

# Assessment Of Technical Expertise Of Building Technology Graduates Of Technical Colleges In Enugu State Nigeria

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## ABSTRACT

The study investigated the technical expertise acquired by building technology graduates of Enugu State Technical Colleges in using tools/equipment, drawing and drafting, and hand tools in the execution of building construction jobs. Three research questions guided the study and two null hypotheses were formulated and tested at 0.05 level of significance. The study adopted a survey research design. Structured questionnaire was used to gather data from 120 respondents. The population was manageable and so, no sampling was applied. Mean rating was used in answering the research questions; t-test statistics was used to test the hypothesis. Cronbach Alpha formular was applied to determine the reliability coefficient of the instrument, which was found to be 0.79. The findings of the study showed that the level of expertise of building technology graduates of Enugu state technical colleges was high in the use of simple hand tools and equipment but low in the application of sophisticated tools and equipment hand which are modern. They were also not familiar with application of computer in drawing and drafting of building plan. It was recommended that while Government should endeavour to equip technical colleges with modern tools and equipment, building technology teachers should upgrade their skills in application of modern tools, equipment, computers and technologies in building technology while graduates of technical colleges need capacity building in modern tools and equipment to enable them blend to the trend in construction industries.

**Keywords:** Technical expertise, Technical College, Assessment, Building technology.

## INTRODUCTION

Technical colleges sometimes referred to as technical schools or technical institutes provide specific classes that prepare students for a particular career or trade. These institutions/colleges were established by the Federal Government of Nigeria to provide individuals with practical skills, basic scientific knowledge and attitude that enable them live successfully in the society. According to Omeje, Okekpa and Chukwu (2019), technical college is a trade based vocational institution with cluster of occupations, designed to provide technical skills required to enter directly into the workforce as craftsman. Previously, Umar (2016) described technical Colleges as post primary schools where students require

knowledge and skills in various occupations. For Hassan and Babawuro (2013), the aim of technical college is to provide graduates with valuable skills, knowledge and attitudes necessary for employment. According to Federal Government of Nigeria (FGN, 2013), technical colleges provide training in a number of courses which include Automobile, Building and Woodwork, Business, Computer, Hospitality, Mechanical, Printing, Textile and Electrical and Electronics Trade. Suffice it to stating the obvious that the aim of technical college is not more or less than to produce construction- industry workers.

Building technology, as one of the trades offered in technical colleges, is the study of the processes involved in the erection of structures to provide shelter for humans and their belongings. It is an aspect of vocational education offered in technical colleges in order to produce craftsmen who will man the building industries. Among the major goals of building construction technology is to produce competent building construction technicians with sound technical knowledge, who should be able to perform all types of construction, renovation, demolition, relocation, maintenance, and repair of building structures as well as chimneys, waste disposal, fencing, landscaping, structural works using building equipment and tools (National Board for Technical Education NBTE, 2004). NBTE is a board of education established by Act No 9 of 11 July 1977 to supervise, regulate and oversee educational programmes offered by technical institutions (Business Day, 2015).

Drawing from the handbook of Government Technical College GTC Nsukka, (2013), building technology graduate of technical college could have any or all of the above certification in addition to any or both of the Senior Secondary Certificate Examination (SSCE) from West African Examination Council and/or National Examination Council. This graduate is also advantaged to obtain the Federal Craft Certificate (FCC) as well as the Trade Test Certificates (dexterity test) from the Federal Ministry of Labour and Productivity. However, such graduate should be capable of; independent work; interpreting building drawings and performing all forms of calculations relating to building trade. He/she should also have sufficient knowledge of elementary science to understand the materials in which he works with. Graduates of the programme have the option to secure employment in industries or set-up their own firm to become self-reliant and able to employ others, or even pursue further education in universities and/or polytechnics. To this effect, technical colleges should provide hands-on-training that equip students with technical expertise to design, build, develop, produce, maintain and repair, source building materials and equipment for use in construction of safe and sustainable projects.

Technical expertise is level of dexterity applied in performing physical tasks which are acquired through repeated practices. It requires training and experience to master. Technical expertise can be typified with hard skills. It is synonymous to job- specific skills and can be defined, evaluated, measured or assessed. Assessment is the process of determining the extent or level of change in learner's behaviour after teaching him/her a particular skill or area of knowledge. In assessing learner's performance in technical education such as building technology either process or product or combinations of both are used. Assessment is a systematic programme involving a planned process of determining the worth of something, level of effectiveness, desirability of skills, attitude and knowledge or adequacy of a programme relative to its curricular and the objective. Lawal (2011) viewed assessment as the process of examining performances of individuals in programmes so as to ascertain the strength and weakness of the programme. Understanding assessment results requires that the user draw inferences from available data and observations that are supported by the assessment following three related key concepts of assessment – reliability, validity and fairness.

