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Comparative Analysis of Academic Performance of Architecture Students in Building Structures and Architectural Designs in Southwestern Public Universities in Nigeria

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ABSTRACT: *Building structures and Architecture designs are major and compulsory courses in the study of Architecture. The knowledge obtained in Building structures is applied in Architectural designs. However, students' performances in Building structures courses have been observed to be generally low and what is not known is if there is low performance in Architectural designs also. This study therefore carried out a comparative analysis of academic performance of Architecture students in Building structures and Architectural designs courses in Southwestern Nigerian public Universities in order to improve on students' performances on these courses. The study was a descriptive survey that involved questionnaire, five public universities approved by the National Universities Commission and Architects Registration Council of Nigeria namely: FUTA, LAUTECH, OAU, UNILAG and OOU were purposively sampled. A total of 702 questionnaires were administered to all the pre-final and final year students in the Department of Architecture of the sampled universities, while only 541 questionnaires were adequately completed and considered fit for analysis. Cross tabulation with chi-square was used to summarize the data. Pearson Product Moment Correlation was employed to show the relationship between Building structure knowledge and Architectural designs performance, while Regression analysis was used to assess the effect of the two courses on students' performances. The study revealed that there was a significant relationship between the knowledge of Building structure and students' performance in Architectural designs as the students progressed in their studies (r=0.641; p=0.046). The study concluded that the depth of knowledge in Building Structures is a function of good performance in Architectural designs, when all other factors leading to good Architectural Designs expertise are kept in place.*

KEYWORDS: Academic, Performance, Structures, Architecture, Universities.

INTRODUCTION

Building or Architectural Structure is a required course, a key course and one of the compulsory courses for students in the study of Architecture (Adetunji, 2014, Opoko, Alagbe, Aderonmu, Ezema, & Oluwatayo, 2014). The contents of this course consist of both theories and designs and it takes at least four years to study. Hence, the understanding of this course is

very important and vital to the success of Architecture students. However, a cursory observation at the performance of Architecture students in Building Structure suggests that there are problems, because the course seems to be the most difficult course for Architecture students who mostly believe that the course is not student friendly (Opoko *et al.* (2014).

Most students are extremely weak in the understanding of the basic principles of Building Structure as well as integrating the same in Architectural designs. They seem not to be applying the knowledge of Building Structure to solve problems arising in their designs which in the past has led to collapse of buildings. The seemingly lack of interest of students in Building Structure mostly in the area of theories (calculations) and application of knowledge is evident in their low performance in courses. The students have no in-depth understanding of the courses and are not ready to face structural challenges in their Architectural designs, believing that it is the duty of professionals. However, what is not knowing is if there is low performance in Architectural designs too as the two courses are interrelated and interwoven.

Architectural designs courses are at the centre of the practice of the professional of Architecture and form the core courses taken by students in schools of Architecture. Thus, the study makes a comparative analysis of the performance of Architecture students in both Building structures and Architectural designs in order to make recommendations towards improving their performances.The study is necessary so that the students of Architecture will have sound knowledge, better understanding of the Building structures and to improve on students performances on the two courses in order to have required knowledge to fulfill employers' demand and to excel in the field of Architecture.

METHOD OF DATA COLLECTION AND ANALYSIS

(1) The study was to investigate the academic performance of the students in Building Structures and Architectural designs courses. To enhance this investigation, the study went ahead to conduct aptitude test for the students; who, by the dictates of the curriculum must have undergone levels of teaching and training in the courses regardless of the universities. The students in each of the sampled universities were tested on the basic theory of Building Structure (definitions and simple calculations). The tested questions were included in the questionnaire to be filled and answered by the students. This allowed full participation of all the students. It was also easier and produced the optimum result of success for the test. The curriculum used for the purpose of setting the questions was a harmonised version of the curricula of all the sampled universities approved by the NUC and ARCON.

In other words, parts of Building structures teachings that were common to all the sampled universities as at the time of data collection and had been taught to the students formed the area of concentration for setting of the questions. This allowed for fairness and equal treatment for the ground of objective assessment of the students in Building Structure across the sampled universities. Comparism of their performances in Building Structure and Architectural designs were carried out to see if there is any correlation between the two courses because it is in designs that the accumulated knowledge of Structures acquired by the

students will be applied. The scores and grades in Architectural designs were collected through questionnaire given to the students to fill.

