

Research Article

Integrating Construction Job Hazard Analysis into Technical College Curriculum for Safer Construction Practices

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Abstract

The lack of adequate training and information on safer construction practices by technicians and artisans in the construction industry and their neglect to safe working procedures in Rivers State is alarming, the rise in cases of accidents and incidents in construction projects in Rivers State led to this work. The aim of the study was to determine Integrating Construction Job Hazard Analysis into Technical College Curriculum for Safer Construction Practices. Specifically, the study explored the importance of the task and environment components of construction job hazard analysis (CJHA) to be included into the curriculum of brick block laying and concreting for safer construction practices. Two research questions and two hypotheses guided the study. This study adopted a descriptive survey research design and the population of the study was 46 respondents, comprising 30 Technical college Teachers and 16 Instructors from the four Government Technical Colleges in Rivers State. The instrument for data collection was a structured questionnaire titled “Job Hazard Analysis Training Questionnaire”. The instrument was subjected to face and content validation by three experts. The internal consistency of the instrument was established using test-retest reliability method. With the aid of statistical package for social science (SPSS) version 22, a reliability coefficient of study was .77. Data collected from the respondents were analyzed using mean and standard deviation to answer the research questions and t-test statistics were used to test the null hypotheses at .05 level of significance. Based on the data analyzed the following conclusions were drawn, that students should be trained to break down tasks into smaller activities or steps, while adopting best hazard control measures for each step of the said task promotes safer construction practices and that students should be trained to know work ergonomics, their working environment, environmental hazards to carry out their duties safely. It was recommended based on the findings of the study that CJHA be added to brick/blocklaying and concreting curriculum to better equip the students for the world of work, necessary funding be made for teachers and instructors to have required resources for effective instructions.

Keywords

Job Hazard Analysis, Construction Job Hazard Analysis, Curriculum, Brick/Block Laying and Concreting

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1. Introduction

Every nation, both the developed and the developing is focused in sustaining and growing their national development, whether economically or industrially; the success of their national development is fully hinged on their various levels of infrastructural development. Infrastructure improves the quality of life by providing consumption goods (transportation, energy, and communication systems) and contributing to economic stability. Nedozi, et al [8] defined infrastructures as the fundamental facilities and services that must be established in order for development to occur. It facilitates and accelerates economic development, as economic development and growth would be difficult to achieve in the absence of infrastructure.

To construct these infrastructures there are institutions in Nigeria that trains students in the construction of infrastructures, both for the public and private sectors. One of such institution are the Technical Colleges. Technical colleges impart necessary skills that lead to the production of craftsmen and technicians who are enterprising and self-reliant (National Policy on Education, [9]). Programs offered in technical colleges are skill oriented and performance-based (Audu, et al [2]). These programs allow for effective training and assessment of craftsmen in a wide range of trade subjects that help the students to achieve various instructional objectives in the different domains of learning using a planned curriculum (Ezeama, et al., [6]).

For these craftsmen to construct infrastructures they must be trained in Brick/Block Laying and Concreting Programme. Brick/Block Laying and Concreting Programme is a program of study that is offered in technical colleges and is concerned with the extensive technological skills which go hand in hand with the capacity to manage people, tools, machines and products in order to carry out building construction tasks professionally and successfully (Oviawe & Adeola, [16]). The objectives of the program are to produce craftsmen (artisans) that will assist engineers/technologists in the production of simple/complex buildings; maintenance of these buildings; management of small projects, selection of materials, etc. (Omidiji & Ogwu, [15]). These objectives emphasize the acquisition of appropriate knowledge, skills and the development of mental, physical and social abilities and safety competencies to equip the individual to work effectively, efficiently and safely in the construction of infrastructures (National Policy on Education, [9]).

Construction is widely regarded as one of the most dangerous industries in the world due to its unique nature (Olutase, [14]). According to the statistics from the International Labour Organization (ILO), at least 60,000 fatal accidents take place on construction sites worldwide each year. This means that one in six work-related death accidents worldwide occur on construction sites. 30% of all work-related accidents occur on construction sites, according to the Global Trade Union Federation, which places the

number significantly higher at 108,000. As a result, there is a renewed emphasis on managing safety procedures in construction firms worldwide (Mopho, [7]). According to the National Bureau of Statistics, there were over 5,000 construction-related accidents in Nigeria in 2021, resulting in about 2,000 deaths and over 5,000 injuries (HSE Nations, [10]).

