Original Research Article

Quality And Sustainability Of Engineering Education: The Role Of Teacher - Student Performance Evaluation Review

ABSTRACT

In a explorative study aimed at evaluating performances of students as well as that of the teachers, and to ensure quality and review of these variables within an educational system, an explorative survey was conducted using a department in the faculty of engineering of a university, south east, Nigeria. The unique characteristics of teachers was also compared with average performances of students in final year to identify the possible cause of poor quality and low Final Cumulative Grade Point Average (FCGPA) by students of that department. The summary results for five consecutive academic sessions, was used to determine the performances of students in varied courses taught by their lecturers, at that level whereas the Pearson Correlation Coefficient was used in reviewing these performances with unique features of gender, qualification and years of experience among lecturerss involved in the teaching, research and service delivery of these 500 level courses. The results showed 79.76, 53.37, 61.16, 73.33, 59.13, 72.73, 66.12, 79.60, 83.49, 76.85, 87.50, 71.96, 84.00, 88.91, 75.86, 76.48, 72.41, 80.90, 71.93 percentage performances respectively, in descending order of codes assigned to lecturers and correlation coefficients of 0.28, 0.01 and -0.51 for inherent peculiarities, respectively while p-values of 0.233, 0.956 and 0.025 was equally obtained accordingly. These outcomes would aid the university's management in its administrative function and decisions making regarding students' and teachers' quality at intakes and recruitments, in ensuring the requisite standards for engineering education study, growth, development and sustainability efforts are effectively achieved in line with its project 200 vision.

Keywords: Performance, Evaluation, Quality, Teacher, Student and Correlation.

1. INTRODUCTION

Universities play a vital role in impacting knowledge to the society which in turn leads to a rapid growth and development of its economy. They contribute in ensuring that its best brains in the various professions and the society as a whole, are involved in this developmental effort, the universities render services that are responsible for the enlargement, development and success of an open end democratic civil society that give its students insight and theme, by, passing on knowledge as well as skills of communication which eventually leads to interactions and knowledge transfer. As countries and nations struggle to grow its educational sector as an essential part of this growth is human capital development, Nigeria is indeed not left out of this with varied plans and programs to establish, equip and trainings with the university and faculty of engineering as a case in point. Ever since, academic performance has been applied to grade schools and most importantly, to determine one's career paths amongst students/staff and most likely their successes, it has therefore become a topical issue in public discussion. With the series of poor performance, many students put the blame on lecturers, curriculum, inadequate environment, etc. and so do lecturers blame poor performances too, on students' distracted lifestyle and other factors but there is yet no systematic measure to ascertain the direct causes of poor student performance and factors affecting them, hence the need for this project, based on causality principle, "that cause and effect are related". The very essence of having students in the university is to acquire knowledge, transfer understanding and transform understanding with respect to reasoning and character, however a school of thought believes that these things can be measured by the performance of students in various courses taught by these lecturers in the department. Regardless of certain factors, the use of students' achievement in academic work to assess the teacher's effectiveness has gained ground. The measure of academic performance as a symbol of school success can be traced way back from the Victorian period [1] and according to [2] that "the teacher is increasingly becoming the focus of interest because of the key role that he or she plays in the delivery of quality education to the learner". Based on this and going by these assertive statements, it is therefore expected that good thinking, produces good product. [3] opined that "If the learner has not learned, then the teacher has also not taught well enough. These are useful insights to this research.

Therefore, the need for performance appraisal cannot be over emphasized because performance evaluation process is seen as the teacher's guide in order to improve his/her ability to teach and also to give as well as to be the best of what he/she has to offer. Faculty/departmental staff also need more accurate and valid data for self-improvement in areas of weak points, to enable systemic overall growth and sustainability. As such, when the evaluation is based on facts, staff will have better measures of positive improvement and progression. This therefore presupposes that, the performance evaluation of faculty/departmental system, must equip teachers to improve teaching methods and bring about the desired change and increase productivity by improving the weaknesses identified by the outcome of such research undertaken. This too is applicable to students, who in turn, should make serious effort at improving his/her performance in areas of deficiency and lack with consistent and diligent refocus on studies and class attendance in school. An ongoing project and vision in one of these universities for instance, provides ample opportunity for excellence to its staff in the role of teaching, research and service delivery, and the students alike, to utilize same in attaining exceptional academic heights, while by working harder in such schools.