(2) The study was a descriptive survey that involved the use of questionnaire. It focused on data obtained from Architecture students of all the five public universities (accredited universities by NUC and ARCON) in Southwestern Nigeria where Architecture is offered.

The research approach adopted for this study was quantitative approach.
(3) The population for the study was seven hundred and two (702), that is, one hundred and two (102) students from LAUTECH, eighty nine (89) students from OOU, two hundred and forty five (245) students from FUTA, one hundred and seventeen (117) students from OAU and two hundred and forty five (245) students from UNILAG. .

Table 1: Population of the Study

S/N	Name of University	Duration	Level	Number of students sampled	Total number of students sampled
1	Federal University of Technology, Akure (FUTA)	5yrs	400	125	245
			500	120	
2	Ladoke Akintola University of Technology (LAUTECH), Ogbomoso.	5 yrs	400	47	102
			500	55	
3	Obafemi Awolowo University (O.A.U), Ile Ife.	4yrs	300	62	117
			400	55	
4	University of Lagos (UNILAG), Lagos.	4yrs	300	72	149
			400	77	
5	Olabisi Onabanjo University (O.O.U), Ago - Iwoye.	5yrs	300	45	89
			400	44	
	Total				**702**

Source: Authors Compilation, 2021

The reason for focusing on only public universities was because public universities are similar in their learning environment. The sample comprises of all students who were in 500 level and 400 level (finalists and semi-finalists) in selected universities of Technology and OOU and all 400 level and 300 level students (finalists and semi-finalists) of conventional universities. The research instrument used for this study was the questionnaire. However, all the sampled students (702) were purposively used for the study. The total feedback was five hundred and forty one (541) representing 77.1% which was valid for assessing the situation under study.

Table 2: Questionnaire Distributed and Retrieved

S/N	Name of University	Duration	Level	Questionnaire Distributed	Questionnaire Received	Total Distributed	Total Received
1	Federal University of Technology, Akure (FUTA)	5yrs	400	125	80	245	172
			500	120	92		
2	Ladoke Akintola University of Technology (LAUTECH), Ogbomoso.	5 yrs	400	47	45	102	100
			500	55	55		
3	Obafemi Awolowo University (O.A.U), Ile Ife.	4yrs	300	62	45	117	95
			400	55	50		
4	University of Lagos (UNILAG), Lagos.	4yrs	300	72	52	149	102
			400	77	50		
5	Olabisi Onabanjo University (O.O.U), Ago - Iwoye.	5yrs	300	45	33		
			400	44	39	89	72
	Total					**702**	**541**

Source: Authors Compilation, 2021.

The distribution and collection of the questionnaire followed the adoption of standardised format of research. The distribution was done by the researcher who ensured that all students collected a copy. During the period when students were to give information in written form, the lecturers in charge of teaching Building Structure were excused so as to allow students to answer and write the true situation of Building Structure in terms of teaching and learning of the courses and in order to give them free hand and mind to respond without any influence or bias. It also gave them the opportunity to write what was in their mind freely without any fear of molestation and they were advised not to put anything that would implicate or identify them on the paper such as names and matriculation numbers. Data collected were analysed based on the information obtained from completed questionnaire. The data was analysed using descriptive statistics such as frequency counts, percentages, Likert scale, Chi-square, regression and correlation analyses. In order to compare the two courses effectively, the grades adopted are shown in Table 3 below

Table 3: The Classification of Grades

Performance Classification	Level of Performance	Score Scale
Distinction (A)	70% and above	5
Good (B)	60% - 69%	4
Credit ©	50% - 59%	3
Pass (D)	40% - 49%	2
Failure (F)	Below 39%	1

Source: Authors Compilation, 2021

FINDINGS AND DISCUSSIONS

Performance in Building Structure

For each and every university in the study, the scripts of the aptitude test were graded objectively, using a unified marking scheme. As may be expected, the pass mark begins from 40%. However, students whose scores were within this range were classified as poor students. This is because they were considered to have scored lower than the average or half the maximum point. On the other hand, students scoring above 70% were considered to be outstanding in knowledge and so, had performed very well in the aptitude test.

