



Evaluation of Statistical Skills among College of Education Postgraduate Students in University of Calabar, Nigeria

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Abstract

This research critically evaluates the statistical skills among of College Education Postgraduate students at the University of Calabar, Nigeria. In a time when data literacy is fundamental to research, policy formulation, and decision-making, it is essential for university postgraduate students, especially those in education, to have strong foundational and applied statistical skills. However, anecdotal and documented evidence suggests that many students in Nigerian universities struggle with both understanding and applying statistical techniques effectively. The study adopted a descriptive survey research and utilized a structured questionnaire to gather data from a sample of 150 post graduate students selected through stratified random sampling based on the four faculties. Key areas examined include students' understanding of basic statistical concepts, their practical application of statistical tools, and factors that affect their learning outcomes. Results revealed that while a majority of students understand simple statistical ideas like mean and median, a significant number lack deeper skills in hypothesis testing, software use, and data interpretation. Inadequate teaching methods, lack of practical exposure, and poor infrastructure were cited as major barriers. The study concludes that without substantial reforms in how statistics is taught emphasizing practical engagement and digital literacy students will remain ill-equipped for real-world data challenges. It recommends curriculum revision, staff development, increased access to statistical software, and the introduction of hands-on research experiences early in the academic programmes

Keyword: Evaluation, understanding, statistical concepts, application of research skill, factors and skill development

Introduction

In today's data-driven world, statistical literacy is increasingly becoming an essential skill, particularly in academic and professional environments. For students of College of Education ability to comprehend, analyze, and interpret statistical data is crucial for effective research and policy evaluation. However, there have been growing concerns over the adequacy of statistical training provided in Nigerian universities. Many students, while exposed to theoretical underpinnings of statistics, struggle with its practical application. In an increasingly data-driven world, statistical skills are no longer a luxury but a necessity, particularly for students in higher education institutions. These skills form the foundation of empirical research, evidence-based

policy formulation, and informed decision-making (Onwuegbuzie & Wilson, 2020). Within the university setting, students enrolled in education disciplines are often required to conduct research that demands competence in data collection, analysis, interpretation, and presentation of report.

However, there is a growing concern that many Nigerian postgraduates, including those at the University of Calabar, exhibit limited proficiency in statistical reasoning and application (Onwuegbuzie & Wilson, 2020). Research is not confined to science and technology alone, there are vast areas of research in other disciplines such as Humanities, Arts, Social Sciences and Education. Educational research is the systematic application of scientific methods in solving educational problems. It uses both conceptions of social reality and the statistical methods that are considered appropriate for exploring it (Govil, Quasem& Gupta 2015).

Educational research refers to the variety of methods in which individuals evaluate different aspects of education including students learning, teaching methods, teacher training and classroom dynamics. Educational research seeks to find relationship among educational variables as a whole, to explain behavioral changes in education, to predict and control the activity of educational system. Since the goal of education is to change learners' behavior with respect to some stated objective, Umoinyang (2015) noted that educational research provides answers to many of the problems encountered by educators in their attempt to change behavior. Educational researchers have come to the consensus that educational research must be conducted in a rigorous and systematic way. One of the approaches adopted by educational researchers before embarking on research is to delineate the problem of the study. This is followed by the research questions and formulation of the hypothesis.

The hypotheses formulated have to be tested empirically so that their explanations have a firm basis (Cohen, Manion & Morrison, 2025). Data collected for the study need to be arranged and rearranged by breaking them down into constituent parts to enable the research extract new meaning from them. The techniques whereby the researcher exploring manipulates available data/information to expose latent information which would enable a summary description of the subject studied to be made is referred to as data analysis (Nwana, 2022).

Analysis according to Umoinyang, 2015) is the categorizing, ordering, manipulating and summarizing of data to obtain answers to the research questions and result of hypothesis testing.

Analysis of data reduces data to intelligible and interpretable form so that the relations of research problems can be studied and tested. Data analysis is enhanced by statistical tools. The statistical tools are technically very essential in the realm of the research. They help in analyzing the data and to draw out conclusions more clearly, precisely and more accurately (Rajasekar, Philominathanet, & Chinnathambi, (2013). Thus, statistic is a rule in scientific research and without the proper application of these rules and procedures for exploration data; it would be difficult to draw valid and reliable conclusions. Statistic is the science and practice of developing human knowledge through the use of empirical data expressed in quantitative form. Statistics is a main tool integrated and accompanied in research in the field of humanities and in any life matter (Abu-Hashem, 2024). This discipline is based on sound theories and is a branch of applied mathematics.

