

COMPARATIVE ANALYSIS OF BUILDING SETTING OUT AND FOUNDATION SKILLS ACQUIRED BY NATIONAL CERTIFICATE OF EDUCATION STUDENTS IN COLLEGES OF EDUCATION AND POLYTECHNICS IN NORTH WEST, NIGERIA

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ABSTRACT

This study compared Setting out and foundation skills acquired by the NCE III building students in Colleges of Education and Polytechnics institutions awarding NCE in Northwest, Nigeria. The study determined the building setting out and foundation skills acquired by the NCE III Building Technology Students of Polytechnics and Colleges of education in northwest Nigeria. A survey research design was used for the study in which the population of the study consisted 154 NCE III building technology students. The study was carried out in Polytechnics and Colleges of education in northwest Nigeria. Two research questions were raised and answered and two hypotheses were formulated and tested at 0.05 level of significance. A structured questionnaire of 74 items validated by three experts was used as an instrument for Data collection, Cronbach alpha method was used to determine the reliability coefficient in the instrument which yielded 0.85. The research questions were analyzed using mean and standard deviation while z- test statistics were used in testing the Hypotheses of no significant difference at 0.05 level of significance. The study revealed among others that there is no significant difference between the setting out of building skills acquired by Building Technology students of Polytechnics and Colleges of Education in North West, Nigeria. There is no significant difference between the laying of foundation skills acquired by Building Technology students of polytechnics and Colleges of Education in North West, Nigeria. Based on the results the following recommendations among others were made; The building technology teachers in polytechnics and colleges of education in North West, Nigeria should be encouraged to maintain the standard in teaching the required building setting out skills in their various schools. The students of building technology in polytechnics and colleges of education in North West, Nigeria should be given more training on building foundation skills. Where facilities are not available the government and stakeholders should provide. The students of building technology in polytechnics and colleges of education in North West, Nigeria should be made to adhere with the minimum standard of the National Board for Technical Education (NBTE) and National Commission for Colleges of Education (NCCE.) for them to be highly skillful and self-reliant citizens.

1. INTRODUCTION

Colleges of Education in Nigeria are the 'train-the-trainers' Colleges as they are responsible for the production of teachers at the primary and junior secondary levels (Oritsebemigho, 2014). The Colleges of Education as stated in the Federal Colleges of Education Act (1986, No. 4) are to perform the following functions:

- a. to provide full-time courses in teaching, instruction and training in:
 - i. technology, applied science, humanities and management
 - ii. Such other fields of applied learning relevant to the development of Nigeria
- b. to conduct courses in Education for qualified teachers
- c. to arrange conferences, seminars and workshops relative to the fields of learning specified in paragraph (a) of this section.

To perform other functions as in the opinion of the National Commission for Colleges of Education (NCCE) may serve to promote the objectives of the college of education. Moreover, the building technology programme among other technology courses such as Electrical, Carpentry and Joinery, plumbing, metalwork and technical drawing, were introduced into accredited Colleges of Education by (NCCE) so that the available facilities within the environment could be utilized toward running the programme by training teachers that will be teaching technology courses in senior secondary, junior secondary, technical and primary schools.

Polytechnic Education is a form of Vocational and Technical Education aimed at training and imparting the necessary skills for the production of technicians, technologists and other skilled personnel who will be enterprising and self-reliant (Dogara, 2011). According to Sa'idu (2017) the functions of each polytechnic shall be;

- a. to provide full-time or part-time courses and training;
 - i) in technology, applied science, commerce and management
 - ii) in such other fields of applied learning relevant to the needs of the development of Nigeria in the areas of industrial and agricultural production and distribution and for research in the development and adaptation of techniques as the Council may from time to time determine;

- b. to arrange conferences, seminars and study groups relative to the fields of learning specified in paragraph (a) above may serve to promote the objectives of the Polytechnic's perform such other functions as in the opinion of the National Commission for Colleges of Education (NCCE). However, the building technology among other technology courses such as; Electrical, Carpentry and Joinery, plumbing, metalwork and technical drawing, were introduced into accredited Polytechnics by (NCCE) so that the available facilities within the environment could be utilized toward running the programme. By training teachers that will be teaching technology courses in senior secondary, junior secondary, technical and primary schools.

Skills acquisition according to Richard (2011) is the process by which individuals are expected to learn and continue to practice in a given task till the learner becomes proficient in the operation and can perform them when required. Skills are the familiar knowledge of any art or science, couple with readiness and dexterity in its execution or performance, or the application of the art or science to practical purposes. These skills training present great challenges to the learner on the integration of both at the practical work and theoretical fields, common sense, a good power of observation and courage (Risikat, 2009). This means that skills acquisition involves practical experience with real equipment and job. According to Ezeji (2012), skills acquisition is practical and theoretical in nature for self-reliance. Acquired skills are a means of increasing the productive power of a nation (Okorie 2010).