The Managing Director of the Nigeria Social Insurance Trust Fund (NSITF), Barrister Oluwaseun Faleye has lamented that in 2024 there had been over 150 reported construction sites accident related deaths in Nigeria (Independent Newspaper, [11]). However, other reports indicate that data collection on occupational accidents in Nigeria's construction industry is often higher due to underreporting by companies to regulatory bodies.

This therefore points to the need to train brick/blocklaying and concreting students to work safely to combat incidents and accidents while on the job. The accidents on Nigerian construction sites continue to have a devastating impact on the lives of workers, property, project delivery times, and have also jeopardized the completion of projects within defined budgets and specifications (Ebekozen [5]).

In view of the many dangers and hazards in the construction industries, the Institute of Occupational Safety and Health (IOSH) recommends that artisans, technicians, technologists, and engineers receive consistent training on Construction Job Hazard Analysis in order to ensure safety and productivity (IOSH, [12]). Construction Job Hazard Analysis (CJHA) is simply Job Hazard Analysis (JHA) tailored to the construction/building industry operations, procedures and processes. It involves breaking down all the construction operations into simpler tasks and analyzing all potential risks, hazards, and controls needed to safely execute the required.

operation. Prepared by reviewing accident reports, involving employees, conducting risk assessments, and prioritizing jobs according to hazardous exposures. Equipping brick/blocklaying and concreting students with this skillset and training via their curriculum will further promote safer working conditions (South African Department of Labour [19]).

The curriculum is a collection of plans and arrangements pertaining to the goals, subject matter, and instructional resources as well as the techniques used to direct the execution of learning activities in order to accomplish specific educational objectives (Wiji, et al., [20]). The curriculum serves as the foundational academic material for all of the learning activities that the brick/blocklaying and concreting students are required to have NBTE [13].

Brick/blocklaying and concreting according to Amobi [1] is the art or science of erecting or constructing shelters or place or habitations for man or animal. Brick/Block laying and concreting works involve the skills required in accomplishing given tasks in mixing of mortars by hand/machine, laying of

blocks, rendering of walls, wall and floor tiling, creating openings in walls (lintel and arches), it also involves placing concrete in positions, application of admixture to concrete, compaction, curing of concrete and fixing of concrete tensile materials.

2. Statement of the Problem

The persistent increase in construction incidents and accidents in Rivers State, reveals a major gap in the competency of craftsmen, owing to a deficient curriculum and the continuous technological innovations in the construction industry have made the needed training for effective safety practices of these new concepts/design of buildings to continue to elude the products of these programmes. The result has been that, the graduates of these programmes are victims to incidents, accidents and fatalities. As measures to keep education and training in tune with the knowledge and skills needed in the world of work, school courses and curricula must be reviewed, enriched and updated regularly in line with occupational health and safety improvements that are taking place in the industries today. This study, therefore, seeks Integrating Construction Job Hazard Analysis into Technical College Curriculum for Safer Construction Practices.

3. Literature Review

Makori, Mamati and Njoroge (2018) carried out a research in Nairobi County – Kenya, on occurrence of accidents at building construction sites to ascertain their causes. They investigated to discover if the occurrence is due to the workers working environment, technical factors, occupational health, skills and safety practices. Using regression and correlation analysis the survey findings showed that working environment and technical factors were insignificantly related to accidents occurrences, but occupational safety practices and skills related to accidents occurrences significantly.

An investigation by the South African Department of Labor (2017) revealed that the responsibility for Health & Safety at different stages of construction work was often handled by incompetent individuals lacking sufficient knowledge of Health & Safety regulations.

Ebekozien (2022) determined that although the Nigerian Building Code mandates compliance with relevant Health & Safety laws and standards, aiming to ensure the well-being of occupants and workers during construction and throughout the lifespan of buildings, there is poor compliance with PPE in Nigeria, especially in indigenous construction companies, due to lax monitoring and enforcement by government regulatory agencies.

The above research works all identified the problem of the lack of adherence to health and safety, and the need to adhere to health and safety standards in the construction industry by

construction workers/employers, which signifies the importance of acquiring construction job hazard analysis skills by construction workers.

