

## Users' Knowledge of Fire Safety Measures in Educational Environment: A Case Study of a College Building in Nigeria



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### ABSTRACT

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*college building, fire emergency, fire outbreak, fire protection measures, fire safety protocols, Nigeria*

This study investigated students' knowledge of the fire safety measures of a college building in Nigeria, in order to identify areas for improvement, towards contributing to ways of enhancing effective fire safety management through users' involvement in educational environments. The research is a case study that adopted quantitative research approach. Data was gathered from 153 students with the use of a closed-end structured questionnaire that was analysed with SPSS software. The findings were presented descriptively with the aid of tables. The results indicated that most of the students' lacked knowledge of some basic fire prevention and protection measures which limits their knowledge of the fire safety measures and protocols of the college building. Likewise, most of the participants are either not certain of their views or not aware of the locations of the fire safety signs, and fire exits of the building. The study emphasised the need for regular fire drills and trainings on fire safety management procedures for regular users of academic environments in conformity with best practice. The study underscored the need for users of public environments, especially educational settings, to be knowledgeable in basic fire safety protocols in order to be able to rightly align with laid down precautions for saving lives and properties in the event of a fire outbreak.

## 1. INTRODUCTION

Fire safety is an important design consideration in the development and construction of buildings. A fire can start and spread in a matter of seconds in a building [1]. Babatunde et al. [2] defined fire safety as all the procedures involved in preventing, detecting, and controlling a fire before it causes any disaster. Suzi [1] emphasised how important it is to grasp how fire emergency protection systems work. Various fire protection systems function in very different ways and capacities, yet they all serve the same objective: to detect fire and safeguard the lives and properties in a building. According to Suzi [1], fire protection systems detect and extinguish fires with no residue. The author noted that some types of fire protection systems are beneficial because they automatically dispatch emergency services when there is a fire. The public's health is jeopardised when fires occur in academic buildings. In Nigeria, though fire breakouts are not always documented, the devastation they cause is evident, wreaking havoc on individuals, schools, and the nation as a whole [2].

The United Nation's Sustainable Development Goals (UNSDGs) do not specifically address fire, but it is important fire is included. Three compelling arguments exist for including a fire perspective in the execution of the UN-SDGs. The first is the United Nations 2030 Agenda for Environmental Protection's vision. It is critical to know and make plans for the consequences of disturbances, such as fire on ecosystem services to achieve this vision. Also, Martin [3] explained that

fires release emissions that have global and regional implications for patterns of rainfall and air quality. Fires produce greenhouse gases that contribute to global warming, including black carbon and CO<sub>2</sub>, which has been categorized as Short-Lived Climate Pollutant (SLCP). Lastly, fire is a complex phenomenon that contributes to deforestation worldwide.

Over the years, fire has been discovered to cause damages to both lives and properties. These damages have caused a downward spiral in the economy of several societies. According to media reports, Nigeria experienced severe fire incidents between 2019 and 2021, resulting in seventy-nine (79) deaths out of sixty-eight (68) fires were reported within 18 months. Thirty-one (31) of the fire incidences are market fires, with losses still being tallied. There have also been fire outbreaks in a variety of other building types in Nigeria. In January 2021, a section of the Sokoto central market located within Sokoto State was burnt down. A power generating equipment was said to be the cause of the incident. In October, a tanker fire in Onitsha destroyed three caterpillars and over 30 vehicles. In that very month, both a well-known Santana market located in Benin and the Federal Inland Revenue Service (FIRS) buildings in Abuja were both damaged by fire [4]. On December 26, 2021, fire gutted one of Abuja's most prominent shopping malls. According to some eyewitnesses, the cause of the fire incident was an electrical surge in the supermarket's administrative division on the first floor. The havoc caused by the fire cannot be denied. Fortunately, no life

was lost, though the fire destroyed goods worth millions of naira [5].

Fire outbreaks have also been reported in some academic environments in Nigeria and other African countries. In 2001, a fire outbreak occurred in a school in Kyanguli, Kenya. A structure in the school was said to have caught fire late at night and 58 people lost their lives in the incident. In Nigeria, several academic environments have also been reported to have been engulfed by fire in the past. Recent situations are buildings at: Redeemers University, Ede, Osun State; UNN, located in Enugu State and Nile University situated in the country's capital city, Abuja. According to reports, the fire outbreaks swiftly escalated out of control due to a mix of negligence and lack of firefighting equipment. The fire disasters led to the disruption of students' everyday activities in the academic environments. Sadly, it was discovered in some cases that the users' and building managers are rarely given training on how to handle extinguishers that are often mounted on the walls. In most cases, the lack of knowledge on how to operate firefighting equipment is one of the reasons why students, building occupants and general users of academic buildings lack the ability to respond directly to infernos [6]. According to Madobi [4], the frequent fire outbreaks in Nigeria has resulted in loss of lives and property where many victims are still counting their losses.

