

**ARE DRAWING SKILLS A PREREQUISITE TO GOOD ARCHITECTURAL DESIGNS?
Employing the use of Anova statistical tool in monitoring students' performance in
Architectural Education in Nigeria.**

By

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ABSTRACT

In recent times, fine arts and technical drawing have been subjects included as one of which prospective students seeking admission into Nigerian Universities to study Architecture should pass at least with a credit at the Ordinary Senior Secondary Certificate Examinations at the point of admission into a Nigerian University. From first year to third year, Architecture students are introduced to various drawing and sketching base courses to help improve drawing abilities and enhance creative and aesthetic qualities in students' Architectural designs. Architectural graphics (ARC 201), Graphic communications (ARC 101), Art appreciation (ARC 106) and Visual design workshop (ARC 303) are some of the drawing based courses taught between first and third year. This paper tends to investigate by using Anova statistical tool to monitor the mean grades of 10 students in the Architecture department of the Federal University of Technology, Akure, between the students' 100 to 500 level drawing related courses, so as to ascertain whether drawing based courses have any relevance to good studio designs or whether the occurrence is purely based on chance. The 10 students were picked out of 77 using the systematic random sampling technique and data were gathered and collated from the department of Architecture, School of Environmental Technology, Akure in Ondo State, Western Nigeria.

Keywords: Architecture, Design curriculum, Graphics, Visual design, Visual perception,

1. Introduction

Students' performance will always be paramount in any institution of higher learning as it is key towards monitoring if students are improving or not. If this practice is done regularly, it will help the management of institutions to take decisive actions towards improving the performance of its students, as no good institution with foresight will condone poor performance of its students.

Today's architects are faced with the challenge of other professionals competing for design jobs, although these other professionals are however not trained for such tasks. This phenomenon leaves the architect with the option of proving himself to be the master builder by the quality of designs produced. How important then are drawing skills in the training of Architects? How is the performance of art gifted students and the non gifted? This paper aims at investigating whether the 2005/2006 matriculated students of architecture department who are currently M.Tech students (Postgraduate Masters Students) were consistent in their performance as undergraduate students especially in their drawing related courses. The overall philosophy of the training programme of the Department of architecture of the Federal University of Technology Akure is to produce graduates that are competent, skilled and versatile, who are capable of understanding the society's need for shelter, and be able to solve pressing environmental challenges (FUTA SET Students' handbook, 2011). The Department aims to develop young minds to tackle developmental challenges such as the Millenium Development Goals (MDG) and more recently the attainment of the Vision (20-2020, that is, Nigeria plans to attain the twentieth economy in the world by the year 2020). These lofty plans according to the minister of National Planning; Dr. Samsudeen Usman cannot be achieved without the contribution of well trained built environment professionals (Adediji, 2010).

1.1 The research aim

The aim of this study is to find out whether there is a significant difference between the scores of 77 students in their drawing related courses within their first five years with a view to verify if the courses influence good architectural designs.

1.2 The research objectives

The objectives are to:

1. Retrieve results of students in ARC101, ARC 103, ARC 201, ARC 203, ARC 301, ARC 303 and ARC 501 from the departmental files,
2. Determine a relevant sample size from the class population, and
3. Compare grades of students in ARC101, ARC 103, ARC 201, ARC 203, ARC 301, ARC 303 and ARC 501 using simple descriptive statistics and the ANOVA technique.

1.3 Scope of the Study

The paper examines a class of seventy seven (77) students who offered ARC101-Graphic communication, ARC 103-Freehand sketching, ARC 201-Architectural Design, ARC 203-

Architectural graphics, ARC 301-Architectural Design II, ARC 303-Visual Design Workshop and ARC 501- Advanced Architectural Design. The courses are all studio based and are meant to develop the drawing and creative skills of students as undergraduates in the department of Architecture at the Federal University of Technology, Akure. Ondo State, Nigeria.

