

EFFECTIVE UTILIZATION OF LABORATORY METHOD IN TEACHING BIOLOGY PRACTICALS IN SECONDARY SCHOOLS

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Abstract

This study was a survey which investigated the effective utilization of laboratory method in teaching biology practicals in the secondary schools. It was conducted in Orumba South L.G.A of Anambra State. The study was guided by three research questions. The population for the study consisted of all the thirteen (13) biology teachers in the Government Owned Secondary Schools of the Local Government Area. Instrument for data collection was questionnaire. Mean was used for data collection. Some of the effective strategies found include planning for the practicals prior to the period, grouping of students, using supervisory strategies, using students to source materials and specimen etc. Problems hindering the use of laboratory method include inadequate number of biology teachers, large class size, large biology content, etc. Findings also show some solutions to the' identified problems. Recommendations were made based on findings.

Introduction

Practical experience in science subject is very crucial for the real knowledge for cognitive growth as well as technological orientation and advancement. Ndu (1980) described practical work as any learning experience that involves students in activities such as observing, counting, measuring, experimenting, recording observations and carrying out field work. Okoli and Egbunonu (2010) described practical approach to teaching as one that engages the students in active learning through interaction with the available resources and equipment; and also provides the learners with opportunity for experimentation, manipulation of variables, verification of facts, collection and analysis of data and drawing inference and conclusions from the data collected.

In the senior secondary schools, theoretical teaching is accompanied by practical work in teaching and learning of science. Biology practical constituted an integral part of biology practicals. There are various reasons for biology practicals. It affords the learners

the basic skills and scientific method of problem-solving. The knowledge obtained through practical work and experience promotes long term memory (Ndu as cited by Nwakonobi and Okoye, 2010). Six aims of teaching and learning practical biology in secondary schools as stated by WAEC syllabus include:

- To promote the power of observation.
- To develop the ability to present observation by illustration and relate form to function.
- To develop the power to recognize general characteristics of animals and plants
- Interpretation of data which illustrate certain known biological principles
- To develop ability to perform simple experiment and draw inferences from results (Agbowuro and Oriade, 2006).

To achieve the above aims by students, effective use of laboratory method in teaching practical biology is imperative. Laboratory is defined as a room or building used for scientific research, experiments, testing, etc. (Hornby, 2004). It is a large room, specially designed and equipped for accommodation and interaction of science teachers, technologists, students, specimens, equipment and materials for practical activities. The laboratory method is activity oriented which offers the students the opportunity to interact with learning content, teacher, laboratory specimen and materials to develop scientific attitudes such as objectivity, critical thinking, carefulness, openmindedness, etc. It is also offers the students the opportunity to develop the scientific skills as they observe, measure, record, manipulate, experiment, draw conclusion and so on. In line with this Schulman and Tamir as cited by Abimbola (1994) identified the objectives of using laboratory methods to include teaching and learning of skills, concepts, attitudes, cognitive abilities and understanding of nature of science. By laboratory methods, students are actively involved in the process of learning and learning is retained. Laboratory activities can help students develop new interest, attitudes and values so that they may learn to investigate and explore further into their environment. It is therefore important to investigate on the effective utilization of this laboratory method in teaching biology practicals in secondary schools.

Purpose of the Study

The purpose of the study is to sensitize biology teachers on the effective utilization of laboratory method in teaching biology practicals in schools.

Specifically this study sets to find out:

- How the biology teacher can effectively utilize laboratory methods teaching biology practicals in secondary schools.
- Problems hindering effective utilization of laboratory method teaching biology practicals.
- Possible solutions to the problems that hinder effective utilization laboratory methods.

Significant of the Study

The findings of this research would equip the biology teachers with the information on how to effectively utilize laboratory methods to enhance students' performance in biology at secondary school level. The principals and secondary school supervisors would also be sensitized on their role expectations to enhance teaching and learning of biology in particular and sciences in general.

Area of Study

This study was conducted in Orumba South L.G.A of Anambra State. Only the government owned secondary schools in the Local Government Area were used for the study.

Research Question

1. How can the biology teachers effectively utilize laboratory methods in teaching biology practicals in secondary schools?
2. What are the problems hindering effective utilization of laboratory methods in teaching biology practicals?
3. What are the possible solutions to these problems hindering effective utilization of laboratory methods in teaching biology practicals?

Population of the Study

The population for the study comprised of all the thirteen (13) biology teachers in the government owned secondary school of Orumba South L.G.A of Anambra State. Because the population size was small, sampling is riot necessary. So the entire population was used for the study.

