REPORT ON TRAINING OF POST-GRADUATE STUDENTS ON RESEARCH METHODOLGY AND DATA MANAGEMENT, TETFUND CENTRE OF EXCELENCE IN FOOD SECURITY, UNIVERSITY OF JOS

Group photograph of Participants for the training

INTRODUCTION

The Research Methodology and Data Management Training for postgraduate students was organized by the TETFund Centre of Excellence in Food Security, University of Jos. The training, which took place from 7th October 2024 to 11th October 2024, aimed to enhance the research capabilities of postgraduate students by providing them with hands-on experience in research methodologies, data management, and analysis tools.

With the growing need for high-quality research in both academia and industry, this training was designed to address gaps in postgraduate students' research skills, particularly in the areas of data collection, analysis, and management. The training focused on practical applications of research design, experimental methods, and statistical tools, with specific sessions dedicated to the use of Excel, SPSS, and other analytical tools.

The objectives of this training included enhancing participants' understanding of qualitative and quantitative research methods, improving data management skills, and fostering critical thinking necessary for effective research. The following sections will detail the training curriculum, participant feedback, key outcomes, and recommendations for future programs.

The resource persons for the training included experienced academicians and experts in the field, such as Prof. Paul S. Amaza, Prof. Zecharias Russom, and Dr. Daniel Lenka, who guided the participants through both theoretical concepts and practical applications. This report provides a detailed account of the training sessions, highlighting key presentations, discussions, and the overall impact on the participants.

Cross-section of participants during the training of Post- Graduate students at TETfund Centre of Excellence in Food Security, University of Jos.

Participant's profile

The training participants included post graduate students currently enrolled in master's and PhD courses. Total number of participants was 50 (males: 23; females: 4) who belonged to different departments.

Table 1: Resource Person's and title of presentation

S/NO	NAME	SESSION TITLE
1	Prof. Paul. S Amaza	Research Methodology
2	Prof. Zecarias Russom	Introduction to Experimental Design
3	Dr. Daniel Lenka	Introduction to Excel Introduction to SPSS

Venue and Date.

The training was organized at the University of Jos ICT center from 7th – 12th October 2024.

DAY ONE

WELCOME ADDRESS BY PROF. PAUL S. AMAZA

The Director of the Center for Excellence, Prof. Paul S. Amaza, delivered the welcome address. He expressed his appreciation for the participants' attendance and emphasized the importance of the training.

Prof. Paul S. Amaza delivering the opening remarks and welcome address to the participants.

He highlighted three primary goals of the program:

1. Hands-on Experience in Data Management Tools and Research Analysis Tools; Prof. Amaza explained that many students often lack practical experience in data analysis. This training was designed to fill that gap by offering hands-on experience.

2. Enhancing Research Skills: He emphasized that the training aimed to strengthen students' research capabilities, enabling them to carry out more effective and impactful research.

3. Improving the Quality of Research Outcomes: Prof. Amaza concluded by stating that the program sought to improve the quality of research output among postgraduate students, which in turn would benefit their academic and professional development.

SESSION ONE: RESEARCH METHODOLOGY

The first presentation of the training was delivered by Prof. Paul S. Amaza on the topic Research Methodology. He began by emphasizing that research methodology is a critical aspect of any study, providing the blueprint for how the study will be conducted.

He explained that postgraduate students are distinguished from undergraduates by the depth and content of their research methodology. It involves a systematic process, and the techniques employed to gather, analyze, and interpret data in a research study, ensuring credibility, reliability, and value. Prof. Amaza highlighted the key components of research methodology as follows:

1. Research Design

This refers to the overall structure or framework for the research, determining how data will be collected and analyzed. He explained the different types of data—qualitative, quantitative, and mixed methods—which guide the research process.

Prof. Paul S. Amaza was delivering his presentation on research methodology.

2. Sampling

Prof. Amaza discussed the process of selecting individuals, groups, or data points for study, known as sampling. He explained various sampling techniques, including:

- ✓ Probability Sampling: Techniques such as random or stratified sampling.

- ✓ Non-probability Sampling: Techniques such as purposive sampling.

- ✓ He also mentioned that the sample size is determined based on the research goals, population size, and the desired accuracy of the study.

3. DataAnalysis

This is the process of interpreting patterns, themes, and meaning in the data. He covered two primary types of data analysis:

   a. Quantitative Analysis: Involves statistical tools such as regression, ANOVA, and t-tests to analyze numerical data and test hypotheses.

   b. Qualitative Analysis: Involves techniques such as content analysis, thematic analysis, and grounded theory to interpret non-numerical data.

4. EthicalConsiderations

Prof. Amaza stressed the importance of obtaining participants' consent and adhering to institutional and professional guidelines to ensure ethical integrity in research.