1.4 Hypothesis

H₀: There is no significant difference between the mean of the scores of the students.

H₁: There is significant difference between the mean of the scores of the students.

This was tested at 0.05% alpha level.

2. Literature review

Who then is an architect? According to Uji, (2010) architecture is the means through which man intervenes in the natural environment and reshapes or refashions the physical environment for the purpose of sheltering himself from the elements, while he carries out his activities that help him to meet biological, social, cultural, physical and spiritual needs. This encompasses the organization of spaces and enclosure, definition or delineation of such spaces with physical boundary features or structural components, in accordance with rules, norms, values or socio-cultural and social-psychological characteristics of the people, in order to create interior and exterior spaces for the required use of man as envisaged. Uji further opines that the only person that is saddled with carrying out these responsibilities is the architect. The word architect was derived from the Greek word 'arkitekton' which means 'master builder'. The architect was supposed to be an artist, a technologist, a designer, an economist and a builder. Michelangelo, the Roman architect was one of the earliest persons to be known by that title, because he had his imprint on St. Peter's Cathedral in Rome as an architect, a painter, sculptor and a master builder. Other contemporaries of Michelangelo were Leonardo da Vinci and Raphael Sangio who were also all of these and much more.

Architecture appears to be the only one known discipline that derives its existence from all the spheres of the learning process as it is a science, an art and a key component in the environment also drawing its essence from the humanities. Vitruvius, one of the earliest best known architects of all times, from Rome underscored his position by asserting this understanding that:

- i. The physical sciences, especially those concerned with understanding the nature of materials, structure and environmental control, including the energies manifestation of heat, light and sound,
- ii. The human sciences (humanities) including behavioural, cultural, sociological and historical studies,
- iii. The normative sciences (or the arts) which give form in different value systems related to the beautiful, the good and the true (i.e aesthetics, ethics and logic). These principles stated above can be summarized as vitruvian principles of a good architecture and are considered thus that:
 - a. A good architecture must meet its utilitarian need and truly reflect its social setting.
 - b. It should stand firmly and appear structurally sound and is capable of withstanding all external and internal load or forces to which it is subjected;
 - c. It should portray beauty and aesthetic appeal.

Uji (2010), posits that for an architect to be able to achieve all these, he ought to be imbued with a combination of;

- . imagination
- . intuition
- . creativity and
- . sensitivity to the surrounding

Uji concludes that these characteristics are usually associated with creative artists. Based on Vitruvian principles and Uji's assertion, it is obvious that an architect should have some level of art training and creative skills which are currently done in Nigerian Universities that offer architecture as a course. But how extensive are these art trainings? Are they really effective? And if they are, how does this reflect in students' studio designs?

2.1 Architectural education in Nigeria

According to Olotuah, (2006) architectural design education started formally in the 17th Century and has undergone significant evolution. Before then, architecture was learnt by apprenticeship under the tutelage of great masters, up to the time of Beaux-art tradition referred to as European and

American model of Architectural education where emphasis was laid on visual design and the study of past architectural historical periods. At inception it had only three years of study and a minimum of five years at the end of the study, a diploma or professional degree is awarded to the student. Architectural design education in Nigerian schools of architecture was fashioned after the European and American models, because the first school of architecture in Nigeria was established by the Europeans and Americans.

Architectural education is an integral part of technical education. In Nigeria the standards of training architects in Nigerian universities is controlled by the Architects Registration Council of Nigeria and the Nigerian Universities Commission. (Nkwogu, 2008). Since the motto of the Federal University of Technology, Akure is 'Towards self reliance', this paper agrees with Bashir (2010) suggestion that architectural design education needs to be re examined by Architects' Registration Council of Nigeria (ARCON) and other stakeholders towards producing successful architects for the creative sector of the 21st Century. Bashir posits that in the re examination artistic based courses should form the most important part of teaching design concepts to enhance these artistic creative abilities of budding architects, to enable them become 'Assessment Resource Tools for Statistical Thinking' i.e the acronym of the word-ARTIST. Olorukooba (1986), assert that creative persons with imaginative thinking will always make better architects, engineers, town planners, industrialists and economists. Also, Dermirbas & Dermikan (2003), argue that architectural design education should be structured to facilitate and advance students learning and that the curriculum must include fundamental courses that develop design knowledge, technological based courses that develop scientific formation of architecture and artistic based courses for strengthening architectural expressions.