The university teaching staff's tasks and indeed that of all other staff, are achieved through the development of students to participate actively in the tremendous knowledge management theory and relevant context, and this matrix of tasks for the staff make(s) them more practical in

approach. Professional development for staff requires a system for assessing the effective performance during their careers. There are different types of methods for assessment such as in assessment of institutions or students or in the assessment by peers, but all these methods are aimed at identifying gaps between performances and provide opportunities to overcome these gaps in the colleges of higher education. We must therefore encourage faculty/departmental members to perform evaluation because of its convenient positive results, and improve effective teaching process on a larger scale and which will ultimately lead to increased insight as to those responsible, and for that university to prioritize on them, within the learning environment and to create the necessary atmosphere that encourages better education for both staff students in that productive system.

2. SURVEY OF LITERATURE

The 'good schools' are acclaimed to be those that are able groom the students well enough to achieve the set standards and this is measured by use of students' academic performance at both school level and nationally. The level of students' performance has an impact on the roles played by education stakeholders. Research has shown that school leadership, teacher's quality are top factors that contribute to students' high or low academic performance [4]. Teacher effectiveness has been the interest of policy makers, educators as well as parents and the effectiveness is measured by students' academic performance in both internal and external examination. The general feeling according to research, that students who fail in examinations are taught by ineffective teachers; while those who excel are taught by the very effective teachers, has so far shown that teacher's effectiveness has an influence on the students' academic attainment [5]. Every organization or establishment must have certain goals or objectives which it has set out to achieve and humans not machines are the ones directly involved in the actualization of these set goals. Employee performance therefore is proportional to the growth or downfall of an organization and this has brought about the need to constantly measure their performance to ensure they don't fall short of expectations previously set by such organization or establishment. [6], described performance appraisal as "What is expected to be delivered by an individual or a set of individuals within a timeframe and this expectation could be stated in terms of outcome or inputs, tasks and quality, with specification of conditions under which it is to be delivered". According to [7], performance appraisal includes a communication event planned between a manager and an employee specifically for the purpose of assessing that employee's past job performance and discussing areas for future improvement. While [8], viewed performance appraisal as the formal assessment and rating of individuals by their managers at, usually an annual review meeting of such as organization or workplace establishment. Performance appraisal is also the process in which works, activities, weak points, competence, and incompetence, in short all aspects of the workers are controlled no matter what position they occupy and where they work [9]. Performance appraisal also helps workers in the use of their personal abilities and skills, by enabling them to become aware of having the correct abilities and skills that stimulates them to perform their tasks in line with the organization's mission and in order to raise performance and attainment of general growth and development [10]. [11], further described performance appraisal as the process of obtaining, analyzing and recording information about the relative worth of an employee and in which the focus of the performance appraisal, is to measure and improve the actual performance of the employee and also harness as well as develop, the future potential of the employee. Performance therefore, is an outcome or

result of an individual's actions and that individual's performance becomes a function of his/her ability and motivation [12].