As a result of the devastating effects of fire outbreaks, some studies were found to have investigated the reliability of fire safety measures in some public buildings [1, 6-10]. Commonly, the focus of the studies found were largely on the efficiency and adequacy of fire protection measures employed in the buildings investigated, with little attention given to user's knowledge level of fire safety protocols, which is considered a key factor for assessing the fire safety readiness of public environments. In combating fire in educational environments, if the users' have adequate knowledge on what to do in case of a fire incident, it is most likely that adequate steps will be taken to save more lives and property during a fire outbreak.

It is on this note that this study investigated students' knowledge of the fire safety measures utilized in the College of Science and Technology (CST) Building in Covenant University, Ota, Nigeria, in order to identify areas for improvement, towards contributing on ways of enhancing effective fire safety management through users' involvement in educational environments. Covenant University is a higher institution that is targeting to become one of the best universities in the world. To achieve this vision, its management procedures, and strategies, including that of fire safety measures, should be world-class that conform with best practices. Thus, the choice of the university for the study. To achieve the aim, the following objectives were established:

- (1) determine the awareness of students on the fire safety measures employed in the college building;
- (2) investigate the ability of students to operate the fire safety devices provided in the college building;
- (3) determine students' knowledge of basic fire safety protocols.

The basic fire safety protocols include awareness of fire emergency numbers, location of fire exits, escape routes, and muster points. The study adopted a case study approach. This implies that the scope of the research is narrowed down to the selected building set aside for the study, which is the CST building in Covenant University, Ota, Nigeria. The study investigation is restricted to the views of students because they constitute the highest population in any academic setting. It is

assumed that where majority of the students are adequately knowledgeable on fire safety protocols and measures in an academic environment, adequate precaution would be considered to have been put in place to safeguard users' and properties in the event of a fire incident.

The scope of the study was further restricted to the views of both undergraduate and postgraduate students of the built environment studies department in the CST. They include: The Departments of Architecture, Estate Management and Building Technology. These departments were selected because they deal with the built environment, and the students are expected to know about building's safety measures for fire prevention and control. The study is significant in providing insight on the awareness of students at Covenant University community on fire safety measures that conform with best practices. Also, the research adds to the repository of knowledge on the subject of fire safety and protection while laying a foundation for further studies. The research provides empirical data for students, lecturers, researchers, and policymakers on user's perception of fire safety protocols and measures, as well as how such knowledge can be improved upon in academic environments. Though fire was not specifically mentioned in the 17 Sustainable Development Goals (SDGs) as earlier mentioned, nevertheless, the study promotes target number 11 of the SDGs that advocates for the development of cities and human settlements to be safe, in addition to being resilient, inclusive, and sustainable.

## 2. LITERATURE REVIEW

### 2.1 Introduction to fire and fire safety measures in building construction

Fire is a spontaneous chemical process of combustion that causes the rapid oxidation of any substance, generating light, heat, and a variety of reaction products [3]. It is a typical natural disaster that affects about 3-4% of the earth's surface annually. It is also a tool employed by people to clear land and dispose of agricultural waste by burning. There are different classes of fire, with each class having a different suitable extinguishing medium. Class A fire involves ordinary combustion materials such as wood, cloth, or paper. Its most appropriate extinguishing agent is water. Class B is the fire resulting from volatile liquids such as petrol, diesel or oils, greases, and fats. The best extinguishing agent is blanketing of the smothering agents to exclude oxygen. The last category is Class C fire which involves live electrical equipment. Non-conductivity of extinguishing agent is the main parameter for the selection of extinguishing agents. Generally, methods of extinction of fire depends on the elimination of one of the factors responsible for fire by cooling, smothering, or starving.

Due to the negative effect of fire, there is a need for fire safety measures to be incorporated in the planning and development of buildings. Fire safety is the planning and design of infrastructure to decrease the danger of fire or to prevent the spread of fire in case of an outbreak. Fire safety involves the utilization of fire-resistant building materials, preventative strategies, flame-resistant protective clothing, fire safety training, and other activities [9]. Some examples of fire safety measures include ensuring that local building codes are adhered to, and fire code provisions (exits, markings, stairs, and signs) are properly utilised. It also includes observance of electrical safety codes, storing hazardous and flammable

materials correctly, and installing fire detection and alarm systems. Fire drills should also be held regularly and coordinated with the local fire department [9].