Building Technology is one of the courses of study/discipline in the Polytechnics and Colleges of Education in Nigeria. Building Technology at the NCE level is offered as a vocational technical education program aimed at producing technicians/technologists who will be able to perform basic functions in Building Technology practice both in the private and public sectors, (National Board for Technical Education (NBTE,2011). Building Technology is one of the courses offered in Polytechnics and Colleges of Education in Nigeria. Building technology programs at the Polytechnics and Colleges of Education level are designed to produce skilled teachers and builders to train workers for the building industry at the vocational/technicians' level. Building technology as a course comprises of different topics and operations which require skills to be performed. These components include designing of building plans, setting out of the building, execution, blockwork on the concrete foundation, leveling of the building, roofing pattern, plastering and rendering of walls. These areas of operation require that Students of building technology should possess the necessary skills to carry them out.

Setting out is the first stage of construction on a site. It is the process by which information is taken from construction design drawings and then pegs, profiles or marks are set to control the construction work and ensure that each element is constructed in the right position and to the correct level. Setting out according to the International Organization for Standardization (ISO) is the establishment of the marks and lines to define the position and level of the elements for the construction work so that works may proceed with reference to them. Also, Chudley and Greeno (2010) maintained that setting out is usually undertaken once the site has been cleared of any debris or obstructions and any reduced level excavation work is finished. They further stated that accurate setting out is of paramount importance and should therefore only be carried out by competent persons and all their work thoroughly checked, preferably by different personnel and a different method. Correct setting out as stated by Obande in Sikemi (2013) should ensure that the building faces the right direction; the building is erected on the correct plot of land; the overall sizes (length and breadth) are according to those shown on the drawing and regard is paid to the local building line.

The first task in setting out as stated by Chudley and Greeno (2010) is to establish a baseline from which the whole of the building can be set out. The position of this line must be clearly marked on-site so that it can be re-established at any time. For on-site measuring a steel tape should be used (30 m would be a suitable length). Linen and plastic-coated tapes are also available. The disadvantage with linen tapes is that they are liable to stretch. After the baseline has been set out, marked and checked, the main lines of the building can be set out, each corner being marked with a stout peg. A check should now be made of the setting-out lines for right angles and correct lengths. There are several methods of checking whether a right angle has been established, 12 and in fact the setting out would have been carried out by one of these methods. A check must still be made, and it is advisable to check by a different method for the setting out, the setting-out procedure and the methods of checking the right angles. After the setting out of the main building lines has been completed and checked, profile boards are set up. These are set up clear of the foundation trench positions to locate the trench, foundations and walls. Profile boards are required at all trench and wall intersections.

When setting out the building on the ground, it is important according to Chudley and Greeno (2010) to consider the angle to plot boundary line. The house should be offset from the boundary line by at least twenty to forty degrees. A building set parallel to boundary line has a small visual plot size. This offset also gives better usable spaces in the front and backyards. It will also make the sun run through the house east to west giving warmth to the whole house. Set house north to south for maximum sun. Setting out commences from a plot corner and putting a peg. Offset the peg by four meters at an angle of twenty degrees from plot end. Measure out the length of the building along this angle and place a peg. Mark the width along ninety degrees from this and complete to first peg. With the four corners in place, map out with chalk powder. Use the drawing to locate the extent of the building line within the mapped area and mark corners.

Setting out simple buildings as stated by Sikemi (2013) can be carried out using these three (3) methods:

The 3, 4, 5, method: This method has the following steps:

- i. mark out the building line from the road by measuring the required distance from the center of the road, or by stretching a line along an existing building to the proposed site. The building line is then represented by a line known as the ranging line, which also marks the front wall of the building.
- ii. mark out the overall length of the building by driving in pegs at A and B, along the ranging line.

