Drainage Maintenance Skills Required For Integration To Building Technology Programme Of Colleges Of Education In Lagos State, Nigeria

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Abstract: *This study was motivated by a great concern about the state of drainage system in Lagos State. Building Technology education programme is the part of education which is meant for the practical and applied skills as well as basic scientific knowledge in the design and construction of buildings. This study was carried out to determine drainage maintenance skills required for integration to Building Technology Programme of Colleges of Education in Lagos State. A descriptive survey design was used for the study. The population for the study comprised of 35 Lecturers from Adeniran Ogunsanya College of Education, Federal College of Education (technical), Yaba College of Technology and University of Lagos and 50 Supervisors of Construction Industries in Julius Berger, Cappa der Berto and Chinese Integrated Company in Lagos State. The instrument used for data collection was structured questionnaire. Three research questions and two hypotheses were formulated. Mean and standard deviation were used to analyse the data for answering research questions while Cronbach alpha reliability was used to test the hypotheses of no significant difference at 0.05 level of significance. The study found that maintenance skills in culvert, stream channel and appurtenance are required for integration to building technology programme of colleges of education in Lagos State. Based on this finding, it was recommended that curriculum researchers and course developers should integrate and develop a course that will meet the need of students of building technology in colleges of education. The government should make funds available for the integration of maintenance skills to be effective. This will equip the graduates of building technology with more skills for better performance on the field of work.*
Keywords: *Building Technology, Culvert, Drainage, Maintenance, Stream Channel and appurtenance*

I. Introduction

In the 21st century, many nations are striving to develop their economy vis a vis technological development. The process of development is changing through globalization hence, it is becoming clear that Nigeria needs to ensure that her education sector is qualitative and practically oriented so that she can participate fully in this global change. This can be achieved through the effectiveness and efficiency put into technology education and training programme. Without these it will be difficult for Nigeria as a nation to compete with her counterparts in the world of technology. One of the areas that need such attention is the curriculum of technology programme of colleges of education. Okoro [1] defined colleges of education as post- secondary school institutions whose major purpose is the production of teachers with different career choices. Colleges of education are post-secondary institutions saddled with the responsibility to train and produce quality teachers with the award of Nigeria Certificate in Education (NCE) in various areas of study. According to the Federal Government of Nigeria [2], Colleges of Education are institutions that engage in training teachers who are able to interpret and communicate the curriculum to learners. One of the national aims and objectives of education at this level is to educate students to acquire appropriate skills, abilities and competences both mental and physical as equipment for the individual to live in and contribute to the development of the society he/she lives in.

The transformation of any nation through technology advancement depends on the quality of her technology education and training. This is subject primarily on the availability of human and material resources relevant for teaching and learning activities in each area. One of such areas is the teaching and learning of skills in drainage maintenance in building technology. Building Technology education programme is the part of education which provides acquisition of practical and applied skills as well as basic scientific knowledge in the design and construction of buildings. This entails the theoretical vocational preparation of students for jobs involving applied science and modern technology in building construction and maintenance of building fabrics

and facilities. One of the building facilities that need adequate maintenance attention especially in Lagos State is the drainage system. Drainage is the system by which water or waste liquids flow away from a location into the ground or down pipes [3]. Drainage is also the ability of soil to allow water to flow away. Drainage as defined in a road and drainage maintenance report [4] is the removal of excess water and salt from the soil at a rate which permit normal plant growth. It is the amount of drainage necessary for successful maintenance and perpetuation of agriculture. Drainage can either be natural or artificial. A natural drainage system can be properly maintained at low costs and is a feasible method of protecting lands from excessive percolation. Artificial drainage also aims at lowering the water table and is accomplished by constructing open ditch drains, subsurface drains and drainage wells. Seeley [5] explained that drainage systems must be designed to provide an efficient and economical method of carrying away waterborne waste, in such a way as to avoid the risk of pipe blockage and the escape of effluent into the ground.