### **Statement of the Problem**

The purpose for establishing technical colleges is to have a type of education that could increase the mental and physical quality of people to enable them to effectively utilize the available raw materials and resources for their own self-development and the nation in general. And, the introduction of building construction technology in technical colleges is to encourage the acquisition of practical skills by students to use their hands in designing, building and repairing building structures. Unfortunately, it has been observed that most of the technical college graduates seek employment outside building and construction industries, while some indulge in social misfit due to no job resort, when the expectation by the aims and objectives of the programme is to make them self-employed, employers of labour and craftsmen who would man our industries.

As a result of this ugly development, the researchers wonder if this could be attributed to fear of lack of requisite practical skills required for the use of building construction machines, hand tools, and equipment during the training period in the school. Therefore, it is desirable to assess building technology graduates of Enugu state technical colleges to ascertain their technical expertise.

### **Purpose of the Study**

The purpose of the study was to assess the technical expertise of building construction graduates produced by technical colleges in Enugu state. Specifically, it sought to;

1. Find out the level of technical expertise of building construction graduates produced by technical colleges in Enugu state in using portable electric power tools/equipment in building construction works.
2. Find out the level of technical expertise of building construction graduates of Enugu state technical colleges in drawing and drafting.
3. Determine the level of technical expertise of building construction graduates of Enugu state technical colleges in using building construction hand tools.

### **Research Questions**

1. What are the levels of technical expertise acquired by building construction graduates of Enugu state technical colleges in using portable electric power tools/equipment for construction of buildings?
2. What are the levels of technical expertise acquired by building construction graduates of Enugu state technical colleges in drawing and drafting?
3. What are the levels of technical expertise acquired by building construction graduates of Enugu state technical colleges in using hand tools?

### **Hypothesis**

A null hypothesis was tested at 0.05 level of significance:

**H<sub>01</sub>:** There is no significance difference between the mean responses of building construction graduates of Enugu state technical colleges and site supervisors on the level of technical expertise of building technology graduates in using portable electric power tools/equipment.

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## METHODOLOGY

For the purpose of this study, survey research design was applied, because it is suitable for collection of public opinion on existing phenomena with the intent to determine the current conditions for or practices and make better plan for improvement (Eze, 2011). Descriptive studies focus on describing in details the observable fact as they are in nature. Since our aim is to describe the practices and level of expertise exhibited, thus this method is found suitable. The area of the study was Nsukka Education Zone in Enugu state. There are 11 technical colleges in the zone and numerous building and construction works also going on within the zone, especially at the urban center. These attracted construction industries where craftsmen could secure employment. Moreover, there are many building supervisors and graduates of building technology in the zone who can react to the technical items in the study instrument. The population of the study was 120 respondents comprising 101 graduates of building technology and its related subjects in the 9 technical colleges in the zone and 19 industry-based supervisors registered with Corporate Affairs Commission (CAC) and domiciled in the zone.

Structured questionnaire was designed for data collection. The questionnaire had two parts. Part 1 solicited information on personal data of the respondent, while Part 2 which had 3 sections; (A, B, and C) elicited information on the level of technical expertise of building technology graduates of Enugu state technical colleges. Instrument was validated by five experts (3 lecturers and 2 instructors) precisely, from the department of industrial technical education, faculty of vocational and technical education, University of Nigeria, Nsukka. The experts were requested to scrutinize each item of the instrument for clarity of statement. They examined the appropriateness and suitability of all items of the questionnaire in providing appropriate data for answering the research questions. Finally, corrections and production of the questionnaire were all in strict adherence to their suggestions, and recommendations. The internal consistency of the questionnaire items was determined using Cronbach alpha ( $\alpha$ ) method. The choice was based on the questionnaire multiple response type. The copies of the instrument were administered on 8 building technology teachers, 8 industry-based supervisors and 8 lecturers all in Kogi state. Their responses were computed using Statistical Package for Social Sciences (SPSS) version 16 and the overall reliability coefficient for the questionnaire items was 0.83.

