BUILDING DRAWING SKILLS NEED OF VOCATIONAL TECHNOLOGY EDUCATION STUDENTS IN NIGER DELTA UNIVERSITY BAYELSA STATE

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ABSTRACT

This study investigated the building drawing skills need of vocational technology education students in Niger Delta University Bayelsa State. To achieve the set goals, two research questions and two research hypotheses were formulated and tested. Descriptive Survey research design was used to carry out this study. The population for the study consisted of 50 respondents from the area of the study. Since the population was sizeable there was no sampling. The instrument for data collection was structured questionnaire which was face validated by three experts, from the Department of Vocational Technology Education. To determine the reliability of the instrument, Cronbach alpha method was used and a reliability coefficient of 0.86 was obtained. Data for the study was collected by the researchers. Data collected was analyzed using mean, and t-test. The mean was used to answer the research questions. The null hypotheses were tested using t-test at P<0.05 level of significance. The result revealed that Lecturers and technical college teachers agreed to building skills being essential to vocational technology education students and there existed no significant difference between their responses. It was recommended among others that Workshop or conferences should be organized for teachers on how these skills can be taught to students.

KEYWORDS: Technology Education, Building drawing, Skills

Introduction

Vocational technology education is an aspect of general education that involves the study of technologies, related science and the acquisition of practical knowledge, understanding, attitudes and skills relating to occupations in various sections of

economic, social life and for the industrial development of a nation (Danko, 2006). It also aimed at preparing an individual in a trade or occupation with employable skills for a better living. Vocational technology education is essential for the economic and social development of a state and the country at large. According to Meyer and Nascimento (2014), developed countries have been showing great concern regarding the attraction of excellent students to areas related to technology and engineering education. The improvement of technology in industries and services has been demanding highly skilled professionals (Nneji, 2013). Due to the rapid technological advances, there is a lack of availability of such professionals in the labour market. Therefore, students must be attracted to and prepared to act to occupy these places. The development of technology and engineering areas strongly depends on the "attractiveness policy" that encourages the high intellectual level of students to choose careers in excellent schools. Developing individuals who are skilled and motivated in the industrial trade will be a step in the right direction. Vocational technology education is concerned with the acquisition of knowledge and saleable skills for the world of work. It is any training and learning activity leading to the acquisition of knowledge, understanding, and skills that are relevant for employment or self-reliance (Eze,2013).Drawing is the representation of objects and machines through the use of lines and shadings. It is also a picture or diagram made with a pencil, pen, crayon rather than paint. It is an essential aspect of industrial technology education. It is the language of industrial professionals. Drawing is a precise language because it provides the craftsman with the information he needs to produce the product the designer had in mind.

Skill is the ability to carry out a task with determined results, often within a given amount of time and energy. It can often be divided into domain-general and domain-specific skills. In the domain of work, some general skills would include time management, teamwork, leadership and self-motivation. While domain-specific skills would be used only for certain environmental situations to assess the level of skills being shown and used (Ryu, 2017).

Scaling skill is an important area in building drawing that needs proper attention to the use of scale. Almost every line on a building drawing must be a measured line for the drawing to be accurate. A designer must be able to make accurate measurements.

Measurements are made in a drafting room with scales. The term scale is used to indicate both the devices used to measure and the size at which an object is to be drawn (Green, 2002). While several different shapes of seals exist, triangular-shaped seals are most widely used in school drawing studios. Scales are categorized into three groups:

a. Full scale e.g. 1:1
b. Reduction scale e.g. 1:20, 1:75, 1:100 and 1:50
c. Enlarge scale e.g. 100:1, 50:1 and 200:1.

When drawing an object in technical, engineering, mechanical or building drawings, its dimensions are taken using a scale rule. If the object is larger than the drawing paper, the dimensions are reduced proportionally. Scale drawings are used to illustrate items that are not useful or convenient to draw at their actual size. This may be because drawing the item at full size would be unmanageable or would not easily fit on a single sheet of paper (such as a building), or alternatively, because items need to be drawn larger than full size to adequately represent all the details that need to be communicated (such as a complex connection).

According to Greenwood (2017), it is important for one to be able to read a simple metric or scale rule and also to transfer measurements from it to a drawing before talking about scale drawing. Green (2002), viewed scale as a means of reducing or enlarging dimensions. For complicated objects, it is quicker and more convenient to use a scale rule. Scale rules are available in both flat and triangular forms (Ofonnanya, 2008).

