CHAPTER VI

EXPERIMENTAL APPROACH

VL1 EXPERIMENTAL STRATEGY
VL2 PLANNING OF THE EXPERIMENT
VL3 CONDUCTING THE EXPERIMENT
VL4 EVALUATION OF THE EXPERIMENT
CHAPTER VI

EXPERIMENTAL APPROACH

In the previous chapter the investigator has explained about the curriculum for hotel workers. After constructing the curriculum, it was necessary to study how much it could be useful. To study it the researcher had conducted an experiment. The present chapter deals with experimental procedure. The experimental procedure involves following four steps:

I) EXPERIMENTAL STRATEGY
II) PLANNING OF THE EXPERIMENT
III) CONDUCTING THE EXPERIMENT
IV) EVALUATION OF THE EXPERIMENT

I) EXPERIMENTAL STRATEGY:

Experimental strategy includes the title of the experiment, experimental design and statistical tools.

a) Title of the Experiment

"To study the effect of teaching the curriculum constructed for hotel workers by the researcher."

b) The experimental design

For present study the researcher had selected pre-test, post-test equivalent group designs as shown below:

The first design used, to compare rural and urban area in gain scores and the second design is meant only to see the achievement after the training. In the first design experimental groups and control groups
are considered. While in the second design only experimental groups is considered and Likert type opinionnaire consisting twenty items was used.

Design 1 (Improvement in knowledge)

<table>
<thead>
<tr>
<th>Area</th>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$N_1$</td>
<td>$N_3$</td>
</tr>
<tr>
<td>Rural area (Gargoti)</td>
<td>$N_1$</td>
<td>$N_3$</td>
</tr>
<tr>
<td></td>
<td>Posttest - pretest</td>
<td>Posttest - Pretest</td>
</tr>
<tr>
<td></td>
<td>$G_1$</td>
<td>$G_3$</td>
</tr>
</tbody>
</table>

| Urban area (Kolhapur) | Posttest - Pretest | Gain Score | Gain Score |
|                       | $G_2$              | $G_4$       |

Design 2 (Improvement in task)

<table>
<thead>
<tr>
<th>Area</th>
<th>Experimental Group only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural area (Gargoti)</td>
<td>Before and after training</td>
</tr>
<tr>
<td></td>
<td>Likert type opinionnaire</td>
</tr>
<tr>
<td>Urban area (Kolhapur)</td>
<td>Before and after training</td>
</tr>
<tr>
<td></td>
<td>Likert type opinionnaire</td>
</tr>
</tbody>
</table>

c) Statistical tools

For statistical calculations 'T' test and analysis of variance are used.
II) PLANNING OF THE EXPERIMENT:

Planning of the experiment includes, study of experimental area, the place, duration, teaching material, selection of groups, preparation of tests etc.

As stated earlier, the investigator selected Kolhapur city as an urban area and Gargoti as (taluka or) rural place. The planning was done under following points:

1) General study of experimental area (Kolhapur city)
2) Selection of proper place for conducting classes in Kolhapur.
3) Time of the class in Kolhapur city.
4) General study of experimental area (Gargoti)
5) Selection of the place for classes at Gargoti
6) Time of the class at Gargoti
7) Duration of the course
8) Selection of teaching material and teaching aids
9) Preparation of the test
10) To make the groups homogeneous in nature.

1) General study of experimental area (Kolhapur city)

Kolhapur is the headquarter of the district, having all the facilities. There are different communities and different colonies. The hotels are located throughout the city, however, majority of the hotels are found near S.T. stand and railway station. There were more than 400 hotels and 2442 workers were working in these hotels.
2) **Selection of proper place for conducting the class in Kolhapur**

The investigator observed that near S.T. stand hotels were more in number and workers could join the class easily, therefore, he selected the secondary school near S.T. stand known as Vikaram High School. He made a contact with the Headmaster of the school and obtained permission to conduct the class in one of the classroom.

3) **Time of the class (at Kolhapur)**

After discussion with hotel owners and workers timing of the class was fixed i.e. 8.00 a.m. to 9.00 a.m.

4) **General study of experimental area at Gargoti**

Gargoti is the headquarter of Bhudargad tahsil. There is big educational institute known as Mount Vidyapeeth, being the tahasil headquarter there are different offices. Once in a week, on Wednesday, there is Bazar. During the survey it was observed that there were 34 hotels and more than hundred workers were working in the hotels.

5) **Selection of the place for conducting class at Gargoti**

To conduct the class the researcher had selected the classroom of B.Ed. College where he is working as a Lecturer. This College is near the S.T. stand and located in Bazar line.

6) **Time of the class (at Gargoti)**

The timing of the class for Gargoti hotel workers was not in the morning as in Kolhapur city but it was fixed at 9.00 p.m. to
This was because hotels at Gargoti generally close at about 8.00 p.m. and workers were free from 8.00 p.m. onwards.