- iii. Procure two steel tape measures and mark out for equal distances on the ranging line starting from the corner peg at B. These distances may be in any unit of measurement, millimeters or meters.
 - iv. Pull a tape measure from point B to C and ask an assistant to hold it, ready with a hammer and a peg.
 - v. Pull the second tape from the fourth mark at D on the ranging line to point E on the first tape.
 - vi. The distance 5m, if using meters, on the tape DE should coincide with the point 3m on the tape BEC, to prove that angle B is 90°. If this does not happen, the tape BC is either shifted outwards or inwards until 5m on the second tape coincides with the 3m mark on the first tape.
 - vii. Repeat the same procedures to obtain the right angle to BAF, and mark out the overall widths of the building.
 - viii. Establish corner pegs and erect profiles.
 - ix. Mark the positions of partition walls on the profiles with either nails or saw cuts. Ranging lines are stretched through these nails and the corner pegs to mark the ground to indicate the line of excavation for foundation trenches.
2. The builder's square methods: This method has the following steps:
- i. Set out the front or building line with pegs or marks at the required distances.
 - ii. Place the builder's square so that the front of the line touches one side of the square right through its length.
 - iii. Stretch a line from the corner pegs so that it is parallel to the second side of the square and establishes the third peg. A corner with an angle of 90° is thereby obtained.
 - iv. With the aid of a tape measure, mark out the length and breadth of the proposed building.
 - v. Transferring the builder's square to the remaining corners and repeating the above operations, a simple rectangular building can be set out.
3. The use of instrument: After establishing the four corner pegs, profiles (separate or continuous) may be erected using Levelling instruments through the following steps:
- i. The front of the building line is set out in the usual manner, with pegs or marks at the required distances.
 - ii. Set up the tripod at No. 2 peg so that the datum rod is directly over the peg or mark which represents the corner point. Ensure that the legs are firm on the ground.

- iii. Release the spike screw and extend the spike so that it sits firmly on the nail or mark, then tighten the screw.
- iv. Before mounting the instrument on to the tripod head, ensure that the locking screw is tighten. Screw on the site square. Release the locking screw by rotating the site square, point the lower telescope along the front or building line. Tighten locking screw.
- v. Check the circular bubble over the top of the instrument. This will probably be found to be off-center. To correct this, release the tripod legs screw and adjust the instrument until the bubble comes into the center of the black circle. When this is achieved, tighten the tripod leg screw. The instrument is now ready for use.
- vi. Sight on to peg No. 1 through the lower telescope to obtain the “dead on” positions by means of the fine setting screw which moves the telescope to the right or to the left and by tilting the telescope up or down.
- vii. When the position is obtained, measure the distance required to peg No. 3. Now by sighting through the top telescope, taking care not to rotate the instrument to the right or left, signal an assistant to move the peg sideways until it is “dead on”. Peg No. 3 is now positioned at an angle of 90.
- viii. By moving the site square to peg No. 3 and lining up on peg No. 2 the remaining corner peg, No.4 can be set using the procedures already given.

Profiles can be marked easily by tilting the telescope upwards, having sighted on the peg, and placing a nail in the “dead on” position on the profile board. 15

Source: Sikemi (2013).

Foundation according to Nunnally (2011) includes the soil or rock upon which a structure rests, as well as the structural system designed to transmit building loads to the supporting soil or rock. The earth beneath a building provides the support for the structure. Foundation of a building as defined by Emmitt and Gorse (2010) is that part of walls, piers and columns in direct contact with, and transmitting loads, to the ground. They further stated that building foundation is sometimes referred to as the artificial foundation, and the ground on which it bears as the natural foundation. Foundations may be formed of stone, concrete or steel, although the most common material in modern construction is concrete (Sikemi, 2013). He further stated that the purpose of foundation is to support the building, transmitting the weight of the building, both live and dead weights to the subsoil without failing as long as the building last. There are many types of foundation, each one being selected according to the type of condition and the load expected to be carried. The common types are: strip foundation, spread footings, pile foundation, pad foundation and raft foundation.

Strip Foundation

Strip foundation as the name implies are continuous strips of mass concrete or reinforced concrete or stones laid at a pre-determined depth below ground level and along the positions of the load-bearing walls only (Sikemi 2013). Strip foundation is suitable for boundary wall, retaining walls and domestic

buildings of not more than three storey. A strip foundation may be stepped in sloping ground to save excessive digging at the higher level. They are suitable for most subsoils and light structural loadings such as those encountered in low to medium rise domestic dwellings where mass concrete can be used (Chudley and Greeno, 2011)

Typical strip foundation types are:

- i. Traditional strip foundation – used for low rise domestic dwellings or similar buildings
- ii. Deep strip or trench fill foundation – this type of foundation was first introduced to reduce the expense involved in constructing orthodox strip foundations to depths of 900mm or more in shrinkable clay soils, to counteract the variable soil conditions at different seasons. It is alternative to traditional strip
- iii. reinforced concrete strip foundation –used where induced tension exceeds concretes own tensile resistance.
- iv. Continuous column foundation – used for closely spaced or columns to boundary columns (Chudley and Greeno, 2010).

