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Effects of Learning Style on Performance of Architecture Students in Building Structures in South Western Nigerian Public Universities

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Abstract- ***Students learn in many ways and use many styles since learning is cognitive of a learner. In a similar way, in the learning of Building structures in Architecture, there are many styles used by the students knowingly and unknowingly because majority of them did not know the style use to read the courses. This affects better understanding and the performance of students greatly because their performance in the courses is low and this is worrisome. Literature acknowledged the use Kolb learning style in the study of Architecture and Engineering. The study therefore carried out effects of learning style using Kolb learning style on the performance of Architecture students in Building structures in South Western public universities in Nigeria in order to improve on the performance of students and to have better understanding in the courses. The study was a descriptive survey with multi – stage sampling procedures that involved the use of questionnaire. It focused on data obtained from Architecture students of five selected public universities in South Western Nigeria where Architecture was offered. The universities were purposively selected and sampled. The research approach adopted for was quantitative. The population for the study was seven hundred and two (702) students. This study utilized the total population since it was not too large and was more representative than a sample. The data was analysed using descriptive statics such as frequency counts, percentages, Likert scaling, and Chi-square while regression analysis was used to assess the effects of Kolb learning style using on students' performance in Building structures. The study revealed that the students were not using Kolb learning style fully in the learning of Building structures and the performance of the students in the courses was very low. It also revealed that there was a significant relationship between Kolb learning style and students' performance in Building structures. The study concluded that the improvement in performance of students in the courses rest on the use of Kolb learning style fully therefore, the need for the students to use the style fully in order to improve on the performance and have better understanding in Building structures.***

I. INTRODUCTION

Learning style is cognitive of a learner. It is a student's proffered technique in approaching learning. Oyadokun *et al.* (2023) described learning style as those preferential strategies that can facilitate the process of gathering, interpreting, and thinking new information. Every student learns and responds to information uniquely (Chan, 2010). Chika (2012) opined that learners are to be responsible for their own learning.

Learning style also refers to a range of competing and contested theories that aim to account for differences in individual learning. These theories propose that all people can be classified according to style of learning, although, the various theories present differing views on how the styles should be defined and categorised. The common concept is that individuals differ in how they learn.

Learning styles often control the way learners associate meanings to the topic taught and enable them to make sense out of it (Oyadokun *et al.*, 2023). It helps to determine the effective tools and efforts required to mastering a topic or subject (Cassidy, 2004). Dodds and Fletcher (2004) showed that once the students are aware of their learning styles, they appear to improve their examination grades and instill confidence in the choice of study methods. Similarly, studies have been conducted which explicates the relationships between performance and learning styles (Riazi and Riasati, 2007; Mulalic, Mohd Shah and Ahmad, 2009; Bidabad and Yamat, 2010; Vaseghi, Ramezani and Gbolami, 2012; Vaseghi, Barjesteh and Shakib, 2013).

Students learn in many ways such as by seeing and hearing, reflecting and acting, reasoning logically and intuitively, memorising and visualising and drawing analogies and building mathematical

models (Oyadokun *et al.*, 2023). As class size increases so, the type and number of students' learning styles increase. In learning Building structures, there are many styles used by Architecture students knowingly and unknowingly although, majority (97.8%) of students did not know the learning style use to read the courses and this greatly affect the performance of students in Building structures because there is a decline in students' performance in the courses (Henri, Frewer, Amato, Thilakaratne & Trinidad, 2004).

The performance of students in Building structures is somehow worrisome and this affects their Architectural designs and construction capabilities greatly so, this study is necessary to have sound knowledge and better understanding of the courses in order to improve on their performance in the courses and to be good Architects in future. However, learning style has been found to be important in predicting performance of students because learning is a criterion, product and goal of teaching. Thus, the need to examine learning style using Kolb learning style on the performance of Architecture students in Building structures because literature acknowledges and recommends the style to study Architecture and Engineering.

II. LITERTURE REVIEW

2.1 Reason for Learning Styles

Learning style is important because it guides the way students learn, change the way they internally represent experiences and the way information is recalled. Research shows that each learning style use different parts of the brain. By involving more of the brain during learning, students remember more of what they learn.

2.2 Types of Learning Styles

There are many types of learning styles numerous to mention but for this study, Kolb learning style will be discussed

Kolb learning style: A significant impetus in the development of the Kolb learning style is Kolb's observation of distress encountered by many students whose learning styles seem mismatched with displinary majors. An underlying assumption of the style is that all learning entailed a cycle of four learning models but each individual is likely to feel most comfortable in one of the four models of the cycle based on individual preference along two dimensions, perception and processing.

