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ASSESSMENT OF SCIENCE TEACHERS' LEVEL OF AWARENESS ON LABORATORY MANAGEMENT TECHNIQUES AT SENIOR SECONDARY SCHOOL LEVEL IN FEDERAL CAPITAL TERRITORY, ABUJA,

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Abstract

This paper assessed science teachers' level of awareness on laboratory management techniques in Federal Capital Territory (FCT) senior secondary schools, Abuja. Survey research design was adopted for the study. A sample of 320 were selected from the population of 1,896 science teachers using simple random sampling technique. Three research questions and two null hypotheses guided the study. A structured questionnaire made up of 20 items was used for data collection. The questionnaire was validated by experts in Science Education and a reliability index of 0.96 was obtained using Cronbach Alpha. Finding of the study revealed that science teachers in FCT have high level of awareness on laboratory management techniques in the areas of ordering, stocking and maintenance of materials while they have low level of awareness on laboratory safety measure. It was also found that male science teachers have higher level of awareness than their female counterparts. Based on the findings, it was recommended among others that science teachers should be exposed to conferences, workshops and seminars to enable them improve on their knowledge of laboratory management techniques.

Keywords: Assessment, awareness, laboratory management techniques, Science Teachers

Introduction

This is a scientific era where it is expected that everyone would directly or indirectly be influenced by scientific discoveries. Therefore, across the world, science is increasingly being recognized as a subject of life-long utility (Iftekhhar, 2013). The success or otherwise of teaching and learning of science depends on several factors among which are the availability of functional laboratory, scientific equipment and the ability of the science teacher to properly manage human and material resources in the laboratory. However, successful teaching and learning of science cannot be achieved without Information and Communication Technologies (ICTs) through the use of manipulating tools, equipment and machines in a functional laboratory setting. A laboratory is a room or building equipped and set apart for practical or experimental studies to take place (Omiko, 2015).

A science laboratory is facility that provides controlled condition in which scientific or technological research, experiments and measurement may be performed. A science laboratory may not be only confined to a room with a sink and fitting for experiments but rather, any place in the field, stream near school, garden or workshop equipped and set aside for the function it is intended to serve (Adams & Salome, 2014). The knowledge of laboratory management is

essential for the correct use of science buildings, installations, machinery and equipment, as well as an economical use of energy, water and other materials in the laboratory. Therefore, science laboratory is very essential in science teaching and places a demand on science teachers to be properly aware of how to manage laboratory effectively.

Science laboratory management is the effective utilization of human and material resources towards achieving the objectives of setting up the place (Samba & Eriba, 2011). It is regarded as those complex activities that involve planning, organization, coordination of equipment and activities in a manner conducive to scientific investigation. Paul (2008) posited that effective laboratory management techniques is a learned skill which involves regular meetings and delegating responsibilities to laboratory staff. Ezeano and Ezeudu (2013) opined that Laboratory management which teachers and technical staff are exposed to include ordering of equipment, storage of materials, safety and maintenance. The management of school laboratory requires the services of qualified science teachers. A science teacher is someone who teaches the principles of different areas of science to students, helps them conduct experiment using the equipment and facilities in the laboratory. The science teacher as a resource manager must train his students in the correct techniques of handling materials, tools and equipment (Muhammad, 2016).

However, some science teachers do not have proper awareness of laboratory management. The major problems facing the teaching and learning of science is connected with the management of available laboratory resources, inability to appropriately manage laboratory resource is a sign of poor management (Muhammad, 2017). The problem then, is to what extent are science teachers aware of laboratory management techniques. Therefore, this study is set to assess science teachers' level of awareness of laboratory management techniques in FCT senior secondary schools, Abuja. It is against this background that this study seeks to assess science teachers' level of awareness of laboratory management in senior secondary schools in the Federal Capital Territory, Abuja.

Aim and Objectives of the Study

The aim of this study is to find out science teachers' level of awareness on laboratory management techniques in FCT senior secondary schools, Abuja. The following specific objectives are formulated to guide the study to:

- (i) Determine science teachers' level of awareness on laboratory management techniques in FCT senior secondary schools, Abuja.
- (ii) Find out the difference between male and female science teachers' level of awareness on laboratory management techniques in FCT, Abuja.
- (iii) Investigate the difference in the level of awareness on laboratory management techniques between science teachers in urban and rural schools of FCT, Abuja.