A spread footing according to Nunnally (2011) is the simplest and most common type of building foundation. It usually consists of a square or rectangular reinforced concrete pad that serves to distribute building loads over an area large enough so that the resulting pressure on the supporting soil does not exceed the soils allowable bearing strength. They are enlargements of the bottom courses of the wall, which may be used in conjunction with strip foundations with the aim of spreading the imposed loads to greater area of the soil.

Pad foundations

Pad foundations: are isolated foundations to support columns, piers and heavy machinery in factories. They are used in basement when the underground of the building will be used as parking space or when the other space is not conducive to have foundation. The area of foundation is determined by dividing the column load plus the weight of the foundation by the allowable pressure of the ground. The thickness of the foundation must not be less than the projection from the column (unless reinforced) and must in no case be less than 150mm. The size of the foundation can be reduced by providing steel reinforcement towards the bottom of the foundation running in both directions Sikemi (2013). stated that pad foundations may be circular, rectangular or square in section.

Raft Foundations

The name for this foundation was derived from the raft which is used to cross a river. The foundation consists of a continuous reinforced concrete slab under the whole building. They are used where it is necessary to avoid imposing any pressure on an adjacent foundation or underground service. The foundation uses the principles of a floating raft and the weight of the building is evenly distributed over a large area so that no particular area is made to receive heavier loads. For ordinary housing purposes, a raft of 150mm to 225mm thick reinforced concrete is sufficient; this thickness can be

increased from 225mm to 375mm for slightly larger building. Raft foundations may be used together with ground beams for greater load bearing capabilities. Chudley and Greeno (2010) stated that raft foundations are used to spread the load of the superstructure over a large base to reduce the load per unit area being imposed on the ground and this is particularly useful where load bearing capacity soils are encountered and where individual column loads are heavy. The typical raft foundation types are solid slab raft and beam and slab raft.

Pile Foundation

A pile foundation according to Nunnally (2011) is a column driven into the soil to support a structure by transferring building loads to a deeper and stronger layer of soil or rock. Piles may be classified as either end-bearing or friction piles, according to the manner in which the pile loads are restricted. Piled foundation is a series of columns constructed or inserted into the ground to transmit the load(s) of a structure to a lower level of subsoil (Chudley and Greeno, 2010). They can be used when suitable foundation conditions are not present at or near ground level making the use of deep traditional foundations uneconomic.

1.2 Statement of the Problem

Among the aims of building technology programme at NCE level in Colleges of Educations and Polytechnic is the training of students to acquire skills that will enable them to be employed in building construction industries or be self-reliant and to produce teachers for the primary, junior and senior secondary levels.

There have been numerous complaints about the quality of building skills acquired by Students of Colleges of Education and Polytechnics in North West, Nigeria. Gimba (2011) observed that there is a growing concern among industrialists, that students of Colleges of Education and Polytechnics in North West, Nigeria do not possess adequate practical skills including setting out of building and casting of foundation which qualify them for employment in industries or be self-reliant. Since the industries and the world of work are among the employers of building technology students, therefore, building technology programs should be geared toward satisfying the needs of these industries.

Oranu (2010) also observed that many factors contributed to the ever-rising demand for skills in the labor market which include technological and organizational change, trade, deregulation of key industries and the decline of unions. The inadequacy of skills seemingly acquired by NCE Students of Colleges of Education and Polytechnic has led to an expensive venture of opening training schools in many industries where fresh graduates are being re-trained. This inadequacy in skills also leads to low productivity, poor quality product, and high cost of production and unemployment of the building technology Students into construction industries. Moreover, it leads to the lack of qualified teacher to teach practical skills in technical schools after graduation. It also affects the economy of the nation in general. It is against this background that the researcher intends to carry out a study on comparative

analysis of setting out and foundation skills acquired by NCE Students in Colleges of Education and Polytechnics in the northwest, Nigeria.

1.3 Purpose of the Study

The purpose of the study was to conduct a comparative assessment of the skills acquired by NCE Students of Building Technology in Colleges of Education and those in the Polytechnics in Northwest, Nigeria. Specifically, the study sought to:

Determine and Compare the level of skills acquired by these NCE Students of Building Technology in Colleges of Education and Polytechnics in the area of Setting-out of Buildings within the Northwest region of Nigeria

Determine and Compare the level of skills acquired by these NCE Students of Building Technology in Colleges of Education and Polytechnics in the skills component of Laying of Building Foundations within the Northwest region of Nigeria

1.4 Research Questions

The following research questions in line with the objectives were raised to guide the study.

What is the difference in the level of skills acquired in Setting-out of Buildings by NCE Building Technology students in the Colleges of Education and those in the Polytechnics within North West, Nigeria?

What is the difference in the level of skills acquired in Laying of Building Foundation by NCE Building Technology students in the Colleges of Education and those in the Polytechnics within North West, Nigeria?