7) **Duration of the course**

The investigator had prepared the curriculum and planned in a such a manner that it would be completed within 2 months. Accordingly he had divided the teaching topics and practicals into different units. The details of periods are given in the syllabus.

8) **Selection of teaching material and teaching aids**

The researcher had prepared a guide book based on curriculum which is enclosed in Appendix No. 7. The other teaching material like filmstrips, charts, slides etc. was used.

9) **Preparing the test**

a) **Layout of the test** - The researcher had prepared the question sheet and handed it over to few workers and experts as well as owners too. After discussion with these people some items of the test were modified and some were omitted and thus the final test is prepared. In the layout of the test following points are discussed:

1. Question should be based on specific objectives.
2. Should cover specific content.
3. Should have definite answer.
4. Should be at maturity level of the worker.
5. Should be precisely worded.

b) **Tryout of the test** - After preparing the test as discussed above it was given to few workers for a tryout. The tryout was necessary, to know how good the test is.
c) **Finalisation of the test** - After the tryout the investigator finalised the test. The weightage given to objectives, content and types of questions is shown in three dimensional blueprint chart as shown below:
## Blue-print of the test

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Content</th>
<th>Knowledge</th>
<th>Understanding</th>
<th>Application</th>
<th>Skill</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>E</td>
<td>S</td>
<td>O</td>
<td>E</td>
<td>S</td>
</tr>
<tr>
<td>1.</td>
<td>Hotel information</td>
<td>-</td>
<td>3</td>
<td>8</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(5)</td>
<td>(4)</td>
<td>(1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Types of food</td>
<td>-</td>
<td>1</td>
<td>4</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Health</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2)</td>
<td></td>
<td>(2)</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>General knowledge</td>
<td>-</td>
<td>2</td>
<td>4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2)</td>
<td>(2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>6</td>
<td>20</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The figures in bracket represent marks
The figures outside bracket represent number of questions

- E = Essay type question
- S = Short answer type question
- O = Objective type of question

Questions = 30
Marks = 20
d) **Characteristics of a good test** - A test can be a good test when it possess reliability, validity, objectivity, adequacy, usability etc. was finalised. The present test given in Appendix No. 4 was finalised by applying the said qualities.

1) **Reliability** -

A test score is called reliable when the score is stable and trustworthy. There are four procedures, in common use, to make a test reliable.

a) Test retest method  
b) Alternative or parallel form  
c) Rational equivalence  
d) Split-half technique.

The researcher used 'Test re-test' method and calculated the reliability as given below:

**Test - Retest - method**

Repetition of the test is simplest method to determine reliability. Test is given for a group of hotel workers and repeated after fifteen days on the same group. The score obtained is recorded. An alternate formula was used to find out co-relation r.
TABLE - XXXIX

**TABLE OF TEST-RETEST SCORE**

<table>
<thead>
<tr>
<th>Sub</th>
<th>Test</th>
<th>Retest</th>
<th>$x^2$</th>
<th>$y^2$</th>
<th>xy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>3</td>
<td>9</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>5</td>
<td>16</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>4</td>
<td>16</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>6</td>
<td>25</td>
<td>36</td>
<td>30</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>5</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>6</td>
<td>36</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>5</td>
<td>36</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>9</td>
<td>7</td>
<td>6</td>
<td>49</td>
<td>36</td>
<td>42</td>
</tr>
<tr>
<td>10</td>
<td>7</td>
<td>7</td>
<td>49</td>
<td>49</td>
<td>49</td>
</tr>
<tr>
<td>11</td>
<td>7</td>
<td>8</td>
<td>49</td>
<td>64</td>
<td>56</td>
</tr>
<tr>
<td>12</td>
<td>8</td>
<td>7</td>
<td>64</td>
<td>49</td>
<td>56</td>
</tr>
<tr>
<td>13</td>
<td>9</td>
<td>8</td>
<td>81</td>
<td>64</td>
<td>72</td>
</tr>
<tr>
<td>14</td>
<td>10</td>
<td>11</td>
<td>100</td>
<td>121</td>
<td>110</td>
</tr>
<tr>
<td>15</td>
<td>11</td>
<td>11</td>
<td>121</td>
<td>121</td>
<td></td>
</tr>
</tbody>
</table>

\[
\sum x = 94 \quad \sum y = 95 \quad \sum x^2 = 80 \quad \sum y^2 = 685 \sum xy = 678
\]

\[
N \frac{\sum xy - \sum x \sum y}{\sqrt{\left[N \sum x^2 - (\sum x)^2\right] \left[N \sum y^2 - (\sum y)^2\right]}}
\]

\[
= \frac{15 \cdot 678 - 94 \cdot 95}{\sqrt{\left[15 \cdot 680 - (94)^2\right] \left[15 \cdot (685) - (95)^2\right]}}
\]

\[
= \frac{10170 - 8930}{\sqrt{(10200 - 8836) \cdot (10275 - 9025)}}
\]

\[
= \frac{1240 \cdot \sqrt{1364}}{1250}
\]

\[
= \frac{1240}{\sqrt{1705000}}
\]

\[
= \frac{1240}{1305.7564}
\]

\[
= 0.9496411
\]