3. METHODS AND MATERIALS

The quantitative research design approach will be adopted in considering the purpose of the study and the size of the target population. Quantitative research approach will include data generation in quantitative form and which will be subjected to strict quantitative analysis in a formal and stiff fashion. Mathematical calculations will also be used in making deductions from observable and complied data to express them in terms of quantity. Quantitative view point analysis and inferential techniques will be deployed, to ascertain effectiveness of teaching service delivery by lecturers in line with the vision and noble objectives of the university as a system known for upholding and entertaining high productivity standards, globally. The primary source data will come from the examination records office of the department, whereas the secondary data will emanate from derivations and deductions from the primary data required in attaining the desired outcome. A department within the faculty of Engineering of a university, South East Nigeria, will form the population for this research study, while the final year students will form the requisite sampling size in view. Non-probability and purposive sampling technique will be used to select lecturers of the department handling 500 level courses, assess them according to students' average performance in taught courses for which they were involved, in its teaching, research and service delivery to the students. Ethical conduct will also be adopted to ensure there are no detrimental effects to the research participants and to reduce the possibility of harm to all characters considered in this research. Codification also adopted for all key participants and courses, was therefore to avoid victimization, bias and consequences of any sort, in the aftermath of any adverse findings in connection with their professional duties. Varied steps were also deployed in analyzing the interplay of cumulative individual lecturers' with unique features of gender, qualification and years of experience with the performances of students across the reviewed sessions and which unveiled interesting outcomes into this research interest or line of thought. And may also be viewed as one of the measures at entrenching quality in our educational system, for evaluative and/or corrective information, necessary improvements, guidance and decision making efforts, upon its adoption.

Correlation analysis is a statistical method used for checking the nature of relationships between two variables or data sets and equally determine how the weighted or impactful that relationship is. It is also used in analyzing quantitative data gathered from research methods to identify whether there are any significant connections, patterns or trends between two variables being considered or understudied. The Pearson's correlation method was used to check the relationship between student performances as response variable with some pre-determined explanatory variables of experience, gender and qualifications respectively which are peculiar to the departmental lecturers.

Pearson's correlation formula is

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}} \quad (1)$$

Source: (McFatter, 2017)

The ratio of the number of students who scored 50 marks and above, over the total number of participating students in each final year course examination, for five academic sessions, was adopted as a measure and basis for obtaining student performance for all courses in the 500 level. Percentage scores of the ratio outcome of students who scored above 50 marks over the student total in course examination, multiplied by 100%, presents the percentage student performances for each 500 level course per academic session, and used accumulatively in this analysis.

$$\%\, performance = \frac{No.of\ students\ who\ scored\ above\ 50\ marks}{Total\ number\ of\ participating\ student\ in\ exam} \times \frac{100}{1} \quad (2)$$

Source: Author's design

4. RESULTS

Table 1: Cumulative Performance of students in taught courses per session.

SESSION/ LECTURER	COURSES LISTINGS ONLY	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	CUMULATIVE AVERAGE PERFORMANCE
001	A531		86.72	79.00	70.98	82.28	79.76
002	B533	46.93	27.91	57.45	64.48	70.08	53.37
003	C534	61.16					61.16
004	D537	74.55	88.90	60.63	55.51	87.10	73.33
005	E538	61.81	67.05	33.61	61.65	71.52	59.13
006	F541	72.73					72.73
007	G543	61.19	74.43	54.70	62.77	77.72	66.12
009	H547	78.57	90.82	72.04	61.86	94.73	79.60
010	I536				91.18	75.81	83.49
011	J539	76.60	77.09				76.85
012	K540					87.50	87.50
013	L542	75.80	68.12				71.96
014	M549					84.00	84.00
015	N550					88.91	88.91
017	F541					75.86	75.86
018	P556					76.48	76.48
019	A531					72.41	72.41
020	I536					80.90	80.90
030	F541	71.93					71.93

The table above summarizes the average performance of lecturers in codes for all 500 level courses taught within the department and even though all courses are merely for listing, for each semester per session for five yearly academic sessions understudied and as a measure of teaching effectiveness, based on students' performance. Other information such as expertise/experience, qualification and gender may as well be used as a measure of comparison for performance,

individually or collectively. Note also that, the coding adopted for lecturers, was to avoid victimization and probable bias.