One hundred and twenty copies of questionnaire were administered on the respondents through personal contact which were carried out by the researchers; and a hundred percent return rate was achieved. The three research questions were answered using mean rating while t-test statistics was used to test the null hypothesis at 0.05 level of significance and at relevant degree of freedom. Based on a four-point scales, items with 2.50 or above were regarded as high level expertise (HLE), while items with mean below 2.50 were regarded as low level expertise (LLE). A null hypothesis was accepted as Not Significant (NS) when a t-calculated value is less than the table t-value. Also, the null hypothesis was regarded as Significant (S) when the table t-value was less than t-calculated value.

## RESULTS

**Research Question 1:** What are the levels of technical expertise acquired by building construction graduates of Enugu state technical colleges in using portable electric power tools/equipment for construction of buildings?

**Table 1:** Mean responses of building technology graduates and industry-based supervisors on the level of technical expertise of building technology graduates produced by Enugu state technical colleges in using building construction portable electric power tools and equipment

S/N	Item statement	$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_t$	Decision
1	Building technology graduates operated concrete mixer for concreting.	2.14	2.36	2.25	LLE
2	Building technology graduates used theodolite for determining angles on setting out	1.71	2.20	1.96	LLE
3	Building technology graduates used portable jig saw for cutting wood accurately	2.57	2.34	2.46	LLE
4	Building technology graduates used metal scaffold for working at heights	2.57	2.45	2.51	HLE
5	Building technology graduates used chain saw for clearing of project sites	2.41	2.43	2.42	LLE
6	Building technology graduates used compactor/rammer machine for ramming over-site	2.28	2.70	2.49	LLE
7	Building technology graduates used block molding machine	1.86	2.19	2.03	LLE
8	Building technology graduates used wheel barrow in batching and measuring of materials	33.00	2.23	2.62	HLE

**Key:**  $N_1$  = Building Construction Industry Supervisors,  $N_2$  = Building technology graduates,  $\bar{X}_1$  = mean of response of site supervisors,  $\bar{X}_2$  = mean of response of building technology graduates,  $\bar{X}_t$  = Average mean responses of the degree of technical expertise of building technology graduates produced by Enugu state technical colleges in using building construction portable power tools/equipment.

The analysis of mean responses of the two groups of respondents in table 1 revealed that the building technology graduates has high level of expertise in items 4 and 8 and low level in items 1,2,3, 5, 6 and 7.

**Research Question 2:** What are the levels of technical expertise of building technology graduates of Enugu state technical colleges in drawing and drafting?

**Table 2:** Mean responses of building technology graduates and industry-based supervisors on the level of technical expertise of building technology graduates produced by Enugu state technical colleges in drawing and drafting

$N_1=19, N_2=101$

S/N	Item statement	$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_t$	Decision
1	Building technology graduates used architectural drafting equipment for drawing	3.00	2.37	2.69	HLE
2	Building technology graduates used metric scale rule for scaling of measurement	3.00	2.72	2.86	HLE
3	Building technology graduates adopt correct building symbols and codes for producing blue prints	3.00	2.28	2.69	HLE

4	Building technology graduates used Computer Assisted Drawing (CAD) software in drawing plans.	2.71	2.03	2.37	LLE
5	Building technology graduates used prepared title block	3.29	3.54	3.42	HLE
6	Building technology graduates worked out the overall dimension of the site for layout/site plan	2.86	3.26	3.06	HLE
7	Building technology graduates complied with use of local town planning design and regulations	2.71	3.46	3.09	HLE
8	Building technology graduates prepared specifications document	3.14	3.18	3.16	HLE

**Key:**  $N_1$ = Building Construction Industry Supervisor.  $N_2$ = Building technology graduates,  $\bar{X}_1$  = Mean of response of building industry supervisors,  $\bar{X}_2$  = Mean of response of building technology graduates,  $X_t$  = Average mean of responses of the 2 groups of respondents on level of technical expertise of building technology graduates produced by Enugu state technical colleges in drawing and drafting.

The data in table 2 revealed that building technology graduates demonstrated high level of expertise in the use all traditional drawing instruments in items 1, 2,3,5,6,7,8 while item 4 which is a modern tool was at a low level expertise.

**Research Question 2:** What are the levels of technical expertise of building technology graduates of Enugu state technical colleges in drawing and drafting?

