



EPiC Series in Built Environment

Volume 4, 2023, Pages 825–833

Proceedings of 59th Annual Associated Schools
of Construction International Conference



Safety and Health Education in the Curricula of Construction-related Programs in Nigeria

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Similar to other injury-prone industries, the construction sector experiences an elevated number of accidents regularly. These inauspicious occurrences mostly lead to unwanted variability in project performance indicators and exert negative impacts on the victims, their families, and society. The major causes of accidents in the construction industry have often been linked to human factors, particularly the lack of adequate safety and health education in tertiary institutions. This study evaluates safety and health education in the curricula of construction-related programs in Nigeria. First, accredited construction-related programs in Nigerian universities were identified after which the curricula of 14 selected programs were examined to determine safety and health education provisions. Thereafter, a survey was designed and administered to faculty from six universities (one per geopolitical zones) to investigate their perception of the barriers and drivers to the inclusion of safety and health education in the curricula of construction-related programs. Findings from the study revealed the existing lack of construction safety and health education in the curricula and the main barriers/drivers impacting inclusion in Nigerian construction programs. These findings could be used to develop a framework and strategies for integrating construction safety and health education into the curricula of construction-related programs in Nigeria.

Keywords: Construction Safety and Health, Education Curriculum, Nigeria, Occupational Safety and Health, Tertiary Institution.

Introduction

The construction industry is undoubtedly the pillar of the economic and social growth of every nation because of its importance for infrastructural development. It serves as a strong nexus for all other sectors of the economy and serves as the pivot of national development. However, the construction industry has historically experienced a disproportionately high rate of disabling injuries and fatalities for its size when compared with other labor-intensive industries (Hinze, 1997; Shen et al., 2017). When fatal accidents occur on a construction site, they adversely impact the construction project in several ways, de-motivate workers, disrupt site activities, delay project progress, and affect the overall project cost, productivity, and reputation of the firms concerned (Okolie & Okoye, 2012). The direct

and indirect costs of the high number of injuries, illnesses, and fatalities experienced in construction relative to other industries contribute to the cost of construction, making the safety of the construction workforce critical.

Construction worker safety is a continuous source of concern in most developing countries (Nnaji et al., 2017). Despite the increasing growth in the construction subsector in Nigeria, the institutional and regulatory framework for construction health and safety is highly fragmented and poorly implemented (Okolie & Okoye, 2012). The Nigerian construction industry is plagued with high injury and accident rates (Idoro, 2011). Although safety is perceived to be an important project indicator, the collective actions of stakeholders in the Nigerian construction industry invalidate this premise (Nnaji et al., 2017). Studies show that Nigerian construction workers are unaware of important health and safety practices (Diugwu et al., 2012; Olatunji et al., 2007) and organizations do not pay adequate attention to health and safety management (Diugwu et al., 2012). The lack of safety emphasis in the formal educational system has been identified as one reason for the lack of safety awareness among educated workers in the construction industry (Idubor & Oisamoje, 2013; Afolabi et al., 2016).

Health and safety training is universally acknowledged as means of limiting the costs associated with construction accidents (Burke et al., 2006). The elevated occupational injuries and illnesses reported annually in the construction industry across the world underpin the need to develop a superior understanding of the efficiency of safety and health education and training. According to Gambatese (2003), the education and training of project personnel in the area of safety are significant aspects of safe construction job sites. Higher education institutions bear a profound and moral responsibility to increase the awareness, knowledge, skills, and values needed to create a just and sustainable future (Cortese, 2003). After receiving formal education from a university, the involvement of the many workers that enter the construction industry in different capacities can have a considerable influence on construction site safety (Gambatese, 2003).

The incorporation of construction site safety in university curricula has been the topic of prior research. Higher education plays a critical role in preparing most of the professionals who develop, lead, manage, teach, work in, and influence society's institutions (Cortese, 2003). According to Burke et al. (2006), most training interventions positively influence safety knowledge, the adoption of safe work behaviors and practices, as well as occupational safety and health (OSH) outcomes. There is therefore a real need to examine if construction site safety is included and covered (and to what extent) in university-level education curricula, particularly in developing countries such as Nigeria faced with fundamental challenges related to lack of safety knowledge, awareness, and practices. Improvements in safety performance can be gained when project personnel is knowledgeable of the potential construction site hazards and the appropriate means to mitigate the hazards (Gambatese, 2003). Education imparts high-level knowledge and skills that are transferable to different situations (Haslam et al., 2005) and the effectiveness of safety training practices is an important part of safety management on a construction site (Awolusi et al., 2017). This research presents an appraisal of the construction health and safety education provisions in the curriculum of tertiary institutions in Nigeria by examining the content of the curricula of construction-related programs in Nigeria.

