CHAPTER 8
INFERENTIAL ANALYSIS OF DATA

8.0 Chapter Overview
This chapter describes the inferential analysis of data. Inferential statistics try to infer information about a population by formation of conclusions about the differences between populations with regard to any given parameter or relationships between variable. This chapter describes the different statistical tests applied to test the hypothesis statistically.

8.1 Introduction
The purpose of research is the discovery of general principles based upon the observed relationship between variables (Best & Kahn, 2009). To achieve this purpose, statistical analysis is done. In descriptive analysis; data are described with the help of statistical measurements.

Description of data through mere descriptive analysis does not provide conclusive results. It only helps to describe the properties of a specific sample under study. Thus in order to obtain conclusive results, hypotheses formulated is tested in the research. These hypotheses are tested statistically with the help of statistical techniques. Inferential statistical techniques are used to test the hypotheses and on that basis it is decided whether the hypotheses are accepted or rejected. This process of analysis that follows description of data to provide conclusive results is called inferential analysis.

On the basis of these tests, generalization made to a certain sample group is extended to the entire population and this process of extension is known as drawing inferences on the basis of inferential analysis. Thus, an inferential analysis is aimed at testing of hypothesis (Pandya, 2010).

Inferential statistics are used to make judgments about the probability that an observed difference between groups is a dependable one or one that might happen by chance. In this study with inferential statistics, one concludes that extend beyond the immediate data alone. Thus, one uses inferential statistics to make inferences from our data to more general conditions. Perhaps one of the simplest inferential tests is used when one has to compare the average performance of two groups on a single measure to see if
there is a difference. Whenever one wishes to compare the average performance between two groups one should consider the t-test for difference between groups. Most of the major inferential statistics come from a general family of statistical model known as the General Linear Model. This includes the t-test, Analysis of Variance (ANOVA), Analysis of Covariance (ANCOVA), regression analysis and many of the multivariate methods like factor analysis, multi-dimensional scaling, cluster analysis, discriminate function analysis, population parameters from observing the sample values.

8.2 Hypotheses

Hypotheses are educated guesses about possible difference, relationships or causes. Hypotheses are statements of expectation about some characteristics of a population. Etymologically, hypothesis are made up of two words, “hypo” (less than) and “thesis” (less certain than thesis). It is the presumptive statement of a proposition or a reasonable guess, based upon the available evidence, which the researcher seeks to prove through his study.

Koul (2009), defines hypothesis as “a tentative or working proposition suggested as a solution to a problem, and the theory as the final hypothesis which is defensibly supported by all the evidence. The final hypothesis which fits all the evidence becomes the chief conclusion inferred from the study (Koul, 2009).

According to Best and Kahn, a research hypothesis is a formal affirmative statement predicting a single research outcome, a tentative explanation of the relationship between two or more variables (Best & Kahn, 2009).

Simply stated, a hypothesis is an assumption or supposition to be proved or disproved. It is a guiding idea, a tentative explanation or a statement of probabilities which serves to initiate and guide observation, search for relevant data or considerations to predict results or consequences. Hypotheses are measurable and testable. They are of various types based on the manner in which they are tested.
Hypotheses are of two types:

- Directional Hypothesis
- Non-Directional Hypothesis

### 8.2.1 Directional Hypothesis

This hypothesis states a relationship between the variables being studied or a difference between experimental treatments that the researcher expects to emerge. Directional hypothesis can also be tested as a statistical hypothesis. However, a statistical hypothesis can be stated in the directional form only when there is a complete certainty that the findings will show a relationship or difference in the expected direction. This is because the directional hypothesis can be tested using one-tailed test of significance (Pandya, 2010).

### 8.2.2 Non-directional Hypothesis

If a given hypothesis does not indicate the nature of the relationship between two variables (i.e. whether positive or negative) or it does not indicate the nature/direction of differences between two or more groups on a variable (i.e. which group will perform better) then it is known as the non-directional hypothesis.

In the present study, null hypotheses were formulated in order to study the information literacy skills of student teachers and the effect of intervention programs. A null hypothesis is non-directional in nature, as it does not specify the direction of differences between relationships among variables. According to Best and Kahn (2009) the null hypothesis is related to a statistical method of interpreting conclusions about population characteristics that are inferred from the variable relationships observed in the sample (Best & Kahn, 2009). Hypotheses are formed to study the existing conditions. Thus, the null hypothesis is individually tested statistically in order to decide whether it should be accepted or rejected.