5. ValidityandReliability

These ensure that the research results are accurate, consistent, and can be replicated.

6. Limitations

He advised researchers to acknowledge the constraints of their studies, such as sample size, scope, or potential biases, which may affect the research outcomes.

Prof. Amaza concluded by introducing the analytical tools that would be covered during the training. He explained that the focus would be on providing hands-on experience with selected tools to build the capacity of postgraduate students. The basic tools for analysis included Excel, SPSS, N-Vivo, and Stata.This ended Prof. Amaza's section of the training.

SESSION TWO

The next session was delivered by Prof. Zecarias Russom, who presented on the topic of Introduction to Experimental Design. He began by explaining the two main types of scientific reasoning:

- **Inductive Reasoning**: This is a bottom-up approach where the researcher starts with specific observations and gradually moves toward generalizations and theories. The process follows the sequence of observation → generalization → theory.

- **Deductive Reasoning**: This is a top-down approach where the researcher starts with a theory, makes predictions, and then conducts experiments to test those predictions. The process follows the sequence of theory → prediction → experiment.

Prof. Russom pointed out that most students are familiar with **deductive reasoning**, but this training would focus on **inductive reasoning**.

He then introduced some commonly used experimental designs:

- **Completely Randomized Design (CRD)**: The simplest experimental design.

- **Randomized Complete Block Design (RCBD)**: The most used design.

- Other designs include **Latin Square Design (LSD)**, **Split-Plot Design (SPD)**, **Strip-Split-Plot Design (SSPD)**, and **Balanced Lattice Design**.

Prof. Zacharia Russom responding to question during his session on Introduction to Experimental Design

Prof. Russom took time to explain key terms related to experimental design in detail. These included:

- **Plot**: The unit where treatments are applied in an experiment.

- **Replication**: Repeating an experiment to increase the reliability of the results.

- **Randomization**: The process of assigning treatments to plots in a random manner to avoid bias.

- **Degree of Freedom**: The number of independent values or quantities which can be assigned to a statistical distribution.

- **Calculated F**: A statistic used in analysis of variance (ANOVA) to determine whether there are significant differences between group means.

He also highlighted the three key Rs in research methodology: Replication, Randomization and Request for Help. Prof. Russom then explained the detailed steps involved in conducting a scientific experiment:

1. Design the experiment

2. Apply the treatments

3. Make necessary measurements and collect data

4. Reduce the data

5. Formulate the null hypothesis

6. Determine the probability level

7. Decide whether to reject the null hypothesis

8. Consider the risk of making an incorrect decision and conclude

To ensure clarity, Prof. Russom used two practical examples to further illustrate these steps and explain the experimental process in detail. This concluded his session.

SESSION THREE

The third presentation was delivered by Dr. Daniel Lenka, who spoke on Introduction to Excel. He began by emphasizing the importance of population distribution and variation in research. He explained that having a sampling frame is essential, and what is being studied in research is referred to as a variable.

Dr. Lenka introduced Excel as a spreadsheet tool consisting of columns and rows, with the primary purpose of storing information in an organized manner and performing tasks quickly. He highlighted Excel's various functionalities, which include data management, data analysis, and data visualization. Dr. Lenka guided participants through the basic elements of the Excel interface, which include: The Ribbon, Workbook, Worksheets, Formula Bar and Status Bar.

Dr. Lenka listening to a student question during his session on introduction to excel and statistics

He then explained the difference between formulas and functions in Excel: A formula is a calculation that users can perform in Excel, starting with an equal sign (=) followed by the mathematical operation or function while a function is a built-in formula in Excel that simplifies common tasks.

Dr. Lenka also discussed cell referencing, explaining the difference between relative and absolute references in Excel. He demonstrated the use of basic arithmetic formulas in Excel, including Addition, Subtraction, Multiplication and Division.

He introduced participants to performing descriptive statistics in Excel, ensuring that the Data Analysis Tool pack is enabled. He also touched on regression analysis and correlation, explaining how Excel provides regression outputs, including values for R-squared, coefficients, and P-values.

Dr. Lenka briefly covered how to add trend lines and create visualizations of data in Excel. He concluded his session by discussing the importance of data cleaning, which involves preparing and organizing data for analysis.

QUESTIONS AND ANSWERS

Following the presentations, there was a Question-and-Answer session, where participants had the opportunity to ask questions on the topics covered throughout the day. The questions addressed various aspects of research methodology, experimental design, and the use of Excel for data management and analysis.

Dr. Ezekiel Oiganji the training officer responding to one of the questions asked during the question and answer session.

The resource persons, including Prof. Paul S. Amaza, Prof. Zecarias Russom, and Dr. Daniel Lenka, provided detailed responses, clarifying key points and offering further insights into the practical applications of the tools and methods discussed during their presentations. The session allowed participants to deepen their understanding and engage with the concepts in a more interactive manner.