The learning style involves four stages, namely: concrete learning or experience, reflective observation, abstract conceptualisation and active experimentation.

(a) Concrete experience: This is where learner encounters a new experience or reinterprets an existing experience. The learner is exposed to a new task in a way haven't seen before.

(b) Reflective observation: The learner reflects on the experience on a personal basis. The metamorphosis from seeing and doing to reflecting are embed the learning into real-time absorption of materials and methodology.

(c) Abstract conceptualisation: This is where the learners form new ideas or modify current abstract ideas based on the reflections that arise from the reflective observation stage.

(d) Active experimentation: The learner applies the new ideas to see if there are any modifications in the next appearance of the experience.

Kolb took these four components to create four overall learning styles. These are: diverging, assimilating, converging and accommodating. The Divergers see things from different perspectives. They are able to use their imaginations to be creative. The Assimilators are able to explore and analyse models well. They are more interested in concepts and tasks. The Convergers are good problem-solvers and practical in analyses of ideas and tasks while the Accommodators are more practical in learning and see problems from intuitive point of view.

The four learning structures in the Kolb learning components are also distinguished by the type of question that concerned each category of "Why?", "What?", "How?" and "What if?". Likewise, each academic field can be mapped against this same set of dichotomous dimensions according to what type of learning models predominate in that discipline. According to this model, in the abstract and active incorporate science - based professions such as engineering and Architecture, Kolb proposed a model involving a 4 – stage cyclic structure that begins with a concrete experience that leads to a reflective observation and subsequently an abstract conceptualization that allows for active experimentation as shown in Figure 1.

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Effective learning can be seen when the learner progresses through the circle. The learner can also enter the cycle at any stage with logical sequence.

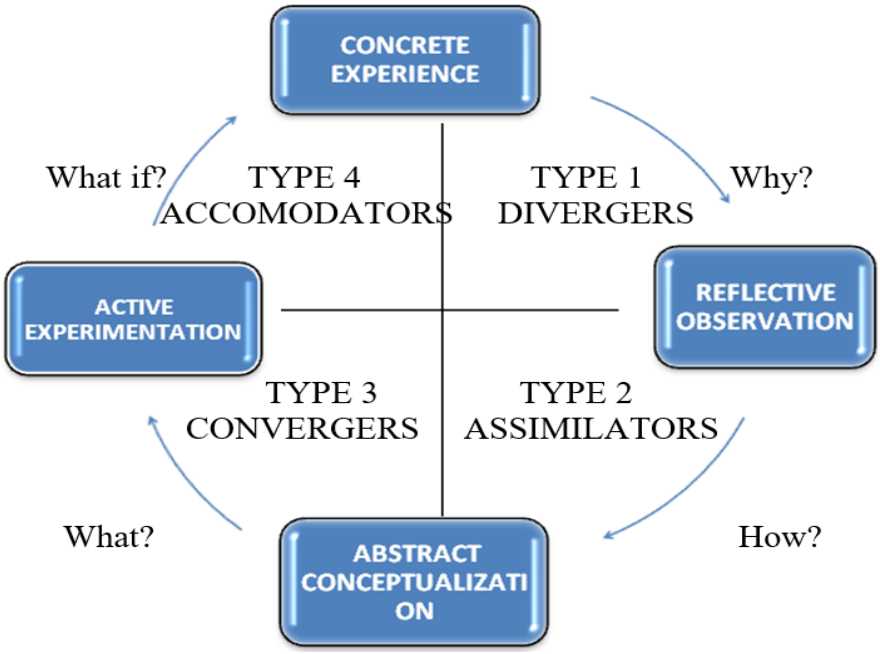

Figure 1: Learning Styles and Learning cycle based on Kolb's model
Source: Kolb, 1981, Oyadokun *et al.*, 2023.

It is easier to see the construction of Kolb's leaning styles in terms of two – two matrix, each leaving style represents a combination of two prefers styles. The matrix also highlights Kolb's terminology for the four learning styles

Diverging - Preference for feeling and watching
Assimilating – Preference for watching and thinking
Converging – Preference for doing and thinking
Accommodating - Preference for doing and feeling

III. METHODOLOGY

The study employed multi – stage sampling procedure and was empirical. It was a descriptive survey that involved the use of questionnaire. It focused on data obtained from Architecture students of all the five selected public universities accredited by National Universities Commission (NUC) and Architects Registration Council of Nigeria (ARCON) in Southwestern Nigeria where Architecture was offered. The research approach adopted for this study was quantitative.