Literature Review

Researchers and stakeholders in the construction industry have been directing efforts with good progress toward improving safety performance in developed nations but developing nations appear to be lagging due to basic challenges such as a lack of safety education and awareness. This section reviews construction safety and health statistics, education, and training globally and in Nigeria.

Construction Safety and Health Statistics

The construction sector accounts for a very high rate of injuries and fatalities relative to other industrial sectors (Choudhry & Fang, 2008; Awolusi & Marks, 2017). In the U.S., construction contributes to 5% workforce, 6% of workplace injuries, and 21.2% of workplace fatalities (OSHA 2021). Data from the Bureau of Labor Statistics show that out of 4,764 worker fatalities in private industry in the year 2020, 1008 were recorded in construction with an injury rate of 10.2 per 100,000 employed workers (BSL, 2021). The leading causes of worker deaths in the construction industry (falls, struck-by-object, electrocution, and caught-in/between) were responsible for more than half (65.9%) of the construction worker deaths in 2020 (CPWR, 2022). In the same year, the construction industry experienced 174,000 non-fatal occupational injuries and illnesses at a rate of 3.2 per 100 full-time workers (BSL, 2021). About 15% of workers' compensation costs are spent on workers injured at a construction site. Each year, around 80,000 construction workers in the UK suffer from an illness they believe was caused or made worse by their work (HSE, 2017). Hong Kong is also well-known for its elevated construction accident rates recording a total of 3,860 occupational injuries in 2016 (HKOSH, 2016). Even with the drop in the accident rate, construction still accounts for 11 % of workplace accidents in Hong Kong.

This situation is worse in developing countries, particularly Nigeria where there are no reliable sources of data for such accident records (Okolie & Okoye, 2012). According to the occupational health and safety profile developed by the Federal Ministry of Labour and Employment in collaboration with the International Labour Organization, Nigeria recorded a total number of 3461 occupational accidents/injuries and 238 fatalities across different sectors of the economy between 2014 and 2016. The construction industry reported the highest number of work-related accidents/injuries, accounting for over 39% of the total figures (ILO, 2016). Africa is faced with inconsistencies and subjectivity in the reported safety data of certain groups of workers, the poor determination of occupational disease, and the impacts of some legal and bureaucratic features of the reporting systems (Loewenson, 1999). Although Nigeria is relatively experiencing a strong growth in construction activities, it is unfortunate to note that the enforcement of health and safety regulations is not a mainstream activity in the country (Okolie & Okoye, 2012). Due to employers' perceptions that the high number of accident reports may subject them to punitive measures from the enforcement authorities, underreporting of accidents in Nigeria appears high when compared to the actual number of accident reports (ILO, 2016). These situations indicate that the current structure for the regulation and enforcement of occupational safety and health in the Nigerian construction industry is inadequate.

Occupational Safety and Health in the Nigerian Construction Industry

As the most populous country in Africa and the 14th largest in land mass with a huge amount of natural and human resources, Nigeria should undoubtedly be categorized as a nation with very active industrial sectors. When compared with other subsectors of the Nigerian economy, the construction industry ranked 7th in the contribution to Gross Domestic Product (GDP) in 2015 despite being separated from the real estate sector (Okoye, 2016). According to data from the National Bureau of Statistics in Nigeria, the construction sector grew by 19.25% in nominal terms (year on year) in the fourth quarter of 2017 with an annual contribution of 3.77% in 2017 and 3.55% in 2016 (NBS, 2018). Despite recent efforts to improve site safety, the construction still accounts for an elevated number of occupational-related fatalities and the safety record continues to be one of the poorest, thus, hindering performance improvement (Alkilani et al., 2013; Shen et al., 2017). Although workplaces in some countries like the US and UK have become safer over the years due to efforts from researchers and stakeholders, a similar feat has not been achieved in Nigeria. Abubakar (2015) suggests that Nigeria

and other developing countries could gain from the vast experiences of countries that have hugely invested and developed OSH management systems over several decades of hard work.