### 8.3 Technique used for testing hypothesis

There are two types of statistical techniques which are used for testing of hypothesis. They are parametric and non-parametric techniques.
**Parametric Techniques:** can be applied for the purpose of testing the hypotheses if the following conditions are satisfied. (Pandya, 2010)

  a. When the sample is randomly selected.
  b. When the variances of the various groups are equal or near equal.
  c. When the data are in the form of interval scale or ratio scale.
  d. When the observations are independent.
  e. When the sample size is more than 30.
  f. When the data follow a normal distribution.

**Non-parametric Techniques:**
When the above conditions are not satisfied, the non-parametric techniques have to be used. The non-parametric tests are population free tests, as they are not based on the characteristics of the population. They do not specify normally distributed populations or equal variances.

The techniques which enable us to compare samples and make inferences or tests of significance without having to assume normality in the populations are known as non-parametric techniques.

Some of the non-parametric techniques are the chi square test, the rank difference correlation coefficient, the sign test, the median test and the sum-of-ranks test. The non-parametric techniques don’t have the “power” of parametric tests; that is; they are less able to detect a true difference when such is present. Non parametric tests should not be used, therefore, when other more exact tests are applicable.

In the present study, normality of data was established through descriptive analysis of the data in Chapter 7. The sample size was 386 for the first phase and 111 for the second phase, which is large sample. Data have been collected randomly wherein every individual had to respond independently. Since all the conditions required for parametric tests were satisfied, the following techniques were employed.

  1. t – test
  2. ANOVA
  3. $\omega^2$ estimate
8.4 t-test
A t-test is used to compare the mean scores obtained by two groups on a single variable (Pandya, 2010). The critical ratio test or t-test is used for two sample difference of means. Here it was applied to determine the differences between means of two scores obtained from the one group based on the two variables. It is very useful when the population variance is not known and when the sample size is small.

The formula for estimating the t ratio following ANOVA test is:

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

Where,
- \(M_1\) = Mean of the first sample
- \(M_2\) = Mean of second sample
- \(\sigma_1\) = Standard deviation of first sample
- \(\sigma_2\) = Standard deviation of second sample
- \(N_1\) = Sample size of the first sample
- \(N_2\) = Sample size of the second sample

8.4.1 Interpretation of t-ratio:
If the calculated t is less than the tabulated values of t in table D at 0.05 or 0.01 levels then the null hypothesis is accepted. If the calculated t is greater than the tabulated t at 0.05 or 0.01 levels then the null hypothesis is rejected. In the present study, if the ANOVA value is significant the hypothesis is further subjected to t-test (Garrett, 1985).

8.5 Analysis of Variance: ANOVA
It is used for comparing more than two groups on a single variable. It is a collection of statistical models and their associated procedures, in which the observed variance is partitioned into components due to the explanatory variables (Pandya, 2010).

Analysis of variance or ANOVA is used for testing hypotheses about the difference among three or more means. This technique is used when multiple sample cases are involved. Through this technique the differences among the means of all the
populations can be investigated simultaneously. If a variance within and between the 
groups are computed and compared it is known as one-way analysis of variance. 
For the present study, ANOVA was used to find the difference in the mean between 
three groups, which were arts, science and commerce and difference in the mean 
between two groups of graduate degree and post graduate degree

**For computing ANOVA,**

- First the variance of the scores of all the groups is combined into one known as the 
total group variances (SST).
- The mean value of the variance of each of the group is computed separately, known as 
among mean variance (SSm).
- The differences between the total group variances and the among mean variances is 
calculated as the within group variances (SSW).
- \[ F = \frac{\text{Among mean variance}}{\text{Within group variance}} \]

**Steps for ANOVA:**

1. Correction Factor =CF
2. \[ CF= \frac{\sum X^2}{N} \]
3. Total sum of square (SST) = (\( \sum X \))^2 − CF
4. Total sum of squares among mean variance (SSm) = \( \frac{(\sum x_1)^2}{N_1} \) + \( \frac{(\sum x_2)^2}{N_2} \) + \( \frac{(\sum x_3)^2}{N_3} \) − CF
5. Within groups variance (SSw)= SST − SSm
6. Mean Square Variance (MS)
   - For among mean variance = (SSm) df= (K-1) where K is the number of groups.
   - df
   - For within groups variance = (SSw) df= (N-K) where N is the total sample.
   - Df