Table 4: Aptitude Test in Building Structure Courses

Question	Scores (%)	OOU (%)	LAUTECH (%)	UNILAG (%)	FUTA (%)	OAU (%)
1	<40	19 (24.4)	11 (11.2)	18 (19.6)	23 (16.8)	16 (16.3)
	41-50	19 (24.4)	17 (17.3)	27 (29.3)	41 (29.9)	13 (13.3)
	51-60	27 (34.6)	39 (39.8)	32 (34.8)	59 (43.1)	38 (38.8)
	>60	13 (16.7)	31 (31.6)	15 (16.3)	14 (10.2)	29 (29.6)
2	<40	17 (21.8)	08 (8.2)	12 (13.0)	23 (16.8)	07 (7.1)
	41-50	20 (25.6)	17 (17.3)	26 (28.3)	46 (33.6)	09 (9.2)
	51-60	26 (33.3)	39 (39.8)	31 (33.7)	34(24.8)	41 (41.8)
	>60	15 (19.2)	34 (34.7)	23 (25.0)	34 (24.8)	39 (39.8)
3	<40	24 (30.8)	06 (6.1)	11 (12.0)	12 (8.8)	09 (9.2)
	41-50	09 (11.5)	11 (11.2)	19 (20.7)	41 (29.9)	10 (10.2)
	51-60	34 (43.6)	45 (45.9)	39 (42.4)	69 (50.4)	38 (38.8)
	>60	11 (14.1)	36 (36.7)	23 (25.0)	15 (10.9)	39 (39.8)
4	<40	11 (14.1)	06 (6.1)	13 (14.1)	09 (6.7)	10 (10.2)
	41-50	22 (28.2)	07 (7.1)	24 (26.1)	22 (16.1)	09 (9.2)
	51-60	27 (34.6)	39 (39.6)	32 (34.8)	63 (46.0)	33 (33.7)
	>60	18 (23.1)	46 (46.9)	23 (25.0)	38 (27.7)	42 (42.9)
5	<40	14 (17.9)	11 (11.2)	14 (15.2)	13 (9.5)	09 (9.2)
	41-50	19 (24.4)	11 (11.2)	28 (30.4)	41 (29.9)	21 (21.4)
	51-60	32 (41.0)	39(39.8)	29 (31.5)	56 (40.9)	38 (38.8)
	>60	13 (16.7)	37 (37.8)	21 (22.8)	27 (19.7)	33 (33.7)
6	<40	13 (16.7)	11 (11.2)	18 (19.6)	03 (2.2)	12 (12.2)
	41-50	19 (24.4)	17 (17.3)	29 (31.5)	31 (22.6)	11 (11.2)
	51-60	20 (25.6)	38 (38.8)	32 (34.8)	69 (50.4)	38 (38.8)
	>60	26 (33.3)	31 (31.6)	13 (14.1)	34 (24.8)	35 (35.7)
7	<40	12 (15.4)	11 (11.2)	14 (15.2)	13 (9.5)	10 (10.2)
	41-50	18 (23.1)	19 (19.4)	23 (25.0)	41 (29.9)	12 (12.2)
	51-60	26 (33.3)	41 (41.8)	41 (44.6)	57 (41.6)	38 (38.8)
	>60	22 (28.2)	27 (27.6)	14 (15.2)	26 (19.0)	36 (36.7)
8	<40	08 (10.3)	11 (11.2)	18 (19.6)	23 (16.8)	14 (14.3)
	41-50	19 (24.4)	17 (17.3)	29 (31.5)	41 (29.9)	12 (12.2)
	51-60	27 (34.6)	39 (39.8)	32 (34.8)	41 (29.9)	36 (36.7)
	>60	24 (30.8)	31 (31.6)	13 (14.1)	32 (23.4)	34 (34.7)
9	<40	10 (12.8)	11 (11.2)	10 (10.1)	11 (8.0)	11 (11.2)
	41-50	17 (21.8)	15 (15.3)	13 (14.1)	39 (28.5)	18 (18.4)
	51-60	27 (34.6)	38 (38.8)	32 (34.8)	43 (31.4)	29 (29.6)
	>60	27 (34.6)	41 (41.9)	37 (40.2)	44 (32.1)	38 (38.8)