Maintenance is a set of activities carried out on an object(s) in order to improve its performance and to elongate its self-life. Maintenance according to Bakare [6] is any activity such as tests, measurement, replacements, adjustment and repairs intended to restore or retain a functional unit in or to a specified state in which the unit can perform its required functions. Maintenance is described as the steps utilization of structures for optimal benefits, machinery or structure facility and to ensure that it attains its specific maximum functional self-life [7]. For students of building technology to be able to perform these activities, they must acquire skills in fixing drainage faults. The graduates of building technology in Lagos State need to be equipped with drainage maintenance skills to ensure the durability and sustainability of drainages in the State. A skill is the learned ability to carry out a task with pre-determined results often within a given amount of time, energy, or both [8]. It is the abilities that one possesses. Skills can often be divided into domain-general and domain-specific skills. For example, in the domain of work, some general skills include time management, teamwork and leadership, self-motivation and others, whereas domain-specific skills would be useful only for a certain job. Skill usually requires certain environmental stimuli and situations to assess the level of skill being shown and used. People need a broad range of skills in order to contribute to a modern economy. Skills are individuals' abilities or characteristics that are keys to effectiveness in work. Skill according to International Labor Organization report [9] is the ability to do something that comes from training, experience or practice. It is the ability to use one's knowledge effectively and readily in execution or performance of tasks.

Overtime, students who undertake study in building technology programme were being taught architectural and building designs. The course content for these courses covers idea generation of design concepts, blue print drawing of finished designs and functionality of the spaces designed are emphasised with aesthetics in the building elevations. Moreover, site planning and landscaping are not left out. These drawings are translated into reality through construction by the professional builders. But observing the environment, it was noticed that the building professionals are only concerned about the building structure and not the environment as the environment lack proper drainage network. Moreover, maintenance of the existing drainage is rather poor. This is due to the fact that the students who have been undertaking a course of study in building technology programme of colleges of education with respect to Lagos State have been taking lessons in building construction without being taught drainage maintenance skills or competencies. This is makes Graduates of colleges of education to be deficient in drainage maintenance skills. This is because drainage maintenance skills have not been included in the curriculum as one of the proficient skills needed to perform well in the field of building construction and maintenance.

II. Research Hypothesis

The following hypotheses will be tested at 0.05 level of significance:

HO$_1$: There is no significant difference in the mean responses of lecturers of building technology in colleges of education and supervisors in building construction industries on the maintenance skills in culvet for integration to building technology of colleges of education in Lagos state.

HO$_2$: There is no significant difference in the mean responses of lecturers of building technology in colleges of education and supervisors in building construction industries on the maintenance skills in stream channel and appurtenant for integration to building technology programme of colleges of education in Lagos state.

III. Previous Studies

2.1 BUILDING TECHNOLOGY IN COLLEGES OF TECHNOLOGY

Colleges of Education are among the institutions offering tertiary education at Nigerian Certificate in Education level(NCE) using the same National Commission for Colleges of Education (NCCE) minimum standard as curriculum for the programme. According to the Federal Government of Nigeria [10], Colleges of Education are institutions that engage in training teachers who are able to interpret and communicate the curriculum to learners. Okoro [11] defined colleges of education as post- secondary school institutions whose major purpose is the production of teachers with different career choices. Various courses of study are offered in

Colleges of education. One of such course of study is Building Technology. Building Technology is a technical education programme that is designed to produce technologists that will be versatile to teach skills in construction and maintenance of buildings, building fabrics and facilities. Sullivan [12] described Building Technology as the art or business of assembling materials into a structure and practical application of knowledge especially in a particular area in a manner of accomplishing a task especially using technical processes, methods, or knowledge.