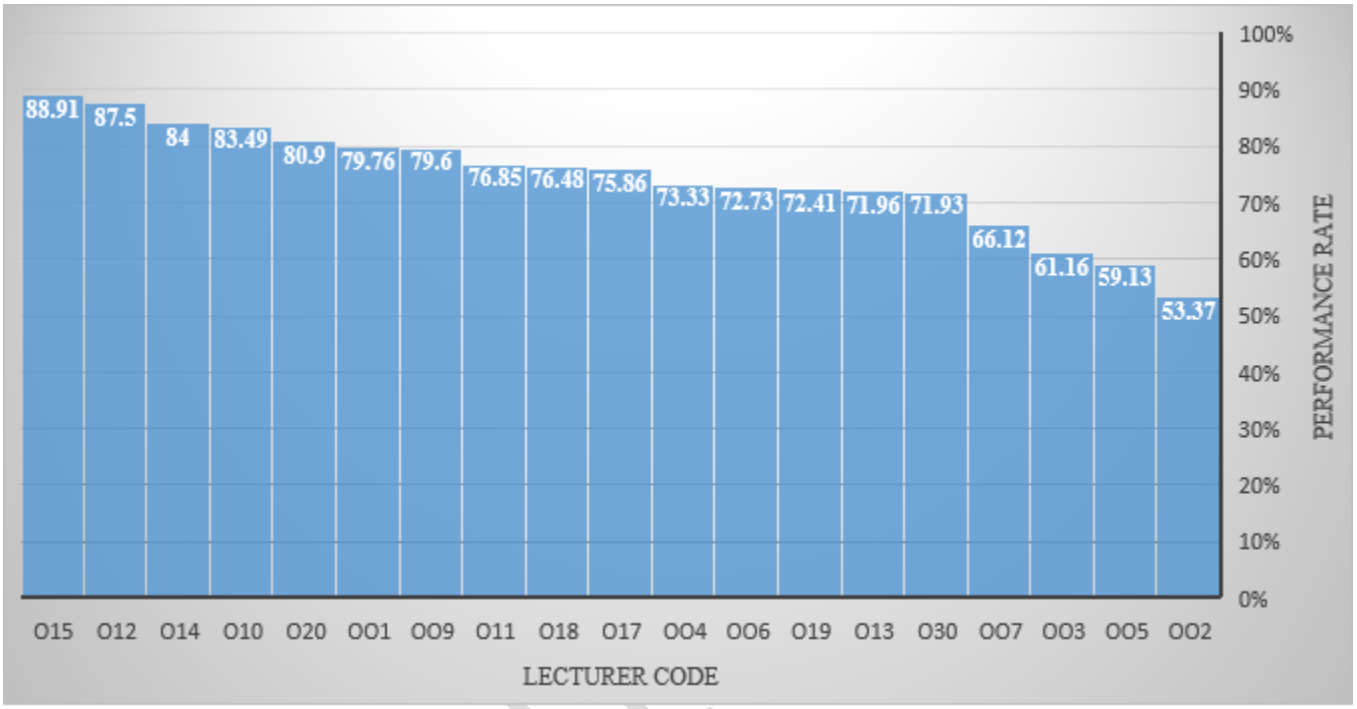

Figure 1: Plot of overall lecturer performance from 2014/15 - 2018/19 sessions

Figure 1 above, is a pictorial presentation, showing the cumulative performance distribution of each lecturer, in taught courses for five consecutive academic sessions being studied. The lecturers were also represented by codes whereas their cumulative performances are premised on students' average percentage performance in taught courses, for 500L students, for five years understudied.

Table 2: Variables for Correlation Analysis.

COURSE	CODE	AVERAGE PERFORMANCE	QUALIFICATION	EXPERIENCE	GENDER
A531	001	79.76	3	15	1
B533	002	53.37	3	14	1
C534	003	61.16	3	13	1
D537	004	73.33	3	12	1
E538	005	59.13	3	11	1
F541	006	72.73	2	10	1
G543	007	66.12	3	9	1

H547	009	79.60	3	8	1
I536	010	83.49	3	9	2
J539	011	76.85	3	7	1
K540	012	87.50	3	6	1
L542	013	71.96	2	4	1
M549	014	84.00	3	5	1
N550	015	88.91	3	3	1
F541	017	75.86	2	3	1
P556	018	76.48	2	2	1
A531	019	72.41	3	3	2
I536	020	80.90	3	2	1
F541	030	71.93	3	15	1

