**CHAPTER THREE**

**METHODOLOGY**

**3.1 Introduction**

The chapter outlines the research methodology that was used in the research. These included the design of the study, population of the study, sample size and sampling techniques, instrument used for data collection, validation of the instrument and reliability, data collection procedures and data analysis.

**3.2 Research Design**

**3.3 Population of the Study**

**3.4 Sample size and Sampling techniques**

**3.5 Instrumentation for data collection**

**3.6 Validation and Reliability of data instrument**

**3.7 Data collection procedure**

**3.8 Data analysis procedure**

**3.2 Research Design**

Kumar (2015) defines a research design as a plan, structure, and strategy of investigation to obtain answers to research questions or problems, while Kothari (2014) defines it as the blueprint for collection, measurement and analysis of data. For this study, a quasi-experimental research design utilizing a pre-test and post-test methodology, as recommended by Kerlinger (2008), was employed. This design encompassed four schools within the Wudil Local Government Area, with two schools allocated as the experimental group and two as the control group. The purpose was to investigate the impact of incorporating laboratory activities into the curriculum.

The research commenced by pre-testing both groups to identify any initial discrepancies. Subsequently, the experimental groups underwent a six-week treatment period involving engaging in practical laboratory activities, while the control groups continued with traditional lecture-based instruction. Following the treatment phase, a post-test using the same instrument was administered to both groups. An additional post-test was conducted two weeks later to further gauge the effects of the treatments. The collected scores from both groups were subjected to analysis.

The quasi-experimental approach, specifically the pre-test and post-test design, was deemed suitable for this study as it facilitated a comparison between the performance of students exposed to laboratory activities (experimental group) and those taught without such activities (control group). Pre-tests and post-tests were instrumental in assessing the impact of the treatments on both groups' performance. The research design is presented as follows:

EG M1 N1 M2 SQ

CG M1 N1 M2 SQ

EG = Experimental group

CG = Control group

N1 = Treatment involving laboratory activities or lecture-based instruction

M1 = Pre-test assessment

M2 = Post-test assessment

SQ = Students Questionnaire

**3.3 Population of the study**

This comprised senior secondary school SS I students in Wudil Local Government Area which consists of four (4) senior secondary schools. Record of the enrollment showed that (374) students in the tagged population which comprises 224 boys and 150 girls a summary of description of the population is presented in the table below

|  |  |  |  |
| --- | --- | --- | --- |
| **S/N** | **NAME OF THE SCHOOL** | **NUMBER**  **OF STUDENT’S** |  |
| 1 | GDSS WUDIL | 72 |  |
| 2 | GSS WUDIL | 70 |  |
| 3 | GTC WUDIL | 50 |  |
| 4 | KUST STAFF SCH. | 55 |  |
| 5 | GGSS WUDIL | 53 |  |
| 6 | GBSS WUDIL | 74 |  |
|  |  | **TOTAL** | **374** |

**3.4 Sample size and Sampling techniques**

A stratified randomly sampling techniques was used to select the sample. Four (4) schools were sampled out of all the senior secondary schools in Wudil Local government of kano state. This method was applied to four schools that were used as sample for this research, the sample of 80 students were used which is in line with central limit theory that recommend minimum of 20 sample as variable for the experimental research (Gaya, 2015). Thus 80 sample was considered appropriate for the research study as viewed out by Sambo (2013).

|  |  |  |  |
| --- | --- | --- | --- |
| *S/N* | *GROUP* | *SCHOOLS* | *STUDENTS* |
| 1 | EXPERIMENTAL | GSS WUDIL | 20 |
| 2 | CONTROL | GTC WUDIL | 20 |
| 3 | EXPERIMENTAL | GDSS WUDIL | 20 |
| 4 | CONTROL | KUST STAFF SCHOOL | 20 |
| TOTAL |  |  | 80 |

**3.5 Instrumentation for data collection**

The data collection process involved two key instruments: the Student Achievement Test (SAT) and a structured questionnaire. These tools were carefully designed and validated to align with the research objectives and effectively gather both quantitative and qualitative data**.**

**3.6 Validity of the instrument**

Validity of the research instrument is the ability of an instrument to measure what it is designed to measure. According to Kumar (2014), the judgement that an instrument is measuring what it is supposed to is primarily based upon the logical link between the questions and the objectives of the study. The researcher used supervisors, departmental lecturers and other science education experts in verifying face and content validity of the SATs and the questionnaires. . The supervisors, departmental lecturers and the science education experts assessed the relevance of the content used in the research instruments and necessary modifications were made based on their feedback. Content validity of research instruments is judged by the researcher and experts in the field (Kumar, 2015). To further establish face and content validity of the research instruments, the researcher carried out a pilot study. The pilot study tested data collection and analysis procedures, clarity of the responses and the research assistants and ensured that the research instruments were not only valid but captured the required data.

**3.7 Reliability of the instrument**

Reliability of a research instrument is the degree of accuracy or precision in the measurements made by the research instrument (Kumar, 2014). Therefore, a measuring instrument is reliable if it provides consistent results (Kothari, 2014). In order to maintain the reliability of the research instruments the following were considered. Standard questionnaires were used with scaling instrument; they were pre- tested to determine their relevance and easy understanding. All returned questionnaires were checked to ensure whether they are all properly filled. The semi-structured interview questions were re-stated in a slightly different form at a later time during the interview sessions so as to evaluate the consistency of the responses as the interview goes on.

**3.8 Data Collection Procedure**

Students questionnaire was given to both experimental and control group. The test instrument which contain 10 multiple choice items with option A-E response option, the subject was allowed for 40 minutes for the test, the subject responses in the test were collected and scored using marking scheme, the result from the test for the two groups (control and experimental) were recorded separately, also the questionnaire contained 9 questions in which 6 question were used for analysis due to the nature of our research questions.

**3.9 Data Analysis Procedure**

Data analysis involves scrutinizing the acquired information and making inferences (Kombo & Tromp, 2016). The data collected in the study were analyzed using mean and standard deviation. The researcher, processed data by carrying out manual editing, coding, classifying and tabulating data obtained from documentation and interview.