Instrument for Data Collection

Instrument for data collection was a 26-itemed questionnaire on Effective. Utilization of Laboratory Methods in Teaching Practical Biology. It is designed to elicit responses from the biology teachers to answer the research questions stated above. Items 1-8, 9-18 and 19-26 were used to answer research questions 1, 2 and 3 respectively. The questionnaire was constructed by the researchers and the initial draft was given to two experts in biology education department for face validations. Their .corrections were effected before the final draft of the questionnaire was produced. It was constructed using 5-point likert scale. Thirteen (13) copies of the questionnaire were administered to the respondents by the researchers and the same thirteen (13) copies were collected back from the respondents after response.

The data obtained were analyzed using mean. A mean rating of 3.50 and above were accepted while less is not accepted.

Presentation of Results

In answer to research question 1, Table 1.1 below represents the mean responses of biology teachers on how laboratory methods can be effectively utilized in teaching biology practicals.

Table 1.1: Mean responses of Biology Teachers on how to Effectively Utilize Laboratory Method on Teaching Biology Practical.

S/N	ITEMS	SA	A	UD	D	SD	\bar{X}
	<i>To effectively utilize laboratory methods in teaching Biology practicals, the biology teacher should</i>						
1	Plan to use laboratory method prior to the	11	2	-	-	-	4.85

	practical Biology class						
2	Always use laboratory method to teach practical from SSI to SSIII.	9	3	1	-	-	4.61
3	Always use laboratory methods for every double period on the time-table for practical Biology in all senior secondary schools	6	5	1	1	-	4.25
4	The Non-available resources materials/specimens for practicals can be sourced from the environment using students	4	5	1	1	-	3.45
5	The students should be encouraged to work in groups in the laboratory.	4	7	-	1	1	3.92
6	Laboratory attendants and/or technologists should be employed to assist the teacher during practicals.	7	5	1	-	-	4.46
7	There should be provision of well equipped Biology laboratory.	11	2	-	-	-	4.85
8	Biology laboratory equipment and materials for practicals should be made accessible to the biology teacher by the Head teacher.	6	5	-	2	-	4.31

All that are stated in items 1-8 on the above table 1.1 had the mean responses that are above 3.5 and therefore are accepted as ways to effectively utilize laboratory method in teaching biology practicals.

Table 2.1: Biology Teachers Responses on the Problems Hindering Effective Utilization of laboratory Methods in Teaching Biology Practical.

S/N	ITEMS	SA	A	UD	D	SD	\bar{X}
	<i>The problems hindering effective utilization laboratory methods in teaching biology</i>						

	<i>practicals include</i>						
9	Large class size (population of biology students) makes it difficult to always use laboratory methods from SSI-SSII	7	3	-	3	-	4.08
10	Content coverage may be difficult because biology content is large.	2	9	-	3	-	4.15
11	Supervision and inspection focus more on coverage of scheme of work and weekly diary and focus less on the use of lab method.	5	5	-	2	1	3.92
12	Lack of laboratory materials for laboratory method.	6	3	1	1	2	3.77
13	Inadequate number of biology teachers for teaching of biology makes it difficult to use lab methods	7	3	1	2	-	4.15
14	Some of the biology topics (content) do not yield themselves to laboratory methods.	2	7	-	3	1	3.46
15	The school does not include laboratory work in her end of term examination.	3	5	1	3	1	3.46
16	Fear of accidents that could lead to students hurts or destruction of scarce materials in the laboratory.	-	6	-	6	1	2.85
17	Lack of adequate number of biology teachers	5	5	1	1	-	3.85
18	Defective pre-service biology teacher training programme which did not equip biology teachers with the appropriate skills and competencies for laboratory method.	5	4	-	4	-	3.77

In answer to research question 2, all the items on the table 2.1 above except item number 16 had mean that is above 3.50. They are therefore accepted as a problems. Only item 16 was not accepted as a problem.

Table 3.1: Biology Teacher Mean Response on the Possible Solutions to Problems Hindering Effective Utilization of Laboratory Method in Teaching Biology Practicals.