Thus coefficient of co-relation was $r = 0.94$ which imply test is reliable.
Since value of co-relation, between test and re-test score is \( r = 0.94 \), the researcher concludes that test is reliable.

ii) Validity of a test

The validity of the test can be defined as the degree to which the test measures what it is intended to measure. There are different types of validities but the researcher considered only content validity. To prepare the test the researcher draw the test content from the course content and proper weightage to objectives, sub-units, type of questions was given. The researcher made careful blue print of the test with questionwise analysis and discussed it with experts and hotel owners.

e) Objectivity

A test is objective when the examiner’s personal judgement does not affect the scoring. Objective judgements are accurate and hence tend to be reliable. The important thing is to make the evaluation tool as objective as possible.

The researcher used more objective type of questions (20 question out of 30). He had omitted essay type of questions, thus, he tried to make the test more objective.

f) Adequacy

A measuring instrument is said to be adequate if it includes all the content. That is, it should be balanced. The careful test maker never assumes that the instrument he has constructed is capable of measuring all knowledge acquired by pupils in a course. But he selects
representative items and construct the test. The researcher, therefore, has selected questions from all the four sections of content which were representative of all sections and which covered expected objectives.

g) **Usability**

Usability or practicability is also an important criteria for assessing the value of a test. Usability of a test depends upon a number of factors such as ease of scoring, ease of administration, satisfactory format and so on.

i) **Ease of administration**: Direction for administering the test should be simple and clear and time of test should be proper.

ii) **Ease of scoring**: One of the most troublesome aspect of a school testing programme has been scoring of the tests. If algebraic manipulations are required to get the scores or the original raw scores are required to be converted into complicated derived scores, a teacher will avoid using such a test.

iii) **Economy**: Economy is certainly not one of the major criteria of a good test but it is a factor that must be considered. Real economy in testing will not be achieved by the indiscriminate use of cheap tests but it is equally true that users will avoid buying costly instrument and test.

The researcher had constructed the test using all above items. Time for test was 50 minutes. It consisted of 20 objective type questions and 10 short answer type questions. The test was prepared after discussion with subject experts. The test is given in Appendix No. 4.
10) **To-make-the-group-homogeneous-in-nature**

To conduct any experiment, the experimental group and control group must be homogeneous in nature. The researcher had collected the information during the survey and with the help of the data he formed two groups equal in following points. The procedure followed to make the groups equal was same for Gargoti and Kolhapur city.

### Groups-at-Gargoti-(Rural-area)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Factors</th>
<th>Experimental group</th>
<th>Control group</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Mean of age</td>
<td>18.7</td>
<td>18.0</td>
<td>Approximately similar</td>
</tr>
<tr>
<td>2.</td>
<td>Mean of Educational standard</td>
<td>VIII Std.</td>
<td>VIII Std.</td>
<td>Similar</td>
</tr>
<tr>
<td>3.</td>
<td>Nature of service</td>
<td>Waiter</td>
<td>Waiter</td>
<td>Similar</td>
</tr>
<tr>
<td>4.</td>
<td>Mean of the pre-test</td>
<td>5.8</td>
<td>5.4</td>
<td>Approximately similar (difference is not significant)</td>
</tr>
</tbody>
</table>

### Groups-at-Kolhapur-(Urban-area)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Factors</th>
<th>Experimental group</th>
<th>Control group</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Mean of age</td>
<td>21.9</td>
<td>22.5</td>
<td>Approximately similar</td>
</tr>
<tr>
<td>2.</td>
<td>Mean of educational standard</td>
<td>IX Std.</td>
<td>IX Std.</td>
<td>Similar</td>
</tr>
<tr>
<td>3.</td>
<td>Nature of service</td>
<td>Waiter</td>
<td>Waiter</td>
<td>Similar</td>
</tr>
<tr>
<td>4.</td>
<td>Mean of pre-test</td>
<td>5.41</td>
<td>6.50</td>
<td>Approximately similar (difference is not significant)</td>
</tr>
</tbody>
</table>
The test was used to see that difference between means of pre-test score was significant or not.