The art of scaling requires some level of understanding. According to Ofonnanya (2008), the following guidelines will be helpful in carrying out measurements accurately and in an appropriate manner. These guidelines are as follows:

- Measurements should not be taken directly off the scale with a compass or dividers. This will mar the subdivisions and ruin the rule.
- Always place the scale along the line to be measured.
- Always make short dashes (use a sharp pencil) at right angles to the scale.
- After setting a dimension, always double-check with the scale to make sure the distance is accurate.
- For vertical measurements, place the paper so that the scale in use is on the left.
- Small letters are used for the various units of measurement.

According to Oluigho (2015), it may not always be possible to prepare full-size drawings. Therefore, they are drawn proportionately smaller or larger when drawings are produced that are smaller than the actual size of the objects (as in the case of buildings, bridges, and large machines). The scale used is said to be a reducing scale. Drawings of small machine parts, mathematical instruments, watches etc. are made larger than their real size. These are said to be drawn on an expanding scale. The scales generally used for general engineering drawings are 1:10, 1:20, 1:50, 1:100, 1:200, 1:250, 1:75, 1:500, 1:300, 1:400, 1:1000, and 1:750.

Scales used by civil engineers and architects include 1:1, 1:2, 1:5, 1:10, 1:20, 1:50, 1:75, 1:100, 1:200, 1:1000 and 1:2000. All these scales are usually 30cm long and subdivided throughout their lengths. The scale of a drawing is indicated on the drawing sheet at a suitable place near the title, thus "scale, 1:2" or scale, half full size.

In building drawings, scale 1:100 is widely used for the ground floor plan and elevations (front, rear, right-hand side and left-hand side); scale 1:75 or 1:50 is used for sectioning; and scale 1:20/ 1:25 is used for the site plan. However, for neatness and accuracy in any drawing design, it's pertinent for the student to possess a high level of manipulative skill on the drawing scale.

The scale of drawings is described as a ratio using the notation:

A distance at full size: The distance at the scale used that would be the same length.

For example:

- A full size drawing would be 1:1 (or sometimes 1/1 or 'one to one').
- A half size drawing would be 1:2.
- A tenth size drawing would be 1:10.
- A double size drawing would be 2:1.

In the construction industry, a range of scales are generally used depending on the nature of the drawing.

It is important that the scale used be noted on the drawing. In addition, because of the ease of reproducing, printing and resizing drawings, it is important to note the original sheet size that the scale was drawn at, for example A4, A3, A2, A1, A0, and so on. In some cases, it may be appropriate to use more than one scale on a single drawing, for example, to show the elevation of land across a significant distance. In this case, differences in elevation might be illustrated at a larger scale and a smaller scale might be used for horizontal distances. Here, the scale might be noted on the axes of the drawing, or actual distances might be shown on the axes. In other cases, a scale might use more than one unit of measurement. The use of computer-aided drawing (CAD) and building information modeling (BIM) has introduced a new concept to this process, as in this case, digital models are created at full size. Drawings of any scale can then be generated from the drawing.

Dimensioning skill is a means of specifying measurement on the size and parts of a component or objects. Such measurement borders around length, width, thickness and diameter of the component prior production. During dimensioning, lines are carefully used. These lines include leader line, extension or projection line, dimension line.

According to Yarwood (2018), a proper way of dimensionalizing clears confusion in the interpretation of any building design. Dimensioning guides craftsmen during the setting out of a building on the ground. In drawing, there are two acceptable methods of dimensioning: unidirectional and aligned methods.

Dimensioning requires some level of technique. Dimensions are placed or done on either in an unidirectional or an aligned manner; however, unidirectional, according to Parkison (2014), is the preferred method. In the reading direction for dimensions, unidirectional dimensions are placed to be read from the bottom of the drawing. In aligned dimensions, dimensions are placed parallel to the dimension line. The numerals are read from the bottom to the right side of the drawing. Parkison (2014) posited that poor and unclearly dimensioned work could mar the workability of the design during construction without the proper techniques of dimensioning. These techniques of dimensioning are:

a. Dimension should be placed outside the views except when they are clearer and more easily readable inside.

b. Dimensions lines should not cross each other.

c. Dimensions should not be shown between dotted lines as far as possible.

d. Dimension lines should be placed at least 6mm from the outlines and from one another.

e. Dimension figures are inserted in break provided in dimension lines. They are usually placed perpendicular to the dimension lines in such a way that they can be read from the bottom or right-hand side. The dividing line of fraction is drawn in line with the dimension line.

f. Arrow heads, Dots or strokes are usually used to indicate limit of dimension in building drawing.

