td>31.6667</td>
<td>4.2801</td>
<td>24</td>
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<tr>
<td>EG 3</td>
<td>33.5417</td>
<td>5.0388</td>
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<td>31.2396</td>
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<td>PSTEABT CG</td>
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<td>29.7500</td>
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<tr>
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<tr>
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### Table no-33 ANOVA details on EAB

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</thead>
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<td>.000</td>
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<tr>
<td>FACTOR1 * GROUPS</td>
<td>47164.083</td>
<td>3</td>
<td>15721.361</td>
<td>2520.532</td>
<td>.000</td>
</tr>
<tr>
<td>Error(FACTOR1)</td>
<td>573.833</td>
<td>92</td>
<td>6.237</td>
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</table>

### 4.2.2. ANALYSIS OF PEDAGOGICAL COMPETENCIES:

1) INDOOR COMPETENCIES-Identifying Infusion spots, organizing Role Play, Narrating Stories and Composing & Reciting Poems (IC1, IC2, IC3, IC4, and IC5 respectively):

The results indicate that the pre-service teachers of EG3 group show highest gain in all the indoor competencies viz. *Identifying infusion spot, Organizing role play, Organising Brain Storming sessions, Narrating Stories & Composing & Reciting Poems*. There exists differential gain in all the three experimental groups who underwent alternative modes of CBT. The descriptive statistics & ANOVA details indicate the following aspects.
Table no-34 Descriptive Statistics of all groups on indoor competencies

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>pre indoor comp</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>CG</td>
<td>10.1250</td>
<td>.1.0759</td>
<td>24</td>
</tr>
<tr>
<td>EG 1</td>
<td>10.0000</td>
<td>.9325</td>
<td>24</td>
</tr>
<tr>
<td>EG 2</td>
<td>9.5417</td>
<td>.9315</td>
<td>24</td>
</tr>
<tr>
<td>EG 3</td>
<td>11.3750</td>
<td>1.7147</td>
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</tr>
<tr>
<td>Total</td>
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<td>post indoor comp</td>
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<td></td>
</tr>
<tr>
<td>CG</td>
<td>10.1250</td>
<td>1.0347</td>
<td>24</td>
</tr>
<tr>
<td>EG 1</td>
<td>10.2917</td>
<td>1.1221</td>
<td>24</td>
</tr>
<tr>
<td>EG 2</td>
<td>12.6667</td>
<td>1.2039</td>
<td>24</td>
</tr>
<tr>
<td>EG 3</td>
<td>47.5000</td>
<td>2.8284</td>
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<tr>
<td>Total</td>
<td>20.1458</td>
<td>15.9974</td>
<td>96</td>
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</table>

(ANOVA details and Profile plot of mean performance are presented in the table nos-34.35 & Graph no.-II) The pre-service teachers had to use any two indoor competencies (techniques) at a time in their transaction in order to minimize the time constraint. The descriptive statistics of all groups indicated that even though differential gain exists it is not at all equal. The pre-test and post-test means indicated that the mean of the CG does not indicate any change in the post-test whereas the means of the treatment groups show change from subtle to high (with EG1 showing the least). ANOVA details for post-test results indicated that ‘F; (overall F=3449.429 & group-wise F=2717.934 Sig. =0.000) is found to be highly significant showing differential gain in the pre-service teachers of all the groups, but the gain is not equal in all. The gain is highest in EG3 and zero ‘0’ in CG and least in EG1, where as in EG2 it is slightly better than CG & EG1.

Table no-35 ANOVA Details for indoor competencies

<table>
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<tr>
<th>Source</th>
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<th>Sig</th>
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</thead>
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<td>4690.630</td>
<td>3449.429</td>
<td>.000</td>
</tr>
<tr>
<td>IMP * GROUPS</td>
<td>11087.766</td>
<td>3</td>
<td>3695.922</td>
<td>2717.934</td>
<td>.000</td>
</tr>
<tr>
<td>Error(IMI)</td>
<td>125.104</td>
<td>92</td>
<td>1.360</td>
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</tbody>
</table>
Qualitative Details:
The gain in EG1, EG2 & CG is very meager, compared to EG3. It is very obvious that the pre-service teachers of these three groups were not at all competent to identify infusion spots to plug-in the environmental dimension in the secondary curriculum. However they made some effort to speak about; Environment and pollution during their transaction. They did not make any conscientious effort to adopt any strategy/technique. They merely spoke in their classes about 'pollution & causes of pollution' very casually with no intention of achieving the objective. In most classes this became a successful 'patch work'. This might be because of the following reasons:

- The pre-service these three groups did lack the motive to take the transaction of EE seriously.
- It took more time for the pre-service teachers to digest the fact that it is possible to infuse environmental dimension in the teaching subjects without jeopardizing the subject's basic nature.

- The pre-service teachers had no hold on the selection of environmental dimension. In the sense they had little provision to infuse what environmental
facts they knew. Instead they had to get some environmental dimension that is relevant to the topic on hand without harming the topic’s basic nature. The environmental input should act as an increment gain in the knowledge but at the same time should not harm the continuity of the topic. Added to this the pre-service teachers had no control over the selection of topics they would be teaching but the school permitted them to teach only certain chapters in a subject. Therefore, pre-service teachers had to take the trouble of identifying environmental dimension to the topics that have been selected for them by schools.

Therefore many students failed in clearly identifying the plug point to infuse environmental theme.

But the pre-service teachers of EG3 after few more trial exercises in it became confident and analysed the content logically, also hierarchically. Since they underwent content training during the course before the practice session, the environmental dimension to select was not very difficult. Therefore all of them have successfully analysed the content to identify the plug point have also identified the apt environmental dimension to infuse.

The informal discussion with the pre-service teachers of CG & EG1 revealed the following points, which go a long way in understanding why this differential gain in the indoor competencies.

a) The pre-service teachers of the CG & EG1 felt that

- It is meaningless to transact EE in the absence of an accepted EE curriculum at secondary level.
- Even if they wanted to vaguely put the idea related to ‘protection of environment’ they did not know how. Thus they decided to opt out.
- They are ignorant of the procedure to identify the right spot (infusion spot) to speak about environment education. They obviously felt that despite of this speaking about environment means a sure deviation from the subject they are teaching.
- those who made attempt in this regard ended in the patching of the environmental dimension because the written material related to the content aspects (issues, principles, problems, knowledge, information etc) of environment as well as the list
of identified pedagogical competencies did not motivate them to read and comprehend. Those who attempted, opine that the material was beneficial to obtain just the factual information but did not develop originality to the extent of transacting that to the secondary students.

b) Pre-service teachers of EG2 were comparatively better than EG1 only to the extent that at least few pre-service teachers made some relevant efforts to transact EE using the techniques/procedures that had been suggested to them using procedure provided to them. But they were not found effective in their venture, because of the following reasons:

- They felt difficult in identifying spot (where exactly to infuse the environmental perspective), thus many took back their steps. They needed practical orientation as well as practice in this regard along with the written information. They failed in the first step & did not have the courage to continue further.

