



An Evaluation of Built Environment Students' Training in Building Maintenance (A Case Study of Federal Polytechnics in Osun State, Nigeria)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aims: This study is aimed at evaluating the training acquired by built environment students in maintenance courses to determine areas of training inadequacy and improvements. This is achieved by identifying of learning outcomes in maintenance courses acquired by built environment students, accessing the level of competence in training maintenance courses, and the barriers to the competence in the training maintenance courses.

Study Design: The study adopted a quantitative analysis technique, relative important index (RII) was used to analyze the data collected. In other to determine the reliability of the data collected, the study sought information on the learning outcome of students in maintenance specifically, student competence area in the training of maintenance, and the barrier to student competence in the maintenance training.

Place and Duration of Study: Data is collected through well-structured questionnaires administered to the selected department in the built environment in Federal Polytechnic Ede. 100 questionnaires were administered, while 90 were duly completed and returned for analysis.

Data Analysis: The data was analyzed using Statistical Software for Social Sciences (SPSS) and an excel statistical package for prediction.

Results: The observed that built environment students are not sufficiently trained in some topics in

the Building maintenance courses. Also, students are not competent in the ability to prepare documents for work alteration, maintenance of high rise building and estate roads. The major barriers to the competence of students in building maintenance are lack practical in maintenance, the lack of student's interest in the course, lack of conducive environment and limited time for learning.

Conclusion: The study concluded that Built environment Students did not receive adequate training in building maintenance courses and recommended that sufficient time should be allocated to carryout practical works in building maintenance and the adoption of training methods to enhance the learning and competency of students in carrying out maintenance work.

Keywords: Building maintenance; built environment students; competences; learning outcomes; training; polytechnic.

1. INTRODUCTION

The quality of teaching and learning at the institutions of higher education is one of the things to be considered by students when entering college since the quality of teaching and learning happens to be one of the instruments influencing students' satisfaction [1]. The components of the quality of teaching and learning encompass the entire aspects involved in implementing teaching and learning to accomplish teaching objectives [2]. One of the measurement indicators of quality teaching and learning is the ability to achieve the instructional goals successfully [3]. The achievement of objectives is the primary indicator of the quality of teaching and learning and students' satisfaction since satisfaction is the effect of participation in teaching and learning [4]. With the widespread of interest in polytechnics education in the developed and developing countries as seen in Nigeria. Therefore, the training in Polytechnic must ensure students are both competent theoretical and practical training in order to be useful in workplace and for national development. For the construction industry, the training in polytechnic is meant to produce work-ready graduates to fit into the various aspect that covers the construction processes up to maintenance of the structures. The training of built environment students in polytechnic comprises several courses; one of these is the training in Building maintenance. Building maintenance is referred to as activities carried out on a continuous basis in order to maintain the building to be safe and be in the best form for daily usage [5]. The building maintenance technology training is intended to benefit the construction industry by raising the technical knowledge of the participants. This maintenance training is meant for every student in built environments such as architecture, building, and quantity surveys. The importance of the training

in maintenance is for all the students to understand the concept of all building and how they can be maintained to fulfil the purpose which it was constructed for. [6] reported that building maintenance practice have been constantly treated poorly and less understood in the construction industry and building owners. This is manifested in the lack of understanding in its scope and significance by various parties in the construction process. The existence of various maintenance issues in buildings has prompted interest in the researches relating to building maintenance by of several researchers to promote its awareness.

One of the ways to promote the awareness of building maintenance practice is by evaluating the training of building maintenance courses among students who will eventually practice it in the construction industry. This vital because the quality of training acquired by students will in turn affect their performance in the construction industry [7]. Also, the essence of course evaluation is to improve the efficiency of course delivery by offering timely feedback to the course lecturers/instructors.

Motivated by the dearth in the study in the evaluation of Building maintenance training in tertiary institutions in Nigeria, this is study aimed at evaluating the training acquired by built environment students in maintenance courses to determine areas of training inadequacy and improvements.

The objectives of the study are as follows:

- ❖ To identify the learning outcomes in Building maintenance course acquired by built environment students.
- ❖ To access the level of competence acquired from the training in Building maintenance courses

- ❖ To identify barriers to the competence of students in the training in Building maintenance courses.