Following table shows that the difference between means of pre-test score was not significant i.e. groups were equal.
### TABLE - No. XXXVII

**TABLE SHOWING M - SD - AND 'T' VALUE OF PRE-TEST SCORE**

<table>
<thead>
<tr>
<th>Area</th>
<th>Control group</th>
<th>Experimental group</th>
<th>D.F.</th>
<th>'T' value calculated</th>
<th>'T' value table value at .05 level</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural area</td>
<td>N₁ = 10</td>
<td>N₃ = 10</td>
<td>18</td>
<td>0.46179</td>
<td>2.10</td>
<td>Not significant</td>
</tr>
<tr>
<td></td>
<td>Mean 5.4</td>
<td>Mean 5.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S.D. = 1.28</td>
<td>S.D. = 2.27</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban area</td>
<td>N₂ = 22</td>
<td>N₄ = 22</td>
<td>42</td>
<td>1.1528</td>
<td>2.02</td>
<td>Not significant</td>
</tr>
<tr>
<td></td>
<td>Mean 6.5</td>
<td>Mean 5.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S.D. = 1.06</td>
<td>S.D. = 2.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
III) **CONDUCTING THE EXPERIMENT:**

a) The researcher had conducted classes for hotel workers of the experimental groups only and not for the control groups. He had carried out the different activities as shown in the curriculum. It was decided in the beginning that knowledgeable persons were to be invited for teaching. Accordingly experts like medical doctors, nutritionist was invited the persons who were interested in hotel industry were also invited.

Generally, lecture method was used, however slides, overhead projector, filmstrips were also used. Some times demonstrations were arranged. After lectures group discussion was followed. During the teaching days, visits were also arranged according to the convenience of the learner.

While conducting the classes investigator kept the following records:

1) day to day attendance,
2) day to day teaching planning,
3) test score etc.

b) Administration of the test - The teaching classes were conducted for about two and half months in Kolhapur as well in Gargoti. In Gargoti the class was conducted for seventy five days and in Kolhapur it was conducted for seventy three days in the year 1988. Before starting the class pre-test was arranged for both the groups control as well as experimental, at both the places and the score was obtained. Then after completing the curriculum, post-test was arranged and the score was recorded accordingly.
While administering the test, the workers were instructed to follow the rules and regulations of the examination which were generally followed in school examinations. The workers were supplied with answer-books and question papers by the researcher himself. For general supervision the researcher took the help from his friends. Time given for answering the test was fifty minutes. All answer-books were collected and examined by the researcher himself. Thus, the pre-test score and post-test scores were recorded for further calculation.

IV) EVALUATION-OF-THE-EXPERIMENT:

The evaluation of the experiment consists of these sections as given below:

1) Testing the hypothesis by 't' tests.
2) Analysis of variance or ANOVA.
3) Testing the achievement score before and after the experiment by Likerts type opinionnaire.

To find out the impact of the training programme the researcher considered two aspects:

1) Improvement in knowledge
2) Improvement in task.

The experimental design, tools and procedure are discussed previously. The researcher wanted to test the first aspect (improvement in knowledge) by 't' test and analysis of variance. The testing procedure consisted of following hypothesis.
Hypothesis-I:
There is a significant difference between gain score in experimental group and control group in rural area, after the training programme, and experimental group acquired more knowledge.

Hypothesis-II:
There is significant difference between gain scores in experimental group and control group in urban area, after the training programme, and experimental group acquired more knowledge.

Hypothesis-III:
There is a significant difference between the experimental group of the urban area and experimental group of rural area and experimental group of urban area, acquired more knowledge.

To test the above hypothesis 't' test is used. The result obtained by the test is given below:

**TABLE-No-XXXVIII**
**TABLE SHOWING M & S.D. VALUE OF GAIN SCORE**

<table>
<thead>
<tr>
<th>Area</th>
<th>Experimental group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural area</td>
<td>N₁ = 10</td>
<td>N₃ = 10</td>
</tr>
<tr>
<td></td>
<td>M₁ = 5.1</td>
<td>M₃ = 1.4</td>
</tr>
<tr>
<td></td>
<td>S.D. = 1.7919573</td>
<td>S.D. = 0.515518</td>
</tr>
<tr>
<td>Urban area</td>
<td>N₂ = 22</td>
<td>N₄ = 22</td>
</tr>
<tr>
<td></td>
<td>M₂ = 10</td>
<td>M₄ = 1.68</td>
</tr>
<tr>
<td></td>
<td>S.D. = 2.954</td>
<td>S.D. = 1.489</td>
</tr>
</tbody>
</table>
Hypothesis-1:

Using the formula \( t = \frac{M_1 - M_3}{\text{SED}} \) where \( \text{SED} = SD \sqrt{\frac{N_1 + N_2}{N_1 N_2}} \)

and \( SD = \sqrt{\frac{\sum (X_1 - M_1)^2 + \sum (X_3 - M_3)^2}{(N-1) + (N_3-1)}} \)

where \( N_1, N_2 \) = No. of students. 
\( M_1, M_3 \) = Means of two groups. 
\( X_1, X_3 \) = Individual raw score in two group and substituting the values.