Source: Authors field survey, 2021

The first question of the aptitude test centered on Building Structure as a course and cut across all categories of students in the universities sampled. The distribution of the grades across the schools is presented above. In the aptitude test, there were nine test questions, all of which were graded on percentage basis. In the table, the number of students who scored a category of grade was reported. The proportion of such students relative to the total number of students sampled in the universities was also computed (these are the ones in bracket).

For instance, considering the first question, more students (23) in the absolute sense scored less than 40% in FUTA but the population accounts for only 16.8% of the FUTA population sampled; whereas, fewer students (19) from OOU scored below 40% accounting for a whopping 24.4% of the university's sampled population, and accounting for the university as having the relatively highest number of students scoring the lowest category of marks in question one.

The pattern at which students from the sampled university scored in different questions was disparate. While a university may have the highest number of students scoring the lowest category of mark in a question, the same university may account for the highest number of students scoring the highest category of scores for the same question with the fewest number of students in the average score categories. Some other school may have most of its students scoring above average and only very few at the lower and the upper extremes. The pattern was not fixed. To this end, it may be difficult to rate the schools on this aptitude test except a method reminiscent of Likert scaling is adopted.

Table 5: Scaled Aptitude Test in Building Structure Courses

Question	OOU	LAUTECH	UNILAG	FUTA	OAU
1	243.8	291.6	247.8	246.7	277.7
2	249.7	301	270.7	257.6	310.1
3	241	313	280.6	263.4	305.2
4	266.7	327.3	270.7	287.7	301.3
5	256.5	304.2	261.7	270.8	303.2
6	275.5	288.6	243.4	297.8	293.8
7	274.3	368.1	259.8	270.1	187.7
8	286.1	291.6	243.7	259.9	287.6
9	298.6	325.4	303.5	287.6	292
Total	**2,392.2**	**2,810.8**	**2,381.9**	**2,441.6**	**2,558.6**

Source: Authors field survey, 2021

For interpretative clarity therefore, weights were subjectively but rationally attached to the score categories. For instance, one (1) was attached to scores below 40, two (2) to scores between 40 and 50, three (3) to scores between 51 and 60, four (4) to scores between 61 and 70 and five (5) to scores above 70. These points were used to multiply the proportion of students relative to the total scoring of the corresponding category of marks from each sampled university. These were the weights for each score category. The weights of the five score categories for each university were summed together and thus, the scores for the nine questions were scaled for the universities.

It was observed that, when all the questions were summed in one, the performance of the students was very low in the test. Majority (69.4%) of the students scored below 50 marks out of 100 marks.

Performance in Architectural Designs

The study proceeded to compare the sampled students in the knowledge of Architectural designs. This is because the study assumes that the knowledge gained from Building Structure courses has the propensity to help students' knowledge and expertise in Architectural designs. The inconsistencies in the program duration and the period of Student Industrial Work Experience Scheme (SIWES) among the universities demanded data normalisation. It may be noted that the second semester of four hundred level (400L) is missing for the selected universities of Technology and OOU. Five hundred level scores were also not accounted for in the case of conventional universities where Architecture programme spans only four years as shown below.

