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COMPETENCY IMPROVEMENT NEEDS OF BUILDING DRAWING TEACHERS, FOR EFFECTIVE PERFORMANCE, IN COLLEGES OF EDUCATION IN SOUTH-SOUTH AND SOUTH-EAST NIGERIA

Shadrach Emoghalome Otiara[1] & O. T. Ibeneme [2]
[1,2]Department of Technology and Vocational Education, Nnamdi Azikiwe University
builtgraphicx@gmail.com, & ogoibeneme@yahoo.com

Abstract
The turnout of low skilled technical graduates which have increased unemployment rate and skill shortages in the technical education field and building construction sector, have resulted to doubts, if the technical teachers possess sufficient skills in Building Drawing. This situation necessitated the determination of the competency improvement needs of Building Drawing teachers for effective performance, in Colleges of Education, in South-South and South-East Nigeria. The purpose of the study was to determine the competency improvement needs of Building Drawing teachers for effective performance in; the use of drafting tools, basic design process and computer aided design (CAD). Two research questions guided the study. Two null hypotheses were also tested at 0.05 level of significance. A survey research design was adopted for the study. The population for the study was 104 Building Drawing teachers from the Colleges of Education offering technical education programmes. The entire population was used for the study without sampling. A 24 item questionnaire structured on a five point rating scale was the instrument used for data collection. One hundred and four copies of the questionnaire were administered on the respondents with 88 percent returned rate. The instrument was validated by three experts. Cronbach alpha reliability co-efficient method was used to test the reliability of the instrument. The reliability co-efficient obtained for the two clusters were 0.81 and 0.64 with 0.73 overall reliability co-efficient obtained. Data collected were analysed using mean, standard deviation and t-test statistics. Findings revealed that building drawing teachers in South-South and South-East Nigeria need improvement in most skill areas. Urgent attention is required in Computer Aided Design (CAD) knowledge. The tests of hypotheses revealed no significant differences between the mean ratings of male and female teachers in the use of drafting tools and materials, while significant difference existed in CAD usage. Based on the findings of the study, it was recommended among others that functional drawing studios with modern facilities such as CAD work stations be made available for teaching and learning of building drawing in Colleges of Education. Training programmes to build the teachers' competencies in all aspects of building drawing should be prioritized in Colleges of Education in both regions.
Keywords. Building drawing, competency improvement, technical education, teachers, competencies.

Introduction

Technical and Vocational Education and Training (TVET) occupy a very vital position in the technological development and growth of many nations. According to Federal Republic of Nigeria (2014) in National Policy on Education, technical and vocational education and training are aspects of the educational process involving, in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of the economic and social life. Hence,

it is important that technical and vocational education provide students with expertise to cope with the changing industrial demands in the present knowledge and technological economy. The aim of Vocational and Technical Education according to Evanson and Ekong (2014) is to provide education for self-reliance and to earn a successful living in an occupation. It is therefore, a catalyst for employment and prime agent for empowerment and self-actualization.

Colleges of Education (COE) is one of the various educational institutions that offers technical education. It is a tertiary institution established in order to provide teachers education programmes to interested individuals in Nigerian society, Ogbuanya and Bakare, (2017). In spite of the efforts made by Federal government to employ technical educators in colleges of education, studies by Idjawe (2017) reveals that there is gross inadequacy in the total number of technical and vocational education teachers needed to teach the various technical courses such as Building Drawing. With this report, it becomes worrisome if this unpleasant development resulted from inability of Building Drawing teachers to turn out skilled graduates in the technical field. The Colleges of Education (Technical) according to Bakare (2015), offers various technical education programmes such as automobile technology, woodwork technology, metal work technology, building technology and electrical/electronic technology. The programmes are designed and integrated to produce quality teachers for the implementation of various technical subjects in secondary schools across the country. Teachers trained in colleges of education are expected to maintain strong foundation for the preparation of future career of students.

Competency improvement is the acquisition of further knowledge, skills and attitude of individuals in an institution to their full capacity (Wahba, 2012). It means investment made with the purpose of enhancing the ability of individuals to achieve their developmental goals. It is geared towards making improvement on what an individual is already doing to increase productivity. Therefore, in the context of this study, competency improvement means the retraining given to Building Drawing teachers to develop their skills or competence, or for general upgrading of performance ability. The set of activities directed towards improving competencies and capacities of the technical teachers to enable them perform effectively to meeting the objectives of technical education in the South-South and South-East region of Nigeria.