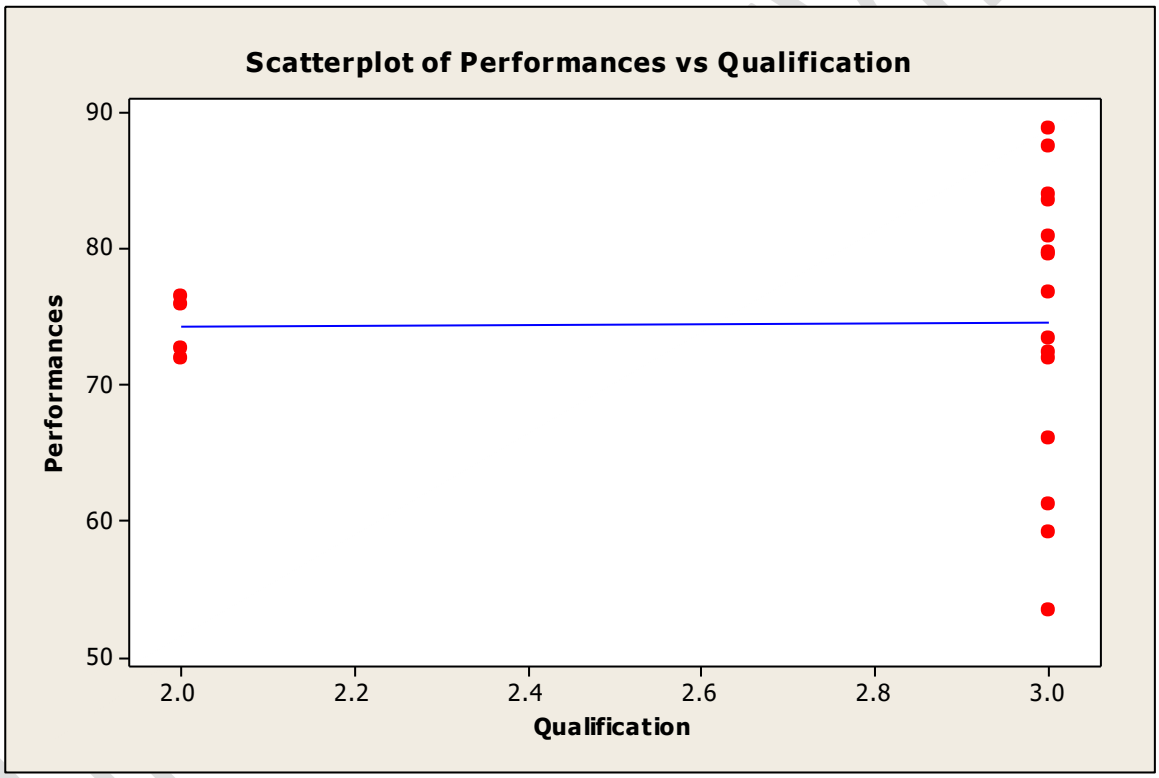

Figure 2: Plot of correlation between performance and qualification

The figure 2 above, shows the Pearson correlation sample plot between performances of students against their lecturers' qualifications, using the Minitab software. The correlation function r, obtained from the plot thereof is 0.014 and a P-value of 0.96.