This study was therefore designed to equip the construction workers with modern world of work construction health and safety skills by integrating CJHA into technical colleges curriculum.

4. Aim and Objectives of the Study

The aim of the study is Integrating Construction Job Hazard Analysis into Technical College Curriculum for Safer Construction Practices.

Specifically, the study explored the following:

- 1) Integrating of the task component of CJHA into technical college curriculum for safer construction practices.
- 2) Integration of the environment component of CJHA into technical college curriculum for safer construction practices.

5. Research Questions

The following research questions guided the study:

- 1) What are the task component of CJHA needed in the technical college curriculum for safer construction practices?
- 2) What are the environment component of CJHA needed in the technical college curriculum for safer construction practices?

6. Hypotheses

The following hypotheses were formulated and tested at .05 level of significance.

H₁ There is no significant difference between the mean responses of teachers and instructors in integrating construction job hazard analysis into technical college curriculum for safer construction practices.

H₂ There is no significant difference between the mean responses of teachers and instructors in integrating construction job hazard analysis into technical college curriculum for safer construction practices.

7. Methodology

This study adopted a descriptive survey research design. Nworgu [17] explained that descriptive survey research design deals with studies which aim at collecting data through questionnaire or interview and describing the data in a systematic manner that interpret the characteristics, features, and facts about a given population.

Table 1. Partial Description of Construction Job Hazard Analysis Training Questionnaire.

S/N	ITEMS DESCRIPTION OF SKILLS	SA	A	U	D	SD
A	Task component of CJHA in integrating construction job hazard analysis into technical college curriculum for safer construction practices					
1.	Train personnel to understand the task or activity to be carried out.					
2.	Train personnel to understand their ability and work place ergonomics.					
B	Environment component of CJHA in integrating construction job hazard analysis into technical college curriculum for safer construction practices					
1.	Train personnel on the impacts of environmental waste on site.					
2.	Train personnel on use of energy alternative tools, materials and equipment.					

The descriptive survey design is suitable when the intention is to obtain information that describes existing conditions, practices, or opinions of a defined population. In this study, it was necessary to seek the perceptions of specialists in construction companies and technical college teachers/instructors to ensure that the integration was relevant, feasible, and aligned with current instructional standards.

The population of the study was 46 respondents, comprising 30 Technical college Teachers and 16 Instructors in the four Government Technical Colleges in Rivers State (Rivers State. Office of the Principals, [18]). A purposive sampling technique was used in selecting participants, as the researcher made a deliberate choice of the participant due to the qualifications/experience the participants possess. The study used census method of data collection, as the entire population was surveyed, considering the small size of the population.

The instrument for data collection was a structured questionnaire titled "Construction Job Hazard Analysis Training Questionnaire". The instrument contains four sections A-D. The instrument was structured on five-point Likert scale of strongly agree (SA), Agree (A), Undecided (U), Disagree (D) and Strongly Disagree (SD). A corresponding numerical value of 5, 4, 3, 2 and 1 were assigned to the response scale for each item as represented below with real limits.

SA = 5, A = 4, U = 3, D = 2, SD = 1.

The instrument was subjected to face and content validity by three experts in the Technical Education Department of Ignatius Ajuru University of Education. The experts were requested to read through the questionnaire item by item for clarity and appropriateness based on the research questions under investigation. The experts' comments and suggestions were utilized to structure the new questionnaire instrument that was used for the study.

The internal consistency of the instrument was established using test-retest reliability method. The initial test was administered and the second test was administered after two weeks. The reason test-retest was chosen by the researcher, was to ascertain if the respondents will make the same choices again, when the second questionnaire was administered to them without prior information.

Thereafter both results were analyzed using Pearson Product Moment Correlation (PPMC) with the aid of statistical package for social science (SPSS) version 22, which yielded a reliability coefficient .77 indicating the instrument was highly reliable.

Data collected from the respondents were analyzed using mean and standard deviation to answer the research questions and t-test statistics were used to test the null hypotheses at .05 level of significance. The decision for hypothesis was; if the calculated value of t (t-cal) is less than or equal to the critical value of (t-crit), accept the null hypothesis, otherwise rejected null hypothesis.

8. Data Presentation

Table 2. Mean scores of respondents on task component of CJHA needed in the technical college curriculum for safer construction practices.

