EFFECT OF PRACTICAL LABORATORY ACTIVITIES ON SENIOR SECONDARY SCHOOL STUDENTS PERFORMANCE ON PROCESS SKILLS ACQUISITION IN BIOLOGY

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ABSTRACT

This study investigated the effect of biology practical laboratory activities on students academic achievement skills acquisition in Ofu Local Government Area of Kogi State, Nigeria. The design of the study was quasi-experimental design specifically the pre-test, post-test nonequivalent control group design. The sample used comprised 71 senior secondary two biology students in intact classes drawn from two government public schools. Both experimental and control groups were taught for eight weeks Experimental group was exposed to practical laboratory activities while control group was taught with lecture method. An instrument known as Science Process Skills Acquisition Test was used for data collection. The data collected were analyzed using mean and standard deviation while Research questions were answered and t-test statistics was used to test hypothesis. The results of the study showed that the experimental group had higher mean scores of 47.89 while the control group with a lower means score of 33.61. This shows that the experimental group exposed to practical laboratory skill activities in biology performed significantly better than the control group that were exposed to less practical laboratory activities and taught with lecture method. The findings also show that a practical laboratory activity was more effective in fostering students' acquisition of science skill acquisition than the lecture method. It was recommended among others that biology teachers should be trained and retrained on the use of practical laboratory activities in senior secondary biology science lesson, which would enhance the student science process skills acquisition.

Key words: Biology, Practical Laboratory Activities, Performance, Process Skills Acquisition

Introduction

Over the years, many have argued that science cannot be meaningful to students without worthwhile practical experience in laboratory activities. Laboratory activities have had a distinctive and central role in the science curriculum and science educators have suggested that many benefits mount up from engaging students in science laboratory activities (Achimugu, 2014). Biology is essentially a laboratory activity oriented subject. No course in biology can be considered as complete without including practical work laboratory activities in it despite the fact that practical work is a unique source of teaching science, it is widely acknowledged that laboratory skills are lacking in most schools (Omosewo, 2010). Olatoye, Aderogba and Anu (2012) opined that practical laboratory activities could help to improve students achievement and retention increase self-esteem, intrinsic motivation and also help students develop more positive attitudes towards learning.

Laboratory practical activities in biology provide opportunities for students to actually do science as opposed to learning about science. Nzewi (2013) asserted that biology laboratory practical

activities can be regarded as a strategy that could be adopted to make the task of a teacher teaching more real to the students as opposed to abstract or theoretical presentation of facts, principles and concepts of subject matters Nzewi maintained that practical activities should engage the students in hands and activities, using varieties of instructional materials to drive the lesson home. Likewise, practical laboratory activities in science are designed to help students acquire basic scientific skills (Johnson, 2014). The use of laboratory practical activities should be encouraged if we hope to produce students that would be able to acquire the necessary knowledge, skills and competence needed to meet the scientific and technological demand of the nation (Nwagbo, 2011). Despite the fact that biology laboratory practical work is a unique source of teaching science, it is widely acknowledged that laboratory skills are lacking in most schools Omosowo (2010).

Realizing the importance of science skills as solution to scientific problems, the Federal Government among other things, states as one of the national goals of education in Nigeria that "education should aim at helping the child in the acquisition of appropriate skills, abilities and competences both mental and physical as equipment for individual to live in and contribute to the development of the society (FME, 2013). According to most researchers, Nwagbo (2011), a number of factors have been identified as contributing to the non-acquisition of skills by secondary school students which invariably lead to poor performance and one of the factors is the teacher variable, that is, the teachers' method. Furthermore, Obiekwe (2012) indicated that many science teachers prefer the traditional/lecture method of teaching, that is, a teaching technique in which it shies away from activity oriented teaching methods which are student centered such as investigatory laboratory activities approach. Agbaryeku (2014), pointed out that one of the commonest errors observed in secondary schools is teacher's omission of practical laboratory activities and non-involvement in practical work as well as lack of participation of the students.