Building Drawing offered by technical education students in the view of Usoro and Bassey, (2019) is concerned with the general knowledge and skills needed to undertake building design, sketches and detailed working drawings before actual building construction takes place. Students undertaking technical education are expected to acquire building drawing skills and competencies, so as to prepare them to fit into the education sector and the highly competitive construction industry. According to the National Commission for Colleges of Education (NCCE) Harmonized Minimum Standards (NCCE, 2020), the building drawing course contents include; Drafting tools/materials, basic responsibilities in design process, standard practice, basic principles and design, preliminary sketches and design, detailed working drawing (to include standard symbols for plumbing) up to a storey building, electrical service plan, preparation of schedules, production of blue printing and introduction to Computer Aided Design (CAD). The purpose of the study was to determine the competency improvement needs of Building Drawing teachers for effective performance, in Colleges of Education, in South-South and South-East Nigeria. Specifically, the study determined the competency improvement needs of Building Drawing teachers in the use of:

1. Drafting tools and materials.
2. Computer Aided Design (CAD)

The following research questions were posed:

1. What are the competency improvement needs of Building Drawing teachers for effective performance in the use of drafting tools and materials?
2. What are the competency improvement needs of Building Drawing teachers for effective performance in Computer Aided Design (CAD)?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

H_{01} Building Drawing teachers in the South-South and South-East do not differ significantly in their mean ratings of their competency improvement needs for effective performance in the use of drafting tools and materials based on gender.

H_{02} Building Drawing teachers in the South-South and South-East do not differ significantly in their mean ratings of their competency improvement needs for effective performance in Computer Aided Design (CAD) based on gender.

Methods

The design adopted for the study was a descriptive survey research design. Descriptive survey design, according to Abanobi and Ajayi (2017) is a research design which collects data on situations and events in order to describe and interpret what is going on in the present. Nworgu (2015) indicated that survey design is most appropriate when the subject of an investigation is directed towards individual opinions or views, attitudes and rating purely on personal basis. Therefore, descriptive survey design was considered appropriate for this study because it enabled the researcher to elicit information from the entire population on competency improvement needs of Building Drawing teachers for effective performance with the use of questionnaire.

The study was conducted in the South-South and South-East States of Nigeria. The population for the study was 104 which comprised male and female building drawing Teachers from the 11 Colleges of Education offering technical education programme in both regions. There was no sampling as all the respondents were used for the study. A structured questionnaire titled: Competency Improvement Needs of Building Drawing Teachers Questionnaire (CINBDTQ) was developed by the researchers on a five point rating scale in line with the (NCCE) Harmonized Minimum Standards for building drawing curriculum. The questionnaire for the study consisted of two parts, I and II. Part I solicited information on the gender of the respondent and part II was divided into two sub-clusters A - B. Cluster A contained 10 items that determined Competency Improvement Needs of Building Drawing Teachers in the use of basic drafting tools and materials. Cluster B with 14 items elicited information on the Competency Improvement Needs of Building Drawing Teachers in Computer Aided Design (CAD). Three experts validated the instrument, one from Measurement and Evaluation, while the other two from the Department of Technology and Vocational Education, all from the Faculty of Education, Nnamdi Azikiwe University, Awka. A Cronbach alpha was used to determine the reliability of the instrument which yielded a coefficient of 0.73. Statistical package for social sciences (SPSS version, 22) was used to analyze the data collected, mean and standard deviation were used to answer the research questions while the t-test was used to test the null hypotheses at 0.05 level of significance. Out of 104 copies of questionnaire distributed, 91 were returned and used for this study. The above numbers shows eighty eight percent returned rate.

Results and Discussion of Findings

Table 1. Mean Ratings on the competency improvement needs of Building Drawing teachers for effective performance in the use of drafting tools and materials.