The hazardous nature of sectors such as the construction industry makes it unacceptable to undermine the importance of occupational safety and health in the Nigerian industrial sectors. Virtually all the occupational safety and health regulations used in Nigeria emanated from foreign countries (Tanko & Anigbogu, 2012). Major legislation that has been enacted to provide for the safety and health of the workforce in Nigeria include the Factories Act, CAP F1, Laws of the Federation of Nigeria (LFN), 2004; Employees' Compensation Act, 2010; Nigerian Minerals and Mining Act, 2007; and Nigerian Nuclear Safety and Radiation Act, 1995. Most SMEs and OSH practitioners in Nigeria have been relying on the Factories Act in the implementation of OSH workplace arrangements in their respective organizations and practices (ILO, 2016). In Nigeria, there is no national Occupational Safety and Health Board in place and no formal National OSH Management Systems have been developed by OSH authorities at the moment, but the country adopts the ILO – OSH 2001 as a guide (ILO, 2016). These regulations used in Nigeria do not efficiently capture construction health and safety nor encourage the need for safety and health education and training in educational institutions.

Construction Safety and Health Education and Training

University graduates hired to work in the construction industry typically have a degree in construction management, building science, civil engineering, or other related fields of study (Gambatese, 2003; Awolusi et al., 2022). These university graduates who are professionally qualified and educated workers are expected to handle different aspects of a construction project from inception to completion. One critical aspect is the design for safety concept (or prevention through design) which helps prevent workers' injuries by building safety into the design of construction projects and facilities. Designers and engineers of construction projects and facilities should be empowered to contribute to construction health and safety (Smallwood, 2020). According to a study by Gambatese (2003), construction programs address safety in the curricula more than civil engineering programs due to the accreditation requirements for construction programs. In the UK, construction worker safety is integrated at relevant points throughout the undergraduate civil engineering curriculum by most universities rather than addressing it in a separate course. Coverage of safety in this manner is due to the Joint Board of Moderators guidelines for developing degree programs and strengthened by the legislatively mandated Construction (Design and Management) Regulations in force throughout the U.K. which include the designer in the safety effort (HSE, 2015). The teaching of construction safety has become a firm requirement because of the need for graduating engineers to understand and implement the CDM Regulations (Gambatese, 2003). For engineers to effectively contribute to worker safety, they must possess at least a limited degree of expertise in construction safety. Without an understanding of safety standards and management, it would be difficult for designers to contribute to worker safety (Toole, 2005). In Canada, the inclusion of safety and health into engineering program curricula is made compulsory by the organization that accredits university-level engineering programs within Canada (Gambatese, 2003). A descriptive survey conducted among architectural departments at a university in South Africa revealed that architectural programs address construction health and safety (H&S) to a limited extent and that construction H&S is perceived to be fairly important to the discipline of architecture, and design-related activities have a moderate impact on construction H&S (Smallwood, 2020). The simplest way to make designers receive safety training might be to include it in the undergraduate engineering and architecture curriculum (Toole, 2005).

In Nigeria, it is not clear if there is a firm accreditation requirement for construction-related programs to include safety and health in their curricula. However, the Department of Environmental Health Services at the University of Ibadan and the Centre for Occupational Health, Safety and Environment

at the University of Port Harcourt currently offer master's and doctoral degrees in “Safety, Health, and Environment” and “Occupational Health, Safety, and Environment”, respectively (ILO 2016). Although, these programs are primarily tailored to meet the needs of industrial workers who are in the health, safety, and environment (HSE) departments, and other related departments, more structured curricula would be needed to take care of the uniqueness of different high-risk industrial sectors such as construction.

Research Method

First, a publicly available database of the National Universities Commission (NUC) was probed to obtain the list of all accredited universities in Nigeria, and extract the list of universities with construction-related programs (including Building, Civil Engineering, Architecture, and Quantity Surveying). Thereafter, 14 construction-related programs from 14 universities were carefully selected across the six geopolitical zones (i.e., South West, South South, South East, North Central, North West, and North East) in Nigeria using a stratified sampling technique. Another online search was conducted to obtain the catalog or handbook of these programs. Furthermore, a content analysis was conducted to examine the safety and health education provisions in the curricula of these programs. The programs considered for the content analysis were only Building and Civil Engineering because the graduates from these programs are common among those that end up taking up a role as a project and construction engineer, supervisor, or manager to oversee the effective operations of workers and other resources on construction sites. Each curriculum is often prepared by the curriculum team in each university in line with the template and guidance of the NUC.