Table 6: Students Scores in Architectural Designs

Semester	Score (%)	OOU (%)	LAUTECH (%)	UNILAG (%)	FUTA (%)	OAU (%)
Harmattan,	<40	09 (11.5)	03 (3.1)	09 (9.8)	12 (8.8)	06 (6.1)
200L	41-50	19 (24.4)	09 (9.2)	27 (29.3)	41 (29.9)	13 (13.3)
	51-60	27 (34.6)	17 (17.9)	32 (34.8)	56 (40.9)	38 (38.8)
	61-70	10 (12.8)	39 (39.8)	09 (9.8)	11 (8.0)	10 (10.2)
	>70	13 (16.7)	17 (17.9)	15 (16.3)	17 (12.4)	29 (29.6)
Rain,	<40	11 (14.1)	08 (8.1)	12 (13.0)	19 (13.9)	07 (7.1)
200L	41-50	20 (25.6)	07 (7.1)	21 (22.8)	42 (30.7)	09 (9.2)
	51-60	26 (33.3)	37 (37.8)	25 (27.2)	30 (21.9)	36 (36.7)
	61-70	06 (7.7)	12 (12.2)	12 (13.0)	12 (8.8)	14 (14.3)
	>70	15 (19.2)	34 (34.4)	23 (25.0)	34 (24.8)	32 (32.7)
Harmattan,	<40	02 (2.6)	00 (0.0)	11 (12.0)	12 (8.8)	09 (9.2)
300L	41-50	09 (11.5)	11 (11.2)	19 (20.7)	41 (29.9)	10 (10.2)
	51-60	34 (43.6)	25 (25.5)	21 (22.8)	45 (32.8)	31 (31.6)
	61-70	22 (28.2)	26 (26.5)	18 (19.6)	24 (17.5)	15 (15.3)
	>70	11 (14.1)	36 (36.5)	23 (25.0)	15 (10.7)	31 (31.6)
Rain,	<40	11 (14.1)	03 (3.1)	11 (12.0)	09 (6.6)	04 (4.1)
300L	41-50	19 (24.4)	03 (3.1)	19 (20.7)	19 (13.9)	08 (8.2)
	51-60	19 (24.4)	28 (28.7)	32 (34.8)	50 (36.5)	29 (29.6)
	61-70	11 (14.1)	19 (19.2)	08 (8.7)	16 (11.7)	11 (11.2)
	>70	18 (23.1)	46 (46.9)	22 (23.9)	38 (27.7)	42 (42.9)
Harmattan,	<40	04 (5.1)	02 (2.1)	04 (4.3)	03 (2.2)	01 (1.0)
400L	41-50	19 (24.4)	11 (11.2)	27 (29.3)	41 (29.9)	21 (21.4)
	51-60	32 (41.0)	09 (9.2)	28 (30.4)	45 (32.8)	30 (30.6)
	61-70	10 (12.8)	39 (39.8)	12 (13.0)	21 (15.3)	16 (16.3)
	>70	13 (16.7)	37 (37.8)	21 (22.8)	27 (19.7)	33 (33.7)
Harmattan,	<40	00 (00)	00 (0.0)		03 (2.2)	
500L	41-50	19 (24.4)	11 (11.2)		31 (22/6)	
	51-60	26 (33.3)	17 (17.4)		41 (29.9)	
	61-70	13 (16.7)	38 (38.8)		28 (20.1)	
	>70	20 (25.6)	31 (31.6)		34 (24.8)	

Source: Authors fieldwork, 2021

For the conventional universities, the semester meant for SIWES was also removed but the mean average for three earlier harmattan semesters and the mean average for the two earlier rain semesters were used as the surrogate to make the data linear. The method of investigation shows the progression in the knowledge and performance of the students in Architectural designs as the students gravitate from semester to semester. The idea is that students going through course unit system of learning should progressively develop in learning, training and expertise over the learning periods through the accumulation of relevant requisite composite of knowledge. One acid test to knowing the quality of the knowledge repository is students' performance in Architectural designs.

The gravitation of the students from the beginning of the programme through the time of study does not follow a definite pattern. While it may be read through the difference in the number of students who score different categories of scores from two hundred level (200L) to five hundred level (500L) of a particular university that, students were developing spontaneously; it may also be seen that it was not necessarily on semester basis.

For instance, 11.5% of the students in OOU scored the lowest score category in two hundred level (200L) harmattan semester. The proportion of students scoring the lowest score category increased to 14.1 in the rain semester of the same year, only that generally decrease with time down the line of the program. This is true of all the selected universities sampled. The extraction of students' result in Architectural designs on semester basis again produced a data that was not easily interpreted to depict the progression of learning in the schools and which may be directly used as a summary for further parametric analysis. To this end, the study resolved to scaling, as has been done in the earlier discussions.

