

ASSESSMENT OF LABORATORY MANAGEMENT AND ORGANIZATIONAL BIOLOGY CURRICULUM DELIVERY AMONG SECONDARY SCHOOL TEACHERS IN ANAMBRA STATE

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Abstract

The study evaluated the laboratory management principles by teachers on biology curriculum delivering in secondary schools in Anambra State. Population of the study comprised all the biology teachers in three education zones out of the six, numbering 262. Random sampling was used to select 3 zones and 40 biology teachers from each zone; making a total sample of 120. Descriptive survey design was used. Instrument was a self structured 4-part Laboratory Management Scale (LMS). Validation was done by experienced lecturers; one from Biology department, while the other was from Measurement and Evaluation unit of Psychology department. Reliability was tested using Pearson Product Moment Correlation Coefficient which gave a value of 0.75. Mean and Standard deviation were used to analyze data. Result obtained showed among others, that teachers mobilize available laboratory resources as well as instructional materials in their teaching of biology; that biology teachers have appropriate skills required in the planning and organization of their laboratory. Based on the findings, it was concluded that to be useful in the laboratory, teachers must establish a professional image. It was recommended among others that biology teachers must elasticize the scope of laboratory practice and operation to extend beyond the preview of manipulative skills, ordering, stocking, storage and safety.

INTRODUCTION

Teachers are responsible for a substantial amount of biology laboratory instruction. They perform a wide range of duties; including: students laboratory exercises, test, providing class sessions, marking exams and assignment or being given the complete responsibility for the biology practical, (Abejirin, 2004). The biology teacher is expected to develop a positive environment for learning through effective laboratory management. To be successful in the laboratory; they must establish and maintain a professional image. Effective laboratory management focuses in preventive rather than reactive procedures and establishes a positive laboratory environment in which the teacher focuses on students who behave appropriately (Ojo 2008).

Rules and routines are powerful preventive components of laboratory

organization and management plans because they establish the behavioral context of the laboratory by specifying what is expected, what will be reinforced and what will be re-taught if inappropriate behaviour occurs (Egunyomi, 2007). Laboratory management, according to Kafyulilo and Mwanyika (2008), are mostly concerned with the provision of materials for laboratory work, maintenance and repair of equipment and the proper organization of the laboratory and auxiliary services. It includes preparation of plans and materials, structuring of activities into time blocks, direct practice of skills and subject matter, grouping of students to provide for the most efficient use of biology laboratory resources, among others.

Pella and Shenrnan (2009), opined that laboratory management is a thing that

enables the biology teacher to cope with or co-ordinate all the complex interactions within the laboratory; which includes ordering, stocking, storage and safety of all equipment. These are so coordinated such that pedagogic activities within the arrangement are maximized to the overall benefit of teacher, and cost minimized to the overall advantage of the department concerned. Biology laboratory management, therefore, helps all teachers of biology to share their skills and experience of making experimental work in laboratory.

The biology curriculum as a teaching syllabus has four main objectives derived from the National Policy on Education (2011). They include.

- i. adequate laboratory and field skills in biology,
- ii. meaningful and relevant knowledge,
- iii. ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture,
- iv. reasonable and functional scientific attitudes.

In accordance with the above stated objectives, the laboratory content and context of the syllabus places emphases on laboratory and field studies, guided discovery and conceptual thinking (Nwagbo, 2008).

Biology laboratory management, therefore, helps the biology teachers to share their skills and experiences of making experimental work in the laboratory. Efforts are being made not only to improve performance but also to find ways of providing scientific literacy and the teaching of attitudes and skills of

scientists, to even non science students. In the view of Ogunniyi (2007), laboratory planning and organizing practices are unique sources of teaching and learning in biology because science students are able to observe and manipulate materials to demonstrate certain aspects of the subject matter which has been learnt in class during lectures, discussions and from books. Hence, well planned and organized practical work provides students with opportunities to engage in processes of investigation and inquiry. Laboratory management will differ from one teacher to another because of the teachers' personality, teaching styles, preparedness and numbers of students in the laboratory at any given time. Effective laboratory management involves teachers being prepared for practical, motivating students self-esteem and designing constructive and entering lesson plans. According to Arokoyo (2003), teachers are effective laboratory managers, excellent multi-taskers and professionals who know the value of preventing a disruption. Disruptions waste valuable time within a laboratory, as it may take a long time moving the laboratory back in track after disruption. Keeping the students focused is one of the best laboratory management practices for secondary school biology practical (Agbogun, 2001).