2.2 MAINENANCE OF BUILDING FACILITIES

Maintenance is a deliberately planned action carried out on equipment and facilities as specified by manufacturers. It is a set of activities carried out on an object(s) in order to improve its performance and to elongate its self-life. It involves planned supplying of necessary materials and activities for the continued operation of the equipment and facility. Solomon [13] noted that no matter how good the materials that are manufactured for the construction of building fabrics and facilities are, or how efficient the supervision and inspection, mechanical plant, craftsmen and operatives, it must be realized that maintenance of building facilities commences from the day that construction terminates. Olaitan, Nwachukwu, Onyemachi, Igbo and Ekong [14] sheds more light that maintenance is taking specific approved steps and precautions to care for a piece of equipment, machinery or facility and ensure that it attains its specific maximum functional self- life. Obiagb [15] is of the view that maintenance is the measure, activity, process, operation or service which is effected on structures for sustaining and deriving their full functions and values in service. While Bakare [16] differ saying that any activity such as tests, measurement, replacements, adjustment and repairs intended to restore or retain a functional unit in or to a specified state in which the unit can perform its required functions. Ogunyemi [17] noted that maintenance means keeping things in function, which should be carried out as the case may be in order to keep the structure in good operating condition. All the writers all agree that maintenance is not about detection of damage but a mechanism put in place to maintain the initial state of a particular construction.

Research Methodology

2.3 AREA OF STUDY

The study was carried out in Lagos State because Lagos State is presently experiencing environmental drainage problems as a mega city. The research work will enhance the acquisition of skills which are needed to correct the drainage system to foster a conducive environment.

2.4 POPULATION OF STUDY

The population for the study is 80 and comprises of lecturers from Adeniran Ogunsanya College of Education, Federal College of Education (technical), Yaba College of Technology and University of Lagos and supervisors of construction industries in Julius Berger, Cappa der Berto and Chinese Construction Integrated Company (CCCIC).

2.5 SAMPLING AND SAMPLING TECHNIQUES

The sample size for the study is 30 lecturers and 50 supervisors. All the Lecturers were involved because of their limited number. Purposive sampling technique was used to select supervisors from registered construction Companies in Lagos State.

2.6 RELIABILITY OF INSTRUCMENTS

The reliability coefficient of the instrument was determined by using Cronbach alpha reliability method. Copies of the structured questionnaire were administered on 10 Lecturers of Building Technology in tertiary institutions and 10 Supervisors in the Construction Industry in Ogun State and statistical package for social sciences (SPSS version 20) was used in computing the overall reliability coefficient and 0.82 was obtained.

2.7 METHOD OF DATA ANALYSIS

Mean and standard deviation were employed to answer the research questions. Null hypotheses were tested using t-test. Decision on research questions, any item with the mean value of 3.50 or above was considered as required, while any item with the mean value less than 3.50 was considered as not required. Decision on hypothesis testing, the null hypothesis of no significant difference was accepted for any item whose P- value was greater than 0.05, but it was rejected for any item whose P-value was less than 0.05.

IV. Discussion Of Findings

Research Question 1

What are the maintenance skills in culvert required for integration to building technology programme of Colleges of Education in Lagos State?

Data for answering Research question 1 are presented in Table 1.

Data presented in Table 1 on research question 1 reveal that fifteen (15) maintenance skills in culvert had their means ranged from 3.62 to 4.43. Each mean is above the cut-off point of 3.50 indicating that fifteen

maintenance skills in culvert are required for integration to Building Technology programme of Colleges of Education in Lagos State. The standard deviation values for the fifteen maintenance skills in catch basin range from 0.74 to 1.10 and were less than 1.96 that is 95% confidence limit. This shows that the respondents were not far from one another in their responses and that their responses were not far from the mean.