SESSION FOUR.

The fourth session of the day was a practical, hands-on session guided by Dr. Daniel Lenka on the Introduction to Excel. Each participant was assigned a computer system to work on, allowing them to directly apply what had been taught during the theoretical class earlier in the day.

Dr. Lenka provided step-by-step guidance, introducing participants to the Excel software interface, which included the Ribbon, Workbook, Worksheets, Formula Bar, and other key elements. Since most of the participants had little to no prior experience with Excel, this session was particularly important for building foundational skills.

Participants practiced basic Excel functions such as data entry, formatting, and the use of arithmetic formulas. They also explored data management and visualization tools, learning how to clean data, input values, and use simple formulas for calculations.

The practical session was instrumental in providing participants with hands-on experience and ensuring that they were comfortable navigating the Excel interface, preparing them for more advanced data analysis tasks in future sessions.

DAY TWO

RECAP.

The second day of the training began with a recap of the work covered on the previous day. Participants were reminded of the key lessons in research methodology, experimental design, and the introductory Excel session. Dr. Daniel Lenka took the opportunity to further emphasize the importance of minimizing errors in research, discussing the significance of precision and accuracy in both data collection and analysis. This set the tone for the day's session, as the participants were prepared for more in-depth learning.

SESSION FIVE

The focus of day two was on more intermediate and advanced aspects of Excel, building on the foundational skills introduced during the first day. The session explored into practical tasks such as printing selections and entire workbooks in Excel, as well as how to import data from external sources into Excel for analysis. Dr. Lenka demonstrated how to add the Data Analysis add-in to Excel, which would enable participants to perform more advanced data analysis functions.

Throughout the session, participants were introduced to the use of basic formulas and functions, enhancing their ability to manipulate and analyze data. Dr. Lenka also explained how to generate random numbers in Excel, a useful feature for experimental design or sampling purposes. In addition to these functions, the session covered how to visualize data using charts. Participants were guided on how to format charts for clearer presentations, ensuring that their data could be effectively communicated. This purely practical session was highly interactive, with participants actively engaging in the exercises. Many of them posed questions during the session, which Dr. Lenka addressed comprehensively, ensuring that everyone followed along and understood each step. The practical approach, combined with the interactive nature of the session, made it a productive and engaging learning experience for all participants.

DAY THREE.

RECAP

Day 3 of the training commenced with a recap of the previous sessions, ensuring that participants were fully aligned with the key concepts and practical skills covered thus far. The review session served to refresh the participants' memory on the foundational topics of research methodology, experimental design, and the

intermediate Excel functions they had practiced. This brief recap helped reinforce the importance of data management, accuracy in research, and the analytical skills they were acquiring.

SESSION SIX

The third day of the training featured an introduction to data analysis using SPSS, conducted by Dr. Daniel Lenka. He began the session by reinforcing the importance of understanding and managing errors in research. Dr. Lenka highlighted two key types of errors—Type 1 (false positives) and Type 2 (false negatives)—and discussed their significance in experimental design and data analysis. He also elaborated on the role of probability levels and confidence levels in ensuring the reliability and validity of research findings.

Cross section of students listening to Dr. Lenka with rapt attention during the recap on day three.

The session then moved to the practical aspects of data entry and importing in SPSS. Dr. Lenka explained that, in SPSS, each row in the dataset represents a case, while each column represents a variable, giving the participants a clearer understanding of how data is structured within the software.

He further elaborated on the different types of analysis that can be conducted in SPSS, including descriptive analysis, which involves summarizing and organizing data; inferential analysis, which helps in making conclusions about a population based on sample data; and advanced analysis, which encompasses more complex statistical tests. Participants were introduced to key statistical methods, including t-tests, ANOVA, chi-square tests, regression analysis, correlation, and post-hoc tests. These techniques were demonstrated using a real dataset, allowing participants to follow along and perform the analyses themselves.

The session was in-depth, providing participants with a strong understanding of how to apply these statistical methods in their own research. The facilitator, Dr. Daniel Lenka, ensured that the session was interactive by addressing all questions raised by participants and providing detailed explanations for each analysis. This hands-on approach allowed participants to gain practical experience with SPSS, making the session both educational and engaging.

The session culminated with a detailed, step-by-step guide on how to analyze data using SPSS. Dr. Lenka's thorough explanations and demonstrations allowed participants to gain practical insights into the software, equipping them with essential tools for their research data management and analysis.

The training officer Dr. Ezekiel Oiganji, thanked the facilitators for making themselves available for the training, and thereafter thanked the students for their

commitment during the training. The training came to an end on the 12ᵗʰ October, 2024 with a closing prayer led by Mr. Igoche at about 3pm.

Group photo showing the facilitators and Post- Graduate students on the first day of the training.