This tends to suggest that a poor biology practical activity by students is traced to the teacher's fault in the area of competencies and quality of laboratory management. The deficiencies in biology laboratory management range from: non-coverage of contents in the scheme of work, non-giving and marking of assignments, non-supervision of instruction, non-organization of practical

lessons, non-assessment of learning outcomes regularly, non-taking out of students to field experiences, among others (Abimbola, 2008). All these suggest that teachers are to be blamed for lack of proper exposure of students to biology laboratory practical and management, which in turn may result to poor learning outcomes. Teachers poor management influences students attitudes; and such attitudes have a powerful influence on their achievement. Problems of teachers poor laboratory management skills pose a serious setback in teachers input, hence this study.

Purpose of the Study

The major purpose of this study is to:

1. ascertain the biology teachers' extent of laboratory management practices in teaching and learning of biology,
2. ascertain the extent of planning and organizational practice in school biology laboratory,
3. ascertain problems encountered by teachers in the execution of laboratory management practices,
4. suggest strategies to be adopted to improve the biology laboratory management practices for enhanced achievement in biology.

Research Questions

The study was guided by the following research questions:

1. What is the teacher's extent of laboratory management practices in the teaching and learning of biology?
2. What is the extent of planning and organization practices in school biology laboratories?

3. What are the problems encountered by teachers in executing laboratory management practices,
4. What strategies should be adopted to improve the laboratory management practices for enhanced academic achievement in biology?

Procedure

The study adopted a survey research design and was carried out in three (3) out of the six (6) educational zones in Anambra State, namely: Onitsha, Ogidi and Awka . There are 32 public schools in Onitsha education zone; Awka has 61 public schools, while there are 27 public schools in Ogidi education zone. The study population comprised all the biology teachers in the 3 zones, numbering: Ogidi 64, Onitsha 96 and Awka 102. (ANPP SSC, Awka, 2015). Through random sampling, 40 teachers were drawn from each of the 3 zones, making a total o 120 biology teachers. Instrument for data collection was a self-structured 4- part Laboratory Management Scale (LMS). The questionnaire consisted of forty (40) items on four point Likert Scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). To ascertain the face and content validity, the instrument was given to two experienced lecturers; one from Biology department and one from Measurement and Evaluation Unit of Psychology department, all of Nwafor Orizu College of Education, Nsugbe. Their inputs were used to develop the final draft of the questionnaire. Reliability was tested using test-retest method while the scores obtained were correlated using Pearson Product Correlation coefficient (r), which gave a value of 0.75, which was

adequate for the study. The questionnaire was distributed and collected on the spot, thus entering a hundred percent return rate. Data obtained were analyzed using Mean (\bar{X}) and Standard deviation (SD).

Results

The results obtained are presented in tables below:

Research Question

1. What is the biology teachers extent of laboratory management practices in the teaching biology?

Table 1: Biology teachers response on their extent of laboratory management practices in the teaching of biology

S/N	Items	\bar{X}	SD	Remark
1	Management time and delegation of duties determines plans and policies of the laboratory	3.19	0.95	Accepted
2	Teachers mobilize (assemble and bring together) available laboratory resources and instructional material	3.69	0.58	Accepted
3	When Performing Maintenance, Teachers Replace Worn Out Parts.	30.00	1.00	Accepted
4	Use of high quality steam for improved laboratory equipment	3.44	0.89	Rejected
5	Use uncontaminated, non -contact and cooli ng water as makeup for non-portable users uses such as in boilers	1.69	0.92	Rejected
6	The top level management has maximum authority and responsibility.	1.75	1.09	Rejected
7	Replace other insufficient equipment with new equipment.	1.75	1.09	Rejected
8	Evaluate supply quality for a period of time before certification.	3.45	0.71	Accepted
9	Making sure that equipment is clean and in good working condition.	3.38	0.86	Accepted
10	They require more conceptual and less technical skills	1.75	1.09	Rejected