Hypothesis

HO1. There is no significant difference between the setting out of building skills acquired by Building Technology Students of Colleges of Education and the setting out of building skills acquired by Building Technology Students of the Polytechnics in North West, Nigeria.

HO2. There is no significant difference in the level Laying of Building Foundation skills acquired by Building Technology Students in the Colleges of Education and those acquired by Building Technology Students from the Polytechnics and in North West, Nigeria.

1.7 METHODOLOGY

The descriptive survey research design was adopted to elicit information on the level of skills acquired by these set of students in their various institutions. This method was adopted in this study to collect direct data from the NCE Building Technology students in the Colleges of Education and the Polytechnics in Northwest, Nigeria on skills acquired in Building Technology practice. Therefore, the

survey research design is considered suitable for this study since data was collected through questionnaires from Building Technology Students on the assessment of building technology skills acquired by NCE Students in Colleges of Education and Polytechnics in the Northwest, Nigeria.

The study was carried out in the North-West, Nigeria, namely: Kaduna, Kano, Kebbi, Katsina, Jigawa, Sokoto and Zamfara States. According to Aliyu&Kwabe (2019), the area lies within the latitude and longitude of 100-140 N and 30-70 E of the country. The North-West States of Nigeria shares boundaries with Bauchi and Yobe states by the east, its shares boundaries with Plateau, Nasarawa, Niger and FCT by the south and with the Republic of Benin, while by the north, it shares boundaries with Niger republic respectively.

The population of the study is made up of 154 NCE III students. This comprised of 84 students from Polytechnics and 70 students from Colleges of Education that offer NCE Building Technology in North-West Nigeria. These were drawn from the State and Federal Colleges of Education and State and Federal Polytechnics in Northwest states.

Purposive sampling technique was used for the study to select only the NCE III Building Technology Students from both the Colleges of Education and Polytechnics programmes in the North West States who have almost covered the curriculum for their building technology programme, and have spent more than two years within their schools. In this way a total of 154 students offering Building Technology at NCE III level from the various schools comprised the sample population.

A structured questionnaire developed by the researcher was used as an instrument for data collection. The questionnaire was comprised of personal data of the respondents in section A, which includes the type of institution (Polytechnics/Colleges of Education) and the status of the respondents (student). While section B was on items on skills acquired based on setting out, foundation, Brick/Block laying and Concreting (BBC), finishes and services in building technology respectively. The structured questionnaire was used to investigate Research Questions 1-5, based on a 5-point Likert scale with the following response categories:

Excellent Acquired (EA)	=	5points;
Highly Acquired (HA)	=	4points:
Moderately Acquired (MA)	=	3points,
Poorly Acquired (PA)	=	2points,
Very Poorly Acquired (VPA)	=	1point.

All the questionnaire items were responded to by the NCE III Building Students respectively.

The instrument for data collection was subjected to face and content validation by three lecturers from the Department of Technology Education MAUTECH. The Lecturers were given copies of the

questionnaire. They scrutinized each item of the questionnaire for clarity of statements. They also examined the appropriateness and suitability of all items of the questionnaire. Their suggestions and corrections were used in modifying the instrument accordingly. The validated instrument was then used for data collection.

The instrument was administered to the Students of Ramat Polytechnic in Borno State and College of Education Hong in Adamawa state which are both out of the researcher's study area but having similar characteristics with those in the study area. The results obtained from the reliability test were analyzed using Cronbach alpha formula and the reliability coefficient of 0.85 was obtained.

The researcher administered the instrument to the respondents with the help of three research assistants. The research assistants were trained on how to administer the questionnaire. The copies of the questionnaire were re-collected by the research assistants as soon as the respondents finished responding to the questionnaire items. The data collected for the study were analyzed using mean, standard deviation and Z-test. Mean and the standard deviation was used to answer the research questions 1 to 5 while Z-test was used to test the hypotheses at 0.05 level of significance.

Decision Rule: For answering research questions, the decision was any item with a mean response of 4.5 to 5.0 were considered Excellently Acquired while items with a mean response of 3.50 to 4.49 were considered Highly Acquired, item with a mean response of 2.50 to 3.49 were considered Moderately Acquired, item with a mean response of 1.50 to 2.49 were considered poorly Acquired finally, item with a mean response 0.5 to 1.49 were considered very poorly Acquired. For testing the null hypothesis, if the calculated Z- value is equal or less than the Z- critical the null hypothesis was rejected. While, if the calculated Z-value is greater than the Z-table (Z-critical), the null hypothesis was accepted.

1.8 RESULTS

This chapter presents the results of the study in line with the research questions and hypotheses that guided the study.