## 2.2 National building code and fire safety regulations in Nigeria

The National Building Code stipulates minimum criteria for the design and construction of buildings in Nigeria to ensure high quality, proficiency, and safety in the construction industry. According to Akerele et al. [11], such step would ensure that buildings are adapted to different environmental changes over their lifespan. Section 5 of the Code is primarily concerned with fire protection and safety measures. To limit combustion, the Code specifies that walls, floors, and roofs made of wood or with wooden parts be fire-retardant or coated with fire-retardant materials. As a result, material choices are expected to align with established standards and specifications [12]. Section 5.3.5 specified that reinforced concrete, steel, and iron should be used to construct stairs. Each riser and tread finishing material are specified to be hard and non-combustible materials like marble or brick. Section 5.3.7 requires sprinkler systems to be installed in any administrative building, including academic buildings and offices, with a height of 22.5 m above access roads for fire vehicles.

Sprinkler systems are designed to be automatic, and each floor should be equipped with a water-flow device and a shut-off valve. All fixtures, both electrical and mechanical, must be tested regularly to make sure they are in good working condition and that they conform to the safety standards, stipulated in the building code. Rooms that contain electrical and mechanical equipment should have smoke detectors (linked to a voice alarm system) installed and any other equipment that the space considers necessary. This should be done in order to control the dispersion of smoke or fire and keep the building inhabitants safe and alert in the event of a fire [6, 13].

## 2.3 Active and passive fire protection systems

Fire protection, suppression and prevention systems are all critical for keeping a building safe from fire. Fire safety systems can be categorized into two main types: active and passive systems. Active fire protection systems, such as sprinklers and fire alarms, are designed to help combat fires, whereas passive systems refer to structural measures that prevent the passage of flames and smoke. Suzi [1] defined fire protection systems as a system that aid in the identification of fires as well as the safety of the building, people, and equipment. The architect and contractor can include passive fire protection features such as fire doors, escape route or fire exit when a building is being constructed. The utilization of non-combustible materials during construction is also categorised as a passive fire protection measure [1].

As a result of the devastating effect of fire outbreak in the built environment, some studies were found to have investigated issues relating to fire in Nigeria. Some of the studies include that of Aderonmu and Eghobamien [7], that examined the active-passive fire protection techniques of Tejuosho ultra-modern market complex in Yaba, Lagos using a mixed-method research approach. The study discovered that, all the active fire protection devices were relatively in good condition, frequently serviced, exceptionally efficient, and reinforced by passive fire protection measures. The study

proposed didactic procedures and strategies that buyers and sellers in the market could use in case of an emergency fire.

Sholanke [6] studied the fire emergency safety readiness in Covenant University's CLDS building in Ota, Nigeria using the mixed-method approach. The authors discovered that the building's fire emergency safety features had varied levels of inadequacies. There was no full-scale firefighting apparatus in the structure, which was a noteworthy finding. According to the suggestions made by the study, the building should be upgraded with passive and active fire emergency safety features that were missing. The study also suggested that workshops and fire drills should be held on a regular basis in accordance with best practices.

Adeleye [8] investigated the readiness of public buildings in Ibadan, Nigeria to handle fire disasters, using a mixed methods research approach that gathered data with qualitative and quantitative methods. The study found that banks and hospitals fire safety equipment were the most adequately maintained. The study suggested that fire safety regulations in the Nigerian national building code should be examined and applied, with offenders penalised as required by law. In addition, residents of public buildings should be urged to engage in regular fire safety training, administration of first aid, and rescue operations.

## 2.4 Gap in literature

It is observed that generally, studies found in Nigeria focused more on the efficiency and reliability of fire protection measures in the buildings investigated. Just few studies were found to have examined users' knowledge level on fire safety measures, both in terms of where the fire safety equipment are located and how to operate them, which is considered fundamental to the success of fire safety management in any building. If the regular users of a building have adequate information on how to deal with fire, there is a likelihood that in the case of a fire emergency, they will know what to do to be safe and safeguard others. To this end, it is necessary to investigate how well users of public buildings, especially learning environments, understand basic fire safety protocols, fire protection measures provided in public buildings and how to operate them, towards promoting effective fire safety management in public environments, especially academic settings. This is because users' knowledge level of the right steps to take in the event of a fire incident in a building is fundamental to achieving the goal of fire safety management in the built environment, which is to first, save lives and then properties. Linking back to the objectives, the literature illuminates the necessity of assessing students' awareness, operational skills, and knowledge of fire safety protocols. It accentuates the importance of users' understanding, stating that effective fire safety management hinges on their participation. This is the gap this study was carried out to fill by investigating users' knowledge of fire safety measures employed in a Nigerian academic setting.