Furthermore, a literature review was conducted to identify the barriers and drivers to the inclusion of safety and health education in the curricula of construction-related programs. Thereafter, a structured survey was designed using the identified barriers/drivers and administered (using both online and in-person distribution) to faculty in six universities (one per geopolitical zones) to investigate their perception of the barriers and drivers to the inclusion of safety and health education in the curricula of construction-related programs. A section of the survey was designed to collect demographic information of the respondents while two other sections were dedicated to collecting the faculty's perception of the barriers and drivers. The level of agreement of the faculty with the barriers and drivers was measured using a five-point Likert scale (1 - strongly disagree to 5 - strongly agree). A total of 112 complete responses were obtained from the surveys administered and the collected data were analyzed using mean item scores (MIS) run on IBM SPSS Statistics.

Results and Discussion

This section presents the results of the analysis carried out in the study. Data analysis shows that there are 192 universities in Nigeria out of which 44 (23%) are Federal, 49 (26%) are State, and 99 (52%) are Private universities indicating that there is a huge interest from the private sector in education in Nigeria. Only about 31 (16%) of these universities have construction-related programs including (Building, Civil, Engineering, Architecture, and Quantity Surveying). Data also show that 15 (48%) of these universities are Federal, while 9 (29%) and 7 (23%) are State and Private universities, respectively, indicating that most construction-related programs can be found in Federal universities. The analysis also shows that construction-related programs are offered by some of the oldest universities in the country indicating a high tendency for the presence of appropriate support for construction-related education. Figure 1 shows that there is a total of 102 construction-related programs spread across 31 universities in Nigeria. Approximately 29% (30) of these programs are in Civil Engineering, 27% (28) in Architecture, and 22% (22) each are in Building and Quantity

Surveying. This is not surprising since Civil Engineering is the oldest engineering discipline after Military engineering, while Architecture is one of the oldest and most important areas of art. The distribution of the programs across the different geopolitical zones also shows that most of the construction-related programs (39%) are in the southwestern region of Nigeria.

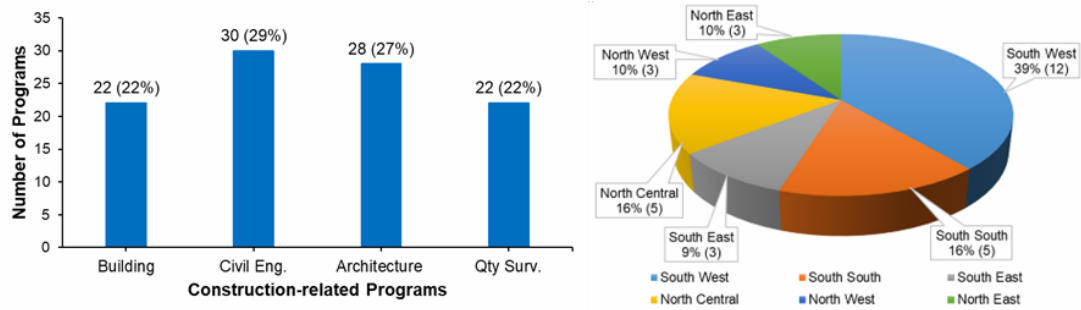


Figure 1: Number of Construction-related programs in Nigeria by (a) Program Type (b) Geopolitical region

Construction Safety and Health Education in the Nigerian Universities

The content analysis of the curricula shows that only one out of the 14 programs (Building and Civil Engineering) examined had a course on construction health and safety in its curriculum. The topics taught in this safety and health course include “Introduction to health and safety on construction sites”, “Health and safety regulations”, “Use of personal protective equipment (PPE)”, “Case studies on construction sites in relation to health and safety practices”, “Safety measures on plants and equipment, and general site conduct.” This result indicates that graduates of Building and Civil Engineering programs from the selected universities may not possess the required knowledge of construction health and safety. The implication of this finding is evident in the high number of injuries and accidents constantly reported in the Nigerian construction sector. This finding is in tandem with previous studies on the lack of construction health and safety education awareness among educated workers in the construction industry in Nigeria (Idubor & Oisamoje, 2013; Afolabi et al., 2016).

Barriers and Drivers to Safety and Health Education Inclusion in Construction Programs’ Curricula

The demographic distribution of the faculty that responded to the survey indicates that 47.3% of the respondents were from Building, 20.5% from Civil Engineering, 17.0% from Architecture, and 15.2% from Quantity Surveying, confirming the assumption about the most common graduate students that take up a role as a project and construction engineer, supervisor, or manager in the construction industry. While 72.0% of the faculty hold a Ph.D. degree, 27.7% hold a master's degree, and 65.2% of the faculty surveyed have more than 10 years (with an average of 25 years) of teaching experience.