- Mere theoretical orientation with regard to different competencies was not sufficient but practical orientation was very much needed as many of the activities/strategies to be used to transact EE through infusion like role play, Story narration, brain storming, poem recitation demand good exposure and practice.

- A few felt the very many number of pages that provided descriptions regarding the procedures/details of the pedagogical competencies de-motivated them & kept them away from reading.

- Some others even though made an honest effort to read and to understand & apply, they found it difficult to understand some key terms (such as 'warm up techniques, cue cards, steps of Cinquain, rating items, etc) even in the text provided to them. The description did not motivate them to take themselves any practical orientation.

c) The pre-service teachers of EG3 have successfully transacted EE. The pre-service teachers from this group were made to transact EE in both peer group setting as well as in the actual class room settings (after the CBT programme). The qualitative details of each of the indoor competencies are given below:
a) **IC<sub>1</sub>-identifying infusion spots in the teaching topics:**

Although in the beginning the pre-service teachers failed to make proper content analysis (wrote only the subheadings of the unit as the content analysis), they could attain the competency towards the end of the training programme. Sample of Content analysis in annexure-

The pre-service teachers in this group could,

- Analyse the content in terms of its major concepts that is to be taught.
- Identify the plug point for infusion of environmental dimension in the major concepts.
- Select suitable environmental dimension for infusion under each plug point.

The attainment of this competency vindicated what has been specified in the Essential Readings in Environmental Education, 2nd Edition,... 1978 ‘A major ingredient of that “plan” must be to respect the integrity of the scope and sequence in a manner, which guarantees that instruction will proceed logically across content areas.’ The lessons given by the pre-service teacher using indoor competencies have vindicated this.

b) **IC<sub>2</sub>-Role play:** It is very strange to notice the EG3 members’ opinion that techniques like ‘role play’ & ‘story narration’ are suitable only for elementary classes and certainly not for secondary classes. It is only after they started using them that they changed their feeling. This awareness provided them with ‘over enthusiasm’ & forced some of them to create story boards by themselves instead of using the readily available ones.

The following characteristics of the competency were identified in their transaction:

- In most cases the characters (roles) chosen for role play were sufficient and were in accordance with the theme. Some times one or two more characters were chosen with not much of impact in the play. They defended rather strangely for this as follows:

  *The secondary students, who are otherwise slow in learning, learnt easily when they actually participated in the play. Picking up such students for the play, who are otherwise not very fast in comprehension, helped them understand the theme & digest*
it well. *This made them purposefully add one or two characters extra to the play.*

They are convinced that their idea clicked and such students learnt the theme easily.

- In most cases the play conveyed some basic information related to environment. In few cases (later this was rectified by the pre-service teachers themselves), the basic information would get elasticized in the sense that they made efforts to give more learning points related to environment. Actually the pre-service teachers were instructed to provide environment related information in small doses through the play to avoid monotony and drudgery. So the pre-service teachers were again instructed & made to learn to maintain a balance between the two. A small theme (simple, clear) can be spread throughout the play. In the final rounds the pre-service teachers picked it up all well.

- The dialogues in the play though, sometimes included irrelevant phrases/words, carried message concerning environment. In fact the pre-service teachers had done their home work related to ‘writing of Cue cards’ perfectly. Also the play was successfully planed to end within 15 minutes.

- The ‘Actual playing’ of the roles by the secondary students conveyed the primary students were given, the needed background information, Relevant instructions in order to ‘Execute on the stage’, Comprehensible cue cards in advance by the pre-service teachers.

- The play was smoothly linked with the day’s lesson in most cases giving continuity to the lesson (except in two cases which ended as a patch work).

- This linking did not confine only to the continuity of the subject on hand but also went a long a way in most cases to link their previous knowledge with some global problems. Eg: one play which was about rain water harvesting linked their knowledge with the local as well as national problem of ‘water crises’. In another play about a ‘Neem Tree’, the play linked successfully with the global problem of ‘Deforestation’. Thus the study identified that such a competency in teachers goes a long way to prove what Hungerford & others have believed EE as...‘EE must emphasize and bridge from the personal, local, and national to the global in linking the actions of today with the consequences of tomorrow.’ (John M. Ramsey, Harold R. Hungerford, and Trudi L. Volk Environmental Education in the K-12 Curriculum 1978).
c) IC3- Composing & Reciting Poems:

Although most of the pre-service teachers exhibited their earlier indifference towards learning this competence finally appeared to be conscientiously involved in the task of composing a ‘Cinquain’. Most of their compositions were in Kannada language annexure.-. The pre-service teachers of EG3 were found to be enthusiastic in the composition of the poem. The language used in the poem appeared very simple and easily comprehensible by the secondary students. They were able to use a single environmental theme (concept/principle/issue) in the composition.

Most of the pre-service teachers in this group pronounced the phrases/words clearly & emphatically except a two members. It is rather interesting to note that there prevailed a misconception among the pre-service teachers that reading loudly makes their recitation emphatic. They were made to overcome this misconception occurred in the beginning of their transaction by providing one more demonstration and practical orientation in this regard.

- They had conscientiously provided basic information related to the theme in their composition. In some cases, where the pre-service teachers themselves lacked sufficient related knowledge, failed to give basic information.
- The poems composed were in accordance with the steps of construction of Cinquain poem. Although in the beginning errors were found in the structuring of the second, third and fourth lines of Cinquain. The two words in the II line & three words in the III line were automatically replaced by statements instead of adjectives and verbs respectively also deviated from the rule in the 4th line (used ‘Godly’ instead of ‘God’) as in the example given below:

```
Sun
You powerful
You emit us light
You give us energy
Godly
```
This might be due to the fact that the pre-service teachers lacked the ability to express facts/opinions etc in a concise manner, poor vocabulary (ability to use a single word instead of a number of words/phrases)

The pre-service teachers were again instructed to correct the above mentioned errors. The pre-service teachers showed improvement to a great extent during the final rounds of their transaction classes.

d) IC4-Narrating Stories:
The pre-service teachers had problem in identifying the correct infusion spots, to use ‘story narration’ technique. The following common errors were found among them in the competency:

- The story even though begun with some environmental theme, slowly deviated from it.
- There were too many irrelevant words/phrases.
- Many were found to be overdoing with their tonal modulation

However, just with the correct feedback dosage to improve both the script and narration, they picked up well. Finally the use of irrelevant words/phrases was reduced to the bare minimum. The tonal modulation in fact impressed the secondary students.

e) IC5-BRAIN STORMING SESSION:
The strong points found by the pre-service teachers in this context were,

- Organized warm up techniques and made a nice collection of varied warm up techniques and executed it pretty well.
- Recorded the ideas generated
- Short listed the number of ideas based on categorization & prioritizing.