2.2 The importance of art education to architects training

Art is self expression of the ideas of the inner mind. Bashir, (2008) posits that teaching artistic based courses is not intended to prepare students for careers in arts but to inculcate a spirit of artistic creativity, in order to enhance their creativity in architectural design. No wonder some architects are more outstanding than others. Architects like Frank Lloyd Wright, Santiago Calatrava and Frank Gherry are prominent architects whose works are of international repute due to their high artistic level embedded in creativity and innovativeness. It is high time art and architecture are reintegrated like it used to be in early architectural training prior to modern era before the emergence of other

related professions like urban planning and others. This affirms the position of Banham (1960), that art and architecture have been inseparable right from the onset, although the rise of modernism in architecture and planning expelled works of art and craft from the fabric and substance of buildings. Art and architecture are interrelated and inseparable and should be treated as such even in design approaches. In art education and architectural education, there are similarities especially in the principles of design and in the elements of design theories. This implies that these two courses are interrelated. The elements of design are line, colour, texture, form and space, while the principles of design still remain rhythm, balance, repetition, unity and symmetry. These basic principles have been qualities that make a good design and have both been approached by artists and architects from time immemorial to date. Stephenie (2006), opined that intensive art training can prepare students for life and work by developing in them the general skills and attitudes they need in the era of technology, no matter what career they choose. But then how can students' performance be measured? These can be done through the use of anova statistical tool in monitoring and assessing students' performance.

2.3 ANOVA statistical tool for measuring average/mean

The Analysis of Variance (ANOVA) technique is important in the context of all situations where comparison is made in more than two populations samples such as in comparing the performance of students in particular courses in a session, the yield of crops from several varieties of seeds, the petrol mileage of four automobiles, the smoking habits of five groups of university students. In such circumstances, it is difficult to consider all possible combinations of two populations at a time for that would require a great number of tests before a decision would be arrived at. This would also consume a lot of time and money, and even then certain relationships may be left unidentified (particularly the interaction effects). Therefore, the ANOVA technique is used and through it to investigate the differences among the means of all the populations simultaneously.

ANOVA is essentially a procedure for testing the difference among different groups of data for homogeneity. The essence of ANOVA is that the total amount of variation in a set of data is broken down into two types, that amount which can be attributed to chance and that amount which can be attributed to specified causes (Kothari, 2009). There may be variations between samples and also within sample items. ANOVA consists in splitting the variance for analytical purposes. Hence, it is a method of analyzing the variance to which a response is subject into its various components corresponding to various sources of variation. Through this technique, a paint manufacturer could check whether the

effect of weather on two different mix of paints differ significantly so that a policy decision could be taken accordingly. Similarly, the differences in various types of feed prepared for a particular class of animal or various types of drugs manufactured for curing a specific disease may be studied and judged to be significant or not through the application of ANOVA technique. Likewise, a manager of a big concern can analyze the performance of various salesmen of his concern in order to know whether their performances differ significantly (Kothari, 2009).

Generally, through ANOVA technique investigations can be made for any number of factors which are hypothesized or said to influence the dependent variable. One may as well investigate the differences amongst various categories within each of these factors which may have a large number of possible values. One-way ANOVA is when one factor is investigated and the differences amongst its various categories having numerous possible values, while two-way ANOVA is in the case when investigation is made for two factors at the same time. In a two or more way ANOVA, the interaction (i.e., inter-relation between two independent variables/factors), if any, between two independent variables affecting a dependent variable can as well be studied for better decisions.