The analysis of the faculty’s perception of the barriers to the inclusion of safety and health education in the curricula of construction programs in Nigeria shows the lack of enforceable safety and health standards and regulation as the major barrier which is a leadership or government-related factor (Table 1). The next three were industry-related barriers including not considering safety a project performance indicator, lack of awareness of safety and health in the construction industry, and lack of support from professional organizations such as the Nigerian Institute of Building (NIOB), Nigerian Society of Engineers (NSE), Nigerian Institute of Quantity Surveyors (NIQS) and Nigerian Institute of Architects (NIA). On the other hand, the institutional or university-related barriers were not

considered major barriers by the faculty. The findings show that more work needs to be put in place at the industry level to help combat the obstacles facing the inclusion of safety and health education into the curricula of construction programs in Nigeria.

Table 1
Barriers to the inclusion of construction safety and health education in Nigerian curricula

Factor	Barriers	MIS	Rank
B1	Lack of enforceable safety and health standards and regulation.	3.86	1
B2	Worker safety and health is currently not considered one of the important performance indicators (like cost, schedule, and quality)	3.60	2
B3	Lack of awareness of safety and health in the construction industry	3.48	3
B4	Lack of support from professional organizations	3.45	4
B5	No regulation supporting or mandating safety and health education for construction professionals	3.29	5
B6	Lack of respect for human rights	3.23	6
B7	Safety and health course not required by the accreditation agency	3.10	7
B8	Poor level of research and development	2.92	8
B9	Lack of adequate teaching facilities	2.50	9
B10	Lack of lecturers/professors knowledgeable in safety and health	2.46	10
B11	Lack of adequate teaching materials	2.21	11

Table 2 also shows that the faculty consider all the factors as drivers with the mean item score (MIS) ranging from 3.73 to 4.34. In line with their perception of the major barriers, the faculty believe that the presence of enforceable safety and health standards and regulations, making safety and health course a requirement for accreditation, promoting the level of research and development, and considering safety and health as one of the important performance indicators could help promote the inclusion of safety and health education into the curricula of construction programs in Nigeria. These findings indicate that a concerted effort of the government, industry, and university stakeholders is required to effectively drive or foster the inclusion of safety and health education into the curricula of construction programs.

Table 2
Drivers of the inclusion of construction safety and health education in Nigerian curricula

Factor	Drivers	MIS	Rank
D1	Presence of enforceable safety and health standards and regulations	4.34	1
D2	Making a safety and health course a requirement for accreditation	4.29	2
D3	Promoting the level of research and development	4.21	3
D4	Considering worker safety and health one of the important performance indicators (like cost, schedule, and quality)	4.18	4
D5	Presence of lecturers/professors knowledgeable in safety and health	4.16	5
D6	Passing a regulation mandating safety and health education for construction professionals	4.15	6
D7	Presence of support from professional organizations	4.14	7
D8	Promoting respect for human rights	4.13	8
D9	Presence of adequate teaching materials	4.08	9
D10	Promoting awareness of safety and health in the construction industry	4.04	10
D11	Presence of adequate lecture facilities	3.73	11

Conclusion

Despite the urgent need to reduce the rates of injuries, illnesses, and fatalities on construction sites, safety and health education has not been made a priority in construction-related programs in Nigeria. It is disheartening to note that adequate provisions have not been made for safety and health education in the curricula of construction-related programs in Nigeria. Indeed, it seems like the graduates coming out of these institutions can only lead the construction industry down the current unhealthy, inequitable, and unsustainable path. A firm understanding of the needs including barriers, drivers, benefits, and how best to incorporate worker safety and health education into the curricula of the programs is a critical public need considering the incessant accidents experienced on construction sites across the world, particularly in Africa where some of these incidents go unreported.

This study contributes to knowledge by drawing out the major barriers and drivers to the inclusion of safety and health education in the curricula of construction programs in Nigeria and laying a strong foundation for future studies and investigations. It is however incumbent on stakeholders including professionals in the construction industry, educators and researchers in academia, and government (regulatory) agencies to explore the importance of safety and health education in combatting the menace facing the construction industry. Current research work being undertaken in this field includes engaging the stakeholders in the industry, academia, and government to evaluate the barriers, drivers, and potential benefits to develop an effective framework and strategies for the integration and promotion of safety and health education in construction programs in Nigeria.

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