But in the beginning following errors were committed by them:

- Statement of the environmental problem was not clearly made. This confused the secondary students while providing ideas.
- The ideas from secondary students were either criticized or appreciated the moment they received. This distracted (affected) their spontaneity.
• The slow rate of ideas/hesitation from the secondary students made them get discouraged.
However, after persistent & relevant feed back, they could perform better in their final rounds.

2) OUT DOOR COMPETENCIES-NATURE WALK, NATURE GAME (Od₁ & Od₂ respectively):

The pre-service teachers were made to organize the outdoor activities in the peer group setting only for the pre-test whereas they were made to organize in the live setting (actual class rooms) for the post test. They were assessed only on the reports submitted by them, as it was not possible to observe them at the time of execution.

The details of the analysis of the pre-test & post-test results are presented in the tables no-36,37 & Graph no-12. ANOVA details indicated that there is significant differential gain the competency attainment of the treatment groups as compared control group. The post-test means in the descriptive details indicated that there is not much difference between them in cases of CG & EG₁. However EG₁ shows slight improvement compared to CG. EG₂ exhibited moderate, where as EG₃ showed highest with regard to the change in mean from pre-test to post-test. It is inferred from ANOVA details that the ‘F’ value (F=1154.082, Sig.=0.000) was found to be significant and there exists differential gain the outdoor competency attainment of the three experimental groups. It is very clear from the scores of the pre-test that the CG, EG₁ & EG₂ did not take the task seriously and could not exhibit the competency in the expected manner.
Thus it is clear from the analysis of the post-test results that CG shows negligible gain where as EG₁ & EG₂ showed some gain (EG₂ slightly better than EG₁) and EG₃ showed the highest gain in the competency attainment.
Table no-36 Details of Descriptive Statistics on Out Door Competencies

<table>
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<td></td>
<td>EG 2</td>
<td>1.3750</td>
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<td></td>
<td>EG 3</td>
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<td></td>
<td>EG 3</td>
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Table n-37 ANOVA details on Out Door Competencies

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<th>F</th>
<th>Sig.</th>
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<td>764.005</td>
<td>1725.753</td>
<td>.000</td>
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<td>510.922</td>
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<tr>
<td>Error(IMP)</td>
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<td>92</td>
<td>.443</td>
<td></td>
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</tbody>
</table>

Graph no-12 Mean performance on outdoor competency
a) **Nature Walk/Game:**

The pre-service teachers from EG3 were made to organize the outdoor activities in the in peer group setting as well as in the live settings (classrooms).

In pre-test, it was found that pre-service teachers tried to perform these activities but failed. In most cases it ended as a sort of entertainment not as an academic activity. The pre-service teachers from all the four groups submitted report written on a single sheet of paper that informed what had happened in the outdoor session. Most of the reports confined to the following aspects of the nature walk & game:

- The location/place – home garden
- The type of plants they could see in the garden
- The uses of the plants
- The flowering plants – its variety

The reports of Nature game indicated that there was no specified game played as Nature game. The groups mistook Nature game for any game that is played in the nature to have better impact of it. Thus the report on it could not serve its purpose except for a few which have mentioned about food chain & web or naming a tree/plant.

The observations made during the analysis of these are the reports had the following details:

1. **The Nature walk game:**

   The name of the location was specified. Only few pre-service teachers from EG2 selected nearby parks & the rest of the pre-service teachers from the above mentioned groups selected school garden for both nature walk and game.

   The learning experiences confined to what had been done in the pre-test session. Few pre-service teachers from EG2 explained about the difference varieties of plants and how each one is an ecosystem itself. The nature game remained *unknown & a new concept* to them. But few pre-service teachers (eight in number) made some effort to play some pick and act/speak activities on some concepts like plants & animals.

   An informal discussion helped analyse the reason as follows:

   - The group CG was kept ignorant of any possibility of infusing EE outdoors
The other groups were kept ignorant of the art of providing outdoor learning experiences to transact EE.

Lack of awareness among the pre-service teachers of the groups CG, EG1 & EG2 regarding the necessity to transact EE outdoors & its positive impact on the secondary students.

The pre-service teachers of EG3, as mentioned earlier submitted the report for assessment after the execution of the activities. The group’s performance is commented based on the criteria given in the assessment tool (annexure-). The details of each one is separately discussed:

Nature Walk: Due to practical problem, a few pre-service teachers chose the practice teaching school-grounds as their location. But majority have chosen nearby parks, lakes as their location. There are evidences of instructions provided to students about their behavior, the things to be observed, recorded in the note book etc.

There are indications in about 17 cases out of 24 cases regarding the positive outcomes of the activities undertaken. For e.g. when the pre-service teacher who had shown them a bird in the lake & explained why it is called ‘snake-necked bird’, noticed situations when the same students pointed out the ‘snake-necked bird’ & screamed happily to the others. This, indeed an outcome of the activity provided. There were quite a large number of such illustrations.

Another case with another pre-service teacher can be illustrated. He noticed one of his secondary students showing a butterfly ‘sitting’ in front of the toilet on urine to others & explaining why it sits on urine? Such things not only show the learning outcome of activities but also indicate that a constant flow of sharing of information existed.

All the pre-service teachers have managed to hold debriefing session to share their view points, opinion, their discovery (if any) etc. The photos of sample reports have been provided in the annexure-

Nature Game:

All pre-service teachers invariably have chosen the game ‘web of life’. Two or three other games also have been played. The games used by the pre-service teachers of EG3 are listed below"
• Web of life
• Sustainable development – ‘how many fishes did you grab?’
• Who am I?
• What does the Deer want?

For each game the pre-service teachers have successfully written the procedure &
objectives of playing ‘each game’.

Games like ‘web of life’ needed some materials that have been listed by all of them.
There has been the mention in their report of the instructions & background information
provided by them to the students.