2.4 Art/drawing related courses in the federal university of technology in akure.

Below are the art base/drawing related courses offered in the department of architecture from 1st year to 5th year. Architectural design course begins from 2nd year to 5th year. It was also chosen so as to monitor students' performance since it is the major course in architecture department.

100 level first semester

Course code	Course title	L	T	P/S	U
ARC 101	Graphic Communication I	0	0	6	2
ARC 103	Freehand Sketching I	0	0	6	2

100 level second semester

Course code	Course title	L	T	P/S	U
ARC 102	Graphic Communication II	0	0	6	2
ARC 104	Freehand Sketching II	0	0	6	2
ARC 106	Art Appreciation	2	0	0	2

200 level first semester

Course code	Course title	L	T	P/S	U
ARC 201	Architectural Design I*	2	0	18	8
ARC 203	Architectural Graphics I	0	0	6	2

200 level second semester

Course code	Course title	L	T	P/S	U
ARC 201	Architectural Design II*	-	-	-	-
ARC 204	Architectural Graphics II	0	0	6	2
ARC 210	Workshop Practice	0	1	3	2

300 level first semester

Course code	Course title	L	T	P/S	U
ARC 301	Architectural Design III*	2	0	24	10
ARC 303	Visual Design Workshop	0	1	3	2

300 level second semester

Course code	Course title	L	T	P/S	U
ARC 301	Architectural Design IV*	-	-	-	-

500 level first semester

Course code	Course title	L	T	P/S	U
ARC 501	Advanced Design Studio I*	2	2	24	12

500 level second semester

Course code	Course title	L	T	P/S	U
ARC 501	Advanced Design Studio I*	-	-	-	-
ARC 506	Interior Design	1	0	3	2

L = Lecture hours. T= Tutorial hours. P/S=Practical/ Studio hours. U= Course Units

*Full sessional courses registered in 1st semester but graded in the 2nd semester.

Source: FUTA SET Students' handbook, 2011-2014.

3. Methodology

Ten students were chosen from the 2015/2016 session from the Department of architecture using the systematic random sampling method from the students' serial number. This was done to eliminate researcher's bias and to randomize the sample effectively. For the purpose of confidentiality, the students' serial numbers will be used in place of their matriculation numbers and their names. The students scores were taken from the following art based courses which are believed to enhance their studio designs. Architectural design course begins from 2nd year to 5th year. It was also chosen so as to monitor students' performance, since it is a major course in architecture department. However, 400 level courses were not considered, because, only first semester is usually approved for academic work. The students go for a six-month industrial training workshop which covers the whole of the second semester. The courses considered in this study include ARC 101 (Graphic Communication) and ARC 103 (Freehand Drawing) from 100 level courses, ARC 201 (Architectural Design) and ARC203 (Architectural Graphics) from 200 level courses, ARC 301 (Architectural Design) and ARC 303 (Visual Design Workshop) from 300 level courses and ARC 501 (Advanced Design Studio) from 500 level courses. 400 level courses were left out as the students don't run a full session, because 400 level students are normally not present for second semester.

Table 1, shows all the 10 students selected and their scores in the various courses chosen from their different levels:

STUDENTS SERIAL No	ARC101	ARC103	ARC201	ARC203	ARC301	ARC303	ARC501	TOTAL
S2	67	68	68	67	66	64	72	472
S13	51	63	63	55	65	56	75	428
S24	63	48	62	62	57	67	62	421
S35	45	57	50	60	54	58	62	386
S46	66	62	65	52	61	58	64	428
S57	61	66	60	62	73	54	75	451
S68	40	61	54	55	43	47	63	363
S4	60	64	53	70	60	60	62	429
S15	40	63	62	58	55	70	67	415

S26	41	51	50	61	52	55	67	377
TOTAL	534	603	587	602	586	589	669	4170

Source: Department of Architecture, FUTA.