**Interpretation of F- ratio:**

The numerical value of F- ratio thus obtained is compared against table F values, with 
the degree of freedom (K-1, N-K). If the obtained F is more than the tabulated value 
of F at 0.05 or 0.01 levels then F is said to be significant at 0.05 or 0.01 levels 
respectively and the null hypotheses are rejected. If the obtained F is less than the
tabulated F then, F is termed not significant and the null hypotheses are accepted. When the ANOVA is significant then each pair of means is subjected to t-test to determine which pair of means differ significantly. The present study had made use of Vassar Stat software available online to calculate ANOVA.

8.6 $\omega^2$ estimate
If the F - ratio in ANOVA is found to be significant the $\omega^2$ estimate is calculated which indicates the percentage of variance in the dependent variable compared on the basis of the independent variable (Guilford & Fruchter, 1981). Its formula is as follows:

$$\omega^2_{est} = \frac{(K-1)(F-1)}{(K-1)(F-1) + N}$$

Where,
F = F-ratio
K= Number of groups
N= Total sample size
and
100$\omega^2$ = Percentage of variance in the dependent variable that is associated with the independent variable

8.7 Testing of Hypothesis:

Phase 1
8.7.1 Testing of hypothesis 1
1. There is no significant difference in the information literacy skills of student teacher from the
   a) Arts faculty
   b) Science faculty
   c) Commerce faculty
The statistical technique used to test this hypothesis is one way classification of ANOVA.
The following table shows ANOVA for information literacy scores of student teachers on the basis of their faculty at graduation.
Table 8.1 ANOVA for Information literacy scores of student teachers on the basis of their Faculty at Graduation

<table>
<thead>
<tr>
<th>Sources of variation</th>
<th>SS</th>
<th>Df</th>
<th>MSS</th>
<th>F-ratio</th>
<th>Table value</th>
<th>L.o.s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.05</td>
<td>0.01</td>
</tr>
<tr>
<td>Among Means</td>
<td>173.0479</td>
<td>2</td>
<td>86.5329</td>
<td>5.15</td>
<td>3.02</td>
<td>4.66</td>
</tr>
<tr>
<td>Within Groups</td>
<td>6434.434</td>
<td>383</td>
<td>16.8001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>6607.4819</td>
<td>385</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tabulated F for df (2,383)

- = 3.02 at 0.05 level
- = 4.66 at 0.01 level

The obtained F = 5.15, is greater than the tabulated F at 0.05 level of significance. Hence the null hypothesis is rejected.

**Conclusion:** There is a significant difference in the information literacy scores of student teachers on the basis of their faculty of study. Since the F ratio is significant, the t-test is done to ascertain which mean scores are significantly different from each other.

The following table shows mean differences in the information literacy scores of student teachers by faculty.
<table>
<thead>
<tr>
<th>No</th>
<th>Groups</th>
<th>N</th>
<th>Df</th>
<th>Mean</th>
<th>S.E.D</th>
<th>Table value</th>
<th>t-ratio</th>
<th>I.o.s</th>
<th>100α2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.05</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Arts</td>
<td>182</td>
<td>287</td>
<td>13.79</td>
<td>0.480</td>
<td>1.97</td>
<td>2.59</td>
<td>1.04</td>
<td>N.S</td>
</tr>
<tr>
<td></td>
<td>Commerce</td>
<td>107</td>
<td></td>
<td>14.29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Arts</td>
<td>182</td>
<td>275</td>
<td>13.79</td>
<td>0.5046</td>
<td>1.97</td>
<td>2.59</td>
<td>3.269</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Science</td>
<td>97</td>
<td></td>
<td>15.44</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.35</td>
</tr>
<tr>
<td>3</td>
<td>Commerce</td>
<td>107</td>
<td>202</td>
<td>14.29</td>
<td>0.557</td>
<td>1.97</td>
<td>2.60</td>
<td>0.897</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>Science</td>
<td>97</td>
<td></td>
<td>13.79</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

It can be seen from the preceding table that the mean information literacy skills of student teachers from the arts and commerce faculties, arts and science faculties and student teachers from commerce and science faculties significantly differ from each other, with student teachers from science faculty being the highest, followed by those from the commerce and arts faculties respectively i.e. student teachers from the science faculty have higher information literacy skills compared to the student teachers from commerce and arts faculty.