2. METHODOLOGY

This study adopted a quantitative research approach. Data were collected through well-structured questionnaires administered to the selected departments within the built environment of the Federal Polytechnic Ede, Osun State, Nigeria. Foremost, a well-structured questionnaire was designed. The questionnaire was designed to have four sections; the first few questions gathered information about general demographics: age, gender, department, and level. The second section focused on “the topics that have been taught in maintenance by selecting Yes/No and included topics related to several learning aspects in maintenance: understanding, method, and process, involved in maintenance. The third gather information on the extent to which the student is competent in the maintenance training, whether the course encouraged participation and interaction, enhanced motivation and academic performance, and improved skills. With a probability random sampling technique, a survey 100 questionnaires were administered to students of building technology, architecture, quantity surveying, and estate management who were actively involved in training on maintenance courses, 92 survey questionnaires were duly completed and returned, after careful sorting, 90 questionnaires were cleared for analysis for this study and the results were analyzed. Consistently with [8], course assessment was utilized as the first step to examine the current student performance and investigate the problems. This step of the investigation is important, as the assessment has been regarded as the most critical influence on what and how well students learn [9]. Based on the data collected, the study elicits information from respondents to assess the topic taught in maintenance training, the learning outcome in the topics in maintenance course, and identified barriers to the training in building maintenance. Frequency, percentages and the relative important index (RII) method were used to analyze the data gathered the data gathered. The formula for calculating Relative Importance Index (RII) is given as:

$$\frac{\sum w}{AN} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5N} \times 100$$

Where w is the weighting given to each factor by the respondent, ranging from 1 to 5, n_1 = number of respondent who answered “very competence/strongly agree”, n_2 = number of respondent who answered “competence/agree” n_3 = number of respondent who answered “moderately competence/neutral”, n_4 = number of respondent who answered “less competence/disagree”, n_5 = number of respondent who answered, “Not competence/strongly disagree” [10,11].

3. FINDINGS AND RESULTS

In this section, data collected from respondent with the use of questionnaire were analyzed, presented, and discussed, and conclusions were drawn from the analyses. The result and discussion attained from the analysis was focused on the three objectives; to identify the learning outcomes in maintenance courses acquired by built environment students, to access the level of competence in training in maintenance courses, and to identify barriers to the competence in the training in maintenance courses.

3.1 Presentation and Analysis of Data

An online questionnaire was created using a google form, and the link was sent to (100) respondent; meanwhile, only ninety (90) respondents filled and submitted the questionnaire, representing a response rate of 90%. This was considering the assertion that the result of a survey would be considered biased and has little value if the return rate were lower than 40%.

The result of the analysis carried out for this research were presented in Table 1 to table 4 below. Table 1 shows the background information of the respondents, Table 2 present information about the learning outcomes acquired in maintenance courses by built environment students, Table 3 gives information about the level of competence from the training in maintenance courses and Table 4 shows the barriers to the competence in the training in maintenance courses.

Table 1 above shows that the Male respondent has the highest with 73.3% of participants with 66 Respondents, while the Female respondent has 24 Respondent with 26.7% of participant, while Fig. 1 shows the graphical performance of

the Gender Respondent. The Respondent from age 20-30 years has the highest number with a percentage of 82.2% with 83 Respondents, the respondent below 20 years have 9 Respondents with 10% of the participant, the respondent above 30 years have 7 Respondents with 7.8% of the participant. The level of the Respondent shows that HND 2 has the highest with 45.6% of participant with 41 Respondents, ND 2 has 31 Respondent with 34.4% of the participant, and HND1 has 18 Respondent with 20% of the participant. The department of the Respondent shows that Building Technology has the highest Department of the respondent which is 47.8% of the participant with 43 Respondents, Architectural has 20 Respondent with 22.2% of a participant, Estate management has 15 Respondent with 13.3% of participant. while Quantity surveyor has 12 Respondent with 13.3% of the participant.

3.2 Learning Outcomes Acquired in Maintenance Courses by Built Environment Students

Table 2 shows the learning outcomes acquired by students in Building maintenance courses. The findings shows that the respondents have been taught the meaning of the terms used in maintenance and repairs and related facilities in maintenance with 96.7% of participant (87 Respondents) said Yes, while those that said No has 3 Respondent with 3.3% of participant, shows that Respondent have been taught Types of defects which affect building and it component and their remedies in maintenance with 97.8% of participant (88 Respondents) said Yes, while those that said No has 2 Respondent with 2.2% of participant, shows that Respondent have been taught Processes for Carrying out Maintenance Work in Buildings and Infrastructural Facilities in maintenance with 92.2% of participant (83 Respondents) said Yes, while those that said No has 7 Respondent with 7.8% of participant, shows that Respondent have been taught Nature of Deterioration in Common Building Materials and Components that are caused by External and Internal Agents with 92.2% of participant (83 Respondents) said Yes, while those that said No has 7 Respondent with 7.8% of participant, shows that Respondent have been taught Types and Causes of Failures in Building and in Infrastructural Facilities in maintenance with 90% of participant (81 Respondents) said Yes, while those that said No has 9 Respondent with 10% of participant, shows that Respondent have been