Dimensioning is of a great essence to designers. The importance to practicing dimensioning include; to:

a. Ensure that drawing, lettering, and positioning of the dimensions are made for accurate production and construction.

b. Ensure that component is easily made as the workman will produce it without having to calculate any dimension.

c. Convey the designer's requirement to the production personnel.

d. Dimension defines the sizes of the geometrical features of an object. They are presented in appropriate units of measure which include metres and millimetres. (Eyo,2013).

Statement of the Problem

Building Drawing in Vocational Technology Education is a course offered in the department of Vocational Technology Education to expose and prepare the students for the situations they are likely to face after graduation. However, in order to be proficient in this course, there are various skills the students need to acquire. It has been observed that most students struggle to produce a neat and accurate design due to a lack of basic drawing skills. The question is: what are the building drawing skill needs of vocational technology education students at the university?

Purpose of the Study

The main purpose of this study is to investigate the significant of building drawing skills need of vocational technology education students in the Niger Delta University(NDU) Bayelsa State. Specifically, the study is aimed at determining:

1. the scaling skill needs of vocational technology education students;
2. the dimensioning skill needs of vocational technology education students.

Research Questions

To guide this study, the following research questions are formulated.

1. How is scaling skills essential for building drawing to vocational technology students?
2. How is dimensioning skills essential for building drawing to vocational technology students?

Null Hypotheses

In line with the purpose of the study, the following null hypotheses are formulated to guide the study:

1. There is no significant difference between the mean responses of lecturers and technical college teachers on how essential scaling skills are to vocational technology education students.
2. There is no significant difference between the mean responses of lecturers and technical college teachers on how essential dimensioning skills are to vocational technology education students.

Methodology

Descriptive survey research design was used, and was carried out in Bayelsa state. The population of the study consisted of 12 lecturers and 38 technical college teachers {50}

respondents from the area of the study. No sampling technique was used because of the small population size. A structured questionnaire was used for data collection by the researchers`. The response option of the questionnaire was structured on five points Likert scale. The questionaire was validated by three experts in the Department of Vocational Technology Education. Cronbach Alpha coefficient method was used to determine the reliability coefficient of the instrument which yielded 0.86. Data was collected by the researchers. Data collected was analyzed using mean, and t-test. The mean was used to answer the research questions, while the null hypotheses were tested using t-test at 0.05 level of significance using SPSS.

Results

Research Question One: How is scaling skills essencial for building drawing to vocational technology students?

Table 1: Mean and Standard Deviation Scores of Responses of Respondents on Scaling Skills

S/N	Scaling skills	N	Ẋ	SD	Remark
1	Scaling skill is essential for enlargement and reduction of object.	50	3.76	1.02	Agree
2	Lack of proper scale reading will lead to serious problem during setting out of building on site.	50	3.56	1.18	Agree
3	It is quicker, accurate and more convenient to use scale rule	50	3.50	1.27	Agree
4	The art of scaling requires some level of skill	50	3.58	1.16	Agree
5	Measurements ought not to be taken directly off the scale with compass or dividers.	50	3.62	1.03	Agree
	Grand Mean		3.60	0.09	Agree

Results in Table 1 shows that the respondents agreed to all the items. It can be inferred from the result that scaling skills are essential for building drawing to vocational technology students in enlargement and reduction of object, setting out of building on site, being quicker, accurate and more convenient, having some level of skills and being able to note that measurements ought not to be taken directly off the scale with compass or dividers.