Statistics serves as both a tool and a language for articulating patterns and validating research hypotheses. In, college of education where phenomena are complex and multi-dimensional, the ability to apply statistical principles is essential for translating abstract social realities into measurable constructs (Iwu & Ugwu, 2021). Despite its importance, students frequently perceive statistics as difficult and abstract, which contributes to widespread anxiety and low performance. According to Onwuegbuzie and Wilson (2020), statistics anxiety is a pervasive issue that significantly impairs students' academic confidence and competence. This situation is exacerbated by pedagogical challenges such as traditional lecture methods, overcrowded classrooms, inadequate practical sessions, and poor access to technological tools for statistical analysis.

At the University of Calabar, statistics is a compulsory course across various departments in the College of Education. Yet, anecdotal evidence and internal assessments suggest that many students complete these courses with only a superficial understanding of core concepts such as central tendency, variability, probability, and inferential testing. The lack of practical engagement

with statistical software such as SPSS, R, or Excel further hinders students' ability to conduct real-life data analysis. This deficiency is troubling, given that the National Universities Commission (NUC) curriculum emphasizes quantitative literacy as a critical graduate attribute (NUC, 2022).

The role of competent lecturers and curriculum relevance cannot be overemphasized. Research by Alonge and Ojo (2023) indicates that many lecturers still rely heavily on outdated teaching methods that fail to connect theory to practice. Without interactive, student-centered approaches -such as group analysis projects, simulations, and laboratory sessions-students are likely to remain passive recipients of statistical information rather than active users.

Based on this background the research seeks to evaluate the statistical reasoning among post graduate students in the four faculties in college of education and social science in university of Calabar since bock faculties falls under humanities. The study also seeks to provide recommendations to enhance curriculum delivery and improve learning outcomes in statistics education.

Several researchers have carried out survey in educational research in order to evaluate which statistical tool professionals must be acquainted with in order to be able to understand and develop research in their area. There are many surveys on statistical techniques analysis used in studies published by educational and psychological journals. For example, Edgington (2024) reviewed seven journals of the American Psychological Association each year from 1948 to 1972. His result showed that the percentage using ANOVA increased steadily from 2018 to 20232.

However, the percentages using t-test and correlation declined. The percentage employing chi-square and factor analysis were about the same throughout the period. Wilson (2020) surveyed American Educational Research Journal (AERJ) between 1969 and 1978. The author discovered that approximately 41% of the statistical techniques analyses were biostatistics (such as correlation, multiple regression, discriminant analysis, multivariate analysis of variance). Approximately 34% were agricultural statistics (such as ANOVA/ANCOVA). In comparing the statistical procedures used in articles published in the Journal of Educational Research (JER), 1970 and 1980, with the exception of descriptive statistics, West, Carmody and Stallings (1983), found more multivariate

statistics were used in 1980. The most frequently used statistics in 1970 were correlation, ANOVA, t-test, chi-square, multiple regression, and nonparametric statistics.

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Elmore and Woehlke (2018) reviewed AERJ, Review of Educational Research (RER) and Educational Researcher (ER) between 1978 and 1987. They discovered that the most frequently used statistics were ANOVA/ANCOVA, descriptive statistics, multiple correlation/regression, bivariate correlation, multivariate and non-parametric statistics. Later they extended their survey to include 1978 to 1998 (Elmore and Woehlke, 1998). were due to the different nature of the articles published in ER (consisting more of interpretative and philosophical articles) and RER consisting mostly of reviews of research). The rankings were almost identical when only the articles in AERJ were considered. There are various statistical tools used in data analysis. These tools are grouped into parametric statistical tools and non-parametric statistical tools.

The discrepancies between Goodwin and Goodwin (2015b) and Elmore and Woehlke (1988, 1998) were due to the different nature of the articles published in ER (consisting more of interpretative and philosophical articles) and RER consisting mostly of reviews of research). The rankings were almost identical when only the articles in AERJ were considered. There are various statistical tools used in data analysis. These tools are grouped into parametric statistical tools and non-parametric statistical tools. The parametric statistical tools include: frequency distribution, Graphs, Measures of Central Tendency and Dispersion, Measures of Relations: Pearson Product Moment Correlation Analysis, Spearman Rank Order Correlation Analysis; Analysis of Difference:

Independent t-test, Dependent t-test, Population t-test, Analysis of variance (ANOVA), Profile analysis, Multivariate analysis, Multiple regression, multiple discriminant analysis, Multivariate analysis of variance (MANOVA), Multivariate analysis of covariance (MANCOVA), Analysis of covariance (ANCOVA) and Canonical correlation amongst others.