A few have failed to a brief description of how the students performed the game.
However it is evident in the report that all the pre-service teachers have linked the game
experience with the hidden environmental theme.

All the pre-service teachers have provided in their report, the highlights of debriefing
session.

3) MAKING ENVIRONMENTAL PRO-DECISIONS:

This was tested by making provision for the pre-service teachers to express their
thought process to take any decision. This was explicitly expressed by them in the
written form.

The descriptive statistics, ANOVA details and profile of mean performance on
this competency are presented in the tables no-38, 39 & Graph no.-13. The post-
test results indicated that ‘F’ is significant (F for overall improvement=639.882;
F for groups=251.587 & significance value =0.000) and there exists significant
differential gain in this competency attainment among three experimental groups.
However CG exhibits negligible gain. EG1 & EG2 have exhibited lower gain
(EG2 being marginally better than EG1), whereas EG3 has indicated the highest
gain.
During the pre-test session the pre-service teachers of all four groups failed to analyse their decisions on some environment related issue in terms of the options they had & the
consequences of each option. The only satisfaction was that they could decide some action on the issue presented. Thus the pre-test results did not indicate any ability of making environmental pro-decision.

The pre-service teachers of the groups CG, EG1 & EG2 did not show any remarkable difference despite the differential treatment they underwent. When they were asked to take decision with regard to their action behaviour towards a particular situation such as the following: ‘On their way back home they notice a street tap kept open and the water is getting wasted. What would you do’? The pre-service teachers from the above said groups could decide the best option. But when probed into details as to why & how they decided, it became apparent that they just had superficial knowledge about which should be the correct option favouring environment. They failed in identifying the environmental significance of each option (both –ve as well as +ve).

They failed to predict the consequences of each option. This is obviously because of their lacking in the awareness of the related impact of their decision. Sometimes it is possible to ‘point out’ to the best option even without being conscious about the act to be performed. This may be due to many other factors such as individual’s intuition, the obvious noise made by mass media, environmentalists by stressing do’s & don’ts etc for environmental protection. But this may not help them in any way to be apparent even in their action behaviour. They need to be trained in collecting environment related information and analyzing the consequences of individual behaviour with nature and identify how the two are related.

The pre-service teachers from EG1 could list the possible options at disposal where as pre-service teachers from EG2 could spell out vaguely the consequences of the options listed. Further the pre-service teachers from EG3 showed remarkable difference and the following characteristics of this competency were exhibited by them:

- List out different options at their disposal as their possible/probable decisions,
- Predict the consequences of each option in terms of what, why aspects of consequences & their environmental significance
- Decide the best option based on their analyses.
Thus it is clear that the pre-service teachers have attained the competency ‘Making Environmental Pro-decision’. This competence helps them in turn to mould their students to become more responsible citizens. The need of this competency therefore is in accordance with Agenda 21 which emphasizes on ‘Education, Awareness and Training’ (Agenda 21, chapter 36.), which states… ‘to make the dream of sustainable future come true, the teachers in the making should be trained so that they become competent enough to produce environmentally responsible citizens.’

The competency attainment also is in accordance with the claim made by Engelson (1986), that EE programs can be described as ‘Neutral’ meaning to say that ‘Approaching issues and problems without bias, where the classroom is a forum where all points of view should be heard.’ (Engelson 1986 – Teaching and Learning for a sustainable future)

A sample of this competence is shown in annexure-.

4) EXECUTING ACTION PROJECTS:

The analysis of the post-test results indicated that there exists significant differential gain in the ‘Executing Action Project’ competency attainment among the three experimental groups & CG. There is a vast difference between the means of the treatment groups and also there exists significant difference between the means of treatment groups (EG1, EG2, EG3) and control group (CG). ANOVA details indicated that ‘F’ value is significant ($F=2005.616$ & the singnificance value=$0.000$).

The competency attainment is higher in EG3 where as it is very less in case of EG1 & EG2 (EG2 slightly better than EG1) and least in CG. The details of the descriptive statistics and ANOVA details, are given in the tables no 40-41.
This competency is also assessed only on the reports submitted by the pre-service teachers of all the four groups (Post-test only). The action project suggests the systematic procedure followed by the pre-service teachers involving the secondary students successfully.

**Qualitative details:**

The action projects revealed that the secondary students were motivated to participate enthusiastically in action projects. Some of the action projects in which the secondary students were involved by the EG3 pre-service teachers were:

- Testing bio-degradability of different substances we use
- Preparing an artificial ecosystem- Aquarium.
- Making a survey of, ‘the kind of waste materials’ thrown by the people of a certain locality.
- Taking students to a location & collecting the different waste materials dumped there & sorting them based on their biodegradability.
• Making an opinion survey of the shop keepers, housewives regarding the use of alternates for plastics.

The following points were found in the reports submitted by them on action projects:

- Nature & significance of the problem clearly stated.
- Steps of the execution of the projects are mentioned.
- List of Sources of data collection is provided.
- Brief explanation of the procedure of the experiment (if any) conducted, is provided.
- Relevant photographs indicative of the activities performed by students, are provided.

The attainment of this competence among pre-service teachers have been found to be in accordance with that of the claims made by Engelson, 1986 for successful EE programs such as 'action oriented', experiential etc (Engelson 1986 – Teaching and Learning for a sustainable future).

5) PREPARING ADDITIONAL RESOURCE MATERIALS

In case of this competency the quality of the products viz. prepared as learning aids, Posters, scrap book & albums related to Environment with regard to pre-validated criteria indicated the attainment of the competency.

a) Preparing Environmental Album and Scrap book

The analysis of Pre-test results indicates that the existence of this competence in pre-service teachers is not significant but all the group pre-service teachers differed in the competency of preparing additional resource materials. EG2 & EG3 are found to be the same in this competency. The CG had the least and the EG1 showed existence of it in between CG and the other two experimental groups.

ANOVA results indicated that there exists significant differential gain in the attainment of this competency since F is found to be significant (F for overall gain=992.216 F for group-wise gain=179.127 with Sig. = .000). The analysis of post-test results indicates that there exists significant differential gain in the competence attainment among all the experimental groups. The gain is not equal with CG acquiring lowest gain and EG3 the highest gain;
EG1 & EG2 have gained better than CG with EG2 slightly more than EG1. The details regarding descriptive statistics, ANOVA results, and Profile plot are shown in the table nos. 42, 43, and Graph no. 14.