Research Questions

The following questions are raised to guide the study:

- (i) To what level are science teachers aware of laboratory management techniques in FCT senior secondary schools, Abuja?
- (ii) What is the difference between male and female science teachers' level of awareness on laboratory management techniques in FCT senior secondary schools, Abuja?

- (iii) What is the difference in the level of awareness on laboratory management techniques between science teachers in urban and rural schools of FCT, Abuja?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance

HO₁: There is no significant difference between male and female science teachers' level of awareness on laboratory management techniques in senior secondary schools in FCT, Abuja.

HO₂: There is no significant difference in the level of awareness on laboratory management techniques between science teachers in urban and rural schools of FCT, Abuja.

Methodology

The study adopted research survey design. According to Nworgu (2015), a survey research design is the one that describes the present status of circumstances or phenomena. The population of the study consisted of all Science Teachers in public senior secondary schools in the six Area Councils of FCT, Abuja. The total number of Science Teachers in FCT, Abuja is 1896 (FCT-SEB, 2018). The sample of the study is 320 Science Teachers selected using simple random sampling technique. This comprised 182 males and 138 females as well as 194 in urban and 126 in rural schools. The sample was determined using Krejcie and Morgan table for determining sample size from a population (Krejcie & Morgan, 1970).

The instrument used for data collection was a structured questionnaire on 5-point rating scale with response options of Not Aware, Slightly Aware, Somewhat Aware, Moderately Aware and Extremely Aware with the weighing of 1, 2, 3, 4, and 5 respectively. In order to take decision as remark, real limits of number was used to indicate the level of awareness with numerical values of 0.5 – 1.49 as Not Aware, 1.5 – 2.49 Moderately Aware, 2.5 – 3.49 Aware, 3.50 – 4.49 Extremely Aware and 4.5 – 5.00 as Very Extremely Aware. The instrument was validated by three experts in Science Education. A pilot study was conducted on 40 Science Teachers. The data collected were analyzed using Cronbach Alpha coefficient and the reliability coefficient obtained was 0.96 which shows that the research instrument is appropriate for the study. The questionnaire was administered and collected by researcher and research assistant. Data collected were analyzed using mean, standard deviation and the hypotheses were tested using t-test.

Results

Table 1: Science Teachers' level of awareness on laboratory management techniques

S/N	Items Description	\bar{x}	SD	Response
1	Checking for production and expiring dates of reagents or chemicals upon delivery	3.27	0.73	High
2	Ensuring that the reagents and other materials requested for are appropriately supplied	3.03	0.68	High
3	Checking for and rejecting fake laboratory equipment/reagents	3.50	0.61	High
4	Proper recording of items or materials supplied	3.47	0.64	High
5	Awareness of priority placed on items that are ordered	2.93	0.82	Low
6	The standard work space required by each student in the laboratory	3.18	0.67	High
7	Serial arrangement of workbenches allows for free movement and supervision of experiments	3.70	0.59	High
8	Stock book is kept in the laboratory	3.16	0.68	Low
9	Accidents and emergencies are recorded in accidents and	2.50	0.76	Low

first aid book kept in the laboratory						
10 Awareness of how to clean spill toxic acids on the skin to avoid chemical burn	3.63	0.65	High			
11 Labeling of reagents or chemicals with name, formular and date	3.21	0.73	High			
12 Light objects that are not frequently used are stored on the top level of shelves in laboratory	2.08	0.91	Low			
13 Storage of chemicals by families with incompatible chemicals separated from each other	4.16	0.49	High			
14 Proper disposal of glassware and used-up chemicals	3.97	0.50	High			
15 Damages and breakages book is kept for day to day running of laboratory	2.85	0.84	Low			
16 Checking the glassware for cracks and chips each time you use it	2.57	0.80	High			
17 Regular checking and servicing of gas and water main tap		3.82	0.53	High		
18 Proper orientation/alignment of laboratory reduces wind and enhances visibility in work place		3.76	0.60	Low		
19 The procedures involved in using a Bunsen burner to heat H ₂ O in a beaker	2.16	0.88	High			
20 Administration of first aid treatment to a student who is cut by broken glassware	2.91	0.77	High			
Grand Mean		3.19	0.69	High		

From the table, science teacher responses on laboratory management techniques show that thirteen (13) out of the twenty (20) items in the instrument pertaining to laboratory management have their mean rating above 3.00. This implies that science teachers have high level of awareness of laboratory management. Conversely, the respondents have low mean scores on the remaining seven (7) items. This indicates that science teachers have low level of awareness of safety aspect of laboratory management.