\( N_1 = 10, \sum d_1^2 = 28.90, N_2 = 10, \sum d_2^2 = 2.40 \)

in given formula we get

\( t = 6.2740917 \) but table value \( t = 2.10 \) at .05 level and 18 degrees of freedom.

Thus difference is highly significant.
This implies that the experimental group acquired significant knowledge after the treatment.

Hypothesis-II:

Substituting the values
\( N_1 = 22, \sum X_2 = 220, \sum d_2^2 = 192, \sum X_4 = 37, \)
\( \sum d_4^2 = 48.7725, N_4 = 22 \) in 't' formula we get

\( t = 11.524998 \) but table value of \( t = 2.02 \) at .05 level and 18 degree of freedom.

Thus, difference is highly significant.
This implies experimental group acquired significant knowledge after the treatment.
Hypothesis-III:

The investigator wanted to find out the joint effect of rural and urban area in these two experiments. This phenomenon is usually referred as interaction variance. It was observed that at the beginning there is not much difference in the control group and experimental group but after the treatment, there was much difference in their means. There was much difference between experimental groups also. This implies that urban group is more superior to rural group of hotel workers. This can be proved by 't' test.

Substituting the values

\[ M_1 = 5.1 \]
\[ N_1 = 10 \]
\[ X_1 = 51 \]
\[ X_1^2 = 289 \]
\[ X_1^2 = 2601 \]
\[ M_2 = 10 \]
\[ N_2 = 20 \]
\[ X_2 = 220 \]
\[ X_2^2 = 2392 \]
\[ X_2^2 = 48400 \]

\[ t = \frac{M_2 - M_1}{\sqrt{\frac{\sum X_1^2 - (\sum X_1)^2 / N_1}{N_1 - 1} + \frac{\sum X_2^2 - (\sum X_2)^2 / N_2}{N_2 - 1}}} \times \frac{1}{N_1} + \frac{1}{N_2} \]

we get

\[ t = 4.73473 \] but table value of \( t \) = 2.042 at 0.05 level with 30 degrees of freedom.

Thus difference is highly significant.
The researcher concluded that there is large difference between the experimental groups. Urban group of workers acquired more knowledge than rural group of workers. Hence, it can be concluded that the course is more useful to urban hotel workers. This is represented by graph (see graph).

**Results of hypothesis**

The result of hypothesis testing are summarised as under:

1) The experimental group acquired more knowledge than control group in the case of rural hotel workers after training programme.

2) The experimental group acquired more knowledge than control group in case of urban hotel workers after the training programme.

3) The experimental group of urban area acquired more knowledge than experimental group of rural area.

Thus, there is improvement in knowledge due to training programme for hotel workers. There is more improvement in city hotel workers than rural hotel workers.

**Analysis of variance or ANOVA**

A composite procedure for testing simultaneously the difference between several sample means is known as the analysis of variance. It helps us to tell whether any of the differences between means of the given samples are significant or not. The researcher used this effective statistical tool.
### Experimental Details for ANOVA

<table>
<thead>
<tr>
<th>Area</th>
<th>Experimental Group</th>
<th>Control Group</th>
<th>Rows</th>
<th>( X_1 + X_3 )</th>
<th>Mean</th>
<th>( X_2 + X_4 )</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural area</td>
<td>T₁</td>
<td>T₃</td>
<td>X₁</td>
<td>65</td>
<td></td>
<td>X₂ + X₄</td>
<td>257</td>
</tr>
<tr>
<td>Gargoti</td>
<td>N₁ = 10</td>
<td>N₃ = 10</td>
<td>Mean = 3.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M₁ = 5.1</td>
<td>M₃ = 1.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( \sum X_1 = 51 )</td>
<td>( \sum X_3 = 14 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( \sum X_1^2 = 289 )</td>
<td>( \sum X_3^2 = 22 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S.D. = 1.7919573</td>
<td>S.D. = 0.5157518</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M.D. = 1.7919</td>
<td>M.D. = 0.516</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban area</td>
<td>T₂</td>
<td>T₄</td>
<td>X₂</td>
<td>257</td>
<td></td>
<td>X₃ + X₄</td>
<td>51</td>
</tr>
<tr>
<td>Kolhapur</td>
<td>N₂ = 22</td>
<td>N₄ = 22</td>
<td>Mean = 3.840909</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M₂ = 10</td>
<td>M₄ = 1.68</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( \sum X_2 = 220 )</td>
<td>( \sum X_4 = 37 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( \sum X_2^2 = 2392 )</td>
<td>( \sum X_4^2 = 111 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S.D. = 2.954</td>
<td>S.D. = 1.489</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M.D. = 3.024</td>
<td>M.D. = 1.524</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Column

\[
\sum (X_1 + X_2) = 271 \\
\sum (X_3 + X_4) = 51 \\
\sum (X_1 + X_2)^2 = (271)^2 \\
\sum (X_3 + X_4)^2 = (51)^2 \\
= 2601
\]

\[
\text{Mean } k_1 = 8.46875 \\
\text{Mean } k_2 = 1.59375
\]
ANOVA Calculations:

Step 1 - Correction term \( C = \frac{\sum^{2}}{N} = 1620.0625 \)

Step 2 - \( TSS - C = 1193.9375 \)

Step 3 - \( SS = \frac{(\sum X_1)^2}{N_1} + \frac{(\sum X_2)^2}{N_2} + \frac{(\sum X_3)^2}{N_3} + \frac{(\sum X_4)^2}{N_4} - C \)

Row and column = 921.864773

Step 4 - \( SS_k = \frac{(\sum X_1 + \sum X_2)}{N (31)} + \frac{(\sum X_3 + \sum X_4)^2}{N (32)} - C \)

between column = 756.25005

Step 5 - \( SS_r = \frac{(\sum X_1 + \sum X_2)}{N (20)} + \frac{(\sum X_3 + \sum X_4)^2}{N (44)} - C \)

between rows = 92.301136

Step 6 - \( SS_{rk} = SS_{rk} - SS_r - SS_k \)

Interaction = 73.31362

Step 7 - \( SS_w = SS_t - SS_{rk} \)

With in sets = 272.072727.

**TABLE-XXX-XXXX**

**SUMMARY-TABLE-OF-ANOVA**

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Degrees of freedom</th>
<th>Sum of squares</th>
<th>Mean sum of squares</th>
<th>F value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Column</td>
<td>1</td>
<td>756,25005</td>
<td>756,25005</td>
<td>166,77694</td>
<td>Significant</td>
</tr>
<tr>
<td>Between rows</td>
<td>1</td>
<td>92,3011</td>
<td>92,3016</td>
<td>20,355298</td>
<td>Significant</td>
</tr>
<tr>
<td>Interaction Row x column</td>
<td>1 (R-1)</td>
<td>73,31562</td>
<td>73,31362</td>
<td>16,167961</td>
<td>Significant</td>
</tr>
<tr>
<td>Residue within</td>
<td>60 (N-r-K)</td>
<td>272,07272</td>
<td>4,5345</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total :** 63 1193,9774

1) Mean square = \( \frac{\text{Sum of squares}}{\text{Degree of freedom}} \)

\[
\begin{align*}
&= \frac{272,07272}{60} = 4,5345 \\
&= \frac{73,31562}{4,5345} = 16,167961 \quad F_1
\end{align*}
\]

2) 'F' for interaction = \( \frac{\text{Mean-square}}{\text{Residue}} \)

\[
\begin{align*}
&= \frac{73,31562}{4,5345} = 16,167961 \quad F_1
\end{align*}
\]

3) 'F' for between rows = \( \frac{\text{Mean-squares}}{\text{Residue}} \)

\[
\begin{align*}
&= \frac{92,3011}{4,5345} = 20,355298 \quad F_2
\end{align*}
\]

4) 'F' for between column = \( \frac{756,25005}{4,5345} = 166,77694 \quad F_3\)
### Source of Calculated value of \( f^* \)'

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Calculated value of ( f^* )</th>
<th>Required ( F ) at level 0.05</th>
<th>( F = 0.01 ) at level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Column</td>
<td>( F_1 = 166.167961 )</td>
<td>4</td>
<td>7.12</td>
</tr>
<tr>
<td>Row</td>
<td>( F_2 = 20.355298 )</td>
<td>4</td>
<td>7.12</td>
</tr>
<tr>
<td>Interaction</td>
<td>( F_3 = 16.167961 )</td>
<td>4</td>
<td>7.12</td>
</tr>
</tbody>
</table>

### Result and discussion:

1) **Between-Columns** (Highly significant)

It is seen from the summary table that \( f^* \) value 'Between columns' is highly significant. This means 'Gain scores' of the experimental group was more than control group. This implies that the course was definitely improved the workers' knowledge.

2) **Between-rows** (Highly significant)

It is seen from the summary table that \( F^* \) value 'Between rows' was also highly significant. This means the workers group in Kolhapur (urban area) was superior to workers group in Gargoti (rural area).

3) **Interaction** (Highly significant)

Since the \( F^* \) value was significant in 'Interaction' the researcher concluded that there was definite improvement in the knowledge after conducting the course in both the groups. There was more improvement in city workers. Using 't' test we can find other information about interaction.
Experimental Design 2

Testing before and after the experiment using Likert Type.