**Table no-42: Details of Descriptive Statistics on preparation of additional resource materials’ competency**

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<thead>
<tr>
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</thead>
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<tr>
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</tr>
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<td>EG 1</td>
<td>2.4583</td>
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<td>24</td>
</tr>
<tr>
<td>EG 2</td>
<td>3.2500</td>
<td>.6757</td>
<td>24</td>
</tr>
<tr>
<td>EG 3</td>
<td>3.4583</td>
<td>1.0624</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
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<td>1.0966</td>
<td>96</td>
</tr>
<tr>
<td>Preparing additional resource materials (post)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>CG</td>
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<td>.7223</td>
<td>24</td>
</tr>
<tr>
<td>EG 1</td>
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<td>.9780</td>
<td>24</td>
</tr>
<tr>
<td>EG 2</td>
<td>6.1667</td>
<td>.7020</td>
<td>24</td>
</tr>
<tr>
<td>EG 3</td>
<td>12.4583</td>
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</tr>
<tr>
<td>Total</td>
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<td>3.7366</td>
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**Table no-43: ANOVA details on preparation of additional resource materials**

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<th>Sig.</th>
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</thead>
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<td>800.333</td>
<td>992.216</td>
<td>.000</td>
</tr>
<tr>
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<td>144.486</td>
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<tr>
<td>Error(IMP)</td>
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<td>.807</td>
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</tr>
</tbody>
</table>

176
Qualitative details:

The pre-service teachers were asked to prepare & submit the additional resource materials in the beginning (pre-test) & at the end (post-test) of the experimentation. In pre-test all the groups failed in preparing any of the additional resources. Even though some could come out with some products, they were not worth considering as additional resources for transacting EE. They could vaguely come out with some sort of Album with pictures of pasted on a book. Very few (4 from EG1 & EG2; 8 from EG3; none from CG) prepared roughly the environmental scrap book that consisted on some clippings from a single magazine pinned together.

a) Environmental album/scrap book:
The pre-service teachers of CG did not prepare any album even after instructions. Some submitted variety of pictures of either flowers, forests etc.

The pre-service teachers of EG1 & EG2 submitted the collection of visuals consisting of sceneries of green environment. These were compiled in a book. But only pre-service teachers of EG2 gave some sort of a title to the visuals.

The Pre-service teachers EG3 fared better in the following aspects: Decided a theme in the first place & tried to collect visuals on the related theme. The visuals exhibited variety, with suitable captions/write-ups. Most of the album had the environment related theme on
‘environmental protection’, ‘green environment’, ‘pollution’, ‘Adverse effect of human interventions’ etc, which would be of great use in the transaction of EE.

The visuals were collected from,

- News paper-Times of India, Sunday Herald, Vijay times (Kannada daily), India Today etc;
- Environmental journals-Environmental pollution & management, Parisara Vahini (a journal published by an NGO)
- Tharanga-a Kannada weekly

Almost similar outcome was noticed in case of preparation of environmental scrap book. The photos of environmental album and environmental scrap book are presented in the annexure-. 

b) **Analysis of the results of the Cometency of Preparation of Learning Aids and Posters.**

For the preparation of learning aid & posters the pre-service teachers in the respective groups were divided into four subgroups of six in each. Due care was taken to see that each subgroup had pre-service teachers from science methods, Arts and language methods as members.

The mean performance on both pretest and post test of competency (preparing learning aid and posters) by the four subgroups (Sg1, Sg2, Sg3 & Sg4) is shown in the following bar graph no-15.
The analysis of the results of this indicated that the pre-service teacher knew some basic aspects related to the preparation of learning aids but lacked it regarding the preparation of posters. There exists reasonable gain in the competency attainment by all the sub groups of EG3 from pre-test to post-test.

The learning aids & poster prepared by subgroups of CG, EG1 & EG2 before the intervention in terms of CBT, were not found of much use for the class room instruction. The products submitted by EG1 & EG2 included some learning aids meant for teaching concepts from other subjects but could be used to speak something about environment. For e.g. globe, picture of a tree, parts of flower etc. The posters prepared by these groups had the collection of visuals pasted on a chart sheet with no focus on any single environmental theme. Some clarity in posters could be seen in the ones submitted by the pre-service teachers of EG2. The subgroups of EG3 prepared reasonably good learning aids & poster. Especially some learning aids possessed originality in their creation.

One unique fact with regard to this competence is that both ‘training’ & ‘testing’ was done group-wise. An interesting aspect observed by the investigator was that the heterogeneity prevailing in the groups due to the difference in their background subjects helped them to exploit each others’ potential ability. Pre-service teachers contributed their expertise to the group, in the following ways to bring out a reasonably good learning aid:
Use ‘Thermo Cole-cutters’ skillfully to cut the thermo Cole.

- Put-forth ideas as to what should be the purpose of the learning aid & how it should be presented.
- Provide with relevant drawing to paste on Thermo Cole.
- Paint/Color the drawing with relevant colours.

The photographs of their preparation are given in the annexure-

Same was the case with the pre-preparation of environmental posters by the pre-service teacher of EG3.

In all the posters by the 4 subgroups most of the visuals were in focus. Most of the posters were attractive by being, neat, bold with reasonably convincing design & layout. Some subgroups used visuals that indirectly convey environmental theme. For e.g. the visuals on the scientific advancement also conveyed the message ‘whether science is boon or bane to the humankind?’ Pre-service teachers used captions to convey their ideas represented through the posters. In all cases the caption and the visuals conveyed the same message. In 2 subgroups originality was lacking in the arrangement of visuals.

Some of the captions chosen for the poster are ‘Scientific advancement boon or bane?’ ‘Air pollution!’ ‘This can kill you!’ ‘Stop becoming deaf!’

6) EVALUATION TOOLS CONSTRUCTION- Rating Scale (RS), Check List (Ch.L) & Questionnaire (Q’R):

The pre-service teachers were asked to set question items for a ‘questionnaire’, ‘rating scale’ & ‘check list’ in order to assess the environmental awareness, environmental action behaviour etc. of the secondary students. The evaluation tools prepared by the pre-service teachers are analysed as follows:

The details of the descriptive statistics, ANOVA & profile performance are given in the table no-. graph no-

Analysis of the pre-test & the post-test results indicated ANOVA details indicated that ‘F’ is highly significant (F for over all gain=2794.136, F for group-wise gain=2266.424 and significance value = 0.000) and thus inferred that there is significant differential gain in the competency attainment. CG & EG1 do not
differ much and exhibit the least gain. EG2 is slightly better than EG1 but not so high. EG3 has the highest gain. The details of the Descriptive statistics, ANOVA details, & profile Plot are given in table nos.-44, 45 & Graph no-16.