S/N	Teachers		Instructors			
	$\bar{x}$	SD	RMK	SD	RMK	RMK
1). Train personnel to understand the task or activity to be carried out.	4.63	.49	A	4.64	.48	A

2). Train personnel to understand their ability and work place ergonomics.	4.87	.34	A	4.76	.43	A
3). Train personnel to ascertain if task or activity is mental, physical or both.	4.04	1.01	A	4.15	.99	A
4). Train personnel to breakdown task into smaller activities or steps.	4.67	.48	A	4.68	.47	A
5). Train personnel to avoid making too many steps in breaking down tasks or activities.	4.63	.49	A		.49	A
6). Train personnel to identify each step with its corresponding hazards.	4.59	.50	A	4.60	.49	A
7). Train personnel to identify factors that could/can contribute to incident or accident.	4.77	.42	A	4.75	.44	A
8). Train personnel to identify how tools and equipment could/can be damaged during steps.	4.79	.41	A	4.82	.39	A
9). Train personnel to adopt best hazard control measures for each step of the task or activity.	4.72	.73	A	4.60	.98	A
10). Train personnel to always review and upgrade their decisions, if need be, as work progresses.	4.51	.60	A	3.64	.92	A
Grand mean	4.62	0.55		4.52	.61	

Source field survey 2025

Research question 1: What are the task component of CJHA needed in the technical college curriculum for safer construction practices?

From *Table 2*: the mean scores of teachers and instructors on the task component of CJHA in the technical college curriculum was presented. The mean scores of the

respondents ranged from 3.64 to 4.87. The grand mean of the respondents are 4.62 and 4.52. Since these mean scores exceeded the criterion mean of 3.5, it indicates that the respondents agreed on all the items as the task component of CJHA required in the technical college curriculum.

Table 3. Mean scores of respondents on environment component of CJHA needed in the technical college curriculum for safer construction practices.

S/N Item	Teachers			Instructors		
	$\bar{x}$	SD	RMK	$\bar{x}$	SD	RMK
1) Train personnel on the impacts of environmental waste on site.	4.28	.45	A	4.54	.66	A
2) Train personnel on use of energy efficient alternative tools, materials and equipment.	4.71	.46	A	4.64	.48	A
3) Train personnel on the importance to maintain the ecological life of their environment.	4.59	.81	A	4.11	1.09	A
4) Train personnel on effective and safe measures of transporting materials on site.	4.36	.48	A	4.38	.49	A
5) Train personnel on biological waste hazards.	4.52	.50	A	4.39	.60	A
6) Train personnel on electrical hazards.	4.41	.64	A	4.30	.76	A
7) Train personnel on chemical waste hazards.	4.32	.79	A	4.46	.76	A
8) Train personnel on pressure hazards.	4.52	.50	A	4.53	.50	A
9) Train personnel on temperature hazards.	4.07	1.00	A	4.09	1.00	A
10) Train personnel on sound hazards.	4.43	1.07	A	5.00	.00	A
Grand Mean	4.42	0.67		4.44	.63	

Source field survey 2025

Research question 2: What are environment component of CJHA needed in the technical college curriculum for safer construction practices?

From *Table 3*: shows the mean scores of teachers and instructors on the environment component of CJHA in the technical college curriculum. The mean scores of the respondents ranged from 4.07 to 5.00. The grand mean of the respondents are 4.42 and 4.44, since these mean scores exceeded the criterion mean of 3.5, it indicates that the respondents were unanimous on all the items as environment component of CJHA

in the technical college curriculum.

9. Hypotheses

H_1 There is no significant difference between the mean responses of teachers and instructors in integrating construction job hazard analysis into technical college curriculum for safer construction practices.

Table 4. Independent sample t-test between the mean responses of teachers and instructors in the integration of task component of CJHA into the technical college curriculum for safer construction practices.

Respondents	No	$\bar{x}$	SD	Df	t-calc	P	T-crit	Decision
Teachers	30	4.62	.55					
Instructors	16	4.52	.61	34	.42	.05	1.70	Accept

Field survey 2025

From *Table 4*: it shows the result of independent sample t-test between the mean responses of teachers and instructors in the integration of task component of CJHA into the technical college curriculum. The mean and standard deviation of teachers are 4.62 and .55 respectively. The mean and standard deviation of instructors are 4.52 and .61 respectively. The calculated t-value is .42 and which is less than the table value of 1.70. Thus, the null hypothesis was accepted indicating that there is significant difference between the mean responses of teachers and instructors in the integration of task component of CJHA into the technical

college curriculum.