Some of the practical laboratory activities in biology outlined by Lunetta, Hofstein, and Clough (2005) mentioned that teachers should engage their students in verification activities thereby students are allowed to experience in a concrete fashion rather than abstract knowledge that has been taught in class. Secondly, engage the students in skill development activities where students master skills by performing exercises for example learning how to use microscope using weighing balances. The teacher should allow students to practice them in the laboratory during teaching and learning processes. While Dienye and Gbamanja (2017) mentioned that laboratory activities foster students' ability towards critical thinking and acquisition of better understanding of science knowledge.

Nwagbo (2016) observed that such teacher centered approach which places the teacher as the sole possessor of knowledge and the students as passive recipients of knowledge may not enhance achievement or promote positive attitude and skill acquisition in biology. Therefore, there is the need to search for a more effective approach for the teaching and learning of biology that would enhance acquisition of practical biology laboratory skills that have persisted over the years. This is because the acquisitions of scientific skills are the roots for scientific inquiry and the development of intellectual skills and attitudes that are required to learn concepts.

A lot has been done to improve science teaching in secondary schools in Nigeria. Such as the use of modern technology in the production of test tube babies or the use of computer in the classroom to teach how photosynthesis takes place in plants or show the film of some wild animals that cannot be brought in real life to the classroom. In spite of this, students continue to perform poorly in science subjects of which biology is one. This situation has created the need for more effective teaching methods, (Uzoamaka and Chinwe, 2011). It then becomes necessary to explore the

efficacy of alternative method of redressing this situation. Researchers have carried out studies on science process skills but there is no empirical evidence known to the researchers so far, on effects of biology practical laboratory activities on student's process skills acquisition. Therefore, the problem of this study posed as a question in which of the two teaching methods chosen that is practical laboratory activities method and lecture method better elicits the acquisition activities of student's academic performance skills acquisition in biology at senior secondary school education in Nigeria.

Purpose of the Study

The purpose of this study is to determine the effects of biology practical laboratory activities on student's academic achievement of skill acquisition specifically, the study intends to ascertain the differential effects of biology practical laboratory activities and lecture method on student's academic achievement of skill acquisition.

Research Question

This study answered one research question.

1. What is the difference between skill acquisition scores of students taught biology using practical laboratory activities method and those taught using lecture method?

Hypothesis

The hypothesis below was tested at 0.05 level of significance

Ho_1: There is no significant difference in the skill acquisition test score of students taught biology using practical laboratory activities method and those taught using lecture method at senior secondary school level.

Materials and Methods

The study design was quasi-experimental control that employed pretest-posttest treatment. This design was adopted because intact classes were used as it was not possible to have complete randomization of the respondents. The experimental and control groups were located at different schools after the pretest. The pretest was administered to determine the equivalence of the subjects. The sample involved 71 students from the schools were randomly selected from eight public secondary schools in Ofu, Local Government of Kogi State. Simple random sampling (balloting) was used for the selection of the public secondary schools.

The instrument used for this study was science process skill Acquisition test adopted from Uzomaka and Chukelu (2011) with little modification, based on the selected biology topics. The selected topics were used to teach the experimental and control groups by their trained regular science teachers. The reliability co-efficient of 0.94 was obtained using test-retest method and analyzed using person product moment correlation co-efficient statistics. The instrument consists of thirty items designed to measure the level of acquisition of each science process skill. The test was based on practical biology centered on skill acquisition in the laboratory. Examples of items in the practical skill test were based on drawing the lateral view of specimen of Tilapia or Agama lizard and, using ruler to measure in their practical book the required centimeters of the length of the specimen of what they are required to draw as well as to rule the guide lines before labeling the parts. The students are also expected to carry out how to test for fats or oil in food test. During this process the students have to observe, record, give inference and conclusion among others process skills

required during the activity. Both the experimental and control groups were the same contents by their respective biology teachers for three weeks. The experimental group carried out their teaching in an activity form while control group were taught using lecture method. Their teachers also administered the post-test. The responses of the respondents on the achievement test were scored. The data were subjected to t-test statistical analysis at $P \leq 0.05$ level of significance.