Table no-44 Details of descriptive Statistics on Preparing evaluation tools' competency

<table>
<thead>
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</tr>
<tr>
<td>CG</td>
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</tr>
<tr>
<td>EG 1</td>
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<td>24</td>
</tr>
<tr>
<td>EG 2</td>
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<tr>
<td>EG 3</td>
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<td>0.9743</td>
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<tr>
<td>Total</td>
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<td>0.9731</td>
<td>96</td>
</tr>
<tr>
<td>post-evaluation tool</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CG</td>
<td>4.4583</td>
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</tr>
<tr>
<td>EG 1</td>
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<tr>
<td>EG 2</td>
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<td>EG 3</td>
<td>26.5833</td>
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Table no-45 ANOVA details on Preparing evaluation tools

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<td>.000</td>
</tr>
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<td>59.292</td>
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<td>644</td>
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</tbody>
</table>
Qualitative details:

During pre-test session almost all the pre-service teachers from CG, EG1, EG2 & EG3 ended in preparing multiple choice question items for rating scales and check lists and prepared essay type question-items that have factual information as answers, as items for questionnaires.

After the intervention when they were tested again the following results were noticed.

The pre-service teachers of CG performed very badly. It was obvious that most of the pre-service teachers were not even aware of tools such as 'rating scales' & 'check-lists'. The knowledge of mere 'content' related to environment which was provided to them was of little help to pre-service teachers of CG in developing question items for 'rating scale' & 'check list'. They again ended structuring some multiple choice question items. The questions did not have any single focus point. But some question items from questionnaire focused on some significant environmental issues.

Even though EG1, EG2 varied in their treatment did not differ much in their performance. The input provided as differential treatment, was of little help to pre-service teachers of EG1 in developing question items for 'rating scale' & 'check list'. Even the pre-service teachers of EG2 were not all benefited by the 'extra input' (than their EG1 counter-parts) in terms of the written procedure for the construction of 'rating scale & check list'. Although both groups were successful in having a single theme as the 'focus point' for the question items,
the pre-service teachers of EG2 could come out with vaguely correct rating items for rating scale & observable situations for check lists. Many statements in the question items structured by the both the groups failed to become learning outcomes of a particular behaviour, in rating scales.

For e.g., one of the pre-service teachers, used a stem for the rating scale as follows, ‘willingness to water the plants everyday’.

In some other conditions, there was no scope for clear observation of the particular behaviour. Most of the statements did not represent behaviour that usually occurs in schools. Both the groups failed in putting clear phrases as the ‘rating items’.

Almost similar result (outcome) existed in case of the preparation of a check list. First of all the pre-service teachers from group-I did not indicate any familiarity with the nature of the kind of behaviours that can be possible to assess using checklist.

For e.g. one of the pre-service teachers used a statement (for observation by teacher using Check list) such as, 'makes the systematic use of holidays'

Groups EG1 & EG2 had difficulty choosing relevant environmental theme as well as the sequential presentation of the statement indicating series of behaviour required to perform the task.

The pre-service teachers of EG3 obviously showed better performance than the other 3 groups. The pre-service teachers prepared reasonably good tools. Although the first 2 tests showed slow improvement rate, the 4th test indicated that they had attained the competency to a greater extent. The important characteristic features observed among the pre-service that substantiate the attainment of this competency are given below:

Rating Scales

- The items in the Rating scales,
  - Used the statements that are environmentally significant.
  - Used statements that are directly observable in schools
  - Used correct phrase for the rating items
  - Used statements that indicate learning outcomes as the stem for the rating scale

- Some of the situations used by the pre-service teachers for preparing rating scales are,
  - Participation in environment related group work
• Working in school garden
• Demonstrating a skill of environmental concern
• Playing an environmental game
• Attitude towards becoming a member of nature club
• Participation in debate competition related to environment.

Check Lists:
Used the statements, which are environmentally significant
Listed the specific action to be performed in the situation provided in the statement
Arranged the specific actions sequentially as desired
Provided a simple procedure to score the behaviour against each specific action identified

Some of the environment related behaviour considered for assessment are,

• Composing a ‘Cinquain’ poem on some environment theme
• Drawing a piece of Nature
• Having lunch during lunch break in schools (exhibiting cleanliness)
• Having lunch during lunch break in schools (exhibiting cleanliness)
• Making recycled envelops during the craft period
• Conducting an experiment for testing biodegradability of different materials.

A sample rating scale & check list prepared by the pre-service teachers of EG3 are provided in appendix.

Questionnaire:
The pre-service teacher of CG could not prepare even a single open ended question. When discussed informally it was revealed that all of them were of the opinion that such questions are ‘wrong questions’ as they increase the subjectivity while assessing.

The members of EG1 & EG2 have attempted to frame certain questions. The two groups failed in focusing their theme to environmental perspective. In both groups less than 15% of pre-service teachers (about 3 in each group) could frame the questions correctly. In most
cases the questions framed demanded not more than the factual information from the text. 

E.g. 'what are the adverse effects of Air pollution?'

The pre-service teachers of EG3 group prepared reasonably good question items for questionnaires (open ended). It is found that the items constructed by them,

- Deal with a significant topic related to environment
- Center round a single environmental theme
- Are well sequenced
- Are concise
- Demand opinion/ suggestions/ comments/ different perspective from the student.

4.2.3 AFFECTIVE COMPONENTS OF THE EE COMPETENCIES:

The fact that, any Competency consists of three component elements viz. knowledge, skill and affective. The knowledge part as already mentioned in chap 3 is not assessed separately. The study has made an effort to assess the affective components of all the components. The results are analysed as follows:

The analysis of the affective components of the EE competencies are given below: In order to know the affective components of the pre-service teachers, Chi-square statistic was computed. The test results revealed that the about 75% of the pre-service teachers of the group that showed gain from the treatment, possessed ‘medium affect’ (positive feelings), about 8.3% possessed ‘high affect’ & 16.7% possessed ‘low affect’ for transaction of EE through infusion approach. The details of these categories in the range of affective components are given in the table no-46.