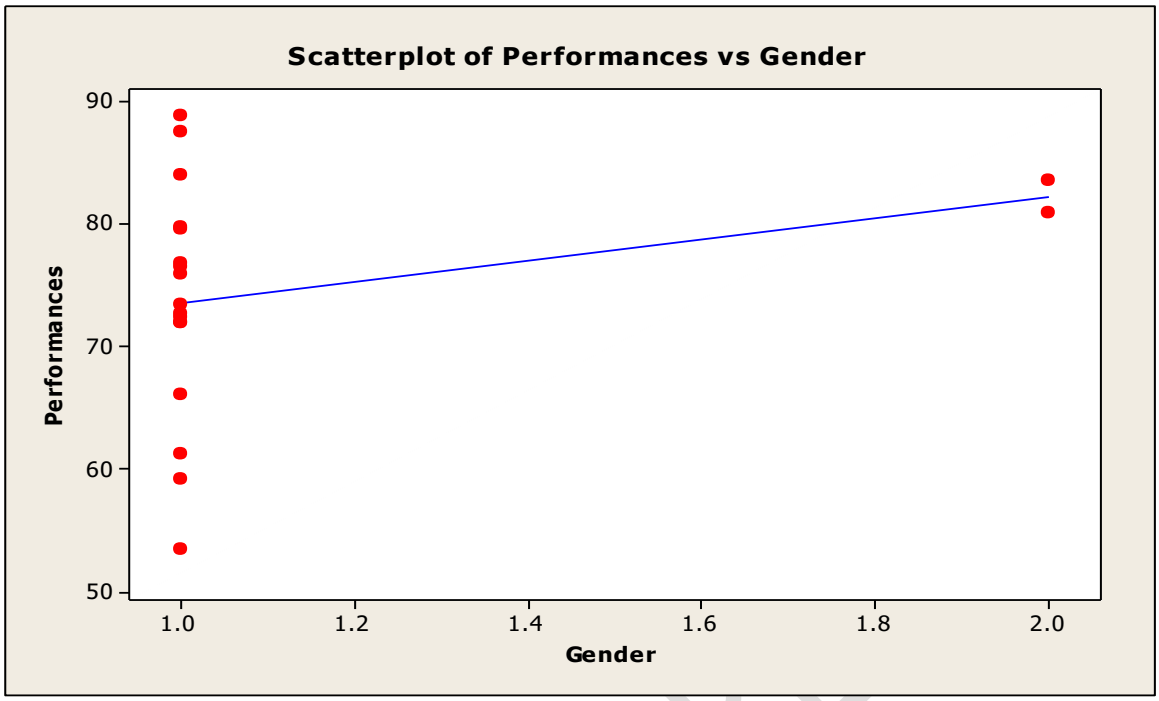

Figure 3: Plot of correlation between performance and gender

The figure 3 above, shows the Pearson correlation sample plot between performances of students against their lecturers' qualifications, using the Minitab software. The correlation function r, obtained from the plot thereof is 0.287 and a P-value of 0.23.

