Original Research Article

AN EVALUATION OF BUILT ENVIRONMENT STUDENTS' TRAINING IN BUILDING MAINTENANCE (A case study of federal polytechnics in Ogun State, Nigeria)

Abstract

Aims: This study is aimed at evaluating the training acquired by built environment students in maintenance courses, including training inadequacy and improvements, identification 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 the student competence in the maintenance training.

Place and Duration of Study: Data is collected through the use of well-structured questionnaires administered to the selected department in the built environment in Federal Polytechnic Ilaro. 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: It is now observed that students of the National Diploma (ND) agree to have not been taught the topics in the training of maintenance. Also, students are not competent in the ability to prepare documents for work alteration and lack practical maintenance. Finally, the student's interest in the course was the most factor affecting the students competency in the training maintenance course.

Conclusion: The study shows that Male respondent has the highest with 73.3% of participant with 66 Respondents, 26.7% of the participant, the Respondent from age 20-30 years has the highest number with the percentage of 82.2% with 83 Respondents, The level of the Respondent shows that HND 2 has the highest with 45.6% of participant with 41 Respondents, and 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.

Keywords: Building maintenance, built environment, data collection, excel package, questionnaires.

1. INTRODUCTION

The polytechnic training of built environment students comprises several courses, one of these is the training in the maintenance of buildings. 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 fulfill the purpose which it was constructed for. 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 the implementation of teaching and learning in the effort of accomplishing 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 as well as students' satisfaction, since satisfaction is the effect produced by participation in teaching and learning (4). It is clear in this day and age that there is widespread interest in polytechnics in both the so-called developed and developing countries. This is exemplified very clearly by the rapid growth of polytechnics in Nigeria. The knowledge of polytechnic bases of the modern, intensively developing production not only will help the youth to quickly master this or that specialty but will also make it professionally demanded and mobile. Polytechnic education implies the students' theoretical and practical familiarization with the main modern production principles, underlying the nature and social development laws; the formation of students' labor skills and abilities acts as a fundament for future professional training. 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 such structures. According to (5), the building maintenance technology training is intended to “benefit the construction industry by raising the technical knowledge of the participants.” This training in maintenance is meant for every student in built environment such as architecture, building, and quantity surveys.

The recent studies in this area include immersive virtual and physical built environment (5), innovating sustainability education in the built environment (6), toward a resource-efficient built environment (7), a neighborhood built environment that influences physical activity among adults (8), Blockchain in the built environment and construction industry (9), virtual reality applications for the built environment (10), an appraisal of generic skills for Nigerian built environment professionals in the workplace (11), building information modeling as an effective process for the sustainable re-shaping of the built environment (12), building information modeling-embedded in built environment and society (13), transcending disciplines in architecture, structural and building services engineering (14). The purpose of this paper is to review students' competency in service quality in the institution on learning of maintenance courses to optimize communication so that improvements can be done by related parties to make a change in all aspects of training maintenance in higher education institutions. Hence, this study will help to evaluate the maintenance training, identify areas of learning adequacy, and improve the teaching of maintenance in learning institutions. In a null shell it will help in improving the performance of student in higher institutions in Nigeria through massive improvement in the quality services of the institution to satisfy the student by meeting their ever-changing demands.

Motivated by the above studies, we establish and assessment of built environment student training in built maintenance (a case study of Ilaro polytechnics in Ogun State, Nigeria).
The remaining sections are organized as follows: Methodology in data analysis in section 2. Findings and results are given in section 3. Discussion is given in section 4. Finally, the work is concluded in section 5.

2. METHODOLOGY

This study adopted a quantitative research approach. Data were collected through the use of well-structured questionnaires administered to the selected departments within the built environment of the Federal Polytechnic Ilaro, Ogun State Nigeria. Foremost, a review of literature was conducted to extract relevant variables for the study. Following this, 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 on the trainings in maintenance, 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 analysed. Consistently with (15), 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 (16). 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. SPSS excel package was also used for statistical analysis where necessary, which involved a combined use of the methods of univariate and bivariate analysis (17). Three measures of central tendency, i.e., the mean, median and mode, and standard deviation for dispersion were used to avoid unexpected effect on results of extreme scores. For bivariate analysis, according to the nature of the variables studied, the measure Pearson's r and Spearman's rho (17) were used for representing correlations between variables. Spearman's rho (17) were used for representing correlations between variables. Relative important index (RII) method was used to analyze the data gathered the data gathered. The formula for calculating RII.