**Interpretation of ‘t’**

1. The obtained $t = 1.04$ for differences in information literacy skills in arts and commerce faculties is less than 1.97 at 0.05 level of significance and hence not significant at 0.05 level. The null hypothesis is therefore accepted.

2. The obtained $t = 3.269$ for differences in information literacy skills in arts and science faculties is greater than 2.59 at 0.01 level of significance and it is significant; hence, the null hypothesis is rejected.

3. The obtained $t = 0.897$ for differences in information literacy skills in science and commerce faculties is less than 1.97 at 0.05 level of significance and hence not significant at 0.05 level. The null hypothesis is therefore accepted.
Conclusion

1. There is no significant difference in the information literacy skills of student teachers from arts and commerce faculties.

2. There is a significant difference in the information literacy skills of student teachers from arts and science faculties. The information literacy skills of student teachers from arts and science faculties differ significantly. Information literacy skills of student teachers from science faculty are higher than information literacy skills of student teacher of arts faculty. 3.35% of variance in information literacy skills is associated with the type of facility.

3. There is no significant difference in the information literacy skills of student teachers from the Science and commerce faculties.

Discussion

The difference in the information literacy skills scores of Arts, Science and Commerce could have arisen due to the fact that science students are learning by doing, i.e. they perform practical and gain knowledge by doing experiments themselves. In addition to this they have to do projects and presentation as a part of their syllabus. Similarly they have to keep themselves updated about the current discoveries in their field of study. This helps in enhancement of their information literacy skills. Since the study of the commerce and arts is limited to self whereby they learn by reading literature, philosophy, history, preparing accounts, statistics etc. which limits their interaction with the rest of the world and this has a direct impact on their information literacy skills.

**Figure 8.1 Bar Graph for student teachers Information literacy skills by Faculty**
8.7.2 Testing of hypothesis 2

The null hypothesis states that there is no significant difference in the information literacy skills of student teachers with

a) graduate degree
b) post graduate degree

The statistical technique used to test this hypothesis is one way classification of ANOVA.

The following table shows ANOVA for information literacy skills of student teachers on the basis of their degree.

<table>
<thead>
<tr>
<th>Sources of variation</th>
<th>SS</th>
<th>df</th>
<th>MSS</th>
<th>F-ratio</th>
<th>Table value</th>
<th>I.o.s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Among Means</td>
<td>28.7381</td>
<td>1</td>
<td>28.7381</td>
<td>1.68</td>
<td>3.86</td>
<td>6.70</td>
</tr>
<tr>
<td>Within Groups</td>
<td>6578.7438</td>
<td>384</td>
<td>17.1321</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>6607.4819</td>
<td>385</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tabulated F for df (1,384)

= 3.86 at 0.05 level
= 6.70 at 0.01 level

The obtained F = 1.68, is lesser than the tabulated F at 0.05 AND 0.01 level of significance. Hence the null hypothesis is accepted
**Interpretation of F ratio**

The obtained $F = 1.68$ for differences in information literacy skills in student teachers with graduate and post graduate degree is less than $3.86$ at 0.05 level of significance and hence not significant at 0.05 level. The null hypothesis is therefore accepted.

**Conclusion**: There is no significant difference in the information literacy scores of student teachers on the basis of their degree of study.

**Phase 2**

8.7.3 Testing of hypothesis 3

The null hypothesis states that there is no significant difference in the pre-test scores on information literacy skills of student teachers in control and experimental group.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>N</th>
<th>Df</th>
<th>Mean</th>
<th>SD</th>
<th>Table value</th>
<th>T value</th>
<th>Los</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information</td>
<td>Experimental</td>
<td>65</td>
<td>109</td>
<td>13.661</td>
<td>3.894</td>
<td>1.98</td>
<td>2.63</td>
<td>0.71</td>
</tr>
<tr>
<td>Literacy Skills</td>
<td>Control</td>
<td>46</td>
<td></td>
<td>13.239</td>
<td>2.368</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$df = total N - 2 = 111 - 2 = 109$