## 3. RESEARCH METHODOLOGY

The purpose of this study was to investigate students' awareness of fire safety measures employed in the CST building in Covenant University, hence the research is a case study. To achieve the aim of the study, three objectives were established to gain understanding of students' perspective on

various aspects of fire safety management protocols. This necessitated the collection of data from the students to resolve. Due to the significant number of students participating, the study adopted a survey research approach that relied on quantitative research methods to conduct. A closed-end structured questionnaire was employed to gather data from both undergraduate and postgraduate students of the Departments of Architecture, Building Technology and Estate Management.

From figures received from the three departments, the study population is 567 students (Architecture-267; Building Technology-200; Estate Management-100). To determine the sample size, the study relied on the position of Nwana adopted by Sholanke [6], that recommended a minimum sample size of 40% of the population for a study of this nature. The study sample size of 227 students was derived by the addition of 40% of the population of the students in each of the three departments as follows:

- Architecture: 40% of 267 students=107 students
- Building Technology: 40% of 200 students=80 students
- Estate Management: 40% of 100 students=40 students
- Sample Size: (107+80+40) students=227 students

Consequently, 227 questionnaires were administered accordingly. To avoid bias in the distribution of the survey instrument, the students that took part in the study were randomly selected. The questionnaires were distributed at departmental functions that involved all the students of each of the departments. The participants were selected using simple random sampling without replacement.

The questionnaire was divided into four parts. The first part was used to collect data on relevant personal characteristics of the respondents such as gender and age of respondents. The second segment was used to retrieve data on the students' knowledge of fire safety measures implemented in the college building. A sample question in this segment is 'How well do you know the fire safety measures in CST?'. The third and fourth sections were used to gather data on their knowledge of the use of fire emergency safety devices and basic fire safety protocols, respectively. Sample questions in the third and fourth sections are 'To what extent do you know how to use a fire extinguisher?' and 'In the case of a fire, do you know the fire emergency number to call?' respectively.

The data collection tool was validated through expert review and the data reliability was verified through consistency checks. The data underwent analysis using Statistical Product and Service Solutions (SPSS) software. The findings were presented descriptively with the use of tables.

The ethical considerations in this study prioritized respondent anonymity, ensuring confidential use solely for academic purposes. Participants engaged voluntarily with informed consent.

## 4. RESULTS AND DISCUSSION

### 4.1 Questionnaire response analysis

A total of 227 questionnaires were shared across the three departments that constitute the study population and sample size as indicated in the methodology section. However, 153 of the questionnaires were found to be dully completed, useful and analysed. This amounts to 67.40% retrieval rate, which is considered reasonable for generalizing the result as the opinion of the study population, since the figure is clearly

higher than half (50%) of the sample size. The data also revealed that the Department of Architecture with 92 (70.13%) respondents had the highest number of participants. This is followed by students from the Department of Building Technology with 41 (26.80%) participants. While the Department of Estate Management has the least number of participants, with 20 (13.07%) students.

### 4.2 Personal characteristics of respondents

The personal characteristics of the respondents were examined based on their gender, age, level of study, department, and length of stay in the college building. The result is presented in Table 1.

**Table 1.** Personal characteristics of respondents

S/N	Variable	Group	Frequency	Percentage (%)
1.	Gender	Male	70	45.75
		Female	83	54.25
		Total	153	100.00
2.	Age	14-18 years	46	30.07
		19-25 years	101	66.01
		26-30 years	5	3.27
		31-40 years	1	0.65
		Total	153	100.00
3.	Level of study	100	17	11.11
		200	25	16.34
		300	17	11.11
		400	40	26.14
		500	22	14.38
		Total	153	100.00
4.	Department	Architecture	92	70.13
		Building Technology	41	26.80
		Estate Management	20	13.07
		Total	153	100.00
		Less than one year	27	17.65
5.	Length of stay in the building	1-5 years	116	75.82
		Above 5 years	10	6.53
		Total	153	100.00

1. Table 1 shows that though 54.25% of the respondents are females, the percentage of the male participants is quite significant (45.75%). The result signifies that both the male and female gender opinions are reasonably recorded in the study. On age groupings, 66.01% of the respondents are between the ages of 19 and 25 years. This is followed by those within the age bracket of 14 to 18 years (30.07%). Those above the age of 25 are 3.27% to indicate that the result is dominated by the opinion of students within the age range of 14 to 25 years. Given that a large number of Nigerian universities, especially private universities, admit students as young as 15 years of age, it is not surprising that majority of the respondents are between the ages of 19 and 25 years, while a significant percentage of them are between the age bracket of 14 and 18 years. 2. The data on level of study indicates that the study was dominated with the opinion of undergraduate students at 79.08%. Those in MSc 1 constitute 17% of the participants, whereas MSc 2 students are the least represented in the study with just 3.9%. A breakdown of the undergraduate figures reveals that 11.11% of the respondents are 100 level