4.1 Research Question 1: What is the level of difference in skills acquired by NCE III Building Technology students in Polytechnics as against those in the Colleges of Education in the area of Setting-out of Buildings within the North West, Nigeria?

A total of twenty-five skills related to Setting out of Buildings, as identified from the NBTE and NCCE minimum standards for NCE III Building Technology programmes were presented to the NCE III Building Technology students in both the Colleges of Education and their counterparts in the Polytechnics. Their mean responses on each of the items are presented in Table 1.0.

Table: 1.0 Mean Rating of Setting out Skills Acquired by of COE and Polytechnics Students of Northwest Nigeria on

S/N	ITEMS	\bar{X}_1	\bar{X}_2	\bar{X}_G	σ	Remark
1	Identification of site plan	3.07	2.97	3.02	1.02	MA
2	Locate the position of proposed structure on site plan	3.74	3.67	3.71	1.18	HA
3	Excavate topsoil to remove vegetable matter	3.93	3.91	3.92	1.27	HA
4	Establish parallel lines	3.93	3.96	3.95	1.20	HA
5	Offset lines from existing buildings	3.82	3.74	3.78	1.18	HA
6	Fix line at each point	3.38	3.26	3.32	1.53	MA
7	Measure out another parallel line using the offset of 500mm to establish position B, and put in another pin	3.39	3.43	3.41	1.31	MA
8	Use 2 tapes to work out the diagonal measurement from point A to B using Pythagoras theorem	3.95	4.14	4.05	1.03	HA
9	Extend tape from position B until the two tapes cross at the required measurement	3.46	3.46	3.46	1.35	HA
10	Drive pin into the ground to establish point C	3.27	3.34	3.31	1.28	MA
11	Run tapes out from position B and C until they exactly cross on the tapes at the established measurements	3.76	3.83	3.80	1.34	HA
12	Drive pin in at position D	3.25	3.17	3.21	1.50	MA
	Get the lines close to the ground using a ground spray paint	3.26	3.11	3.19	1.02	MA
14	Set up profiles at about 500mm away and 300mm about the finished level	3.59	3.44	3.52	1.52	HA
15	Plumb up pins and mark the line on top of the profiles	3.63	3.76	3.70	1.32	HA
16	Put a nail and write on the profile "outside of dig"	3.75	3.80	3.78	1.27	HA
17	Mark the center of the structural wall	3.29	3.16	3.23	1.13	MA
18	Establish on the profile the actual building line	3.37	3.24	3.31	1.55	MA
19	Nail tie rods on top round the entire area	3.62	3.69	3.66	1.28	HA
20	Write on the profile "outside structural wall"	3.37	3.29	3.33	1.23	MA
21	Transfer what is on the plan to the profile boards	3.73	3.67	3.74	1.19	HA
22	Establish each room measurements by nails	3.79	3.93	3.86	1.15	HA
23	Stretch ranging lines through these nails and the corner pegs to mark spaces for excavation.	3.67	3.74	3.71	1.42	HA
24	Set up-leveling instruments for accuracy of readings	2.94	2.83	2.89	1.56	MA
25	Record levels in accordance with an established datum point	2.85	2.81	2.83	1.65	MA
	Grand Mean	3.54	3.49	3.50	1.29	HA

Key: \bar{X}_1 =mean rating of COE Students, \bar{X}_2 =mean rating of Polytechnics Students, \bar{X}_G =Grand mean of items, σ =standard deviation

The result of the data analysis as presented in this Table 1.0 shows that out of the 25 identified Setting-Out related skills, the College of Education students Highly Acquired 13 of the skills and moderately acquire the remaining 12 skills, while the NCE Building Technology students from the Polytechnics

Highly Acquired 12 of the skills and 13 of the skill were moderately acquired at different levels of mean scores. The analysis shows that the NCE III from Colleges of education only marginally out-performed their counterparts from the Polytechnics in area of “Setting up profiles at about 500mm away and 300mm about the finished level (item 14)” at 3.59 and 3.44 mean scores respectively.

The grand mean of the students’ performance under the research question I as presented in the bottom row of Table 1.0 clearly shows that the NCE Building Technology Students out-performed (at 3.54 Highly Acquired) their colleagues from the Polytechnics with 3.49 (Moderately Acquired) Mean scores respectively. It is therefore safe to conclude that there is a measure of difference in the Setting-Out skills acquired by NCE students in the Colleges of Education and those in the Polytechnics in favour the Colleges of Education students.

4.1. Research Question 2: What is the difference in the level of skills acquired in Laying of Building Foundation by NCE Building Technology students in the Colleges of Education and those in the Polytechnics within North West, Nigeria?