From Table D, for $df = 109$  
NS = not significant

Tabulated $t = 1.98$ at 0.05 level  
1.o.s = level of significance  
$= 2.63$ at 0.01 level

**Interpretation of t**:  
The obtained value of ‘t’ for Information literacy skill is $0.71$ which is smaller than the table value $1.98$ at the 0.05 level of significance is and $2.63$ at 0.01 level of significance. The obtained value of $t$ is $0.71$ which is less than both the tabulated value for both levels of significance. Hence the null hypothesis is accepted.
Conclusion

There is no significant difference in the Information literacy skills scores of control and experimental group, i.e. both the groups are on the same level. Thus it can be said that student teachers from both the experimental and control groups are nearly similar in their information literacy skills. Hence it assures that both the groups were similar before administering the pre-tests consisting of information literacy skills as well as implementation of the treatment. i.e. information literacy instruction program.

8.7.4 Testing of hypothesis 4

The null hypothesis states that

There is no significant difference in the post test scores on information literacy skills of student teachers in control and experimental group.

Table 8.5 Relevant statistics of Post-test Information literacy skills scores of Experimental and Control group

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>n</th>
<th>Df</th>
<th>mean</th>
<th>sd</th>
<th>Table value</th>
<th>T value</th>
<th>Los</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.05</td>
<td>.01</td>
<td></td>
</tr>
<tr>
<td>Information Literacy Skills</td>
<td>Experimental</td>
<td>65</td>
<td>109</td>
<td>17.538</td>
<td>3.894</td>
<td>1.98</td>
<td>2.63</td>
<td>5.543</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>46</td>
<td></td>
<td>12.97</td>
<td>4.534</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

df = total N – 2 = 111-2 = 109  
1.os = level of significance

From Table D, for df = 109  
S = Significant

Tabulated t = 1.98 at 0.05 level  
= 2.63 at 0.01 level

From the table it can be seen that for df = 67, the table value at 0.05 level of significance is 1.98 and at 0.01 level of significance is 2.63. The obtained value of t is 5.543 which is more than tabulated values for 0.01 levels of significance. Hence the null hypothesis is rejected.
Conclusion
There is a significant difference in the post-test information literacy skills scores of the control group and the experimental group after exposing them to the Information literacy instruction program.

Figure 8.2 Graphical Representation of the Mean score of Information literacy skills Post-test of Experimental and Control group
8.7.4 Testing of hypothesis 5

The null hypothesis states that

There is no significant effect of the treatment on students’ information literacy skills post-test scores when the differences in the pre-test scores of the two groups have been controlled.

**Conclusion:** There is a significant difference in the post-test information literacy scores when the differences in the pre-test scores have been controlled. The post-test information literacy scores of experimental group is higher as compared to the post-test information literacy scores of the control group when the difference in the pre test have been controlled. Thus it can be said that there was significant effect of the treatment on students’ information literacy scores. Hence the null hypothesis is rejected. In order to estimate the effect and size of treatment Wolf’s formula was applied

8.8 Estimating the magnitude and the effect of the size of treatment

The magnitude and the effect size of treatment have been estimated by using Wolf’s formula

Wolf’s formula for computing the effect size is as given below

**The effect size of the experiment by applying Wolf’s formula:**

\[ d = \frac{M_1 - M_2}{SD \ of \ Group} \]

Where

\( d \) = Magnitude of Effectiveness of experiment

\( M_1 \) = Mean score of the dependent variable of the experimental group

\( M_2 \) = Mean score of the dependent variable of the control group

\( SD \) = standard deviation of the dependent variable of the control group

The following criteria provided by Wolf’s have been used for interpreting the results.

<table>
<thead>
<tr>
<th>Magnitude size</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>Minimum effect</td>
</tr>
<tr>
<td>0.5</td>
<td>moderate effect</td>
</tr>
<tr>
<td>0.8</td>
<td>Maximum effect</td>
</tr>
</tbody>
</table>
If the obtained D is greater than 0.8, it indicated that there have been maximum effect of the treatment of the students.