S/No.	Use of drafting tools and materials	Mean	S. D.	Decision
	Ability to:			
1.	use movable / adjustable Tee-square effectively to draw lines at different angles.	2.13	1.36	SN
2.	demonstrate the use of adjustable set-square efficiently to learners.	2.08	1.34	SN
3.	identify various standard sizes of drawing papers.	2.24	1.49	SN
4.	produce drawings with standard scales using scale rule.	2.11	1.41	SN
5.	demonstrate the use of compass effectively	2.05	1.44	SN
6.	use adjustable electronic drafting board	2.84	1.19	MN
7.	demonstrate the use of digital blue print measuring tool to students.	2.93	1.34	MN
8.	identify the right pen for different lines thickness to be drawn.	2.52	1.39	MN
9.	demonstrate the use of drafter while making plans.	2.81	1.47	MN
10.	mount drawing sheets appropriately to the drawing board.	2.32	1.70	SN
Cluster mean		**2.40**		**SN**

The data in Table 1 shows the result on the competency improvement needs of Building Drawing teachers for effective performance in the use of drafting tools and materials. Building drawing teachers in Colleges of Education in South-South and South-East rated four items (6, 7, 8 and 9) as moderately needed with mean scores of 2.84, 2.93, 2.52 and 2.81 respectively. The teachers also rated the remaining six items (1, 2, 3, 4, 5 and 10) as slightly needed with mean ratings ranging from 2.05 – 2.32 with the mean values which fell within the real limits of 1.50 – 2.49 thus regarded as slightly needed. The above table revealed that a cluster mean of 2.40 was obtained, indicating that the listed competencies are slightly needed. The standard deviation ranged from 1.19 – 1.70 which implied that the respondents were homogenous in their responses and very close in opinion. This therefore means that competency improvement of building drawing teachers in the use of drafting tools and materials for effective performance in Colleges of Education in South-South and South-East Nigeria is slightly needed.

This finding is in agreement with Agbonghale and Iserameiya (2018) who held that though technical drawing facilities, materials and instruments were grossly inadequate in various technical education institutions across the country, technical teacher in Nigeria posses to a large extent the skills to utilize most technical drawing instruments. However, the findings of the study in Table 1 is in contrast with the views of Ghanat and Brown (2017) who noted that one major problem in teaching and learning of technical drawing and related courses is inefficient techniques among teachers, to manipulate and use the modern drawing tools and equipment effectively for good practical training. A similar support to this is the findings of Hassan and Maizam (2017) where they reported lack of qualified technical teachers and modern teaching aids among the constraints of technical education program. Therefore, minimal attention is required in training building drawing teachers in their ability to; use movable / adjustable Tee-square, demonstrate the use of adjustable set-square efficiently to learners, identify various standard sizes of drawing papers, produce drawings with standard scales using scale rule, demonstrate the use of compass effectively and to mount drawing sheets appropriately to the drawing board.

Table 2. Summary of the t-test comparison of male and female Building Drawing teachers' Mean Ratings on competency improvement needs for effective performance in the use of drafting tools and materials.

Gender	N	$\bar{X}$	SD	t-cal	α	df	t-crit	Decision
Female	20	1.93	0.91	1.77	0.05	89	1.96	Not significant
Male	71	2.54	1.48					

The result in Table 2, shows the t-test analysis of responses of male and female building drawing teachers in Colleges of Education in South-South and South-East on competency improvement needs for effective performance in the use of drafting tools and materials, with mean scores of 2.54 and 1.93 for male and female respectively. The t-calculated value of 1.77 was less than the t-tabulated value of 1.96 at 89 degree of freedom and 0.05 level of significance. Therefore, the null hypothesis was not rejected (accepted) which implies that, male and female building drawing teachers in Colleges of Education in South-South and South-East do not differ significantly in their mean ratings on competency improvement needs for effective performance in the use of drafting tools and materials.

The findings in respect of the hypothesis agreed with the findings of Aremu (2015) who in his previous study regarding competency improvement needs of technical teachers opined that all teachers, which include male and female must possess competencies in the use of drawing instruments and materials. The teachers therefore, need minimal training in the use of manual drafting tools for the teaching of the course content. However, pencil on paper final work for Technical Drawing (building plan, mechanical drawing etc.) are no longer recognized in the society because of the era of ICT.

Table 3: Mean Ratings on the competency improvement needs of Building Drawing teachers for effective performance in Computer Aided Design (CAD).