**Table 2:** Mean responses of building technology graduates and industry-based supervisors on the level of technical expertise of building technology graduates produced by Enugu state technical colleges in drawing and drafting

$N_1=19, N_2=101$

S/N	Items statements	$\bar{X}_1$	$\bar{X}_2$	$X_t$	Decision
1	Building technology graduates used hawk for holding mortar on pointing operations	3.57	2.60	3.09	HLE
2	Building technology graduates used builder's square in squaring blocks	3.43	3.69	3.55	HLE
3	Building technology graduates used measuring tape in measuring distances	2.43	2.57	2.50	HLE
4	Building technology graduates used tingle plate in correcting sag of lines	2.57	2.47	2.97	HLE
5	Building technology graduates used spirit level in obtaining surface level	2.43	2.72	3.08	HLE
6	Building technology graduates used cold chisel with club hammer in cutting away chasing	3.00	2.00	2.50	HLE

7	Building technology graduates used jointer in jointing and pointing block work	3.29	3.86	3.58	HLE
8	Building technology graduates used carpenters saw in cutting wood	3.29	3.38	3.34	HLE
9	Building technology graduates used mason's saw in cutting blocks	2.71	2.63	2.67	HLE
10	Building technology graduates used scotch in dressing out surfaces of the wall	4.00	3.86	3.93	HLE

**Key:**  $N_1$  = Building industry supervisors,  $N_2$  = Building technology graduates,  $\bar{X}_1$  = Mean of response of building industry supervisors  $\bar{X}_2$  = Mean of response of building technology graduates,  $X_t$  = Average mean of responses on the level of technical abilities of building technology graduates of Enugu state technical colleges in using hand tools.

The analysis in table 3 disclosed that building technology graduates demonstrated high level of expertise in the use of all the hand tools listed from item 1 to 10.

**H<sub>01</sub>:** There is no significance difference statistically between the mean responses of respondents on the level of technical ability acquired by the building technology graduates of Enugu state technical college in using building portable electric power tools /equipment.

The result of the test of significance difference in mean responses of respondents on the levels of technical abilities of building technology graduates of Enugu state technical colleges in using building construction tools/equipment is presented in table 4.

**Table 4:** t- test statistical analysis of the supervisors and building technology graduates on levels of technical expertise acquired by building technology graduates in using tools and equipment

$N_1=19, N_2=101$

S/N	Item Description	SD <sub>1</sub>	SD <sub>2</sub>	t-cal	Decision
1	Concrete mixer	1.12	0.98	-0.42	NS
2	Theodolite	0.88	1.20	-10.9	NS
3	Portable Jig saw	0.05	1.13	0.77	NS
4	Metal Scaffold	1.40	1.17	0.19	NS
5	Portable power Chain saw	0.70	1.15	-0.05	NS
6	Compactor or Rammer machine	0.88	1.10	-0.19	NS
7	Block moulding machine	0.99	1.13	-0.69	NS
8	Wheel barrow	1.07	0.39	1.90	S

The analysis in table 4 disclosed that the two groups of respondents agreed with all the items, it revealed that the t-test accept the null hypothesis only on items 1-7 while reject item 8 respectively at 0.05 level of significance, meaning that there is no statistical significance difference between the mean responses of respondents on the technical ability level of building technology graduates in using building construction tools/equipment.

**Ho<sub>2</sub>:** There is no statistical significance difference between the mean responses of building industry supervisors and building technology graduates produced by Enugu state technical colleges on the level of technical abilities of building technology graduates in drawing and drafting,

**Table 5:** T- test statistical analysis of the supervisors and building technology graduates on levels of technical expertise acquired by building technology graduates in using hand tools

**N<sub>1</sub>=19, N<sub>2</sub>=101**

S/N	Building technology graduates	SD <sub>1</sub>	SD <sub>2</sub>	t-cal	Remark
1	used hawk for holding mortar on pointing operations	0.49	1.11	3.34	S
2	used builder's square in squaring blocks	1.05	0.47	-0.55	NS
3	used measuring tape in measuring distances	0.73	0.98	0.08	NS
4	used tingle plate in correcting sag of lines	0.73	1.03	0.68	NS
5	used spirit level in obtaining surface level	0.49	1.15	2.37	S
6	used cold chisel in cutting away chasing	0.64	1.03	2.94	S
7	used jointer in jointing and pointing block work	0.45	0.35	-7.85	S
8	used carpenters saw in cutting wood	1.03	0.81	2.32	S
9	used mason's saw in cutting blocks	0.70	1.19	0.21	NS
10	used scotch in dressing out surfaces of the wall	0.00	0.35	4.67	S

Data in table 5 revealed that t-test accept the null hypothesis only on items 2, 3, 4 and 9 at 0.05 level of significance, meaning that there is no significance difference statistically between the mean responses of respondents on the level of technical expertise of building technology graduates of Enugu state technical college in the use of building construction hand tools, while null hypothesis was rejected on items 10, 8,7,6,5 and 1.