The mean scores from the above table between the teachers and instructors significantly explains the need for a curriculum reform in the technical colleges, identifying the items presented as current and ideal for training student for the realities of today's world of work.

H_2 There is no significant difference between the mean responses of teachers and instructors in integrating construction job hazard analysis into technical college curriculum for safer construction practices.

Table 5. Independent sample t-test between the mean responses of teachers and instructors in the integration of environment component of CJHA into technical college curriculum for safer construction practices.

Respondents	No	$\bar{x}$	SD	Df	t-calc	P	T-crit	Decision
Teachers	30	4.42	.67					
Instructors	16	4.44	.63	34	0.1	.05	1.70	Accept

Field survey 2025

From *Table 5*: it shows the result of independent sample t-test between the mean responses of teachers and instructors in the integration of environment component of construction JHA into the technical college curriculum. The mean and standard deviation of teachers are 4.42 and .67 respectively. The mean and standard deviation of instructors are 4.44 and .63 respectively. The calculated t-value is .1 and which

is less than the table value of 1.70. Thus, the null hypothesis was accepted. Thus, there is no significant difference between the mean responses of teachers and instructors in the integration of environment component of construction JHA into the technical college curriculum. This mean scores further implies that teachers/instructors who agreed on this integration, saw the gap existing in the current curriculum and

need to equip their students with modern world of work skills to prepare them for safer practices.

10. Discussion of Findings

Research question 1: examined the task component of CJHA needed in the technical college curriculum. The findings of the study revealed that students should be trained to understand the task or activity to be carried out, understand their ability and work place ergonomics, ascertain if task or activity is mental, physical or both, breakdown task into smaller activities or steps to train personnel to avoid making too many steps in breaking down tasks or activities.

The null hypothesis was accepted. The findings of the study is in harmony with Boakye, et al [3] who asserted that an effective safety program can significantly reduce accidents by creating a safe working environment.

Research question 2: the researcher examined the environment component of CJHA needed in the technical college curriculum. The study revealed that personnel should be trained on the impacts of environmental waste on site, on the use of energy efficient alternative tools, materials and equipment, train students on the importance of maintaining the ecological life of their environment, train students on effective and safe measures of transporting materials on site and train students on biological waste hazards. The null hypothesis was accepted. The findings of the study are in harmony with Devdatt, et al [4] who maintained that with the use of appropriate PPE most environmental hazards such as slips, trip, collapse of unstable rocks, atmosphere containing toxic or combustible gases, effect of chemical and hazardous material can be prevented.

11. Summary and Conclusion

Based on the data analyzed the following conclusions are drawn:

The reviewed related literatures all agreed on the need for construction workers to be trained and equipped to carryout their jobs safer, to mitigate against prevailing incidents, accidents and fatalities in the construction industry. Also, other researchers agreed on the increase in the incidents and accidents data prevailing in the construction sector, owing to both incompetent construction workers and poor health and safety practices.

Data analyzed from this study agreed that both the task and environment components of the CJHA are highly needed to train students in technical colleges in Rivers State, following the responses of the teachers/instructors and the importance of its integration into the colleges' curriculum.

12. Recommendations

The following recommendations are made based on the

findings of the study;

- 1) That the current curriculum in the technical colleges in Rivers State should be reformed and updated to integrate CJHA, to prepare students for safer practices.
- 2) That teachers and instructors of these institutions should be funded and provided with the required resources for both the task and environment components of CJHA to be effectively and efficiently instructed and students trained.

Abbreviations

C JHA	Construction Job Hazard Analysis
SPSS	Statistical Package for Social Science
NSITF	Nigeria Social Insurance Trust Fund
IOSH	Institute of Occupational Safety and Health
JHA	Job Hazard Analysis
HSE	Health, Safety, Environment
PPMC	Pearson Product Moment Correlation
PPE	Person Protective Equipment

Conflicts of Interest

The authors declare no conflicts of interest.

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