Results

Table 1: Summary of t-test Analysis of Mean Scores of Experimental and Control Groups

Group	Method	N	Mean	Std	Df	t-cal	t-critical	p
Experimental	Practical Laboratory Activity	30	47.89					
				7.37	69	5.08	0.24	.00
Control	Lecture	41	33.61					

Significant at $P \leq 0.05$

The result in Table 1 showed that t-value calculated is 5.08 which is greater than t-critical of 0.24 at df of 69, also the p-value observed was 0.00 which is less than $p \leq 0.05$ meaning that there is significant difference in the academic achievement of the experimental group as shown in the mean scores. Therefore, the null hypothesis which says there is no significant difference is rejected.

Discussion of Findings

Table 1 shows t-test analysis of no significant difference. The calculated of 5.08 which is greater than t-critical of 0.24 with $p = 0.00$, hence the null hypothesis was rejected. Table 1 also shows that the mean scores of 47.89 for the students in the experimental group that were taught using practical laboratory activities is greater than the mean scores of 33.61 of the subjects in the control group taught using conventional method (lecture). This shows that the use of practical laboratory activities is potentially viable in enhancing student's academic achievement of acquiring skill acquisition at Senior Secondary School level. The finding is in line with the findings of Olatoye, Adeorgba and Anu (2012) that opined that practical laboratory activities could help to improve students achievement and retention and also help students develop more positive attitudes towards learning. According to Osbonye (2012) during practical laboratory activities students are actively engaged in manipulating material and carrying out experiments and observational in order to develop basic science practical skills in them.

Also, the use of practical laboratory activities method in acquiring skill acquisition involved the carrying out of many activities and the use of sense organs. Rizzoli (2011); mentioned that appropriate teaching method and assessment which will involve carrying out activities and the use of sense organs, may improve the academic performance of students and acquiring skill acquisition in biology. Despite that the active involvement of students in biology practical laboratory activities may have given rise to efficient learning, which accounted for the reported significant effect of skills acquisition.

The results of the study also were in line with the views of previous researchers like Uzomaka and Chinwe (2011); Lunetta, Hofstein, & Clough (2005); FME (2013); Nzewi (2013); Johnson (2014); Nwagbo (2016) and Dienye&Ubamanja (2017) who indicated the active participation of the students gave rise to more meaningful learning in addition to promoting science process skills

acquisition. What this finding revealed was that, it encouraged and sustained interest in science as well as improved their performance and acquiring of practical laboratory skills. Therefore, since the use of practical laboratory activities enhances students acquisition of science process skills, it follows that curriculum planners can create awareness of this method in teachers by including it in the biology curricula.

Conclusion

Based on the finding of the study it was concluded that;

Students that were given the opportunity to do more practical laboratory activities perform significantly better and acquire science process skills than their counterparts who were not exposed to the approach but lecture method, the study helped to identify one of the problems example poor labeling of the parts of the specimen or not be able to record the food test correctly which displayed the poor academic performance of students in senior secondary school practical biology?

Furthermore, study also showed that, if science teachers can be effectively trained in handling laboratory practical activities in science, they can deliver and improve the standard of science education in the country.

Recommendations

Based on the results of study, the following recommendations are made.

1. That use of practical biology laboratory activities approach in senior secondary schools should be encouraged.
2. That is need to train and retain biology science teachers at Senior Secondary Schools in order to meet the demand of the objectives of science (Biology) programme of senior secondary school level.
3. That government should build more biology laboratories to enable the biology students build on their laboratory activity skills when conducting practical in biology.

Conflicts of interest

The authors have no conflicts of interest to declare.

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