Computing values manually using the 1-way anova technique:

Considering Alpha level (α) to be 0.05;

Calculations based on sum of squares principle

Begin by solving for correction factor: correction factor is given as;

Correction factor = T^2 / N Where T = Total sum of squares, and N = Number of squares.

Therefore correction factor = $4170^2/70 = 248,413$

T_{SS} (Total sum of squares) = $67^2+68^2+68^2+67^2+66^2+64^2+72^2+51^2+63^2+63^2+55^2+65^2+56^2+75^2+63^2+48^2+62^2+62^2+57^2+67^2+62^2+45^2+57^2+50^2+60^2+54^2+58^2+62^2+66^2+62^2+65^2+52^2+61^2+58^2+64^2+61^2+66^2+60^2+62^2+73^2+54^2+75^2+40^2+61^2+54^2+55^2+43^2+47^2+63^2+60^2+64^2+53^2+70^2+60^2+60^2+62^2+40^2+63^2+62^2+58^2+55^2+70^2+67^2+41^2+51^2+50^2+61^2+52^2+55^2+67^2 - T^2/N$

$$252,804 - 248,413 = 4,391$$

$T_{SS} = 4,391$

SS columns (Sum of squares in columns) = $(534^2/10+603^2/10+587^2/10+602^2/10+586^2/10+589^2/10+669^2/10) - T^2/N$

$$28,515.6 + 36,360.9 + 34,456.9 + 36,240.4 + 34,339.6 + 34,692.1 + 44,756.1 - T^2/N$$

$$249,361.6 - 248,413 = 948.6$$

SS rows (Sum of squares in rows) = $(472^2/7+428^2/7+421^2/7+386^2/7+428^2/7+451^2/7+363^2/7+429^2/7+415^2/7+377^2/7) - T^2/N$

$$31,826.3 + 26,159.2 + 25,320.2 + 21,285.2 + 26,159 + 29,057.3 + 18,824.2 + 26,291.6 + 24,603.6 + 20,304.2 - T^2/N$$

$$= 249,830.8 - T^2/N$$

$$= 249,830.8 - 248,413 = 1,417.8$$

SS Residual factor (Sum of squares in Residual factor) = $T_{SS} - (SS \text{ columns} + SS \text{ rows})$

$$= 4,391 - (948.6 + 1,417.8)$$

$$= 4,391 - 2,366.4$$

$$= 2,024.6$$

Computing for F – Ratio;

TABLE 2: One-way ANOVA Table.

Source of Variation	SS	d.f	m.s	F - Ratio
Between Students' scores	948.6	6	158.1	4.22
Within Students' scores	1,417.8	9	157.5	4.2
Residual Error	2,024.6	54	37.5	

Source: Researchers' computations (2013).

4. Discussions of Results

The F-ratio which is the value of F as calculated for both between columns (or between students scores) and between rows (or within students scores) are 4.22 and 4.2 and are both higher than the F- critical or F-value in the table, which is 2.25 and 2.04 respectively. This means there is a significant relationship between the students' scores and the students' courses. The null hypothesis is therefore rejected and the alternative hypothesis accepted due to the significant relationship found.

The above hypothesis therefore suggests that the drawing related courses are adequate and are therefore recommended for the institution to continue running all seven drawing courses as sampled and that any student who fails or is not performing above average could either be an unserious student, could be facing other challenges not studied within the context of this paper or could be purely based on chance, and should be subjected to further close monitoring for better performance.

5. Conclusion

This paper therefore concludes that the students who offered art/drawing related architecture courses: ARC101-Graphic communication, ARC 103-Freehand sketching, ARC 201-Architectural Design, ARC 203- Architectural graphics, ARC 301-Architectural Design II, ARC 303-Visual Design Workshop and ARC 501- Advanced Architectural Design, were consistent in their performance and should therefore keep up or improve their performance in art/drawing related courses in the university. This has further proven and confirmed that drawing skills are very essential and are prerequisites to good architectural designs.

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