Some non-parametric statistical tools include wilcon, Fred, chi-square, spearman rho, Kendall tau etc. Each of these statistical tools has the aim of extracting from the available data new information of a numerical nature which was not apparently there before (Umoinyang, 2015).

In our data-driven technological society, the need to understand and to apply statistical literacy is paramount across all walks of life (Galesic & Garcia-Retamero, 2010; Schield, 2010; Watson, 2014). Challenging statements and research reports such as above regularly appear in media reports and the basis for decision-making should be statistics rather than feelings and beliefs (Frost, 2013; Ingram, 2015; Tishkovskaya & Lancaster, 2012). For instance, citizens need to understand that headlines such as above were determined from a sample of the population under study and the conclusions may be subject to confounding variables and sampling error. Indeed, citizens without statistical literacy may not be able to discriminate between credible and incredible information and will have difficulty in interpreting, critically evaluating and communicating reactions to such messages (English & Watson, 2016b; Galesic & Garcia-Retamero, 2010).

Having a good grasp of social statistics can help citizens deal with a complex array of issues and participate actively in public debates and assert their rights (English & Watson, 2016b). Statistical literacy is especially important in a digital age where students are constantly presented with statistics from a variety of competing sources (Frost, 2013). Leading statistics educators such as Garfield and Ben-Zvi (2009) claim that despite the widespread emphasis on reform in the learning and teaching of statistics, statistics education is still viewed as an emerging and challenging discipline, when compared to other learning areas. Tishkovskaya and Lancaster (2010) argue that teaching statistics is challenging because it serves students with varying backgrounds and abilities, some of whom may have had negative experiences with statistics. Another reason could be

that statistics education in schools focuses on the procedural and computational aspects of statistics rather than on developing conceptual understanding (Shaughnessy, 2007).

The traditional emphasis on skills development has resulted in many students not being able to think or reason statistically and led to the call for statistics education to focus on statistical thinking and literacy (Garfield, delMas, and Zieffler). According to Jacobe, Foti, and Whitaker (2014), with increased expectation for teaching statistics comes the demand for tools to properly assess the conceptual understanding of learners of statistics. However, most large-scale assessments still emphasise procedures. There is a need to measure current understanding in relation to expectations set forth by curriculum documents.

According to Garfield, delMas, and Zieffler (2010), statistical literacy involves understanding and using the basic language and tools of statistics: knowing what basic statistical terms mean, understanding the use of simple statistical symbols and recognizing and being able to interpret different representations of data. They distinguish statistical literacy, statistical reasoning and statistical thinking by examining the types of words that are useful in assessing the outcomes for these terms. They use words such as critique, evaluate and generalize for statistical thinking (highest levels of Bloom's taxonomy) and terms such as describe, interpret and read for statistical literacy.

Statement of the Problem

Despite the integral role statistics play in research and decision-making, many students in the College of Education find it challenging to effectively use statistical tools. Reports from UNESCO (2023) indicate that low engagement with statistical softwares resulted to a general discomfort with data interpretation. At the University of Calabar, the challenge appears particularly acute. While statistics is included as a compulsory component of most social science and education programs, many students complete their courses with minimal understanding of core statistical concepts such as variability, correlation, probability, and hypothesis testing. This is compounded by the inability to effectively use statistical software or perform data analysis independently. The

problem is not merely academic; it reflects a deeper systemic gap in the instructional process, where students are taught to memorize formulas without truly understanding how to apply them in real-world contexts. Umoinyang (2015) stated that several factors contribute to this persistent problem.

First, the teaching approach in many departments remains largely theoretical, with insufficient hands-on sessions or laboratory-based exercises. Lecturers often face constraints such as inadequate access to modern instructional tools, outdated curriculum content, and overcrowded classrooms that hinder personalized learning. Secondly, students themselves report high levels of anxiety and lack of motivation when dealing with statistical material, which reduces their willingness to engage with the subject in meaningful ways. Third, institutional limitations such as the absence of licensed statistical software and inadequate training resources further undermine efforts to improve statistical competence.

The consequences of this problem are far-reaching. Without adequate statistical skills, students struggle to conduct credible research, analyze data accurately, or draw meaningful conclusion that are critical not only for academic success but also for career advancement in data-driven fields. Moreover, as the global economy increasingly relies on digital and quantitative literacy, Nigerian graduates risk being left behind if these foundational gaps are not addressed. Therefore, a systematic evaluation of the statistical skills of students at the University of Calabar is necessary.