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

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"(19).

3. FINDINGS AND RESULTS

In this section, data collected from respondent with the use of questionnaire were analyzed, present and discussed and conclusions was 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 course acquired by built environment students, to access the level of competence in training in maintenance courses, 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 google form, 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 of that the result of a survey world be considered as biased and 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. 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 Technology	43	47.8%
		Architectural	20	22.2%
		Quantity survey	12	13.3%
		Estate management	15	16.7%

Source: Field Survey (2021)

From **Table 1** above, shows that Male respondent has the highest with 73.3% of participant with 66 Respondents, while Female respondent has 24 Respondent with 26.7% of participant, while **Figure 1** shows the graphical performance of the Gender Respondent. The Respondent from age 20-30 years has the highest number with the 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, while **Figure 2** show the graphical performance of the Age of the Respondent. 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, while **Figure 3** show the graphical performance of the Level of the Respondent. 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 participant, Estate management has 15 Respondent with 13.3% of participant. while Quantity surveyor has 12 Respondent with 13.3% of the participant, while **Figure 4** show the graphical performance of the Department of the Respondent.

Figure 1. Gender of the respondent.

Figure 2. Age of the respondent.

Figure 3: Level of the respondent.

Figure 4. Department of the Respondent.

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	81	10	90%	9%

	Infrastructural Facilities.				
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)

Figure 5. Learning outcomes by built environment students.

From **Table 2** above, shows that Respondent 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 **Figure 5** show the graphical performance of the Learning Outcomes by Built Environment Students.

Table 3. Level of competence from the training in 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	0.68	9

Source: Field Survey (2021)

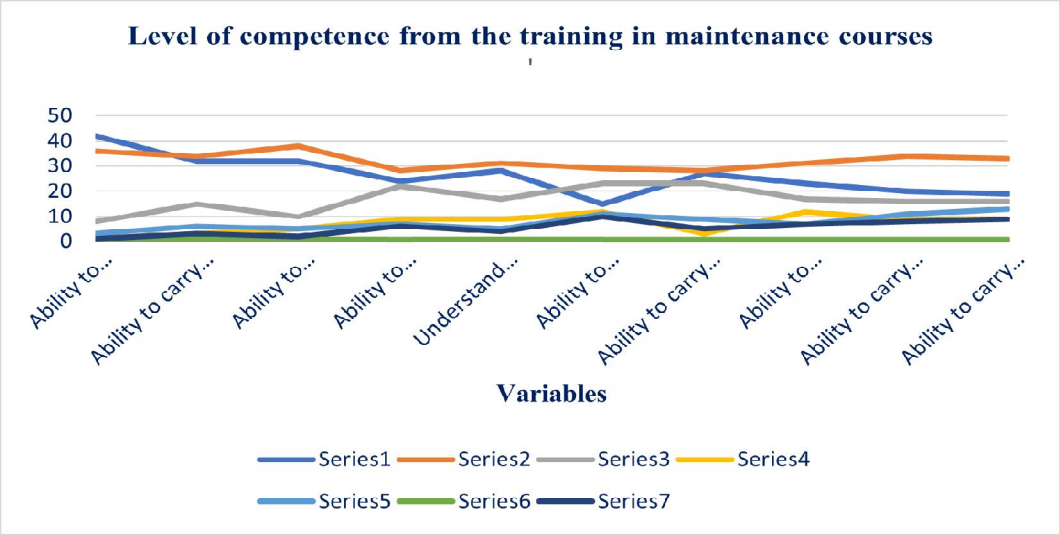

Figure 6. Level of competence from the training in maintenance courses.