HO₁: There is no significant difference between male and female science teachers' level of awareness on laboratory management techniques.

Table 2: t-test Analysis of differences between male and female science teachers' level of awareness on laboratory management techniques

Variable value	N	Mean	SD	df	t-cal	P-
Male	182	33.91	7.934			
Female	138	29.95	5.946	318		4.92
						.00

Table 2 shows t-cal=4.92, df (318), P<.0.05. this meant that P <0.05, therefore the null hypothesis that there is no significant difference between male and female science teachers level of on laboratory management techniques is rejected. There is actually significant difference.

Table 3: t-test Analysis of the difference in the level of awareness on laboratory management techniques between science teachers in urban and rural schools

Variable	N	Mean	SD	df	t	sig
Urban	194	35.162	7.397			

				318	8.011	.000
Rural	126	28.698	6.483			

Table 3 indicates $t=8.011$, $df=318$ and $p=0.000$. Since $p < 0.05$, H_0 was rejected. Therefore, there is significant difference in location on science teachers' level of awareness on laboratory management.

Discussion

The result of the findings revealed that science teachers in FCT have high level of awareness on laboratory management in the areas of ordering, stocking and maintenance of laboratory equipment. The finding agrees with earlier studies conducted by Ezeano and Ezeudu (2013), that Chemistry Teachers apply laboratory management skills of storage and maintenance of equipment to a reasonable extent. This is also in line with the finding of Udu (2010) that Science Teachers in Ebony State utilized laboratory management skills in the area of maintenance of equipment to appreciable extent. This implies that Science Teachers in FCT have demonstrated similar level of awareness in the ordering, stocking and maintenance of laboratory equipment and organize the laboratories for effective teaching and learning of science.

The finding of this study also revealed that Science Teachers in FCT have low level of awareness of safety aspect of laboratory as shown in table 1. This agrees with the result of Akubuo and Eze (2007) that teachers are not sufficiently skilled in the area of safety. This implies that Science Teachers in FCT are deficient in a number of safety management techniques put in place in the laboratory to guarantee safety of life and longevity of equipment. This is also in agreement with the finding of Achufusi and Ezenduka (2017) that safety equipment is lacking in most biology laboratories, thus limiting the implementation of safety practices to a great extent.

Furthermore, the study found that there is significant difference between male and female science teachers' level of awareness on laboratory management techniques in favor of the male as shown in table 2. The finding is line with that of Udu (2010) which revealed that the male science teachers in Ebony State utilized laboratory management skills more than their female counterparts. This implies that gender accounts for differences in science teachers' level of awareness of laboratory management. The finding also agrees with Ibe, Adah and Ihhejiamazu (2013) who asserted that gender influences teachers' level of competency in the usage and management of laboratory apparatus. This ought not to be so because both teachers passed through teacher education during pre-service training and are exposed to similar training experiences in the institutions.

It was also found that there is significant difference in science teachers' level of awareness of laboratory management based on school location as indicated in table 3. This implies that science teachers in urban schools have higher level of awareness of laboratory management than those in rural schools of FCT, Abuja. The finding is in agreement with that of Ibe, Adah and Ihhejiamazu (2013) that Chemistry Teachers in urban schools recorded higher mean achievement in identification of the commonly used pieces of laboratory apparatus than those in rural schools. This is an indication that science teachers in rural schools of FCT, Abuja are still lagging behind in terms of laboratory management.

Conclusion

The study which assessed science teachers' level of awareness of laboratory management revealed that science teachers in FCT have high level of awareness of laboratory management in the areas of ordering, stocking and maintenance of laboratory equipment but they have low level of awareness of laboratory safety, and the male and urban science teachers have higher level of awareness of laboratory management than the female and rural science teachers.

Recommendations

Based on the findings of this study, the following recommendations are made:

- (i) Science teachers should be exposed to conferences, workshops and seminars to enable them improve on their knowledge of laboratory safety
- (ii) Science teachers especially those in rural schools should be involved in routine retraining and symposia on science laboratory management for effective teaching of science.
- (iii) There should be regular in-service training for science teachers by team of Inspectorate and Ministry of education to ensure quality science teaching in schools.

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