students, 16.34% are in 200 level, 11.11% are in 300 level, while 26.1% of them are 400 level students. The 500 level students are 14.4%. This result points to the fact that majority of the participants have been students for at least a year, which is considered adequate time for any student who uses the college building, to be able to make informed judgment on the fire safety protocols and protection measures of the building. 3. The analysis of the data on the department of the participants shows that the study is largely dominated by the opinion of students of the Department of Architecture, but with a significant contribution from students of the Department of Building Technology. The result revealed that 70.13% of the participants are from the Department of Architecture, 26.80% are students from the Department of Building Technology. Whereas, Estate Management Department has the least percentage of participants with just 13.04%. 4. The results on the length of stay of the students in the college building indicate that over three quarter of them (75.82%) fall in the category of those who have been using the building for between 1-5 years. 17.65% of the participants have spent less than a year in the building, while those who have been using the building for over 5 years are few, 6.53%. Again, the result indicates that majority of the respondents have spent more than a year making use of the building. This is considered enough time for them to be conversant with the building, as well as its fire safety protocols and protection measures.

#### 4.3 Awareness of the fire safety measures employed in the college building

To determine the student's awareness of the fire safety measures employed in the college building, three response options were used. They include: "Not Aware", "Uncertain" and "Aware". The result is presented in Table 2.

**Table 2.** Awareness of the fire safety measures employed in the college building

S/N	Variable	Group	Frequency	Percentage (%)
1.	Awareness of the fire safety measures of the building	Not aware	39	25.49
		Uncertain	63	41.18
		Aware	51	33.33
		Total	153	100.00
2.	Awareness of the location of the fire safety devices	Not aware	34	22.22
		Uncertain	49	32.03
		Aware	70	45.75
		Total	153	100.00
3.	Awareness of fire extinguishers	Not aware	13	8.50
		Uncertain	38	24.83
		Aware	102	66.67
		Total	153	100.00
4.	Awareness of hose reels	Not aware	35	22.88
		Uncertain	51	33.33
		Aware	67	43.79
		Total	153	100.00
5.	Awareness of fire drills	Not aware	83	54.25
		Uncertain	50	32.68
		Aware	20	13.07
		Total	153	100.00
6.	Awareness of sand buckets	Not aware	15	9.80
		Uncertain	46	30.07
		Aware	92	60.13
		Total	153	100.00

1. The data in Table 2 reveal that majority of the participants are either not aware or uncertain of the fire safety measures of

the college building. While 25.49% of the respondents are outrightly not aware, 41.18% of them are not certain of their opinion. Just about 33.33% of the respondents are aware of the fire safety measures employed in the building. On awareness of the location of the fire safety devices, again majority of the participants are either not aware or not sure of their view. Those who have no idea of the location of the devices are 22.22%, whereas those who are not certain of their opinion are 32.03%. However, a significant percentage of the participants (45.75%) are aware of the location of the fire safety devices. 2. In terms of the awareness of the respondents on specific fire safety measures and protocols identified in the building (extinguishers, hose reels, sand buckets as well as fire drills - a fire safety protocol expected to be conducted in the building periodically in conformity with best practice), 66.67% of the respondents are aware of the extinguishers. Likewise, 60.13% of them are aware of sand buckets. However, with regards to hose reel and fire drills, most of them are either not aware or uncertain of their opinion. Though a significant percentage of the participants (43.79%) are aware of hose reels, just few (13.07%) of them are knowledgeable of fire drills. A further breakdown of the results indicates that few (8.50%) of the respondents are aware of extinguishers while about a quarter (24.83%) of them are not certain of their opinion. 22.83% of the participants are not aware of hose reels, while a significant percentage, 33.43% of them are not sure of their view. On fire drills, 54.25% of the respondents have no idea about it, while 32.68% of them are not sure of their opinion. But with regards to sand buckets, while 30.13% of the participants are uncertain of their view, only 9.8% of the respondents are not aware of them. 3. In general, though some respondents indicated that they are either unaware or not certain of the fire safety measures incorporated in the college building, a larger number of them signified that they are aware of extinguishers (66.67%), sand buckets (60.13%) and hose reels (43.79%). This suggests that quite a number of the students seem to be unaware that fire extinguishers, sand buckets and hose reels are fire safety measures employed in the building. However, on fire drills, the findings indicate that the exercise is rarely carried out in the building with just few (13.07%) of the respondents attesting to being aware of fire drills.