Table 1: Mean response of Lecturers and Supervisors on maintenance skills in Culvert for integration to Building Technology programme of Colleges of Education in Lagos State

S/N	Maintenance Skills in Culvert	Mean	SD	Remark
1.	Identify appropriate materials for the maintenance of Culvert	3.64	0.93	Required
2.	Select relevant tools culvert maintenance	3.73	0.89	Required
3.	Observe safety measures when maintaining culverts	3.80	0.88	Required
4.	Inspect the culvert barrel for trees or vegetation roots	4.12	**0.91**	Required
5.	Remove accumulated debris from culvert	3.62	0.97	Required
6.	Remove trees or vegetation roots	3.62	0.75	Required
7.	Examine the inlet and outlet part of the culvert	3.72	0.74	Required
8.	Use appropriate tools to remove sand deposited in the culvert	4.00	0.91	Required
9.	Mend the cracks in the culvert	3.96	1.08	Required
10.	Guide the reconstructed culvert during curing period	4.43	0.81	Required
11	Inspect for change of abrasion of damage or deterioration	4.31	0.74	Required
12.	Upgrade the culvert when situation demands	3.72	0.80	Required
13.	Reconstruct the culvert when it is totally bad	3.95	1.15	Required
14.	Identify cracked culvert on the road using appropriate technology	3.90	0.86	Required
15.	Select non corrosive materials for culvert construction	3.79	1.10	Required

Research Question 2

What are the maintenance skills in stream channel and appurtenance required for integration to building technology programme of Colleges of Education in Lagos State?

Data for answering Research question 2 are presented in Table 2.

Data presented in Table 2 on Research question 4 reveal that fifteen (15) maintenance skills in stream channel and appurtenance had their means ranged from 3.62 to 4.61. Each mean is above the cut-off point of 3.50 indicating that fifteen maintenance skills in stream channel and appurtenance are required for integration to Building Technology programme of Colleges of Education in Lagos State. The standard deviation values for the fifteen maintenance skills in stream channel and appurtenance range from 0.36 to 0.83 and were less than 1.96 that is 95% confidence limit. This shows that the respondents were not far from one another in their responses and that their responses were not far from the mean.

Table 2: Mean response of Lecturers and Supervisors on maintenance skills in stream channel and appurtenance for integration to Building Technology programme of Colleges of Education in Lagos State.

	Maintenance Skills in Stream channel and appurtenance	Mean	SD	Remark
1.	Select relevant tools and materials for stream channel and appurtenance maintenance	3.73	0.50	Required
2.	Observe safety practice when maintaining stream channel and appurtenance	3.70	0.70	Required
3.	Inspect stream channel	4.16	0.37	Required
4.	Identify bad pipes and channels	4.61	**0.54**	Required
5.	Remove bad and obsolete pipes from the channel	3.81	0.77	Required
6.	Remove cracked or corrosive pipes	3.64	0.65	Required
7.	Design new stream channel	4.22	0.83	Required
8.	Remove materials that lead to stream channel instability	4.61	0.49	Required
9.	Identify appropriate materials and technology for maintenance of stream channel and appurtenance	4.38	0.77	Required
10.	Select appropriate pipes to replace bad ones	3.93	0.55	Required
11	Replace bad pipes in the stream channel	3.62	0.52	Required
12.	Cut and remove grown trees in the stream channel	3.79	0.41	Required
13.	Remove sediments and debris from stream channel	3.82	0.83	Required
14.	Use long rods to through blocked channel	3.64	0.48	Required
15.	Dredge stream channel periodically	3.68	0.49	Required

Research Question 3

What is the safety skills required for drainage maintenance?

Data for answering Research question 3 are presented in Table 3.

Data presented in Table 6 on Research question 6 reveal that ten (10) safety skills required for drainage maintenance had their means ranged from 3.51 to 4.42. Each mean is above the cut-off point of 3.50 indicating that ten safety skills are required for drainage maintenance. The standard deviation values for the ten safety skills for drainage maintenance range from 0.51 to 0.84 and were less than 1.96 that is 95% confidence limit.

This shows that the respondents were not far from one another in their responses and that their responses were not far from the mean.

Table 3: Mean response of Lecturers and Supervisors on the safety skills required for drainage maintenance.