Opinionnaire

In this last article of evaluation, the researcher wanted to evaluate the same experiment in a very simple way. This way of evaluation is to test the behaviour of the hotel workers before and after the experiment. This procedure was applied to hotel workers in Gargoti and hotel workers in Kolhapur.

The behaviour of workers was recorded before the course and after the course using Likert type of opinionnaire which consisted of four sections (1) Cleanliness, (2) service, (3) reception, (4) co-operation. Each section consisted of five statements and thus in all 20 sentences. The marks obtained were out of 100 (20 x 5 = 100). The score of individuals were thus calculated and 't' test was used to see the effect of training programme.

Preparation of Likert type of Opinionnaire

To make the opinionnaire good realistic, the researcher discussed with five hotel owners and five evaluation experts and finalised his tool (refer Appendix No. 6). This opinionnaire consisted of 20 sentences and each sentence carried 5 (five) marks and total score is out of 100 marks. The data thus obtained was used for statistical treatment.
# TABLE No-X X X X X X

SCORES-IN-LIKERT-TYPE-OF-OPINIONNAIRE

RURAL-GROUP

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Score $x_1$</th>
<th>$x^2$</th>
<th></th>
<th>Score $x_3$</th>
<th>$x^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>51</td>
<td>1601</td>
<td></td>
<td>83</td>
<td>6889</td>
</tr>
<tr>
<td>2.</td>
<td>55</td>
<td>3025</td>
<td></td>
<td>80</td>
<td>6400</td>
</tr>
<tr>
<td>3.</td>
<td>57</td>
<td>3249</td>
<td></td>
<td>80</td>
<td>6400</td>
</tr>
<tr>
<td>4.</td>
<td>57</td>
<td>3249</td>
<td></td>
<td>82</td>
<td>6724</td>
</tr>
<tr>
<td>5.</td>
<td>54</td>
<td>2916</td>
<td></td>
<td>82</td>
<td>6724</td>
</tr>
<tr>
<td>6.</td>
<td>56</td>
<td>3136</td>
<td></td>
<td>84</td>
<td>7056</td>
</tr>
<tr>
<td>7.</td>
<td>57</td>
<td>3249</td>
<td></td>
<td>82</td>
<td>6724</td>
</tr>
<tr>
<td>8.</td>
<td>52</td>
<td>2704</td>
<td></td>
<td>82</td>
<td>6724</td>
</tr>
<tr>
<td>9.</td>
<td>61</td>
<td>3721</td>
<td></td>
<td>82</td>
<td>6724</td>
</tr>
<tr>
<td>10.</td>
<td>60</td>
<td>3600</td>
<td></td>
<td>86</td>
<td>7396</td>
</tr>
</tbody>
</table>

**Before**

$$\sum x_1 = 560$$
$$\sum x_1^2 = 31450$$
$$m_1 = 56$$
$$S.D. = \sqrt{\frac{31450 - (56^2)}{10}} = 3$$

**After**

$$\sum x_3 = 823$$
$$x_3^2 = 67761$$
$$m_3 = 82.3$$
$$S.D. = \sqrt{\frac{67761 - 67732}{10}} = 3$$
$$S.D. = \sqrt{\frac{28}{10}} = 2.81$$
"T" test for rural group

\[ T = \frac{M_3 - M_1}{\sqrt{\frac{\sum d_2^2 + \sum d_1^2}{(N_3 - 1) + (N_1 - 1)}} \times \frac{1}{N_3} \times \frac{1}{N_1}} \]

\[ = \frac{81.3}{\sqrt{\frac{90 + 28}{9 + 21} \times \frac{1}{10} \times \frac{1}{21}}} \]

\[ t = 34.770565 \]

But table value of \( t = 2.10 \) at 0.05 level and with 18 degrees of freedom.

Since calculated \( t = 34.770565 \) > table value \( t = 2.10 \) difference between mean is highly significant. This implied that there was improvement in workers behaviour after experiment (for hotel workers in Gargoti).
### TABLE No. XXXXXII