### Discussion of the Findings

The finding of this study shows that building technology graduates of Enugu state technical colleges used only metal scaffold and wheel barrow with high proficiency level while they could only operate the concrete mixer, theodolite; portable jig saw, portable power chain saw, compactor machine and block moulding machine in low level expertise which indicates that that technical college graduates of building technology in Enugu state has low level expertise in modern construction practices. This could be attributed to lack of those machines in their schools workshop, or that those available were obsolete and not functional or that the students were not exposed to actual demonstration with such tools, i.e, the teacher failed to teach them with those tools due to lack of skills to conduct hands-on practical work in school workshops. Ngure (2013) disclosed that employers attributed the poor performance of TVET graduates on the use of obsolete equipment in their training institutions. The study revealed among others that inadequate training environment and facilities adversely affected the vocational skills development of students in agricultural education.

Emphasis here is that the skills taught did not follow the same basic practices as industrial employers expected. These issues have implications for the delivery of quality TVET instruction globally, and expertise of graduates and employer requirements in terms of skills. The result of this study contradicts that of Owo and Deebom (2020) who contend that technical vocational education and training equips technology education students with relevant building technology skills for employment generation. The situation revealed by the analysis is also not consistent with Ogbuanya et al. (2017) who stated that equipment/facilities were not put to effective use to train the student, stressing that only



hammers, set of screw drivers and pliers were effectively used to train the students while the rest of the facilities were not put to effective use in electrical and electrical and electronics sections. Fadzil and Saat (2017) pointed out that students have the problems of obtaining specific skills in manipulative scientific apparatus and equipment in laboratory due to lack of practical work, while Abrahams, Reiss and Sharpe, (2013) earlier noted that the development of manipulative skills is one important aim of practical work. These findings are consistent with Dave's (1970) imitation category of skills learning, in Fadzil and Saat (2017) which explained that students' replication of skills can only occur by referring to an exemplar. This simply means that they always can exhibit high level of expertise using those tools they were taught with during their training in school. This resonates with the notion of Olorunyomi (2002) that principals of technical colleges should endeavour to make sure that teachers teach by making use of relevant tools and machines. The onus by this assertion decreed upon the teacher is supported by Ogbuanya (2010) stating that effective preparation of any caliber of students is dependent on the quality of teachers. In the same vein, Abubakar and Adamu (2016) maintained that a competent teacher cannot deliver his subject effectively without the use of functional tools, equipment and machines in the workshop.

The finding disclosed that building technology graduates used all the hand tools listed, which include; hawk, builder's square, tape, tingle plate, spirit level, cold chisel, jointer, carpenter's saw, mason's saw and scotch. While in drawing and drafting, they also applied all except the modern one which is computer. This result is symptomatic to the contention of Okolie, Igwe and Elom (2019) that poor students' academic performance results from lack of equipment. The findings also indicated that most of the machines tools/equipment they could not operate are modern and were lacking in the technical college workshop during their training. This result is in consonance with Okolie (2014) who states that Nigerian technical colleges and technical teachers face problems of high-level shortage of adequate teaching facilities for teaching vocational and technical subjects. This shows that technical college graduates possess technical expertise in the application of any equipment/tools that they have ever been exposed to during their schooling. This conforms to the description of technical college by National Board for Technical Education (NBTE) (2001) as institutions where students are trained to acquire relevant knowledge in the world of work. This can only be achieved when students are exposed to practical skills using machines while in school (Shobowale, Odo & Okwoli, 2011).

## **Conclusion**

Education of a people should be germane to their needs. Technical education is one such education that is designed to achieve developmental objectives of the society. Therefore, it must be functional to the people's needs. To this effect, it requires application of tools, machines to equip recipients with the necessary skills. Building technology teachers should adopt the demonstration method to get students exposed to technical skills. Therefore, provision of modern equipment is necessary so that effective establishment of technical abilities in any learner will be secured in proportion as the training is given on actual jobs and not on exercises or pseudo jobs.

## **Recommendations**

Based on the findings, recommendations are made as follows;

1. Enugu state government should endeavour to equip technical college with modern tools/equipment for practical skill acquisition.
2. Teachers of building technology should upgrade their skills in application of modern technologies such as computer in building construction.

3. Building technology graduates of Enugu State technical colleges needs capacity building in modern tools/equipment.

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