S/N	Safety Skills required for Drainage Maintenance	Mean	SD	Remark
1.	Apply appropriate tools for appropriate a given job	3.51	0.62	Required
2.	Put on necessary safety gadgets during maintenance work	3.59	0.64	Required
3.	Use standardized tools and equipment for maintenance of drainage	3.54	0.58	Required
4.	Observe safety rules as applicable to various tools and machines	3.73	0.62	Required
5.	Carry stock with optimum caution	3.85	0.68	Required
6.	Design all drainage features for safety	3.62	0.56	Required
7.	Remove all trash, debris and sediments from drainage inlet	3.71	0.82	Required
8.	Check top concrete slab of drainage systems periodically	3.62	0.72	Required
9.	Seek for assistance to lift heavy objects	3.90	0.71	Required
10.	Construct road camps on the road for periodic and routine checks	4.42	0.68	Required

TESTING OF HYPOTHESIS

Hypothesis 1

There is no significant difference in the mean responses of Lecturers of Building Technology in Colleges of Education and Supervisors in Building construction in companies on the maintenance skills in culvert required for integration to Building Technology programme of Colleges of Education in Lagos State.

The data required for testing hypothesis 1 are presented in table 4.

The result in Table 4 shows the comparism between the responses of Lecturers and Supervisors. The data revealed that fifteen maintenance skills had their p-value ranged from 0.42 to 0.97 and were greater than 0.05. This indicated that there was no significant difference in the mean response of Lecturers and Supervisors in Building construction industry on maintenance skills in culvert required for integration to Building Technology programme of Colleges of Education in Lagos State. Therefore, the null hypothesis of no significant difference in the mean response of the respondents was accepted for the fifteen maintenance skills in culvert.

Table 4: t-test analysis of the mean response of the Lecturers and Supervisors on the maintenance skills in culvert required for integration to Building Technology programme of Colleges of Education in Lagos State.

S/N	Items	Lecturers N_1 35		Supervisors N_2 41			
		X_1	SD_1	X_2	SD_2	P-value	Remark
1.	Identify appropriate materials for the maintenance of culvert	4.09	0.82	4.05	1.02	0.86	non-sig
2.	Select relevant tools for culvert maintenance	4.09	0.78	3.98	0.99	0.86	,,
3.	Observe safety measures when maintaining culvert	3.71	0.83	3.88	0.93	0.42	,,
4.	Inspect the culvert for trees or vegetation roots	4.11	0.90	4.12	0.93	0.97	,,
5.	Remove accumulated debris from culvert	4.11	0.87	4.12	1.05	0.97	"
6.	Remove trees or vegetation roots	4.31	0.63	4.22	0.85	0.59	,,
7.	Examine the inlet and outlet part of the culvert	3.77	0.60	3.68	0.85	0.61	,,
8.	Use appropriate tools to remove sand deposited in the culvert	4.03	0.75	3.98	1.04	0.80	,,
9.	Mend the cracks in the culvert	3.91	0.95	4.00	1.18	0.73	,,
10.	Guide the reconstructed culvert during curing period	4.40	0.65	4.46	0.92	0.74	,,
11.	Inspect for change of abrasion of damage or deterioration	4.37	0.60	4.29	0.84	0.65	,,
12.	Upgrade the culvert when situation demands	4.40	0.69	4.24	0.89	0.40	,,
13.	Reconstruct the culvert when it is totally bad	4.00	1.24	3.90	1.09	0.72	,,
14.	Identify cracked culvert on the road using appropriate technology	4.00	0.73	3.80	0.95	0.33	,,
15.	Select non corrosive material for culvert construction	3.89	0.93	3.71	1.23	0.48	,,

Hypothesis 2

There is no significant difference in the mean responses of Lecturers of Building Technology in Colleges of Education and Supervisors in Building construction industries on the maintenance skills in stream channel and appurtenance required for integration to Building Technology programme of Colleges of Education in Lagos State.

The data required for testing hypothesis 2 are presented in table 5

Table 5: T-test analysis of the mean response of the Lecturers and Supervisors on the maintenance skills in stream channel and appurtenance required for integration to Building Technology programme of Colleges of Education in Lagos State.