#### 4.4 Ability to operate fire emergency safety devices employed in the college building

The fire emergency safety devices employed in the college building are fire extinguishers, hose reels and sand buckets. Although, fire alarms were not incorporated in the building, it is an important fire emergency safety device. To this end, it was included in the questionnaire. To ascertain if users are capable of operating the fire emergency safety equipment, again respondents were asked to select one of these three options: "Not Aware", "Uncertain," or "Aware". Table 3 is a display of the result.

**Table 3.** Awareness of the fire safety measures employed in the college building

S/N	Variable	Not aware (%)	Uncertain (%)	Aware (%)
1.	Fire extinguisher	24.80	22.90	52.30
2.	Hose reel	41.20	37.30	21.60
3.	Fire alarm	23.50	26.10	50.30
4.	Sand bucket	7.20	18.30	74.50

According to the data in Table 3, majority of the respondents are aware of how to make use of the common firefighting hand appliances such as extinguishers (52.3%), alarms (50.30%) and sand buckets (74.5%). On the contrary, 41.3% of the participants have no idea of how to operate hose reels, while a significant percentage, 37.3% of them are uncertain if they can operate it or not. 21.6% of the participants are aware of how to operate the hose reel which is a full-scale firefighting appliance.

#### 4.5 Awareness of basic fire safety protocols

The basic fire safety protocols investigated include: fire emergency number to call; location of fire exits and escape routes; location of muster points; location of fire safety signs; and participation in fire drills. The options made available for the respondents to choose from are also, "Not Aware," "Uncertain" and "Aware". Table 4 shows the result on the students' awareness of basic fire safety protocols.

**Table 4.** Awareness of basic fire safety protocols

S/N	Variable	Group	Frequency	Percentage (%)
1.	Awareness of fire emergency number to call	Not aware	122	79.70
		Uncertain	23	15.00
		Aware	8	5.20
		Total	153	100.00
2.	Awareness of the location of fire exits and escape routes	Not aware	51	33.30
		Uncertain	36	23.50
		Aware	66	43.10
		Total	153	100.00
3.	Awareness of the location of the muster point	Not aware	49	32.00
		Uncertain	36	23.50
		Aware	68	44.40
		Total	153	100.00
4.	Awareness of the location of fire safety signs	Not aware	46	30.10
		Uncertain	83	54.20
		Aware	24	15.70
		Total	153	100.00
5.	Participation in fire drills	Not aware	104	68.00
		Uncertain	30	19.60
		Aware	19	12.40
		Total	153	100.00

1. The results in Table 4 reveal that, in case of a fire emergency, majority of the participants will not be able to put a distress call to the fire emergency department. This is because, 79.7% of the respondents have no idea of the fire emergency number to call in the event of a fire outbreak. Those who are not certain of their opinion make up 15% and those who are aware are 5.2%. Regarding the awareness of the location of fire exits and escape routes, the contrary is the case. Though 43.1% of the respondents are aware of their locations, majority of them fall under the category of students who are either not certain of their opinion or outrightly not aware of their locations. One-third (33.3%) of the respondents have no idea of the fire exits or escape routes, while close to a quarter (23.5%) of them are not sure if they are aware of their locations or not. This implies that in the event of a fire outbreak, again, majority of the respondents will most likely find it difficult identifying the fire exits and escape routes of the college building. Nevertheless, a significant number of them will have no issues with escaping the building through the fire exits and escape routes. 2. The data in Table 4 also indicates that in the event of a fire outbreak majority of the respondents will again

most likely find it difficult to know where to gather for a head count after leaving the building. Though 44% of the participants know the location of the muster point, again majority of them fall under the category of students who are either not aware (32%) of the location or uncertain (23.5%) of their opinion. 3. The result on the students' awareness of the location of the fire safety signs in the building reveals that 54.2% of the respondents are uncertain of their opinion, whereas a significant 30.1% of them are not aware at all. Just 15.7% of them know where the signs are located in the building. This finding implies that most of the respondents are not likely to benefit from the information on the fire safety signs. 4. The result of the investigation on participation of the respondents in fire drills, shows that majority (68%) of the participants have never participated in the exercise before. Those who have participated are few (12.4%), while close to one fifth (19.6%) of them are uncertain if they have taken part in a fire drill or not. This signifies that it is most likely that regular fire drills are not usually conducted in the college building. This suggests that most of the respondents are not likely to get regular information on how to react swiftly and correctly in the event of a fire emergency situation, which fire drills provide.