The population for the study was seven hundred and two (702) students. This study utilized the total population since it was not too large and was more representative than a sample. The distribution is depicted in Table 1.

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	4yrs	300	62	117

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	Ife.		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, 2023

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. Purposive sampling method was used in selecting the students.

The total number of questionnaire distributed was seven hundred and two (702) and the total feedback was five hundred and forty one (541) representing 77.1% as shown in Table 2 below:

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, 2023

Grade in Building structures of each student was collected to observe the academic performance of the students in various universities. (Table 3).

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, 2023

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The data was analysed using descriptive statistics such as frequency counts, percentages, Likert scaling, and Chi-square while regression analysis was used to assess the effects of Kolb learning style on students' performance in Building structures.

IV. DISCUSSION AND FINDINGS

Since majority of the students in selected universities did not know much about Kolb learning style, variables that would simplify, explain and easier for the students to understand the style were used. Hence, nineteen (19) variables used to measure this style of learning which include: noting important points when reading, always digest Building structures ideas, examine new ideas, perfectly understand the curses from teachers, comfortable with teaching method, take note during class. Easily understand learning materials, teachers method of teaching helps, class participation, asking question in class, personal and group learning, toughness of the courses and whether the courses are interesting or not. Others are consultation, class attendance with expansive reading and personal discussion with teachers on Building structures.

4.1 Scaled Learning Outcome in the Selected Universities

The study scaled the ordinal data into interval form, using a method reminiscent of Likert scaling. The measurement nineteen variables led to the opinion formed on the learning outcome of the courses in Architecture.

Table 4: Scaled Learning Outcome in the Selected Universities

S/N	Variables	OOU	OAU	LAUTECH	FUTA	UNILAG
1	Do not note important points when reading the courses	101	129	198	197	153
2	Always digest Building structures ideas	211	266	299	435	266
3	Examine new Building Structure ideas	197	237	320	380	215
4	Perfectly understand Building structures from teachers	204	226	259	363	203
5	Comfortable with teaching method	221	248	282	370	222
6	Take note during class is necessary	215	335	324	497	265
7	Building structures learning materials are easily understood	197	218	277	389	224
8	Teachers method help in-depth understanding of the courses	196	265	229	366	228
9	Participation in Building structures classes help	220	250	309	428	261
10	Asking question in the class is unnecessary	128	147	232	323	197
11	Personal reading and solving problems in the courses help	182	244	252	421	206
12	Participation in group learning is unnecessary	111	84	210	253	138
13	Building structures courses are challenging and difficult	126	163	259	271	181
14	No matter the effort, failing Building structures courses is inevitable	66	87	214	157	166
15	Students are not interested in the courses	75	100	195	234	117
16	Building structures classes are interesting but personal study is confusing	97	163	232	298	212
17	Consultation helps to understanding the courses	200	311	293	457	219
18	Class attendance with expansive readings do not help understand the courses	176	292	280	394	249
19	Personal discussion with teachers on Building structures helps	101	179	212	263	188

Total	3,024	3,944	4,876	6,496	3,910

Source: Author Computation, 2024

In all, FUTA (6,496) was observed to be doing better in the area of learning outcome judged by the rating of the students (Table 4). This was followed by LAUTECH (4,876); OAU (3944); UNILAG (3,910) and OOU (3,024). The relative advantage that FUTA and LAUTECH had over other universities may be attributed to both the length of training that is longer (five years) and the compulsory learning of science subjects earlier in university studies being universities of Technology. The advocacy here is not that all schools must elongate the study duration; however, introduction of some basic scientific studies at early study life of Architecture students has the propensity to help the study of Building structures courses. While it is a fact that all the universities sampled need to improve in the order that they have been listed, the Architecture students should put in more efforts to achieve a better learning outcome in the courses.