<table>
<thead>
<tr>
<th>Table no-46 Chi-square details of affective components of EE competencies</th>
</tr>
</thead>
<tbody>
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<td>Frequency</td>
</tr>
<tr>
<td>Valid</td>
</tr>
<tr>
<td>Low</td>
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<tr>
<td>Medium</td>
</tr>
<tr>
<td>High</td>
</tr>
<tr>
<td>Total</td>
</tr>
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</table>
Higher percentages of pre-service teachers are found to be average in their affective component of the competencies. This indicates that though pre-service teachers are not very much in favour of using infusion approach to EE, they are not against it. This further suggests proper training in this regard, help them to develop positive feelings towards EE & practice infusion approach & achieve the objectives of EE.

4.2a DIFFERENCE IN THE COMPETENCY ATTAINMENT (INDOOR AND OUTDOOR) OF PRE-SERVICE TEACHERS BETWEEN PEER GROUP SETTING AND ACTUAL CLASS ROOM SETTING.

Since the post test on indoor and outdoor competencies has been done in two different settings i.e. peer group setting and actual classroom setting, the investigator developed interest & curiosity to know if there is difference in the competency attainment in two different settings. For this purpose, EG3 group, which has shown highest gain in the competencies, was considered. Therefore, one more hypothesis (null)-H2a was formulated and tested using,'t' test for equalities of Means.

Hypothesis 2a: There is no significant difference in the Competency attainment (indoor and outdoor) of Pre-service teachers who undergo POA to CBT, between peer group setting and actual classroom setting.

To test this hypothesis, T-test for equality of means was adopted and the details of this for both indoor and outdoor competencies are presented in the table nos.-47, 48 49 & 50. The analysis indicated that there is not much difference in the mean scores between the two groups and the significance value does not indicate significant difference in competency attainment of pre-service teacher between peer group and actual classroom setting (Sig. =.565, .763, .821, .793 respectively for Brain Storm, Story Narration, poem Recitation and role play; Sig.=.738, 1.000 respectively for Nature Walk and Nature Game).
Table no-47 Details of the descriptive statistics of indoor competencies in peer group and classroom setting

<table>
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<td>.8999</td>
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<td>13.9583</td>
<td>1.0826</td>
<td>.2210</td>
</tr>
<tr>
<td><strong>Story Narration</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>24</td>
<td>8.7500</td>
<td>.8969</td>
<td>.1831</td>
</tr>
<tr>
<td>P</td>
<td>24</td>
<td>8.6667</td>
<td>1.0072</td>
<td>.2056</td>
</tr>
<tr>
<td><strong>Poem Recitation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>24</td>
<td>13.5000</td>
<td>1.3831</td>
<td>.2823</td>
</tr>
<tr>
<td>P</td>
<td>24</td>
<td>13.5833</td>
<td>1.1389</td>
<td>.2325</td>
</tr>
<tr>
<td><strong>Role Play</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>24</td>
<td>5.4583</td>
<td>.5090</td>
<td>.1039</td>
</tr>
<tr>
<td>P</td>
<td>24</td>
<td>5.4167</td>
<td>.5836</td>
<td>.1191</td>
</tr>
</tbody>
</table>

**Samples Test on indoor competencies**
(whisper group & classroom setting)

<table>
<thead>
<tr>
<th></th>
<th>t</th>
<th>df</th>
<th>Mean Difference</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brain storm</td>
<td>.580</td>
<td>46</td>
<td>.1667</td>
<td>.565</td>
</tr>
<tr>
<td>Story narration</td>
<td>.303</td>
<td>46</td>
<td>8.333E-02</td>
<td>.763</td>
</tr>
<tr>
<td>Poem Recitation</td>
<td>.228</td>
<td>46</td>
<td>-8.333E-02</td>
<td>.821</td>
</tr>
<tr>
<td>Role Play</td>
<td>.264</td>
<td>46</td>
<td>4.167E-02</td>
<td>.793</td>
</tr>
</tbody>
</table>
Table no-49 Details of Group Statistics on outdoor competencies (peer group & class room settings) of EG3

<table>
<thead>
<tr>
<th>GP</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>nature walk</td>
<td>C</td>
<td>24</td>
<td>9.0417</td>
<td>.8065</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>24</td>
<td>8.9583</td>
<td>.9079</td>
</tr>
<tr>
<td>nature game</td>
<td>C</td>
<td>24</td>
<td>7.0833</td>
<td>.7173</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>24</td>
<td>7.0833</td>
<td>.7755</td>
</tr>
</tbody>
</table>

Table no-50 Details of Independent Samples Test on outdoor competencies (peer group & class room settings)

<table>
<thead>
<tr>
<th>t-test for Equality of Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>t</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>nature walk</td>
</tr>
<tr>
<td>nature game</td>
</tr>
</tbody>
</table>

The results of this test indicate that there is no significant difference in the indoor competency attainment of pre-service teachers between peer and actual class room settings. The significance value for the indoor competencies such as Brain storm, Story Narration, Poem Recitation & Organising Role play are .565, .763, .821 & .793 respectively. Similarly the T-test for Outdoor competencies indicates that there exist no significant difference in the competency attainment of pre-service teachers between peer and actual class room settings. The significance value for the outdoor competencies such as Nature Walk & Nature Game are .738 & 1.000 respectively.

Even the subtle difference found in their competency attainment might be due to the fact disclosed by the pre-service teachers during informal discussion with the investigator:

Few of the pre-service teachers feel comfortable in the actual class rooms since they are not to teach in front of their friends, who know something better than the secondary students for whom they are transacting.

Some pre-service teachers felt comfortable to teach in the peer group setting i.e., in front of those whom they know & who know their weaknesses than in front of those...
who are new & depended totally on them for information. This made them lose confidence in the actual class room setting than in the peer group setting.

By noticing the highest gain in the group EG3 that received POA to CBT than other treatment groups (EG1 & EG2), it was decided to test whether the gain was irrespective of the background variables considered in the study viz. Attitude towards EE and Subject Background of pre-service teachers. The hypotheses 3 & 4 were tested only for EG3.

4.3 RELATIONSHIP BETWEEN THE COMPETENCY ATTAINMENT OF PRE-SERVICE TEACHERS WITH ATTITUDE TOWARDS EE

**Hypothesis 3.** There is no significant relationship between the attitude towards Environmental Education (AEE) and competency attainment of pre-service teachers who undergo practical orientation approach to CBT.