Table 7: Scaled Students Scores in Architectural Designs

Semester	OOU	LAUTECH	UNILAG	FUTA	OAU
Harmattan 200L	298.8	323.9	293.5	285.6	337.9
Rain 200L	292	354.5	317.2	300.2	356.3
Harmattan 300L	339.7	387.4	325.5	291.5	343.6
Rain 300L	308	373.5	312.1	329.2	368.6
Harmattan 400L	311.6	400.2	320.1	320.1	369.3
Harmattan 500L	343.5	350.5	**1,568.4**	342.7	**1,775.7**
Total	**1,893.6**	**2,190.0**		**1,869.3**	

Source: Authors field survey, 20121

Again, weights were attached to the score categories and the attached weight was used to multiply the corresponding number of students whose scores were in the category. For each semester, all the points scored in all the categories were summed together; this summarises the performance of all students from each sampled university. This was totaled for the entire student's program for a more condensed summary.

The semester that each of the university has the highest point differs, but the points increased through the program except LAUTECH (350.5) where the points were relatively lower than the previous. Overall, for universities of Technology, LAUTECH (2,190.0) takes the lead, followed by OOU (1,893.6) and FUTA (1,869.3) and for conventional universities; OAU (1,775.7) takes the lead and followed by UNILAG (1,568.4). One of the reasons adduced for the two conventional universities sampled is that the mean average was computed for five semesters whereas, Universities of Technology was six semesters.

The fact that the gravitations from two hundred through five hundred levels saw gradual increment in the points scored by each university, measured by the graded performance of the students may be safely hypothesised that knowledge of Building Structure do reflect in students' performance in Architectural designs. If the performance in designs is to be plotted into graph, it is sinusoidal; going up and down because the semesters in each of the selected universities have high and low points followed each other. What can keep the grades going higher and higher is the students' sound knowledge and better understanding in Building Structure. Hence, there is still room for improvement.

Effect of Building Structure Knowledge on Architectural Designs Performance

The resultant objective of Architectural training is to produce experts who are creative and capable of providing workable and sustainable design of buildings that satisfy all the needs of the society. Therefore, performance of students in Building Structure courses directly depicts the intellectual strength of such students so developed over the years and gleaned from multi-dimensional aspects of teaching and training in the department.

In the study, the contribution of the knowledge of Building Structure courses to the ultimate knowledge of Architectural designs was investigated. This was done through a Pearson Product Moment correlation analysis of the performance in Architectural designs (the dependent variable) and the knowledge of Building Structure courses (the independent variable).

Table 8: Building Structure and Architectural Designs Performance Correlation

Variable	Coefficient	p-value at 95% confidence level
Architectural designs performance (Dependent) Building Structure Performance (Independent)	0.641	0.046

Source: Authors computation, 2021

From the Table 8, considering that the correlation coefficient of the analysis is 0.641 and that the p-value is 0.046; it can be said that at 95% confidence level, there is a reasonable relationship between the knowledge of Building Structure and students' performance in Architectural Designs. In other words, when students become versatile in the knowledge of Building Structure, they have high tendencies to do very well in designs. It would be noted however that the coefficient is not very close to one (1); the implication is that it is not only

Building Structure knowledge that accounts for the reason why a student would be good in designs or not.

In other words, there can be many other factors that leads to better performance in Architectural Designs, only that the knowledge of Building Structure cannot be left out, rather it is worthy to be reckoned with when better performance in Architectural Designs is desired.

CONCLUSION

The study has made a comparative analysis of the academic performance of Architecture students in both Building structures and Architectural designs courses in Southwestern public Universities in Nigeria and conclude that the depth of knowledge in Building Structure is a function of good performance in Architectural designs, when all other factors leading to good Architectural Designs expertise are kept in place.

The study also noted that the rate at which the knowledge of the courses was integrated into Architectural designs was getting better and improving as the students' progress to higher classes. To improve on this, the students need to understand the basic Building Structure theory correctly so as to be able to apply the knowledge when necessary especially in designs and in solving structural problems in building construction.

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