S/No.	Computer Aided Design (CAD)	Mean	S. D.	Decision	
	Ability to:				
11.	launch AutoCAD Program.	2.25	1.40	SN	
12.	navigate through AutoCAD graphic workspace.	2.98	1.37	MN	
13.	set drawing limit in CAD.	3.65	1.29	HN	
14.	impute drawing parameters.	3.54	1.38		HN
15.	demonstrate how to design floor plans in two dimensions (2D) view using the draw commands.	3.67	1.41	HN	
16.	use three dimensions (3D) in CAD program.	3.70	1.39	HN	
17.	demonstrate to learners how to create different layers for CAD drawings.	4.04	1.26	HN	
18.	use object snap tools to enhance accuracy in designing.	3.73	1.37	HN	
19.	communicate effectively with the program command windows.	3.53	1.35	HN	
20.	use the modification tools to make different changes to drawings.	3.53	1.37	HN	
21.	dimension accurately with the dimension tools bar.	3.68	1.34	HN	
22.	demonstrate how to create CAD hatching patterns.	3.85	1.41	HN	
23.	retrieve CAD drawing from internet.	3.70	1.27	HN	
24.	plot completed drawings in CAD.	3.73	1.55	HN	
	Cluster mean	**3.83**		**HN**	

Table 3, shows the result on the competency improvement needs of building drawing teachers for effective performance in Computer Aided Design (CAD). The teachers rated only one item (11) as slightly needed with a mean score of 2.25. The mean value fell within the real limits of 1.50 – 2.49 regarded as slightly needed. Also, only item (12) was rated as moderately needed, with a mean value of 2.98 within the real limit of 2.50 – 3.49. The data also revealed that other 12 items (13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23 and 24) had mean values ranged from 3.53 - 4.04 which fell within the real limits of 3.50 – 4.49 and were regarded as highly needed. The entire cluster mean 3.83 fell within the real limit of 3.50 – 4.49 thus regarded as highly needed. The standard deviation ranged from 1.26 – 1.55 which shows the homogeneity and closeness of the respondents opinion. Hence, it was adjudged that competency improvement of building drawing teachers in Computer Aided Design (CAD) for effective performance in Colleges of Education in South-South and South-East Nigeria is highly needed and therefore required urgent attention.

The findings of the study shows that all the skills mentioned in Table 3 are among the skills needed for effective application of CADD in TVET program. The findings revealed that the teachers' ability to initiate or open the AutoCAD program are high, hence item (11) was rated slightly needed. However, the teachers' competency to navigate through AutoCAD program working environment rated moderately needed in item (12) revealed that much attention is required to help the teachers master the Auto CAD environment to ease their learning of the software. This result complement the view of Dabolins, (2018) who posited that most often, the teachers' earlier knowledge of computer-aided design CAD program particularly in the practice of building design may be too weak for successful teaching of the building drawing course content.

The result further uncovered the teachers' inability to use CAD program effectively to teach building drawing in their various institutions. The skill competencies captured in item (13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23 and 24) rated as highly needed are indicators that urgent attention is required to making the Colleges of Education building drawing teachers in South-South and South-East Nigeria become CAD proficient. This result is in conformity with the idea of Okwelle and Ebikeseye, (2022) who lamented that teachers in Colleges of Education lack adequate skills to impart good knowledge of ICT (CAD) tools to their students, due to lack of desired training in CAD. The findings further has strong congruence with the findings of Okoro (2013) that there were minimal use of CAD facilities in teaching and learning due to lack of software, fewer facilities, lack of computer skills by teachers, power blackouts and inadequate computer laboratory spaces in schools.

This implied that most of the respondents cannot produce simple design with CAD software. They did not learn CADD package neither did they update their knowledge of the program. In essence, they cannot produce 2D drawing and generate 3D models from it without any difficulty using CADD applications. The consequence of this is that they cannot impart CADD skills on the learners. In addition, it shows that there is great need for the teachers to posses those skills, as this will give them the opportunity to master the CADD programs, so as to enjoy its numerous advantages.

Table 4.

Summary of the t-test comparison of male and female Building Drawing teachers' Mean Ratings on competency improvement needs for effective performance in Computer Aided Design (CAD).