taught Maintenance Problems Associated with High rise Buildings, Industrial Buildings and Their specialist work with 80% of participant (72 Respondents) said Yes, while those that said No has 18 Respondent with 20% of participant, shows that Respondent have been taught Maintenance Problems Associated with Estate Roads and Infrastructural Works with 77.8% of participant (70 Respondents) said Yes, while those that said No has 20 Respondent with 22.2% of participant, shows that Respondent have Conduct Practical to improve understanding of Theoretical Component OF Maintenance with 68.9% of participant (62 Respondents) said Yes, while those that said No has 28 Respondent with 31.1% of participant, shows that Respondent have been taught Importance of Planned, Preventive and Organized Maintenance and Improvement Projects in maintenance with 76.7% of participant (69 Respondents) said Yes, while those that said No has 21 Respondent with 23.3% of participant, shows that Respondent have been taught Planning and Preparation of contract Documents and Programme for Maintenance and Improvements Works with 72.2% of participant (65 Respondents) said Yes, while those that said No has 25 Respondent with 27.8% of participant, while Fig. 5 show the graphical performance of the Learning Outcomes by Built Environment Students.

3.3 Competence Acquired from the Training in Building Maintenance Courses

The perception of the respondents on the competence acquired from the training in maintenance courses in the learning outcome in Table 3 established that Ability to identify defect and their causes in the building was ranked first position [1st] with RII of 0.851111, Ability to identify methods used for maintenance was ranked second position [2nd] with RII of 0.793333. Ability to carry out maintenance work of defective building was ranked third position [3rd] with RII of 0.784444, Understand and interpret building maintenance manual and work Programme for maintenance was ranked fourth position [4th] with RII of 0.751111, Ability to carry out renovation work from start to finish was ranked fifth position [5th] with RII of 0.735556, Ability to prepare Schedule of Dilapidation for maintenance was ranked sixth position [6th] with RII of 0.717778, Ability to prepare cost for maintenance work was ranked seventh position [7th] with RII of 0.713333, Ability

to carry out maintenance of problem associated with Estate Road and Infrastructural work was ranked eight position [8th] with RII of 0.695556, Ability to carry out maintenance of problem associated with High rise building, Industrial buildings and their specialist work was ranked ninth position [9th] with RII of 0.662222.

Table 1. Background information

S/N	Information		Frequency	Percentage of Participant
Gender				
1	Gender of the Respondent	Male	66	73.3%
		Female	24	26.7%
Age group				
2	Age of the Respondent	Below 20years	9	10%
		20-30years	74	82.2%
		30years above	7	7.8%
Level				
3	Level of the Respondent	ND2	31	34.4%
		HND1	18	20%
		HND2	41	45.6%
Department				
4	Department of the Respondent	Building	43	47.8%
		Technology		
		Architectural	20	22.2%
		Quantity survey	12	13.3%
		Estate management	15	16.7%

Source: Field Survey (2021)

Table 2. Learning outcomes acquired in maintenance courses by built environment students

S/N	Learning Outcomes	Frequency		Percentage	
		Yes	No	Yes	No
1	Meaning of the terms used in maintenance and repairs and related facilities	87	3	96.7%	3.3 %
2	Types of defects which affect building and it component and their remedies	88	2	97.8%	2.2%
3	Processes for Carrying out Maintenance Work in Buildings and Infrastructural Facilities	83	7	92.2%	7.8%
4	Nature of Deterioration in Common Building Materials and Components that are caused by External and Internal Agents.	83	7	92.2%	7.8%
5	Types and Causes of Failures in Building and in Infrastructural Facilities.	81	10	90%	9%
6	Maintenance Problems Associated with High rise Buildings, Industrial Buildings and Their specialist work.	72	18	80%	20%
7	Maintenance Problems Associated with Estate Roads and Infrastructural Works	70	20	77.8%	22.2%
8	Conduct Practicals to improve understanding of Theoretical Component of Maintenance	62	28	68.9%	31.1%
9	Importance of Planned, Preventive and Organized Maintenance and Improvement Projects	69	21	76.7%	23.3%
10	Planning and Preparation of contract Documents and Programme for Maintenance and Improvements Works.	65	25	72.2%	27.8%

Source: Field Survey (2021)

Table 3. Competence Acquired from the training in Building maintenance courses

S/N	Variables	5	4	3	2	1	RII	RANK
1	Ability to identify defect and their causes in building	42	36	8	1	3	0.851111	1
2	Ability to carry out maintenance work of defective building	32	34	15	3	6	0.784444	3
3	Ability to identify methods used for maintenance.	32	38	10	5	5	0.793333	2
4	Ability to prepare Schedule of Dilapidation for maintenance	24	28	22	9	7	0.717778	6
5	Understand and interpret building maintenance manual and work programme for maintenance.	28	31	17	9	5	0.751111	4
6	Ability to prepare document for work alteration.	15	29	23	12	11	0.655556	10
7	Ability to carry out renovation work from start to finish	27	28	23	3	9	0.735556	5
8	Ability to prepare cost for maintenance work	23	31	17	12	7	0.713333	7
9	Ability to carry out maintenance of problem associated with Estate Road and Infrastructural work	20	34	16	9	11	0.695556	8
10	Ability to carry out maintenance of problem associated with High rise building, Industrial buildings, and their specialist work.	19	33	16	9	13	0.662222	9