The perception of the respondent on level of competence from the training in maintenance courses in the learning outcome in **Table 3** established that Ability to identify defect and their causes in 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 0.685, while **Figure 6** show the graphical performance of the Level of Competence from the Training in Maintenance Courses

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	1st
2	Lecturer Competence	22	30	16	15	7	0.7	7tn
3	Lack of tools and equipment for practical	21	35	19	11	4	0.728889	6tn
4	Student interest in the course	31	42	10	3	4	0.806667	2nd
5	Limited time for learning	25	33	21	7	4	0.751111	4tn
6	Lack of interactive learning	4	21	18	30	17	0.522222	9tn
7	Relationship between student and lecturer	15	43	9	16	7	0.695556	8tn
8	Lack of conducive learning environment	26	39	16	5	4	0.773333	3rd

9	Students commitment to learning	23	39	14	9	5	0.746667	5tn
10	Frustration	21	28	22	13	6	0.7	7tn

Source: Field Survey (2021)

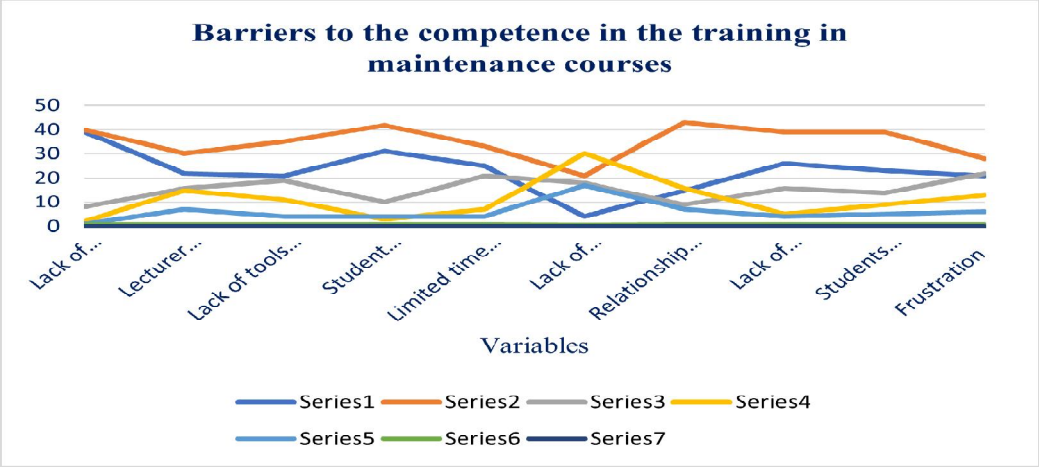

Figure 7. Barriers to the competence in the training in maintenance courses.

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, Student interest in the course was ranked 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 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 seventh position [7th] with RII of 0.700, 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, while **Figure 7** show the graphical representation barriers to the competence in the training in maintenance courses.

4. Discussion

In other to determine the reliability of the data collected, the study sought information on the learning outcome of student in the training of maintenance, student competence area in the training of maintenance and the barrier to the student competence in the training in maintenance from student in building technology, architecture, estate management and quantity surveyor department in ND2, HND1 and HND2 point of view. The result revealed that: Respondents agree to have been taught the all the topics in building maintenance courses**.** Respondents are competent in the ability to identify defect and their causes in building, the ability to identify methods used for maintenance, and the ability to carry out maintenance work of defective building. While they are less competence in the ability to prepare cost for maintenance work, the ability to carry out maintenance of problem associated with estate road and infrastructural work and the

ability to carry out maintenance of problem associated with high rise building, industrial buildings, and their specialist work. The main barriers affecting student competence are lack of practical in maintenance, student interest in the course, and lack of conducive learning environment.

5. Conclusion

The study was carried out to assess student training in building maintenance environment in national diploma (ND) and higher national diploma (HND) for their level of experience after the student training in building maintenance**.** From the view of the training, the students in ND have basic knowledge in maintenance training which limit their competence area in the training, while the HND student agree to have been taught the topic in training of maintenance. Also, ability to identify defect and their causes in building is observed to be the most competent area in the training of maintenance, while student is not competent in ability to prepare document for work alteration, ability to carry out maintenance of problem associated with high rise building, industrial buildings, and their specialist work and ability to carry out maintenance of problem associated with 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 most factor affecting the competency of student in the training of maintenance course. We recommend more practical be done on maintenance, especially maintenance relating high rise building, industrialize building and estate road, and infrastructural work. Future work should focus on other sectors including institution, colleges, technical school, and more.

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