Table 5: Learning Style using Kolb Learning Style

S/N	Variables	Disagree (%)	Indifferent (%)	Agree (%)	Learning Style used
1	Do not note important points when reading structure	55.8	22.9	21.3	Kolb
2	Always digest Building Structure ideas	5.0	16.9	78.1	Kolb
3	Examine new Building Structure ideas	10.9	23.5	67.6	Kolb
4	Perfectly understand Building Structure from teachers	21.9	22.5	57.6	Kolb
5	Comfortable with teaching method	16.7	22.0	61.3	Kolb
6	Take note during classes	4.4	9.9	85.7	Kolb
7	Building structure learning materials are easily understood	20.6	18.7	60.7	Kolb
8	Teachers method helps in-depth understanding of Structure	13.4	19.0	67.6	Kolb
9	Participation in Building Structure classes helps	8.9	14.4	76.7	Kolb
10	Asking questions in Structure classes is unnecessary	33.9	23.7	42.4	Not
11	Personal reading and solving problems in Structure help	20.2	18.8	61.0	Kolb
12	Participation in group learning is unnecessary	51.9	22.3	25.8	Kolb
13	Structure courses are challenging and difficult	35.6	22.2	42.2	Not
14	No matter the effort, failing Structure courses is inevitable	58.1	16.6	24.3	Kolb
15	Students are not interested in Structure courses	54.0	23.4	22.6	Kolb
16	Structure classes are interesting but personal studies are difficult	39.5	19.4	41.1	Not
17	Consultation helps to understanding Building Structure	9.4	9.0	81.6	Kolb
18	Class attendance and expansive readings do not help in understanding Building Structure	43.3	23.3	33.4	Not
19	Personal discussion with teachers on Building Structure helps	6.4	16.0	77.6	Kolb

Source: Authors Computation, 2024

Similarly, in learning outcome using Kolb learning style (Table 5), the students were asked on noting important points when reading. Without prejudice to any of the universities sampled, students were

observed to averagely note important points when studying and reading Building structures Many (55.8%) of the students 'disagreed' to the assertion that students did not take note of important points when reading Building structures and few (21.3%) disagreed (Kolb learning style). Students' ability to digest Building structures materials and ideas were similar in study area. More (78.1%) of students attested and agreed to always digest the courses ideas. However, majority (82.6%) students of OOU claimed to be able to digest ideas and topped the list while OAU (76.4%) was the least (Kolb learning style).

In the study, examination of new ideas among students was observed. Many (67.6%) of the students 'agreed' to this assertion and few (10.9%) disagreed (Kolb learning style). The ability to perfectly understand these courses from the teachers were also investigated. More (57.6%) of the students 'agreed' to this and few (21.9%) disagreed (Kolb learning style). The comfortability of the students with the teachers' teaching method was also investigated. Many (61.3%) of the students claimed to be comfortable with teacher's method of teaching and few (16.7%) disagreed (Kolb learning style). Another point of investigation was the quality of note taking in classes. Very many (85.7%) of students agreed to be taken notes during classes and very few (4.4%) disagreed (Kolb learning style).

Ability to understand Building structures learning materials easily was investigated. More (60.7%) of the students 'agreed' to understand learning materials easily while few (20.6%) disagreed (Kolb learning style). Students were made to comment on whether they were able to get an in-depth understanding through teachers' teaching method. More (67.6%) of the students 'agreed' that teachers method of teaching helped in-depth understanding of the courses and few (13.4%) disagreed (Kolb learning style). Students were asked to rate their participation in classes. Many (76.7%) of the students claimed to be participating in class and few (8.9%) claimed not to be participation (Kolb learning style). Learning by inquiry was also investigated. Students were asked to rate whether asking questions in class were necessary. Few (42.9%) of the students disagreed while very few (33.9%) agreed to this attribute (Not Kolb learning style).

When students do not learn through enquiries, the next thing can be that such students are very good at learning privately. This explains why the next question of investigation in the study bothered on personal studies. More (61.0%) of the students 'agreed' that personal reading and solving problems in the course helped and few (20.2%) disagreed (Kolb learning style). Participation in group learning was also investigated. Averagely, (51.9%) of the students 'disagreed' that participation in group learning was unnecessary and few (25.8%) disagreed (Kolb learning style). Students were asked to comment on toughness of the courses, few (42.2%) of the students reacted that the courses were tough and difficult while very few (35.6%) claimed that courses were not tough and difficult (Not Kolb learning style).

The study investigated whether the students worked hard and put in more efforts to succeed or had given up. More (58.1%) of the students 'disagreed' that no matter the effort, failing the courses was inevitable but few (24.3%) agreed to this assertion (Kolb learning style). The students were further asked to commend on students interest in the courses. The study revealed that students were very much interested in Building structures because more (54.0%) of the students 'disagreed' and few (22.6%) agreed that students were not interested in the courses (Kolb learning style).

The students were asked to rate personal studies in the courses. Few (41.1%) of the students agreed and very few (39.5%) of the students 'disagreed' that personal studies were confusing and difficult (Not Kolb learning style). It was also investigated if consultation helps to understand the courses. More (81.6%) of the students 'agreed' to this assertion that consultation helps while very few (9.4%) disagreed (Kolb learning style). (Kolb learning style). In the study, students were asked about combining class attendance with expansive reading. Relatively, more (43.3%) of the students believed that combining class attendance with expansive reading helped in understanding Building structures while few (33.4%) agreed that it does not help (Non Kolb learning style). Finally, the students were asked whether they preferred personal discussion with teachers especially when it comes to problem solving in the courses. More (77.6%) of the students 'agreed' to this while very few (6.4%) disagreed (Kolb learning style).