**Table 8.6 Effect of Information literacy skills Instruction Module (Independent Variable) on Information literacy skills (Dependent Variable)**

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Experimental Gr. Mean</th>
<th>Control Gr. Mean</th>
<th>Control Gr. SD</th>
<th>Effect</th>
<th>Effect Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Literacy skills</td>
<td>17.538</td>
<td>12.97</td>
<td>4.534</td>
<td>1.00</td>
<td>High</td>
</tr>
</tbody>
</table>

**Findings and Conclusions**

The effect size of treatment on information literacy skills program is 1.0, which means there is high effect of treatment on enhancement of information literacy skills of student teachers of the experimental group.

**Interpretation**

The treatment i.e. the information literacy instruction module developed by the researcher for the enhancement of information skills among the student teachers of the experimental group was effective. It means student teachers have gained the knowledge and understanding of the research process and research skills to a large extent.
8.9 Phase 3 Analysis of the Research Project
Phase three of the study involved analysis of the research project to assess the extent of usage of information literacy skills in the preparation of the research project. 65 project reports of the students from the experimental college were analyzed to the extent of usage of information literacy skills. Analyses of the project were done on the basis of the model i.e. A Portfolio Assessment Model developed by NJIT. This model included four independent variables based on the standards given by ACRL. Brief information of the four variables follows:

Citation: According to this model, citing sources so that they could be found was more important than strict adherence to a standard citation style. If all the elements necessary to easily locate a referenced work are present and clear, it would seem to be strong evidence that a student understood the particular attributes of a source, even if the punctuation or capitalization might not conform to standard documentation systems sponsored by MLA or APA. If students were to cite used sources in this fashion, they would achieve competence in ACRL Performance outcomes 2.5, c and D that is competence would be exhibited if students differentiated between types of sources and included all pertinent information in the varying cases so that sources could be retrieved by a reader without undue burden. For example, in the case of a print source, the place of publication of a book is not as important to locate it as the date of publication. Finally, consistently following proper citation style and usage for both text and cited works compiled with ACRL standard 5, because such adherence is evidence that the student acknowledges the intellectual property right issues surrounding the information use in our society.

Evidence of Research: Evidence was sought in a student project that relevant research had been conducted that went beyond the syllabus and sources recommended by the instructor. If the student sought ideas from a variety of additional sources to become truly informed about the topic in hand, it would be good evidence that ACRL Standards 1 and 2 were being met. Additionally, papers with little variety or diversity of sources in scope, subject and format were less likely to have been well researched.

 Appropriateness: Did students choose sources that were not only relevant, but had a high probability of being accurate and authoritative? If so, they were meeting standards 1 and 3. Standard 1 and 3 require that information literate students evaluate information and its sources critically and inerentially, incorporate selected information into both a knowledge base and value system. If students were able to use
outside information as part of the knowledge base on which the essay was developed, these standards are met.

**Integration:** Did students integrate the information found in the argument of the paper or where the citations pasted in to fulfil a source requirement? Evidence of integration would include the use of concepts from outside sources to build a foundation, compare, contrast and refute arguments—this is, to use sources in a fashion that were not merely cosmetic. The use of in text citations relevant to the concepts and arguments made would be taken as further evidence of integrative ability. This variable was also intended to assess the degree to which a student was able not only to summarize the main ideas from sources consulted, but synthesize ideas to construct new concepts. To meet standard 4—use “information effectively to accomplish a specific purpose”—the sources cited would be used reflectively in the paper. For instance, if a student was able to use outside information as part of the knowledge base on which the essay was developed, that student would meet ACRL Performance indicator 4.1

**Analysis of the Report**

Based on the criteria suggested by the Portfolio Assessment model, researcher scrutinize the research projects submitted by students. On the basis of the analysis overall information literacy score was given on the 6 point Likert type scale. Only 10 research projects submitted by the students were found to demonstrate an acceptable level of information literacy skills whereas 55 projects submitted by the students were found to demonstrate below average information literacy skills.

**Interpretation**

Results indicate that only 15.38% of the research projects had made use of the information literacy skills learnt during the information literacy instruction.

**Observations**

While analyzing the research report of the student it was observed that

1. Students with particular guides were following a common format.
2. Arrangement of the bibliography was not alphabetical
3. There was review of related literature and recent reviews were missing.
4. There were not more than ten references in a project.
8.10 Summary
The chapter on inferential analysis discussed the results obtained from the statistical analysis for accepting or rejecting the hypothesis of the study. The next chapter will discuss the data through pre-test post-test analysis.