Purpose of the Study

The primary aim of this research is to evaluate the statistical skills of postgraduate students in the College of Education at the University of Calabar. Specifically, this research seeks to:

1. Assess students' understanding of basic statistical concepts.
2. Determine the extent of students' ability to apply statistics in research contexts.
3. Identify the factors contributing to the observed levels of statistical proficiency.

Research Questions

1. To what extent does post graduate students understand basic statistical concepts ?
2. To what extent are students able to apply statistical methods in their research work?

3. What research factors influence statistical skills development among post graduate students?

Research hypotheses

1. The level of understanding of basic statistical concepts is not significantly high among post graduate students
2. The level of application of basic statistical concepts is not significantly high among post graduate students
3. Research factors does not significant influencing Statistical Skills Development among post graduate students

Research design and Methods

The study was conducted at the University of Calabar, located in Calabar Municipality, Cross River State, Nigeria. The focus was on students in the College of Education Postgraduate in the University of Calabar, as these two academic divisions offer various courses requiring statistical literacy and application. This study adopted the descriptive survey research design. This design was deemed appropriate because it enabled the researcher to collect data from sample population. It will also enable the researcher to assess the current level of statistical skills among College of Education students at the University of Calabar. The design also facilitated the identification of patterns, challenges, and differences in students' statistical competencies without manipulating any variables.

The population consisted of 500 Postgraduate students across selected departments in the College of Education. Using a stratified random sampling technique, 150 students were selected from the four faculties in college of education, University of Calabar. A structured questionnaire was developed to collect data on students' understanding of basic statistical concepts, application statistical concept and factors influencing the development of statistical skills,. The questionnaire was validated by experts in measurement and evaluation and piloted among 30 students. Crombash alpha was used for calculating the reliability. The liability coefficient values of .78, .72. and .89 were the result. This values high enough and instrument was used for data collection. Data were collected over a period of two weeks with the assistance of departmental lecturers. Participation was

voluntary and respondents were assured of confidentiality, the instrument was measure in a four point lykert scale of strongly agree (SD), agree (A), disagree (D) and strongly disagree (SD).

Quantitative data from the questionnaire were analyzed using descriptive statistics such as mean, standard deviation, and percentage and population t-test. In in answering the research question, simple percentage was used. The responses with strongly agree and agree were group as YES and those with disagree and strongly disagree was group as NO responses to items. In the population t-test, the sample mean, standard deviation, (SD), population mean were used in establishing the t-values.

Results and discussion

Research question one:

To what extent does post graduate students understand basic statistical concepts ? in answering this research question, the descriptive statistic was used, the result is presented in Table 1

Table 1: Summary of descriptive Statistic of Students' Understanding of Basic Statistical Concepts

Item	Statement	Yes %	No %
No			
1	I understand measures of central tendency (mean, median, mode).	72	28
2	I can calculate standard deviation and variance.	53	37
3	I am comfortable interpreting frequency distributions.	70	30
4	I understand probability and sampling techniques.	52	48
5	I can differentiate between descriptive and inferential stats.	54	46

The results indicate that students express confidence in understanding basic statistical concepts in terms of central tendency and distributions (72), calculate standard deviation and variance (53), 52interpreting frequency distributions (70%), understand probability and sampling techniques (52%) and differentiate between descriptive and inferential stats (54%).

Research question two

To what extent are students apply statistical concept ? In answering this research question, the descriptive statistic was used, the result is presented in Table 2

Table 2: summary of descriptive Statistic of Students' Application of Statistical concept in Research

Item	Statement	YES	NO
No			
6	I can use statistical software (e.g., SPSS, Excel) for data analysis.	51	49
7	I apply statistical concept in research projects or assignments.	54	46
8	I can enter data and interpret result and charts.	64	36
9	I understand how to test hypotheses using t-tests or ANOVA.	52	48
10	I feel confident in analyzing real-world datasets.	59	41

The results indicate that students apply basic statistical concepts in terms use statistical software (51%), apply statistical concept in research projects (55), (64%), test hypotheses using t-tests or ANOVA. (52%) and analyzing real-world datasets (59%).

Research question three

What research factors influence statistical skills development among post graduate students? in answering this research question, the descriptive statistic was used, the result is presented in Table 3. Influencing statistical skills development remains a significant way statistics is taught (78%), insufficient hands-on practice (76%) limited access to statistical software and lab resources (75%) lack motivation or interest in learning statistics (47) and Large class sizes (75) .