Source: Field Survey (2021)

Table 4. Barriers to the competence in the training in maintenance courses

S/N	Variables	5	4	3	2	1	RII	RANK
1	Lack of practical in maintenance	39	40	8	2	1	0.853333	1
2	Lecturer Competence	22	30	16	15	7	0.700000	7
3	Lack of tools and equipment for practical	21	35	19	11	4	0.728889	6
4	Lack of student interest in the course	31	42	10	3	4	0.806667	2
5	Limited time for learning	25	33	21	7	4	0.751111	4
6	Lack of interactive learning	4	21	18	30	17	0.522222	9
7	Relationship between student and lecturer	15	43	9	16	7	0.695556	8
8	Lack of conducive learning environment	26	39	16	5	4	0.773333	3
9	Students commitment to learning	23	39	14	9	5	0.746667	5
10	Frustration	21	28	22	13	6	0.700000	7

Source: Field Survey (2021)

3.4 Barriers to the Competence in the Training in Building Maintenance Courses

The perception of the respondent on the barriers to the competence in the training in maintenance courses in Table 4 established that Lack of practical in maintenance was ranked first position [1st] with RII of 0.853333, and Student interest in the course was ranked the second position [2nd] with RII of 0.806667. Lack of conducive learning environment was ranked third position [3rd] with RII of 0.773333, Limited time for learning was

ranked fourth position [4th] with RII of 0.751111, Students commitment to learning was ranked the fifth position [5th] with RII of 0.746667, Lack of tools and equipment for practical was ranked sixth position [6th] with RII of 0.728889, Lecturer Competence and Frustration was ranked the seventh position [7th] with RII of 0.700000, Lack of conducive learning environment was ranked eight position [8th] with RII of 0.695556, Ability to carry out maintenance of problem associated with High rise building, Lack of interactive learning was ranked ninth position [9th] with RII of 0.522222.

4. DISCUSSION

It is mandatory for built environment students directly involved in the construction processes and its deposer to be taught building maintenance courses before the completion of their training in polytechnic. They are expected to be taught the meaning, terms used in building maintenance, as well as identification of defects in building and also competent carrying out maintenance work in defected buildings. The study by [12] acknowledged that the learning, understanding and the ability to identify and detect defects in buildings as well as their causes is one of the most important pre-requisite in minimizing and preventing defects in building. The findings on the expected learning outcomes acquired by students in building maintenance also align with the study of [13] that the knowledge of the causes of defects in buildings is the first step to resolving any defects in building. As identified in the study not achieving the expected learning outcome will hamper the competence of students in the practice of maintenance of buildings. In consistent with the study of [14,15] the inadequate training and understanding of preparing relevant documents for maintenance works as resulted into limited competent professionals in carryout out maintenance especially in high rise buildings. It is acknowledged that the maintenance of high rise building is difficult as compared to low level buildings, it is therefore important that students are adequately trained in this areas in order to produce professionals to handle the maintenance of this type of buildings. Furthermore, The major barriers to the competence of built environment students in building maintenance training is in consistent with the studies of [16,17,18,19] on the problems facing the teaching and learning generally in tertiary institutions in Nigeria. The lack of practical training in tertiary institutions are as a result of inadequate equipment and underfunding to provide conducive learning environment for staff and students. Also, students are no longer interested in learning as a resulting poor learning environment and obsolete equipment [18]. In line with the barriers to the competence of built environment students in building maintenance, [19] study agreed that incessant industrial action by tertiary institution has limited the time for learning and in most the expected learning outcomes are not achieved resulting to producing half-baked and incompetent graduates for the workplace.

5. CONCLUSION

The study was carried out to assess built environment students' training in building maintenance courses among National diploma (ND) and Higher national diploma (HND) students. From their learning outcomes the student agrees to have been taught the major topics in building maintenance but practical were not conducted to improve their learning in the course. Also, students possess some important competence from the training in building maintenance, however, the students is not competent in ability to prepare a document for work alteration, ability to carry out maintenance of problem associated with high rise building, industrial buildings, specialist work, estate road, and infrastructural work. In addition, lack of practical in maintenance, student interest in the course, lack of conducive learning environment, and limited time for learning were observed to be the most factors affecting the competency of students in the training of maintenance course. The study therefore recommends that sufficient time should be allocated in carryout practical building maintenance courses and the adoption of training of methods that will stimulate the interest of students in the course. Future work may be carried out in the assessment of the training in other courses in the built environment as well as its effects on the performance of students in construction industry.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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