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The study revealed that the students were not using Kolb learning style fully in the study of Building structures. Majority (79.0%) of the variables were used in the learning of the courses, that is, fifteen (15) variables out of nineteen (19) were used while few (21.0%), four (4) variables out of nineteen (19) were not used. Therefore, the unused variables will definitely affect the academic performance of the students in the courses.

Table 6: Scaled Aptitude Test in Building Structures 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, 2024

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 universities (Table 6). 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 were very low in the test. Majority (69.4%) of the students scored below 50 marks out of 100 marks although, students from LAUTECH did relatively better compare to their counterparts from other universities with the total point of 2,810.8. It was closely followed by OAU with the score of 2,558.6; FUTA (2,441.6); OOU (2,392.2) and UNILAG (2,381.9). This does not mean that LAUTECH students did better in all the questions; however, the average score of the selected schools was shown in Table 7. OOU (33.2%) performed better in the test. This was followed by LAUTECH (28.1%), OAU (26.9%), UNILAG (23.4%) and lastly FUTA (14.2%). The reason that may be adduced for the relatively low performance may be lack of using Kolb learning style fully.

Table 7: Average Score of Selected Universities in Percentage (%)

School	Number of students	Total marks	Marks scored	%
OOU	72	7,200	2,392.2	33.2
LAUTECH	100	10,000	2,810.8	28.1
UNILAG	102	10,200	2,381.9	23.4
FUTA	172	17,200	2,441.6	14.2
OAU	95	9,500	2,558.6	26.9

Source: Authors Fieldwork, 2024

V. EFFECTS OF LEARNING STYLE (KOLB) ON STUDENTS PERFORMANCE IN BUILDING STRUCTURES

The learning style imbibed by the students have been investigated. Aptitude test was also conducted for students in selected universities. Arising from the test were different levels of performance; while some did very well, some lagged behind. The

question that follows are: is the level of performance in Building structures courses dependent on students' learning style factor?. If so, by what proportion this factor impact students' performance in Building structures?

This leads us to the null hypothesis stated in the study that learning style influenced students' academic performance in the courses'. Here, the hypothesis is tested using the instrument of regression analysis. The data was prepared in a manner that made it amenable to parametric testing. The linear regression produced the coefficient of joint correlation (R) of 0.885, coefficient of determination (R^2) of 0.783 with the p-value of 0.065 at the confidence level of 95% (Table 8).

Table 8: Regression Analysis

Dependent	Independent	R	R^2	F	P-value		B	p-value
Building Structure Performance	Kolb learning style	0.885	0.783	0.503	0.065	Constant	8.716	0.207
						Kolb learning Style	0.082	0.616

Source: Authors computation, 2024

This implies that there was a strong relationship between the level of students' performance in the courses and Kolb learning style. In other words, the reason behind an Architecture student's success in the courses is hinged on learning style. The coefficient of determination (R^2) indicated that 78.3% of the reasons why students perform well in Building structures can be attributed to fully using of Kolb learning style. However, the description of the relationship though valid, is not significant at 95% confident level (p-value = 0.065). Holding other variables and factors constant, a unit increase in the quality of the style will produce 0.082 increases in Building structures performance.

It follows that when a better performance in the courses is desired, a strong priority should be given to the quality of learning and Kolb learning style is encouraged among students of Architecture and to be used fully.

VI. CONCLUSION

This study carried out the effects of learning style using Kolb leaning style on academic performance of Architecture students' in Building structures in selected South Western Nigeria public universities. The study revealed that the students were not using Kolb learning style fully and definitely affected the academic performance of the students in Building structures. Moreover, the students' performances play an important role in producing the best quality graduates therefore; there is the need for improvement in Building structures.

The study also found out that the performance of the students was very low in Building structures and there were variations in students' performances across the selected universities. To improve on this, the students need to fully use Kolb learning style in order to understand the courses better because the success of Architecture students is measured in the quality of student performance.

Better understanding of Building structures and its application in Architectural designs are the main factors considered by employers recruiting Architects especially fresh graduates into Architectural firms; therefore, there is the need to improve on students' performance in the courses so that the students will have required knowledge to fulfill employers' demand and to excel in the field of Architecture. The world is developing at an increasingly rapid rate especially in terms of building construction and structural technology therefore; Architecture students must not be left out.

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