S/N	Items	Lecturers N_1 35		Supervisors N_2 41			
		X_1	SD_1	X_2	SD_2	P-value	Remark
1.	Select relevant tools and materials for stream channel and appurtenance maintenance	4.51	0.51	4.44	0.50	0.52	non-sig

2.	Observe safety practice when maintaining stream channel and appurtenance	4.17	0.66	4.02	0.72	0.36	"
3.	Inspect stream channel	4.20	0.41	4.12	0.33	0.40	"
4.	Identify bad pipes and channels	4.60	0.55	4.61	0.54	0.94	"
5.	Remove bad and obsolete pipes from the channel	4.34	0.76	4.41	0.77	0.69	"
6.	Remove cracked or corrosive pipes	4.60	0.81	4.68	0.47	0.58	"
7.	Design new stream channel	4.17	0.92	4.27	0.74	0.61	"
8.	Remove materials that leads to stream channel instability	4.54	0.51	4.66	0.48	0.31	"
9.	Identify appropriate materials and technology for maintenance of stream channel and appurtenance	4.31	0.80	4.44	0.74	0.48	"
10.	Select appropriate pipes to replace bad ones	3.86	0.49	4.00	0.59	0.26	"
11.	Replace bad pipes in the stream channel	4.63	0.55	4.61	0.49	0.88	"
12.	Cut and remove grown trees in the stream channel	4.94	0.24	4.66	0.48	0.02	"
13.	Remove sediments and debris from stream channel	4.26	0.95	4.49	0.71	0.23	"
14.	Use long rods to through blocked channel	4.57	0.50	4.71	0.46	0.22	"
15.	Dredge stream channel periodically	4.43	0.50	4.34	0.48	0.44	"

The result in Table 5 shows the comparism between the responses of Lecturers and Supervisors. The data revealed that fifteen maintenance skills had their p-value ranged from 0.22 to 0.94 and were greater than 0.05. This indicated that there was no significant difference in the mean response of Lecturers and Supervisors in Building construction industry on maintenance skills in stream channel and appurtenance required for integration to Building Technology programme of Colleges of Education in Lagos State. Therefore, the null hypothesis of no significant difference in the mean response of the respondents was accepted for the fifteen maintenance skills in stream channel and appurtenance.

The findings of the study is in consonance with the finding of Ogbuanya and Bakare [18] who carried out a study on mechatronics skills required for integration to electrical/electronic engineering technology programme in Polytechnics for sustainable employment of graduates in contemporary Nigeria and found out that skills in any training programme modifies the behaviour of students or the trainees. Omolola [19] identified supervisory skills as a requirement in building construction by building technology teachers in technical colleges in Ondo State which is also in agreement with the finding of this research. It was found out that skills are essential to train technical students for capacity building. This skills must therefore be what is incorporated into the learning process of those who choose to attend college of Education so they can be properly equipped to not just teach young Nigerians in building technology but they too will be able to respond when the need arise for drainage challenges across Lagos State that is constantly facing drainage challenges.

Furthermore, it was discovered that there was no significant difference in the mean responses of Lecturers of Building technology in Colleges of Education and Supervisors in Building construction industries on the maintenance skills in catch basin, culvert, roadside ditches, stream channel and appurtenance. Therefore, the null hypothesis formulated was upheld for the 30 maintenance items.

V. Conclusion And Recommendation

The study identified the maintenance skills in culvert, stream channel and appurtenance required and the use of appropriate safety skills and techniques by Students and Lecturers to ensure workshop and site safety for integration to building technology programme of colleges of education in Lagos State in order for graduates of building technology to become better skilled and exhibit greater professionalism.

Based on the findings of this study, we like to recommend that curriculum researchers and developers should integrate maintenance skills into the curriculum of building technology students of colleges of education in Lagos State so as to help the state in dealing with the frequent drainage challenge in the State. Also, Workshops and seminars should be organized by the colleges of education and other professional bodies in building related fields to train building technology lecturers on the skills required for drainage maintenance.

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