Gender	N	$\bar{X}$	SD	t-cal	α	df	t-crit	Decision
Female	20	4.10	1.10					Significant
				2.14	0.05	89		1.96
Difference								
Male	71	3.38	1.39					

In Table 4, it was observed that mean scores of 3.38 and 4.10 was obtained for male and female building drawing teachers respectively. A calculated t-value of 2.14 and a critical t-value of 1.96 were obtained at 0.05 level of significance and at a degree of freedom of 89. However, the calculated t-value of 2.14 was greater than the critical t-value of 1.96, the tested null hypothesis was therefore rejected (not accepted). Therefore, male and female building drawing teachers differ significantly in their mean ratings on competency improvement needs for

effective performance in Computer Aided Design (CAD) in Colleges of Education in South-South and South-East Nigeria. This implied that, gender had a significant relationship with job performance in teaching building drawing with Computer Aided Design (CAD).

This finding shows that most building drawing teachers lack proficiency in the use of application software (CAD) for teaching building drawing. This finding corroborates that of Malachi (2016) that teachers of Technical Drawing and other related courses needed capacity building on Basic Design Process; Drafting Materials and Equipment; Sketching and Designing; and on Computer Aided Drafting (CAD). Furthermore, male and female teachers' use of Computer Aided Design (CAD) had a significant relationship with their performance in teaching Building Drawing, an outcome of the present study which affirmed the study of Oluwadare, Adebayo and Olowe (2015) that there are positive impacts created by AutoCAD package on teachers towards the teaching and learning of Technical Drawing and related courses. The findings of the study also agree with that of Bakare, *et al.* (2018) who concluded that majority of the lecturers in tertiary institution possess inadequate ICT skills required for effective teaching and learning practices. Furthermore, the findings support their view that teachers of vocational education must be continuous learners through improvement programmes. The findings of the above research activities helped to support the justification of the results of this study on competency improvement needs of building drawing teachers for effective performance in Computer Aided Design (CAD).

5. Summary of Findings

The following findings were made with respect to the research questions and hypotheses of the study:

1. Competency improvement of building drawing teachers in the use of drafting tools and materials for effective performance in Colleges of Education in South-South and South-East Nigeria is slightly needed.
2. Male and Female building drawing teachers in Colleges of Education in South-South and South-East do not differ significantly in their mean ratings on competency improvement needs for effective performance in the use of drafting tools and materials.
3. Competency improvement of building drawing teachers in Computer Aided Design (CAD) for effective performance in Colleges of Education in South-South and South-East Nigeria is highly needed and therefore require urgent attention.
4. A significant difference was found between the mean ratings of male and female building drawing teachers on their competency improvement needs for effective performance in Computer Aided Design (CAD) in Colleges of Education in South-South and South-East Nigeria.

Conclusion

The quality of any educational programme is dependent on the quality of the teachers. The building drawing teachers in Colleges of Education in South-South and South-East Nigeria appear to be ineffective in facilitating technical education students' skills acquisition especially, in building drawing. This prompted the need for identifying the competencies considered necessary by the teachers for effective performance.

It was therefore concluded that technical education teachers who are teaching building drawing in Colleges of Education generally possess a measure of competencies in the use of drafting tools and materials, preparation of title block, general arrangement of drawings on papers, ability to produce free hand sketches of building plans, make visual notes in the form of sketch text, ability to label all spaces as required in working drawing and open the CAD

progamme hence, little additional training is required in these areas. However, it was observed that the teachers' intermediate knowledge in most competency areas as rated will dictate a greater level of training in order to improve their proficiency. Also, the poor experience and low skills as rated by the teachers in their usage of AutoCAD will require urgent training in CAD to facilitate effective teaching of building drawing in Colleges of Education in South-South and South-East Nigeria.

Recommendation

Based on the findings of this study, the following recommendations are made:

1. Functional and conducive learning environment (well-equipped studio) with modern drawing facilities such as CAD work stations and instructional materials should be made available for teaching and learning building drawing in Colleges of Education as they stimulate learning and arouse students' interest and develop a good attitude toward the course and career in building technology.
2. The Federal and State government should assist institutions of learning by providing funds to obtaining the teaching and learning facilities for the implementation of the building drawing course curriculum.
5. Computer Aided Design CAD software training courses should be organized for building drawing teachers in Colleges of Education in South-South and South-East Nigeria as this will improve their experiences and enable them become more versatile and acquainted with CADD software for effective teaching of building drawing.

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