In order to find out the relationship between the competency attainment and attitude towards EE, Pearson’s correlation was used. The details of this is given in the table no-51:

<table>
<thead>
<tr>
<th>Variable V1</th>
<th>Variable V2</th>
<th>Correlation coefficient (r)</th>
<th>significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE Competencies</td>
<td>Attitude towards EE</td>
<td>0.043</td>
<td>.842</td>
</tr>
</tbody>
</table>

It is very clear from the table (r=0.043 & Sig. =.842) that there is no significant relation between competency attainment and attitude towards EE of the pre-service teachers of EG3. The details of the results of the attitude of Pre-service teachers towards EE is given in the table no-52:
Table no-52 classification of pre-service teachers on AEE scale using frequencies of scores

<table>
<thead>
<tr>
<th>CLASSSES</th>
<th>AEE SCORES</th>
<th>No. of Pre-Service Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Positive</td>
<td>190-200</td>
<td>09</td>
</tr>
<tr>
<td>Moderate Positive</td>
<td>165-189</td>
<td>15</td>
</tr>
<tr>
<td>Low Positive</td>
<td>140-164</td>
<td>-</td>
</tr>
<tr>
<td>Neutral including</td>
<td>115-139</td>
<td>-</td>
</tr>
<tr>
<td>Mild +ve/-ve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Negative</td>
<td>90-114</td>
<td>-</td>
</tr>
<tr>
<td>Moderate Negative</td>
<td>65-114</td>
<td>-</td>
</tr>
<tr>
<td>High Negative</td>
<td>40-64</td>
<td>-</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>24</strong></td>
<td></td>
</tr>
</tbody>
</table>

The results indicated that out of 24 pre-service teachers in EG3 15 of them are with Moderate Positive attitude towards EE where as 9 of them indicate High Positive attitude towards EE. The analysis indicated that the pre-service teachers although possess favourable disposition towards EE, were not influenced by it in their competency attainment.

4.4 DIFFERENCE IN COMPETENCY ATTAINMENT BETWEEN PRE-SERVICE TEACHERS WITH SCIENCE METHODOLOGY AND ARTS & LANGUAGE METHODOLOGY.

**Hypothesis 4:** Pre-service teachers with Science methodology and Arts & language methodology who undergo practical orientation approach to CBT do not differ significantly in their competency attainment.

The Hypothesis was tested using 't'-test for independent samples and the details of the group statistics and the results of the independent samples test are given in the tables no-

There is not much difference in the attainment of competencies between the pre-service teachers with science and arts background. It is clear from the analysis of pre-and post-test results that pre-service teachers with arts background have benefited equally
like their counterparts with science background. In the ‘Making environmental pro-
decisions’ competency, the pre-service teachers with arts background (8.000) show a
greater mean scores than that of the pre-service teachers with science background
(7.8421), whereas their means remained almost the same in the pre-test results. In
almost all other competencies the means do not vary much except in the content
competency and execution of Action projects. Significant difference is not found in the
competency attainment between the different subject backgrounds. The Sig. value for
the Content Competency and Execution of Action Projects are .040 & .005 respectively.

Table no-53 Details of Group Statistics on competency attainment by pre-service teachers with science methodology and arts
& language methodology

<table>
<thead>
<tr>
<th>SUBJECTS</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>72.5263</td>
<td>8.2756</td>
<td>1.8996</td>
</tr>
<tr>
<td>Arts</td>
<td>62.0000</td>
<td>14.0535</td>
<td>6.2849</td>
</tr>
<tr>
<td>POST</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>106.4737</td>
<td>3.8926</td>
<td>.8930</td>
</tr>
<tr>
<td>Arts</td>
<td>101.8000</td>
<td>3.0332</td>
<td>1.3565</td>
</tr>
<tr>
<td>ACTION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>14.9474</td>
<td>.7799</td>
<td>.1789</td>
</tr>
<tr>
<td>Arts</td>
<td>13.6000</td>
<td>1.1402</td>
<td>.5099</td>
</tr>
<tr>
<td>pre-envt pro dec</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>3.0000</td>
<td>.7454</td>
<td>.1710</td>
</tr>
<tr>
<td>Arts</td>
<td>3.2000</td>
<td>.8367</td>
<td>.3742</td>
</tr>
<tr>
<td>post-envt pro dec</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>7.8421</td>
<td>.5015</td>
<td>.1150</td>
</tr>
<tr>
<td>Arts</td>
<td>8.0000</td>
<td>.0000</td>
<td>.0000</td>
</tr>
<tr>
<td>pre-additional res</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>3.3684</td>
<td>1.1648</td>
<td>.2672</td>
</tr>
<tr>
<td>Arts</td>
<td>3.8000</td>
<td>.4472</td>
<td>.2000</td>
</tr>
<tr>
<td>post-additional res</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>12.6842</td>
<td>1.2043</td>
<td>.2763</td>
</tr>
<tr>
<td>Arts</td>
<td>11.6000</td>
<td>1.8166</td>
<td>.8124</td>
</tr>
<tr>
<td>pre-evaluation tool</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>3.9474</td>
<td>1.0260</td>
<td>.2354</td>
</tr>
<tr>
<td>Arts</td>
<td>3.8000</td>
<td>.8367</td>
<td>.3742</td>
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<tr>
<td>post-evaluation tool</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Science</td>
<td>28.8947</td>
<td>1.7605</td>
<td>.4039</td>
</tr>
<tr>
<td>Arts</td>
<td>25.4000</td>
<td>1.8166</td>
<td>.8124</td>
</tr>
<tr>
<td>pre indoor comp</td>
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<td></td>
</tr>
<tr>
<td>Science</td>
<td>11.5263</td>
<td>1.3892</td>
<td>.3187</td>
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<tr>
<td>Arts</td>
<td>10.8000</td>
<td>2.7749</td>
<td>1.2410</td>
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<td>post indoor comp</td>
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<td></td>
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</tr>
<tr>
<td>Science</td>
<td>47.4737</td>
<td>2.5899</td>
<td>.5942</td>
</tr>
<tr>
<td>Arts</td>
<td>47.6000</td>
<td>3.9749</td>
<td>1.7776</td>
</tr>
<tr>
<td>pre-outdoor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>2.5263</td>
<td>.7723</td>
<td>.1772</td>
</tr>
<tr>
<td>Arts</td>
<td>2.0000</td>
<td>1.4142</td>
<td>.6325</td>
</tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>16.2632</td>
<td>.9335</td>
<td>.2142</td>
</tr>
<tr>
<td>Arts</td>
<td>15.6000</td>
<td>1.3416</td>
<td>.6000</td>
</tr>
</tbody>
</table>
Thus the analysis of the results indicated that even though significant differential gain was noticed in all the Treatment Groups, EG3 has shown the highest gain in the attainment of all the Competencies identified for an EE teacher. This clearly indicated effectiveness of POA to CBT over the other two approaches (CA & WA) to CBT.