Items 5, 6, 7, and 10 were rejected having scored below the acceptance level of 2.50, while the others were accepted (table 1). The table thus indicates that biology teachers' level of laboratory management is satisfactory.

Research Question 2: What is the biology teachers level of planning and organization practices in the school biology laboratories?

Table 2: Biology teachers response on their level of planning and organization practices in the school laboratory.

S/N	Items	\bar{X}	SD	Remark
11	Identifying clear lesson and learning objectives while carefully linking activities to them, which is essential for effectiveness	3.31	0.85	Accepted
12	Creating quality assignment, which is positively associated with quality instruction and quality student work	3.29	0.89	Accepted
13	Planning practical lessons that have clear goals logically structured.	3.31	0.85	Accepted
14	Planning instructional strategies to be developed in the laboratory.	3.38	0.86	Accepted
15	Using organizers and outline to plan for instructional delivery	1.69	0.92	Rejected
16	Considering students attention spans and learning styles when designing practical lessons.	3.25	0.83	Accepted
17	Systematically developing questions and activities that reflect psychological skills as appropriate for the student	3.41	0.86	Accepted
18	Setting up experiments or investigations and ordering controlling of stock.	3.31	0.85	Accepted
19	Carrying out risk assessment for laboratory activities.	1.75	0.09	Rejected
20	Handling administrative tasks quickly and effectively and prepare materials in advance.	1.75	0.09	Rejected

Table 2 Items 15, 19, and 20 were rejected by the respondents while the others were accepted having scored above the mean acceptance level of 2.50. The table also indicated that the biology teachers have the appropriate skills required in the planning and organization of biology laboratory in secondary schools.

Research Question 3: What are the problems encountered by biology teachers in executing laboratory management practices?

Table 3: Response of biology teachers on the problems encountered when executing laboratory management practices.

S/N	Items	\bar{X}	SD	Remark
21	Toxic, corrosive and inflammable chemical s are the main chemical hazards.	3.44	0.85	Accepted
22	Burns and scales from hot equipment	3.42	0.85	Accepted
23	Handling blood, body tissues and tissues which may contain infectious agents (biological hazard).	3.31	0.92	Accepted
24	Fires from inflammable materials.	3.38	0.86	Accepted
25	Inadequate laboratory materials and time allocation for practicals.	3.31	0.92	Accepted
26	Working in awkward positions and standing for long periods of time; back and arm injuries.	3.31	0.92	Accepted
27	Repetitive motions and working alone - wear and tear.	3.44	0.86	Accepted
28	Cuts and laceration from broken glass.	3.41	0.86	Accepted
29	Heavy work load of the biology curriculum hindering proper laboratory management practices and practical.	3.25	0.90	Accepted
30	Trips and falls from congested work areas and spills from liquids	3.41	0.85	Accepted

All the respondents accepted that the above listed problems are some of what hinders the effective execution of laboratory management by biology teachers in our secondary schools, each of them having scored above the mean acceptance level of 2.50. (Table 3).

Research Question 4: What strategies should be adopted to improve the laboratory management practices for enhanced academic achievement in biology?

Table 4: Response of biology teachers on strategies to be adopted to improve the laboratory management practices.