Research Question Two: How is dimensioning skills essential for building drawing to vocational technology students

Table 2: Mean and Standard Deviation Scores of Responses of Respondents on Dimensioning Skills

S/N	Dimensioning skills	N	Ẋ	SD	Remark
6	It is essential for vocational technology students to be competence in dimensioning an object	50	3.54	1.27	Agree
7	Proper way of dimensioning clears confusion in the interpretation of any building design	50	3.66	1.04	Agree
8	Dimensioning guides craftsmen during development of a project.	50	3.56	1.01	Agree
9	Poor and unclear dimensioned work could mar the workability of the design during construction.	50	3.60	1.07	Agree
10	Good dimensioning and neat line works are very pleasing to look at on a drawing	50	3.62	1.26	Agree
	Grand Mean		3.60	0.04	Agree

Results in Table 2 shows that the respondents agreed to all the items. It can be inferred from the result that dimensioning skills are essential for building drawing to vocational technology students in dimensioning an object, clearing confusion in the interpretation of any building design, guiding craftsmen during development of a project, understanding workability of the design during construction and pleasing to look at on a drawing.

Hypothesis One

There is no significant difference between the mean responses of lecturers and technical college teachers on how essential scaling skills are to vocational technology education students.

Table 3: Independent t-test Analysis of Lecturers and Technical College Teachers' Responses on Scaling Skills to Vocational Technology Education Students

Group	N	$\dot{X}$	SD	df	t_{cal}	Sign at P<.05
Lecturers	12	18.25	1.91			
				48	0.40^{NS}	.69
Technical College Teachers	38	17.95	2.36			

NS = Not significant at .05 level of significance.

Table 3 showed that the calculated probability value (p-value) .69 is greater than the significance level of .05. Therefore, the null hypothesis is retained. This implies that there exists no significant difference between the mean responses of lecturers and technical college teachers on how essential scaling skills are to vocational technology education students.

Hypothesis Two

There is no significant difference between the mean responses of lecturers and technical college teachers on how essential dimensioning skills are to vocational technology education students.

Table 4: Independent t-test Analysis of Lecturers and Technical College Teachers' Responses on Dimensioning Skills to Industrial Technology Education Students

Group	N	$\dot{X}$	SD	df	t_{cal}	Sign at P<.05
Lecturers	12	18.92	2.15			
				48	1.23^{NS}	.22
Technical College Teachers	38	17.68	3.24			

NS = Not significant at .05 level of significance.

Table 4. showed that the calculated probability value (p-value) .22 is greater than the significance level of .05. Therefore, the null hypothesis is retained. This implies that there exists no significant difference between the mean responses of lecturers and technical college teachers on how essential dimensioning skills are to vocational technology education students

Discussions of the Findings

The findings from the results on how scaling skills is essential to vocational technology education students was that scaling skills are essential for building drawing to vocational technology education students in enlargement and reduction of objects, setting out of building on site, being quicker, accurate and more convenient, having some level of skill and being able to note that measurements ought not to be taken directly off the scale with compass or dividers .It was also found that there existed no significant difference between mean responses of lecturers and technical college teachers on how essential scaling skills are to vocational technology education students. The findings could be attributed to the importance of scaling in measurements. Almost every line on a building drawing must be a measured line for a drawing to be accurate due to the fact that scale drawings are used to illustrate items that it is not useful or convenient to draw at their actual size. The findings collaborate with Madsen(2012)who stated that scaling enables students to read correctly, simple metric or scale rule and to transfer measurement from drawings.

The findings from the results on how dimensioning skill is essential to vocational technology education students was that dimensioning skills are essential for building drawing to vocational technology students in dimensioning an object, clearing confusion in the interpretation of any building design, guiding craftsmen during development of a project, understanding workability of the design during construction and pleasing to look at on a drawing. It was also found that there existed no significant difference between mean responses of lecturers and technical college teachers on how essential dimensioning skills are to vocational technology education students. The findings could be attributed to the fact that dimensioning guides craftsmen during setting out a building on the ground. According to Yarwood (2018),proper way of dimensioning clears confusion in the interpretation of any building design. This is why Parkison (2014) posited that poor and unclear dimensioned work could mar the workability of the design during construction. The findings are in line with that of Parkison (2014), who found that there were no significant differences in the mean responses of respondents on strategies for improving interest of technical drawing students in technical colleges

Conclusion

From the findings of the study it can be concluded that, scaling skill and dimensioning skill are very essential skills for vocational technology education students.

Recommendations

Based on the findings of this study, the researchers therefore make the following recommendations:

1. Teachers should teach vocational technology education students the various skills of scaling and dimensioning. The government or stakeholders should ensure that these skills are taught to students in the school system.
2. Conferences or workshops should be organized for teachers on how these skills can be taught to students.

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