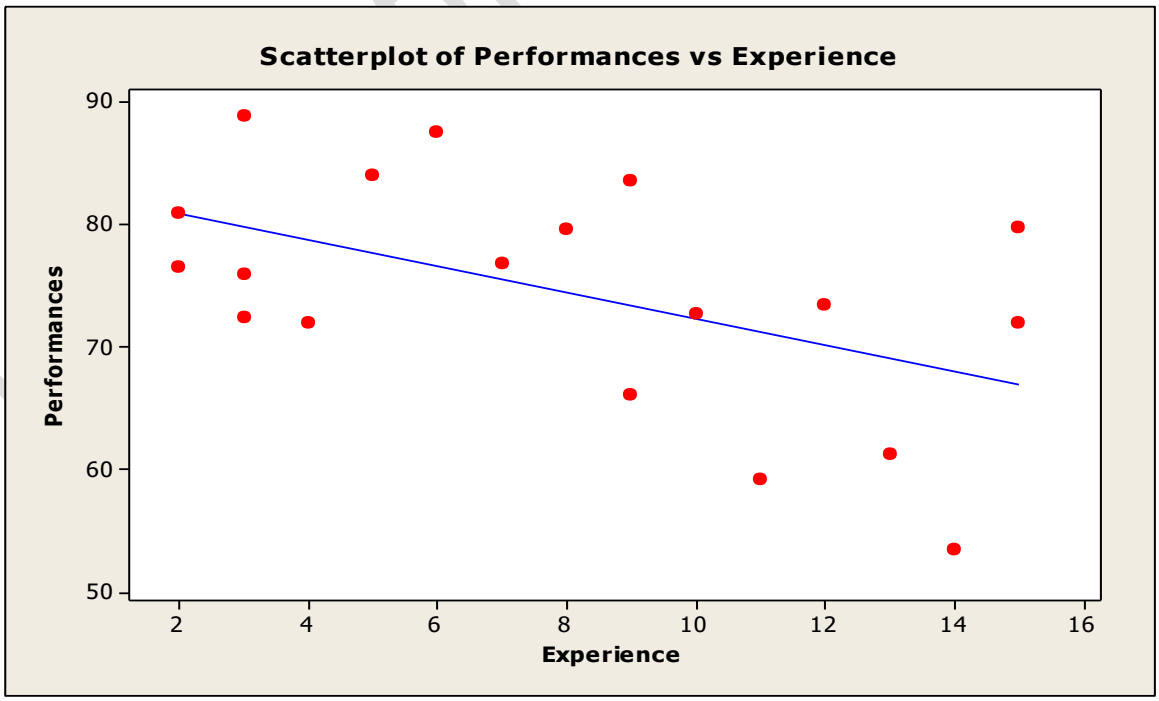

Figure 4: Plot correlation between performance and experiences

The figure 4 above, shows the Pearson correlation sample plot between performances of students against their lecturers' qualifications, using the Minitab software. The correlation function r, obtained from the plot thereof is -0.513 and a *P*-value of 0.02.

4.1 SUMMARY OF CORRELATION ANALYSIS RESULTS

Correlations: Performances, Qualification

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Pearson correlation of Performances and Qualification = 0.014
P-Value = 0.956
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Correlations: Performances, Gender

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Pearson correlation of Performances and Gender = 0.287
P-Value = 0.233
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Correlations: Performances, Experience

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Pearson correlation of Performances and Experience = -0.513
P-Value = 0.025
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5. DISCUSSION OF RESULTS

The scatter plots showed the trend and model development for each interaction and relationship between performance and each of the independently and unique variables of experience, gender and years of experience among lecturers. These tends to raise further questions as to other germane but invisible criteria for which could contribute to student performances, and/or lecturer performances, outside students' results or performances in examinations other than covered here. When performance is correlated and compared with qualification, and a correlation coefficient of 0.01 was obtained, which is an indication that there is no significant relationship between student performance and lecturers' qualification garnered or as a requirement for teaching within the department being understudied. In the same vein, when performance was correlated with gender, the obtained coefficient of correlation of 0.28 posits that there is a weak correlation between student performance and lecturers' gender within the department. This therefore paves way for gender equality in recruitment of teaching staff for the department unlike the apathy and phobia to the study of STEM related courses and subjects by the female gender, on grounds of its difficulty. When the cumulative performance of students was compared with the years of lecturers' experience, the coefficient of correlation of -0.5 was obtained, which shows a strong negative relationship between both variables and an implication that performance decreases as age or years of experience increases, and vice versa. This should therefore, also raise a red flag for the department, with respect to its lecturer progression and performance of taught students as the progress in age and experience within the department. The *p*-values of 0.956 for qualification, 0.233 for gender and 0.025 for experience, respectively showed the levels of significance of the relationships within the variables and therefore the null hypothesis must therefore be rejected for all as they are all less than.

6. CONCLUSION

A correlation analysis has been conducted to unravel the nature of relationships between performance and teacher unique attributes of qualification, experience and gender. The ensuing outcome has shown that there are no tangible as well as strong positive relationship between

performance and variables such as qualification and gender whereas a negative and yet significant correlation coefficient value, obtained for years of experience, ought to be of grave concern to departmental administrators and the university management in its decision making at personnel engagement. The nature of these outcomes also goes on to open new areas for further research, on other performance indicators and measures for the student, other than the use of results from examination scores and records, as there may possibly be other factors that when considered and summed up, could be added to determining and ascertaining the overall performance of not just students but also lecturers, in an academic environment such as is understudied, for quality education propagation, improvement, growth and sustainability, necessary systemic feedbacks.

CONSENT

No consent is required prior to publication of this research work.

ETHICAL APPROVAL

No ethical approval was sought as the basic information of organization personnel, understudied were masked to avoid victimization, bias and negative outcomes.

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