S/N	Items	\bar{X}	SD	Remark
31	Store, handle laboratory chemicals properly and ensure that tools and equipment are in working condition.	3.44	0.86	Accepted
32	Use fume hoods, lamina hoods to remove aerosols, vapours, dusts and infectious agents.	3.02	1.30	Accepted
33	Ensure that all chemical are used and stored according to manufacturer's instructions.	3.06	1.20	Accepted
34	Proper lifting techniques, manual material handling to prevent leaks, spills and contamination.	3.41	0.86	Accepted
35	Proper techniques to avoid needle stick injuries.	3.31	0.85	Accepted
36	Avoiding open flames and ensuring proper labeling of all chemical and samples.	3.25	0.90	Accepted

37	Use and maintain correct personal, protective equipments such as eye goggles, lab coats and gloves.	3.17	0.99	Accepted
38	Employing of a laboratory technologist to help in proper management.	3.44	0.86	Accepted
39	Revision of the biology syllabus to include more points for practical and proper students involvement.	3.54	0.76	Accepted
40	Handling administrative tasks quickly and efficiently and preparing materials in advance.	2.92	1.11	Accepted

All the respondents agreed that the above listed strategies, if adopted will improve laboratory management practices in biology curriculum delivery, having all scored above the acceptance level of 2.50. (See table 4)

Discussion

Research question 1 sought to find out teachers level of laboratory management practices in biology curriculum delivery. The study found out that the level of teachers in laboratory practices for curriculum delivery is satisfactory. Teachers mobilize available laboratory resources and instructional materials. The findings are in agreement with Akinfe et al (2012), who opined that laboratory management helps teachers of biology to share their skills and experiences of making experimental work in the laboratory. Also professionally training is an important teacher .quality needed in proper laboratory management, thus ensuring students academic achievement in biology. From research question 2, the findings revealed that biology teachers have the appropriate skills required in the planning and organization of biology laboratory. Thus Oguniyi (2007), agreed that laboratory planning and organizing practices are unique sources of teaching and learning in biology because students

are able to observe, manipulate materials to demonstrate certain aspects of the subject matter which has been learnt in class through lectures, discussions and textbooks. Hence well planned and organized practical work provides students with opportunities to engage in processes of investigation and inquiry. An organized laboratory activity also gives students appreciation of the spirit and methods of problem solving analytic and generalization ability (Oyelere 2003). Head teachers should be adequately trained so as to regularly supervise their teachers and other school activities. The findings from research question 3 revealed that chemical hazard, electrical hazard, overloaded workload, inadequate laboratory facilities, among others are some of the problems hindering execution of the laboratory management in biology This is in agreement with Omosemo (2014), who opined that facilities were inadequate; students did not perform experiments as often as they should, post laboratory discussions were not held in many schools. Keeping students on tasks, providing stimulating seat work, maintaining a brisk laboratory pace and overlapping laboratory events will keep the laboratory moving forward and will help to prevent disruption.

From research question 4, it was revealed

that protective clothing equipment should be kept, cleaned, stored properly, maintained and used appropriately. Egunyoni (2007), stated that rules and routines are powerful preventive components to laboratory organization and management plans because they establish the behavioural context of the laboratory by specifying what is expected, what will be reinforced, and what will be re-taught if inappropriate behaviours occurs.

Conclusion

Being an effective teacher requires more than teaching the content. The biology teacher is expected to develop a positive environment for learning through effective laboratory management. To be successful in the laboratory, teachers must establish and maintain a professional image. Effective laboratory management focuses in preventive rather than reactive procedures and establishes a positive laboratory environment in which the teacher focuses on students who behave appropriately.

Recommendations

Based on the findings, the following recommendations are made:

1. Biology teachers should be made to attend regular workshops, based on effective laboratory techniques and safety measures.
2. Biology teachers must elasticize the scope of laboratory practice and operation to extend beyond the preview of manipulative skills, ordering, stocking, storage and safety.
3. They should be resilient to the point of including in the schedule

periodic seminars to survey curriculum and to suggest changes and adaptation to suit local setting.

4. Teachers should maintain their consistency in teaching and should be involved in continual training to keep abreast with innovations
5. Having the appropriate skills, they should put in more efforts towards maintaining and improving on their skills.
6. More attention should be paid to rural based schools in terms of supplying them with sufficient human and material resources.

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