To investigate this Research Question 2, a total of ten Building Foundation Laying skills as identified through the library survey in the NCCE minimum Standard was also presented to the students for self-assessment. The result of the analysis of the data obtained under these ten items is presented in Table 2.0. The result on this Table 2.0 clearly shows that both groups of students performed lower than in the skills acquisition under the setting-out building skills.

Table: 2.0: Differences in the Mean Rating of Foundation Laying Skills Acquire by NCE Building Technology Students in the COE and Polytechnics within Northwest Nigeria

S/N	ITEMS	\bar{X}_1	\bar{X}_2	\bar{X}_G	σ	Remark
1	Carry out soil surveys to ascertain the compressibility or consolidation potentials as well as bearing capacity of the soil.	2.35	2.93	2.64	1.23	MA
2	Clear the building site	3.36	3.07	3.22	1.33	MA
3	Laying of continuous membrane over the whole area of the building	3.07	2.86	2.97	1.30	MA
4	Dig trenches around the perimeter of whole walls	2.36	2.50	2.43	1.26	PA
5	Use boards to build formwork for the footings	2.85	2.86	2.86	1.33	MA
	Ability mark column base to achieve a smooth level	2.86	3.11	2.99	1.34	MA
7	Ability to cast a strip foundation	2.70	2.88	2.79	1.25	MA
8	Ability to cast a pad foundation	3.29	2.80	3.05	1.33	MA
9	Ability to cast a raft foundation	3.08	3.46	3.27	1.29	MA
10	Ability to cast a pile foundation	2.82	3.49	3.16	1.16	MA
	Grand Mean	2.73	2.84	2.78	1.28	MA

Key: \bar{X}_1 =mean rating of COE Students, \bar{X}_2 =mean rating of PolytechnicsStudents, \bar{X}_G =Grand mean of items, σ =standard deviation

A closer look at the data on this Table 2.0 shows that the students from the Colleges of Education performed poorly Items 2 and 4 (i.e. Carry out soil surveys to ascertain the compressibility or consolidation potentials as well as bearing capacity of the soil and Dig trenches around the perimeter of whole walls), while those from the Polytechnics still maintained a moderate level of skills acquired in all of the ten (10) items presented to the students.

From the data presented and analyzed so far, the researcher considers it safe to conclude that the NCE students from the Polytechnics slightly did better than their counterparts from the Colleges of Education in the level of skills acquired in laying of building foundations.

Hypothesis 1: HO₁. There is no significant difference between the setting out of building skills acquired by Building Technology Students of Colleges of Education and the setting out of building skills acquired by Building Technology Students of the Polytechnics in North West, Nigeria.

The data generated under Research Question 1 was subjected to a z-test to determine whether the difference under this research was significant or a chance error. The result of the z-test of these data is presented in Table 6.0

Table 6.0: Z-Test Analysis of Difference between Opinion of COE and Polytechnics Students on Setting out Skills Acquired

Respondents	N	\bar{X}	S^2	z-cal	Sig.	Decision
COE Students	84	87.82	15.78	0.85	0.05	Accepted
Poly Students	70	87.36	15.20			

Key: N=numbers of respondents, \bar{x} mean, S^2 =standard deviation, z-calculated value, z- critical value.

The result of the z-test analysis as presented in Table 6 shows that 0.05 level of significance the data returned an F-value of 0.85 which is far greater than 0.05, hence the null Hypothesis 1 that “there is no significant difference between the setting out of building skills acquired by Building Technology Students of Colleges of Education and the setting out of building skills acquired by Building Technology Students of the Polytechnics in North West, Nigeria” is accepted in favour of an alternate hypothesis.

Hypothesis 2: HO₂. There is no significant difference in the level Laying of Building Foundation skills acquired by Building Technology Students in the Colleges of Education and those acquired by Building Technology Students from the Polytechnics and in North West, Nigeria.

Once again, the data collected under Research Question 2 was used to test level of significance of differences in the Laying of Building Foundation Skills acquired by NCE Building Technology student in Colleges of Education and those reading their NCE Building Technology under the Polytechnic setting. The z-test statistics was adopted for this test and the result of the analysis is presented in Table 7.0.

The result of this z-test analysis returned the values of z-calculated as 0.08 and z-test critical value at 0.05. This result clearly shows that the z-cal (0.08) is greater than the z-crit (0.05).