**Scores in-likert-type-of-opinionnaire**

**Urban-group**

<table>
<thead>
<tr>
<th>Sr.</th>
<th>(x^2)</th>
<th>(x^2)</th>
<th>(x^4)</th>
<th>(x^4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>55</td>
<td>3025</td>
<td>92</td>
<td>8464</td>
</tr>
<tr>
<td>2.</td>
<td>53</td>
<td>2809</td>
<td>88</td>
<td>7744</td>
</tr>
<tr>
<td>3.</td>
<td>50</td>
<td>2500</td>
<td>91</td>
<td>8281</td>
</tr>
<tr>
<td>4.</td>
<td>56</td>
<td>3136</td>
<td>88</td>
<td>7744</td>
</tr>
<tr>
<td>5.</td>
<td>56</td>
<td>3136</td>
<td>93</td>
<td>8649</td>
</tr>
<tr>
<td>6.</td>
<td>56</td>
<td>3136</td>
<td>89</td>
<td>7921</td>
</tr>
<tr>
<td>7.</td>
<td>54</td>
<td>2916</td>
<td>89</td>
<td>7921</td>
</tr>
<tr>
<td>8.</td>
<td>55</td>
<td>3025</td>
<td>91</td>
<td>8281</td>
</tr>
<tr>
<td>9.</td>
<td>55</td>
<td>3025</td>
<td>88</td>
<td>7744</td>
</tr>
<tr>
<td>10.</td>
<td>55</td>
<td>3025</td>
<td>85</td>
<td>7225</td>
</tr>
<tr>
<td>11.</td>
<td>54</td>
<td>2916</td>
<td>87</td>
<td>7569</td>
</tr>
<tr>
<td>12.</td>
<td>56</td>
<td>3136</td>
<td>88</td>
<td>7744</td>
</tr>
<tr>
<td>13.</td>
<td>55</td>
<td>3025</td>
<td>93</td>
<td>8649</td>
</tr>
<tr>
<td>14.</td>
<td>57</td>
<td>3249</td>
<td>88</td>
<td>7744</td>
</tr>
<tr>
<td>15.</td>
<td>58</td>
<td>3364</td>
<td>89</td>
<td>7921</td>
</tr>
<tr>
<td>16.</td>
<td>55</td>
<td>3025</td>
<td>87</td>
<td>7569</td>
</tr>
<tr>
<td>17.</td>
<td>57</td>
<td>3249</td>
<td>88</td>
<td>7744</td>
</tr>
<tr>
<td>18.</td>
<td>56</td>
<td>3136</td>
<td>87</td>
<td>7569</td>
</tr>
<tr>
<td>19.</td>
<td>56</td>
<td>3136</td>
<td>89</td>
<td>7921</td>
</tr>
<tr>
<td>20.</td>
<td>58</td>
<td>3364</td>
<td>87</td>
<td>7569</td>
</tr>
<tr>
<td>21.</td>
<td>57</td>
<td>3249</td>
<td>88</td>
<td>7744</td>
</tr>
<tr>
<td>22.</td>
<td>55</td>
<td>3025</td>
<td>91</td>
<td>8281</td>
</tr>
</tbody>
</table>
\[ \sum x^2 = 67607 \quad \sum x^2_4 = 174173 \]

\[ M_2 = 55.409091 \quad M_4 = 88.954545 \]

'T' test for urban group

\[ \sum x^2 = 1219 \quad \sum x^2_4 = 1957 \]

\[ \sum x^2_2 = 67607 \quad \sum x^2_4 = 174173 \]

\[ M_1 = 55.409091 \quad M_4 = 88.954545 \]

\[ \text{S.D.} = 2.8780909 \]

Variance

\[ V_A = \sum x_i^2 A - \left( \frac{\sum x_A}{N} \right)^2 / N \text{ variance} \]

\[ V_B = \sum x_i^2 B - \left( \frac{\sum x_B}{N} \right)^2 / N \]

Putting these values in the formula:

\[ t = \frac{M_4 - M_3}{\sqrt{\frac{\sum x^2_4 - (\sum x^2_4 / N)}{N_4 - 1} + \frac{\sum x^2_2 - (\sum x^2_2 / N)}{N_2 - 1} \times \left( \frac{1}{N_4} + \frac{1}{N_2} \right)}} \]

\[ t = 58.483524 \]

But table value of \( t = 2.02 \) at .05 level with 42 degrees of freedom.

This implies that difference is highly significant and training programme of hotel workers changed the behaviour of workers.

**CONCLUDING REMARKS:**

The above statistical treatment shows that there is improvement in behaviour of hotel workers after the training programme.
EVALUATION-EXPERTS-AND-HOTEL-OWNERS-WHO HELPED-TO-PREPARE-TEST-AND-OPINIONNAIRE

Hotel-owners:

1) Shri V.B. Pai (Hotel Sahyadri)
2) Shri M.G. Latakar (Hotel Opel)
3) Shri R.B. Ingale (S.T. Canteen and Hotel Danat)
4) Shri D.M. Chavan (Central Restaurant)
5) Shri S.D. Khot (Hotel Maharaja)

Evaluation-Experts:

1) Dr. K.R. Kulkar,  
College of Education, Sangli
2) Dr. M.G. Mali,  
Principal, A.J.A. Mahavidyalaya, Gargoti
3) Dr. A.N. Joshi,  
Department of Education,  
Shivaji University, Kolhapur
4) Prof. B.S. Odeyar,  
A.J.A. Mahavidyalaya, Gargoti
5) Prof. Alamprabhu Ravikirti,  
Azad College of Education, Satara.