CHAPTER – 3

RESEARCH METHODOLOGY

3.1 Introduction

The present chapter is devoted to the description of the methodology given in the present study. In this chapter, the discussion will be in detail about the variables, population, sample, tool used for collecting the data, steps for tool construction, the procedure of the data collection, and statistical techniques used for the given study.

3.2 research design

The present study adopts a quasi-experimental research design with a pre-test and post-test comparison. This design is chosen to evaluate the effectiveness of Artificial Intelligence (AI)-integrated instruction in bridging learning gaps between children with and without learning disabilities.

The study involves two groups:

- An experimental group consisting of students with learning disabilities who receive AI-based teaching intervention.
- A comparison group consisting of typically developing peers whose pre-test scores is used as a benchmark.

Academic performance in four areas—reading, writing, speaking and numeracy—is measured using standardized tools both before and after the intervention for the experimental group. The comparison group is assessed only during the pre-test phase to establish the initial performance gap.

This design enables the researcher to determine whether there is a significant improvement in the academic achievement of children with learning disabilities after the AI intervention, and whether the gap between the two groups has been reduced. The quasi-experimental approach is suitable for educational settings where random

assignment is not feasible, but where group comparisons can still yield meaningful insights into intervention effectiveness.

3.3 Research Methods

The present study employs a quantitative research method to examine the effectiveness of Artificial Intelligence (AI) in bridging learning gaps between children with and without learning disabilities. The method involves the collection and analysis of numerical data obtained through standardized tests administered before and after the intervention.

The quasi-experimental method used in this study includes a pre-test and post-test design applied to the experimental group (students with learning disabilities). The scores of a comparison group (typically developing students) are used to evaluate the extent of the learning gap and to measure the relative improvement of the experimental group after the AI intervention.

This method allows for objective measurement of academic performance in four core skill areas: reading, writing, speaking and numeracy. It also provides a framework to statistically analyze the impact of AI-based instruction on learners with disabilities, using tools such as t-tests to determine the significance of observed differences.

By applying a structured and systematic research approach, the study aims to generate reliable and valid conclusions regarding the role of AI in enhancing educational outcomes in inclusive classroom settings.

3.4 Population

The population for the present study consists of students aged 15 years who are enrolled in mainstream schools located in the Kannur district of Kerala. This population includes both students with learning disabilities and their typically developing peers. The study focuses on this age group as it represents a crucial stage in the academic journey where foundational skills in reading, writing, speaking and numeracy are expected to be well established. Selecting students from mainstream schools ensures that the learning environment reflects inclusive educational practices

and allows for a meaningful comparison between students with and without learning disabilities within the same academic context.

3.5 Sample

The sample for the present study consists of 20 students aged 15 years, selected from mainstream schools in the Kannur district of Kerala. The sample was purposefully chosen to include students with and without learning disabilities, allowing for a comparative analysis of academic performance before and after the intervention.

Among the 20 students:

- 10 students identified with learning disabilities formed the experimental group, who received instruction through AI-integrated learning tools.
- 10 typically developing students served as the comparison group, and their pre-test scores were used to measure the initial academic gap.

The selection was guided by the objective of the study—to explore the effectiveness of Artificial Intelligence in reducing learning disparities. All participants were chosen in consultation with school authorities, based on academic records, teacher recommendations, and observed learning difficulties in reading, writing, speaking or numeracy. This focused sampling ensures that the study addresses its aim with relevance and precision.

3.6 Sampling

The present study employed a purposive sampling technique, a form of non-probability sampling that involves selecting participants based on predefined characteristics relevant to the research objectives. This method was chosen to ensure the inclusion of students who specifically fit the criteria of having learning disabilities, as well as their typically developing peers for comparison.

A total of 20 students, aged 15 years and enrolled in mainstream schools in the Kannur district of Kerala, were selected as the sample. Among them:

- 10 students with learning disabilities constituted the experimental group, who received instruction through AI-integrated tools.
- 10 typically developing students formed the comparison group, whose pre-test academic scores served as a reference point for evaluating the performance gap.

The purposive sampling method was deemed appropriate for this study, as it allowed the researcher to target individuals directly relevant to the investigation, thereby ensuring the validity and focus of the study outcomes.

3.7 Tools Used

The following tools were developed and employed in the present study to collect data and measure the effectiveness of Artificial Intelligence (AI) in bridging learning gaps between children with and without learning disabilities:

a) Numeracy Test (Operations and Reasoning)

A teacher-made test was constructed to assess basic mathematical operations—addition, subtraction, multiplication, and divisionand reasoning ability. The test was adapted to suit the learning level of students with disabilities, with simple and age-appropriate word problems. The total marks were 25, and the test duration was 45 minutes.

b) Literacy Assessment

The literacy component was assessed through three skill areas:

- Reading: Simple reading passages were given in Malayalam, English, and Hindi to evaluate fluency and comprehension.
- Writing: Students were asked to write a short paragraph about “The Most Memorable Day of My Life” in all three languages.
- Speaking: Students were asked to introduce themselves in Malayalam, English, and Hindi to assess oral expression and language confidence.

c) Observation Checklist

A structured observation checklist was used to assess behavioral, cognitive, and emotional engagement, as well as overall improvement. It consisted of 15 statements rated on a 5-point Likert scale ranging from 1 (Never) to 5 (Always).

Each tool was carefully aligned with the objectives of the study and designed to provide both quantitative and qualitative insights into the impact of AI-assisted instruction.

3.8 Procedure of Data Collection

The data collection process began with the researcher visiting mainstream schools in Kannur district, Kerala, and obtaining formal permission from the school authorities to conduct the study. Once approval was granted, students aged 15 years were selected using purposive sampling. The final sample consisted of 20 students—10 students identified with learning disabilities (experimental group) and 10 typically developing peers (comparison group). A pre-test was administered to both groups to assess their academic performance in reading, writing, speaking and numeracy using teacher-made tools adapted from the WIAT-III framework. Following the pre-test, the experimental group received instruction through AI-integrated learning tools designed to support foundational skills. This intervention took place over a specific period during regular school hours. During the sessions, the researcher used an observation checklist to record students' behavioral, cognitive, and emotional engagement. After the completion of the intervention, a post-test was administered to the experimental group using the same academic tools to evaluate improvement. This systematic procedure enabled a comprehensive assessment of both academic gains and the effectiveness of AI-assisted instruction.