Chapter- 3
Research Methodology

3.1 Introduction

Research methodology refers to the systematic framework through which research problems are addressed and hypotheses are tested. In this chapter, the procedural architecture of the present study is described in detail, including the research design, population and sample, development of research tools, data collection procedures, scoring scheme, and the statistical techniques employed for analysis. The methodology is grounded exclusively in the quantitative research paradigm to ensure objectivity, replicability, and statistical rigor.

3.2 Research Design

The present study employed a **pre-experimental one-group pre-test post-test design**, embedded within a **quantitative framework**. This design was selected to assess the effect of differentiated instructional strategies on environmental awareness among students with special learning needs (CWSN), by comparing awareness levels before and after the intervention. No control group was used, and the same cohort participated in both assessment phases.

3.3 Population

The population for the study consisted of students with special learning needs enrolled in inclusive schools and specialised institutions within **Bhopal city**, Madhya Pradesh. These included learners diagnosed with conditions such as total visual impairment, partial hearing loss, autism spectrum disorder, neuromuscular problems, speech and language impairments, and specific learning disabilities.

3.4 Sample

A **purposively selected random sample** of **60 students** was drawn from four institutions (Supplementary Table 1):

- Kendriya Vidyalaya No. 1 (Maida Mill)
- Kendriya Vidyalaya No. 3 (Bagmugalia)
- Kendriya Vidyalaya Bairagarh
- National Association for the Blind (NAB), Bhopal

The age range of the selected students was **14–18 years**, and diagnostic representation ensured inclusion across at least **seven disability categories**, in line with the RPWD Act (2016) and PRASHAST checklist classifications. Efforts were made to ensure gender diversity and diagnostic heterogeneity across the sample.

3.5 Development of Tools

Tools used

Question on Environmental Awareness

- 30 questions: 17 multiple-choice and 13 true / false.
- Topics: climate change, pollution, plants and animals, saving resources.
- Time: 1hr
- Checked beforehand with teachers to make sure questions were age-appropriate and clear.
- A second quiz with similar questions (same level, different wording) served as the post-test.

To quantify changes in environmental awareness, a **structured questionnaire** was developed specifically for this study. The instrument was validated through expert review and pilot-tested on a small sample to ensure reliability and content relevance for CWSN learners.

Structure of the Questionnaire

The questionnaire consisted of **30 items**, organised across three dimensions:

1. **System Knowledge** – Basic ecological concepts (e.g., energy flow, water cycle)
2. **Issue Knowledge** – Environmental threats (e.g., plastic pollution, air quality)
3. **Action Knowledge** – Sustainable behaviours and preventive practices

Item formats included **multiple-choice** and **binary response items (Yes/No)**. Accessibility considerations were addressed by adapting formats for visual, auditory, and cognitive impairments—e.g., Braille formats, pictorial choices, and simplified language where required.

3.6 Procedure of Data Collection

The intervention was administered over a **two-week period**, during which students engaged with environmental content through differentiated instructional modules.

1. **Pre-Test Phase**: Students were administered the environmental awareness questionnaire under supervised conditions. Each student was given **one hour** to complete the instrument.
2. **Instructional Intervention**: A range of **inclusive, multi-sensory strategies** were implemented, including visual aids (charts, infographics, short videos), experiential activities (waste sorting, tree planting), and tactile learning tools for students with sensory impairments.
3. **Post-Test Phase**: Following the intervention, the same questionnaire was re-administered to measure gains in awareness.

Institutional permission was formally obtained from school principals. Instructions and assistance were provided by trained personnel to ensure that all students understood and could access the questionnaire.

3.7 Scoring Scheme

Responses were assigned numerical scores according to a predetermined rubric.

- For multiple-choice items: **1 point for each correct response**
- For true/false items: **1 for affirmative responses aligned with environmental literacy objectives**, 0 otherwise

Total awareness scores were computed for both pre- and post-test datasets, with a **maximum score of 30**. Higher scores indicated greater environmental awareness.

3.8 Statistical Techniques Used

The quantitative data were analysed using **Microsoft Excel and Python.** To evaluate the efficacy of the instructional strategies, a **paired sample t-test** was employed to compare pre- and post-test scores. The level of significance was set at **$\alpha = 0.05$.**

These analyses were used to test the study's null hypothesis (H_0) and alternative hypothesis (H_1):

- **H_0**: There is no statistically significant difference between pre- and post-instruction environmental-awareness scores among participating students.
- **H_1**: There is a statistically significant difference between pre- and post-instruction environmental-awareness scores among participating students.