Table 7.0: z-test Analysis of on the Difference between Performance of COE and Polytechnics Students on Foundation Laying Skills Acquired

Respondents	N	\bar{X}	S^2	z-cal	Sig.	Decision
COE Students	84	28.73	3.88	0.08	0.05	Accepted
Poly Students	70	29.91	4.40			

Key: N=numbers of respondents, \bar{x} mean, S^2 =standard deviation, z-calculated value, z- critical value

The z-test result presented on this Table 7.0 shows that , with z-calculated greater than the z-test critical, the null Hypothesis 2 (There is no significant difference in the level Laying of Building Foundation skills acquired by Building Technology Students in the Colleges of Education and those acquired by Building Technology Students from the Polytechnics and in North West, Nigeria). This shows that the slight difference shown under Research Question 2 is not significant. The alternate hypothesis is therefore rejected.

1.9 FINDINGS

Based on the analysis of the data collected for this study under the research questions and hypothesis testing, this study has revealed that:

1. There is a marginal mean difference in the level of skills acquired by NCE Building Technology students in the Colleges of Education and those from the Polytechnics in North West Nigeria in the area of Setting-out of Buildings in favour of NCE students from the Colleges of Education (COE students = 3.54 mean & Polytechnics = 3.49 mean). But this difference in Means was proved to be insignificant under Hypothesis 1.
2. Both the NCE students from the Colleges of Education and those from the Polytechnics in North East, Nigeria performed moderately low in the level of skills they acquired in Laying of Building Foundations at a mean score of 2.73 for COE students and the Polytechnics students at 2.84 mean.
3. There is no significant difference between the setting out of building skills acquired by Building Technology Students of Colleges of Education and the setting out of building skills acquired by Building Technology Students of the Polytechnics in North West, Nigeria”.

4. There is no significant difference in the level Laying of Building Foundation skills acquired by Building Technology Students in the Colleges of Education and those acquired by Building Technology Students from the Polytechnics and in North West, Nigeria

1.9.1 Discussion of Findings

The finding of the study in Research Question 1 revealed that the NCE Building Technology students in Polytechnics and Colleges of Education in North West, Nigeria have moderately highly level of skills acquired in Setting-out Buildings This finding is similar to the finding of Ugochukwu, Elisha, Afam, Patrick, Nworie, Emmanuel and Joseph (2014) who found that the Business Skills acquisition Nigerian Higher Education Institutions Students is moderately high even though this study was Building Technology Skills Under Research Question 2 this study revealed that the NCE Students of Building Technology in the Polytechnics and Colleges of Education in North West, Nigeria performed moderately low in the skills acquired in the area of Laying Foundations to Buildings. This finding is in line with the findings of Usman, Waziri, Abdullahi and Babayo (2018) who found that participation in an entrepreneurship skills acquisition programme was found to have a moderately positive impact on the respondents.

However, the findings relating to hypothesis 1 in table indicated that the calculated Z-value (0.85) is greater than the critical Z-value (0.05) level of significance, hence, the null hypothesis 1 was accepted. This implies that there was no significant difference in the mean response of COE and Polytechnics Students based on Setting out Skills Acquired in Northwest states. The finding of the present study is in contrast with the finding of Usman, Waziri, Abdullahi and Babayo (2018) who found that there is a significant difference in Students' participation in entrepreneurship skills acquisition programme in Adamawa State Polytechnic Yola, Nigeria.

Moreover, the findings relating to hypothesis 2 in table 7 indicated that the calculated z-value (0.08) is greater than the critical t-value (0.05) level of significance, as a result, the null hypothesis 2 was accepted. This implies that there was no significant difference in the mean responses of COE and Polytechnics Students based on foundation casting Skills Acquired in Northwest states. The finding is in line with the finding of Dogara (2011) were the result of the null hypotheses tested showed that there was no significant difference in the mean ratings of graduates, their lecturers and their employers on the employability skills required by university business Education graduates in Enugu State.

1.9.2 CONCLUSION

The NCE III Students of Building Technology in Polytechnics and Colleges of Education in North West, Nigeria highly acquired the necessary skills in Setting out of the building. The skills inlaying Foundation by the Students of Building Technology in Polytechnics and Colleges of Education in North West, Nigeria was moderately acquired this has indicated both the Polytechnics and Colleges of Education Students need additional training for them to be more competent. The bricklaying, block

laying and concreting skills are acquired by the Students of Building Technology in Polytechnics and Colleges of Education in North West, Nigeria.

1.9.3 RECOMMENDATION

Based on the findings of the study, the following recommendations were made:

1. The building technology teachers in Polytechnics and Colleges of Education in North West, Nigeria should be encouraged to maintain the standard in teaching the required building setting out skills in their various schools.
2. The students of building technology in Polytechnics and Colleges of Education in North West, Nigeria should be given more training on building foundation skills. Where facilities are not available the government and stakeholders should provide.

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