Chapter 4

Data, It's Analysis and Interpretation

4.1 Introduction

This chapter presents a focused statistical analysis of environmental awareness scores collected from 60 students with special learning needs before and after a structured instructional intervention (Supplementary Table 1). The objective was to test whether there is a statistically significant difference in awareness levels attributable to the intervention using a paired-sample t-test.

Further the present chapter aims to provide a detailed statistical interpretation of the quantitative data collected to evaluate the impact of differentiated instructional strategies on environmental awareness among students with special learning needs (SWSLN). Following the structured administration of a pre-test and post-test using a validated questionnaire, this chapter elaborates on the statistical approach adopted, the findings derived, and their broader educational implications.

4.2 Rationale for Using the Paired-Sample t-test

The **paired-sample t-test** (also called the dependent t-test) is a statistical method used when:

- The same subjects are measured at two time points.

- The aim is to determine whether the mean difference between the two sets of scores is statistically significant.

In this study, each student's awareness level was assessed twice—**before treatment (pre-test)** and **after treatment (post-test)**. Thus, the scores form a pair of related observations for each subject, satisfying the assumptions of the test.

4.3 Method of Data Analysis

The data collected comprised (Supplementary Table 1) environmental awareness scores measured before and after the instructional intervention. Statistical analysis was conducted using **paired-sample t-tests** to assess whether the observed difference in means was statistically significant. This test is appropriate when comparing two related groups, such as the same subjects evaluated at two points in time. The level of significance (α) was fixed at 0.05.

4.3.1 Process of Analysis

1. **Data Cleaning**: Only entries with non-missing values for both pre- and post-test scores were included.
2. **Computation**: The t-test was applied to the differences between paired scores using Python's scipy.stats.ttest_rel function.
3. **Level of Significance**: A significance level of $\alpha = 0.05$ was chosen to test the null hypothesis.
4. **Hypotheses**:

   Null Hypothesis (H_0): There is no significant difference between pre-test and post-test scores of environmental-awareness scores among participating students.

   Alternative Hypothesis (H_1): There is a significant difference between pre-test and post-test scores of environmental-awareness scores among participating students.

Additionally, descriptive statistics (mean, standard deviation) and graphical representations (histogram, bar chart) were used to visually examine trends and distribution of scores.

Interpretation

The results allow us to reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1). The difference between the pre- and post-intervention scores is not due to chance but is a result of the instructional strategies employed.

Thus, it is concluded that the inclusive, multimodal instructional intervention significantly enhanced environmental awareness among students with special learning needs.