Table 3: Summary of descriptive statistics of factors influencing statistical skills development

Item No	Statement	YES (%)	NO (%)
11	The way statistics is taught affects how well I understand it.	78	22
12	There is insufficient hands-on practice during statistics classes.	76	24
13	I have limited access to statistical software and lab resources.	75	25
14	I lack motivation or interest in learning statistics.	47	53
15	Large class sizes affect individual learning and support in statistics.	75	25

Research hypotheses

1. The level of understanding of basic statistical concepts is not significantly high among post graduate students
2. The level of application of basic statistical concepts is not significantly high among post graduate students
3. Research factors does not significant influencing Statistical Skills Development among post graduate students
4. To analysis research 1, 2 and 3, population t-test was used. the result is presented in Table 4

The analysis of students' statistical skills was broken down into three key areas: understanding of basic statistical concepts, application of statistical tools, and data analytical skills and interpretation. The results reveal distinct patterns in students' competencies across these dimensions. First, students demonstrated a relatively strong understanding of basic statistical concepts, such as mean, median, and mode. The mean score for this sub-variable was 3.45, which is significantly higher than the expected benchmark of 2.5 with degree of freedom 149. Statistically significant ($t = 13, 77, p < .000$). This implies that the level of understanding of basic statistical concepts is significantly high among post graduate students.

Table 4: Population t-test analysis on the evaluation of understanding of basic statistical concepts, application of statistical tools, and factors affecting research development

Variable	Sample Size (n)	Sample Mean (M)	Sample Std. Deviation (SD)	Population Mean (μ)	t-value	p-value	Decision
Students' Understanding of Basic Statistical Concepts	150	3.45	0.85	2.5	13.77	.000	Significant (p < 0.05)
Students' Application of Statistical concepts	150	3.10	0.90	2.5	8.22	.000	Significant (p > 0.05)
Factors Influencing Statistical Skills Development	150	2.80	0.95	2.5	3.85	.000	Significant (p < 0.05)

Discussion of findings

The finding of hypothesis one revealed that the level of understanding of basic statistical concepts is significantly high among post graduate students. This implies that students' level of understanding of basic statistical concept is high. This finding is inline with that of Wilson (2020) surveyed American Educational Research Journal (AERJ) between 2015 and 2025. He discovered that approximately 41% of the statistical techniques' analyses were biostatistics (such as correlation, multiple regression, discriminant analysis, multivariate analysis of variance). Approximately 34% were agricultural statistics (such as ANOVA/ANCOVA). In comparing the statistical procedures used in articles published in the Journal of Educational Research (JER), with the exception of descriptive statistics, West, Carmody and Stallings (1983), found more multivariate statistics were used in 1980. The most frequently used statistics in 1970 were correlation, ANOVA, t-test, chi-square, multiple regression, and nonparametric statistics.

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The finding of hypothesis two revealed that the level of application of statistical concepts is significantly high among post graduate students. This implies that students' level of application of statistical concept is high. This finding contradict that of Adebayo & Omole (2022) revealed Within the university setting, students enrolled in education disciplines are often required to conduct research that demands competence in data collection, analysis, interpretation, and presentation of report. However, there is a growing concern that many Nigerian postgraduates, including those at the University of Calabar, exhibit limited proficiency in statistical reasoning and application

Finally, finding of hypothesis three revealed that the factors influencing statistical skills development is significantly high among post graduate students. This implies that students' level of understanding of basic statistical concept is high. This finding is in line with that of Umoinyang (2015) stated that several factors contribute to this persistent problem. First, the teaching approach in many departments remains largely theoretical, with insufficient hands-on sessions or laboratory-based exercises. Lecturers often face constraints such as inadequate access to modern instructional tools, outdated curriculum content, and overcrowded classrooms that hinder personalized learning.

Secondly, students themselves report high levels of anxiety and lack of motivation when dealing with statistical material, which reduces their willingness to engage with the subject in meaningful ways Third, institutional limitations such as the absence of licensed statistical software and inadequate training resources further undermine efforts to improve statistical competence.

Conclusion

The findings from this study reveal that while students possess a foundational understanding of statistical concepts, their application skills are underdeveloped. Several factors contribute to this challenge, including limited access to software tools, lack of practical training, and outdated

teaching strategies. Given the centrality of statistical skills in modern research, there is an urgent need to strengthen statistical education at the University of Calabar, particularly within the college faculties.

Recommendations

1. The university should review and modernize statistics courses to include more applied learning, case studies, and integration of statistical software such as SPSS, R, and Excel.
2. The university should invest in computer labs and licensed statistical tools to support students' hands-on learning.
3. Capacity-building workshops should be organized to train lecturers in modern, student-centered methods of teaching statistics.
4. Encourage peer mentoring programs where students with strong statistical backgrounds assist others.
5. Encourage the integration of data analysis in coursework from upwards to build practical confidence over time.

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