#### 4.6 Discussion of findings

The results presented in the previous sections is considered reliable and a true reflection of the opinions of the students who make use of the CST building on a regular basis. The respondents' characteristics help to support the reliability of the results. Though the scope of the study is limited to the views of students of the built environment fields situated in the college building, the opinions cut across male and female genders, undergraduate and postgraduate students, as well as young adults who are largely between the ages of 18 and 25 years of age. Also, majority of the participants have been using the building on a regular basis for over a year to indicate that most of the respondents' views are a true reflection of what obtains in the college building, regarding fire safety management measures and protocols. This is because it is expected that within a year of using a building on a regular basis, majority of the respondents should have taken part in a fire drill that helps to prepare occupants on what to do and the right steps to take to safeguard lives and properties in the event of a fire outbreak.

In order to ascertain the students' knowledge of the fire safety measures of the CST building, three objectives were set. The result on the first objective, which is to determine the awareness of students on the fire safety measures employed in the college building revealed that, majority of the respondents are either not aware of the measures employed or not certain of their opinion. Just barely a quarter of the participants are aware of the fire safety measures utilized in the college building. Though a significant number of the students indicated that they are aware of the location of the fire safety measures of the building, it is not surprising that most of the participants are either not aware of the locations of the fire safety devices or not sure of their opinion. With regards to specific fire safety measure or protocol, most of the participants are mindful of fire extinguishers, sand buckets and horse reels. As for fire drill, just few of them are knowledgeable of what a fire drill is, to suggest that fire drill is hardly conducted in the building. This finding is similar to that of Sholanke [6] that discovered that fire drills were rarely

conducted in the College of Leadership Development Studies in Covenant University, as majority of the students have never participated in a fire drill before, thus lack knowledge on what a fire drill entails. According to Safeopedia [9], fire drills should be held regularly under the coordination of the local fire department. This is supported by Sholanke [6] that affirmed that conducting fire drills in public buildings is in line with best global practice.

The second objective was carried out to determine the ability of the students to operate the fire safety devices provided in the college building. The result indicates that a vast majority of the respondents can use fire extinguishers, sand buckets and fire alarms. But on hose reels, most of the participants have no idea on how to operate it. Hose reels, which are full-scale firefighting systems, are installed for the use of firefighting professionals rather than for individuals who utilise a building to operate. Therefore, it is understandable that majority of the respondents are not aware of how to operate the device. This result indicates that majority of the respondents can use fire safety hand devices to indicate that in an ideal situation, in the event of a minor fire outbreak, it is most likely that the students would be able to put it under control with the use of the firefighting hand appliances incorporated in the building.

However, the findings showed that majority of the students are either not aware or certain of their opinion on the location of fire safety measures utilized in the building. In order to be able to have a chance of minimising the damage of a fire outbreak in a building, it is important that regular users of the building are aware of the location of the fire emergency devices. To be aware of the location of the fire safety devices in a building is just as important as knowing how to operate them. If the users do not know the location of the devices, they will not be able to use them, even if they know how to operate them. The general implication of this result is that majority of the students may not be able to directly locate the fire safety appliance even though they are capable of operating them which is counterproductive to the goal of fire safety management in public environments. This revelation agrees with Ndetu and Kaluyu [14] that found that in the event of a fire outbreak, most students are not able to utilise retardant systems as a result of various inadequacies.

The result on the third objective which is to determine if students are knowledgeable of basic fire safety protocols shows that their knowledge level is inadequate. Though a significant number of the students are aware of the fire exits, escape routes and muster points of the college building, majority of the participants are either not aware of them or uncertain of their opinion. While some of the respondents are likely to easily find their way out of the building to reach the muster point in the event of a fire incident, majority of them would most likely find it difficult to do so. To make matters worse, most of the respondents have no clue on the fire emergency number to dial in case of a fire incident, nor are aware of where the fire safety signs in the building are positioned. This result is similar to the findings of Sholanke [6], that discovered that majority of the participants in their study, lacked knowledge of the fire emergency number to call in the event of a fire mishap in the CLDS building in Covenant University.

To worsen the situation, majority of the respondents indicated that they have never participated in fire drills and trainings before. This implies that either fire drills or training are not usually conducted in the CST building or the

respondents are not aware of it. The former is most likely to be the case as the data indicated that majority of the students that participated in the study have been using the building on a regular basis for over a year. This is considered enough time to have participated in a fire drill if they are conducted as expected on a regular basis in the college building. The implications of these findings are that majority of the students are not adequately equipped with information on fire safety management protocols, which is necessary for them to react swiftly and effectively in the event of a fire incident. This result is similar to that of Adeleye [8], that found that individuals residing in public buildings lacked adequate training to handle fire emergencies. Consequently, the authors recommended that people should be encouraged to undergo regular fire safety training, learn how to administer first aid, and conduct rescue operations.

In general, the results indicate that users' knowledge of fire safety measures in the CST building is low. The broad implication of the findings is that users of the college building are not adequately prepared and equipped to handle a fire emergency situation, especially in a critical scenario. In the event of a severe fire occurrence, the damage that may occur would most likely be greater than in a situation where the users are adequately knowledgeable on fire safety management protocols. This infers that effective fire safety management through users' participation cannot be adequately achieved in the CST building.