S/N	ITEMS	SA	A	UD	D	SD	\bar{X}
	<i>Possible solutions to the problems hindering effective utilization of laboratory method in teaching biology practicals include</i>						
19	The teachers could use cooperative learning strategy where students would be encouraged to work in groups in the laboratory	4	8	1	-	-	4.23
20	The principals should use supervisory techniques to help the biology teachers to use laboratory methods.	2	8	1	2	-	3.62
21	Continuous assessment and examination at the end of each term should include laboratory work for each of the SS1, SSII and SSIII classes	7	6	-	-	-	4.54
22	Use of resources persons can be of big relief to the biology teachers in demonstrating	5	4	-	4	-	3.77
23	Supervisors and inspector should also focus their attention on the laboratory work/activities of the students and teachers	6	7	-	-	-	4.46
24	Biology teachers at secondary schools level should be sponsored to conferences, seminars and workshops especially the ones organized by Science Teachers Association of Nigeria (STAN) to enhance their confidence in the used of laboratory methods	10	2	-	1	-	4.62
25	The parents and community through PTA, Towns Union and Philanthropists should help to provide the required human and materials resources for	4	8	1	-	-	4.23

	the laboratory						
26	Biology teacher should be adequately motivated through enhanced salaries, allowances and incentives	12	1	-	-	-	5.92

In answer to research question 3, those solutions itemized on table 3.1 above were all accepted having the mean responses that are above 3.50.

Discussion of Finding

From table 1.1 above, the strategies for effective utilization of laboratory methods in teaching biology practicals include planning on, the part of the teacher Hornby, (2004) defined plan as arrangement for a set of things to do in order to achieve something; especially one that has been considered in details in advance. So for a successful practical teaching, the teacher should make a detailed arrangement in advance for the specimens, materials/equipment and students' activities as well as his/her own activities to enhance learning. Previous studies had shown that most schools have biology laboratories which are poorly equipped (Cirfat and Zumyil, 2000). In the course of planning, the teacher could arrange the students to source some of the needed specimens from their local environment and the teacher would arrange to improvise the needed materials/equipments using local materials. Improvisation from local materials can be used to promote teaching and learning, straighten and fortify what students learn (Jaja, 2002). In line with this, Ogumniyi et al (1990) as cited by Ihegbulem (2006) held that equipment made from things around us help to make concepts and principles clearer and does not give the students the impression that science can only be learned with specialized equipment. Ihegbulem (2006) specified some of biology equipment and materials that can be improvised for laboratory methods to include quadrat, measuring cylinder, skeleton, dissecting board, spring balance, mounted pictures etc.

Part of the problem hindering the effective use of laboratory method is lack of adequate number of biology teachers. This has no doubt resulted in large class size of biology students. To ease out, the students should be encouraged to work in groups. Grouping the student does not only improve students' learning of content and skills but also helps the students to retain learning and develop in them spirit of cooperation (Cirfat and Zumyil and Tongjura, 2003).

Biology curriculum and content is usually voluminous (large) and at such, coverage using laboratory method is usually difficult as portrayed by the findings of the research. Note also that some of the contents do not yield themselves to laboratory method. The teacher should use the laboratory method along side with lecture and other methods of teaching to enhance learning. Supervision and inspection of science teaching should not only focus on content coverage and note of lesson written, but should also focus on laboratory activities of the students. In line with this, Eneasator and Okonkwo as cited by Igwe (2001) describe supervision of instruction as a process of overseeing the work of teachers with the aim of assisting them to solve their instructional problems in such a way that students can benefit maximally from the classroom activities. Prominent among the specific tasks of supervision as stated by Igwe (2001) are helping teachers to make better use of instructional materials and improving his methods of teaching. Therefore, both the internal supervision (by the principal or designated teacher in the school) and external supervision among their numerous roles should also endeavour to pay attention to science activities such as laboratory activities. There is also need to provide laboratory equipment and materials as well as sponsor science teachers so workshops, conferences and seminars for improved performances.

Recommendation

In the light of the findings of the study, the researchers are making the following recommendations:

- Biology teachers should always use the double periods allocated on the time table for laboratory activities from senior secondary classes I to III.
- Supervision of sciences and biology in particular should not only focus on the coverage of scheme of work and weekly dairy as recorded by the teachers, but should endeavour to use its roles to encourage the teachers use of scientific methods such as laboratory method.
- Biology teachers should be adequately motivated through enhanced salaries, allowances and incentives for them to improvise for laboratory method.
- Biology teachers should be sponsored by the government and/or parents through PTA to ST AN conferences, seminars and workshops to be equipped with current activities.

- Continuous assessment and terminal examinations should include laboratory work (practicals) from SSCI to SSCIII.

Conclusion

Effective use of laboratory method of teaching Biology and Sciences in general is a practical effort towards producing scientists which our society currently needs most. The biology teacher, principal, students, examination bodies, and all stakeholders in science education should therefore intensify their efforts towards ensuring that this becomes a reality.

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