The identified lack of fire safety knowledge in the CST building implies a broader systemic risk for educational institutions. This deficiency heightens vulnerabilities across academic settings, jeopardizing effective fire safety management. Urgent reassessment of safety protocols is imperative, necessitating collaborative initiatives and policy enhancements on a broader scale. This can be improved upon by implementing regular fire drills, offering workshops on how to use fire safety equipment, and creating more visible signage for fire safety measures.

## 5. CONCLUSIONS AND RECOMMENDATIONS

The study was conducted to investigate users' knowledge of fire safety measures and protocols in the College of Science and Technology building in Covenant University, Ota, Nigeria. To achieve the aim, three objectives were set. They include to: determine the awareness of students on the fire safety measures employed in the college building; investigate the ability of students to operate the fire safety devices provided in the college building; and determine students' knowledge of basic fire safety protocols.

On the first objective, the result indicates that most of the participants either lacked awareness on the fire safety measured employed in the building or are not certain of their judgement. On the second objective, though most of the participants have no idea on how to make use of hose reel, which is understandable, as hose reel is a full-scale firefighting appliance meant for the use of firefighting professionals, a vast majority of them can operate basic fire safety hand appliances such as fire alarms, extinguishers, and sand buckets. However, majority of the respondents are either not aware of the location of the fire safety devices in the college building or not sure if they are aware or not. This is most likely to reduce the positive impact of having majority of the participants knowledgeable on how to operate basic fire safety hand appliance would have

had in the event of a fire disaster in the building. The investigation on the third objective revealed that the participants' knowledge of basic fire safety protocols is inadequate. Most of the respondents are either not knowledgeable of the fire exits, escape routes and muster point of the building or are not sure of their opinion. Whereas, on the location of fire safety signs, fire emergency number to call in the event of a fire incident and awareness on fire drills, a vast majority of the respondents lack knowledge on them. Generally, the results show that users' knowledge of fire safety measures in the College of Science and Technology building in Covenant University is way too low. This implies that the risk level to the safety of individuals and damage to property in the event of a fire outbreak is higher in the college building compared to if the users' knowledge of fire safety measures in the building were to be adequately high.

Based on the findings of the research, the study recommends as follows:

(1) fire drills should be conducted regularly in the college building to enable its users to be adequately informed on fire safety management requirements for safeguarding lives and properties in the event of a fire incident; This can be implemented by collaborating with fire safety authorities to organize fire drills for the users of the building.

(2) the drills should be followed up with periodic trainings and workshop programmes for students and other regular users of the building, to learn how to operate basic fire safety appliances in the building; This can be achieved by providing users with training materials such as flyers.

(3) regular users of the building should be encouraged to know where the fire safety devices of the building are located for quick and easy find for deployment in case of a fire outbreak;

(4) fire safety signs should be positioned at strategic and conspicuous locations in the building to enable users to easily see, understand and benefit from their contents towards effective fire safety management in the building;

(5) the college building should be retrofitted with fire alarms that were observed to be conspicuously missing in the building; This can be achieved by employing competent professionals to oversee the installation of fire alarm systems.

The research is a case study that relied on the opinions of students of the three departments of the built environment fields in the College of Science and Technology building in Covenant University. The departments are: Architecture, Building Technology and Estate Management. This is recognized as a limitation of the study. However, this does not diminish the contributions to knowledge of the research which includes:

(1) establishment that the awareness of students on the fire safety measures employed in the College of Science and Technology building in Covenant University is far too low; This can result in the increased orientation of students on fire safety measures.

(2) provision of empirical evidence that indicates that the students' ability to operate the fire safety devices provided in the college building is inadequate; This can result in implementing mandatory programmes where student can learn to operate the fire safety devices.

(3) establishment that the students' knowledge of basic fire safety protocols in the college buildings is too low for achieving effective fire safety management through users' participation in the academic environment; This can result in establishing a fire safety committee comprising faculty, staff,

and students to oversee and continually improve fire safety measures.

Based on the limitation of the study, the study recommends that similar studies should be conducted with a larger scope to include students of all the departments in the college building and other users of the academic environment. Similar studies should also be extended to cover other building types within academic settings such as: lecture theatres, libraries, hostels, staff residence, cafeteria, worship centres, as well as sports and health facilities. Further studies should also consider enlarging the scope from a case study to a survey research to allow for a comparative analysis of two or more institutions. Hopefully, such studies are most likely to reveal new noteworthy findings that would be beneficial towards effective fire safety management in academic environments.

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