

Effect of Laboratory Practical on Senior Secondary School Students Performance in Biology in Ilorin South LGA, Kwara State

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Abstract: The study investigated the effect of Laboratory practical on senior secondary school students' performance in Biology in Ilorin South LGA, Kwara State. Three research questions and two hypotheses guided the study. Descriptive survey was adopted for this study. The population comprised SS1 to SS3 Biology students in Ilorin South LGA, Kwara state. Questionnaires were designed for one hundred and eighty (180) Biology students and the data collected were analyzed using descriptive mean, t-test and analysis of variance ANOVA. The findings revealed that the impact of Laboratory practical was significant to the students' performance. There was no significant difference in students' opinion towards the impact of Laboratory practical on the performance of students based on gender and school type. The following recommendations are made: Adequate laboratory equipment should be provided for senior secondary school students to ease the learning difficulty experienced in learning Biology practical. School authorities as well as teachers should ensure that both male and female students engage in the carrying out Biology practical exercise in the laboratory. Government and private school owners should ensure the provision of well-structured infrastructural facilities and equipment that would improve practical work.

Keywords: *Effects, laboratory practical, performance in biology, secondary, senior school students.*

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Introduction

Science is defined as a body of knowledge, a way or method of investigating and a way of thinking in the pursuit of an understanding of nature (Abimbola & Mustapha, 2003). The aim of the teaching and study of sciences are to encourage and enable students to provide the broader objectives of science that is process skill i.e., knowledge, curiosity; develop skills of scientific inquiry to design and carry out scientific investigations and evaluate scientific evidence to draw conclusions; communicate scientific ideas, arguments and practical experiences accurately in a variety of way; demonstrate attitudes and develop values of honesty and respect for themselves, others and their shared environment (Ezeh, 2016).

Biology is the natural science that studies life and living organisms, including their physical structure, chemical processes, molecular interactions, physiological mechanisms, development and evolution. According to the national policy on education (Federal Republic of Nigerian, 2013), learning of biology will provide the students with suitable laboratory and field skills in biology. To make objectives of teaching and learning of biology achievable, emphasis should be placed on field studies, guided discovery, laboratory techniques and skills. The teaching and learning of biology motivate students to; develop practical techniques and process skills; acquire knowledge and develop understanding of fundamental biological principles, concepts, terms and facts; show understanding of the applications and uses of biological knowledge in daily life; develop an understanding of current issues and developments in biology.

Nworgu (2006) said that teaching of biology involves three major domains of educational objectives namely cognitive, affective and psychomotor skills. The study shows that teachers of biology mostly emphasize the cognitive domain at the expense of the other two domains. The development of psychomotor domain involves practical activities which require laboratory facilities and equipment. Ihejiamaizu et al. (2020) investigated the effect of Biology practical activities on the academic performance of secondary school students in cross river state. A quasi-experimental research design was adopted for the study. 120 SSIII students formed the sample of the study. Biology Achievement Test (BAT) was the main instrument used in gathering data for the study. The data collected were analyzed using analysis of covariance (ANCOVA). Findings from the research showed that there is a significant difference in the academic performance of students taught with practical Biology activities.

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Godwin et al. (2015) investigated the impact of Physics laboratories on students' performance. It was carried out among senior secondary school students offering Physics in Ethiope West Local Government Area of Delta State using descriptive surveys. Five public schools were a random-event. Sampling technique was adopted for precision. Fifty questionnaires were distributed to students in each school, making it a total of 250 students in all schools and retrieved immediately to avoid alteration of information. Percentage analysis was to evaluate the collected data. The findings revealed that the physics laboratory helps in the teaching of physics students in senior secondary schools, in Ethiope West L.G.A. of Delta State. There is a significant relationship between students and teachers during experimental classes, physics laboratory helps to inculcate scientific reasoning among physics students and physics laboratory enhances students' performance in physics in senior secondary schools in Ethiope West L.G.A. of Delta State respectively.

Abidoeye (2018) observed the status of behavioural objectives on senior secondary school students' performance in Biology practical in Irepodun LGA, Kwara State, Nigeria. The target population for the study comprised Senior Secondary School two (SSS II) students in Kwara State. One hundred and eight (130) Biology students in Senior Secondary school two (SSS 2) took part in the investigation. A quasi experimental, non-randomized, non-equivalent, pre-test, post-test control group involving a 2x2x3 factorial design was employed as research design. The dependent variable was students' scores in the performance test. The independent variables were the lecture method. The test scores were analyzed using mean scores, standard deviation, t-test and analysis of covariance on the three null hypotheses formulated. An alpha level of 0.05 was used to determine the significant level. The result shows a significant difference in the behavioral objective and the performance of students.

Agboghoroma and Oyovwi (2015) evaluated the effect of students' academic achievement on identified difficult concepts or topics in Senior Secondary School Biology in Delta State, Nigeria. The study was quasi-experimental and the design was a 2X2 factorial non-randomized pretest-posttest control group design. The sample was drawn from intact classes from four coeducational schools located in urban and rural centers in Delta Central Senatorial District. A total of 160 male and female students were used in the study. The sample was obtained using a purposive sampling technique. The instrument for the study was designed by the researchers and tagged BAT. This was validated by experts and Kuder-Richardson formula 21 was used for the reliability estimate and this yielded 0.71 alpha. This was tested at 0.05 significance level. The method used for evaluating the students was Concept mapping and the Regular Teaching Methods, as experimental and control groups respectively. The results showed that students perceived some topics like Hereditary, Genetics, Ecology as difficult while it was found out that gender (male and female sex) and school location (urban and rural) had no effect on difficult concepts in Biology.

Buba and Marcel (2019) investigated the effect of practical teaching methods on academic achievement of senior secondary biology students in Mubi Educational Zone, Adamawa State. Two research questions and two hypotheses were formulated to guide the study. The population of the study was 5,331 senior secondary schools Biology students in Mubi Educational Zone. A sample for the study was 125 drawn from Senior Secondary two (SS II) students, which were randomly selected through purposive sampling technique. The design was quasi-experimental research which involves pre-test, post-test control groups. The instrument used for data collection was 40 items Biology Achievement Test (BAT) adopted from WAEC past question papers. The instruments were subjected to face and content validity by two experts. The reliability of the instrument was obtained using the Pearson Product Moment Correlation Coefficient of 0.61. Mean and standard deviation were used to answer research questions. Analysis of Covariance (ANCOVA) was used for hypothesis testing at 0.05 level of significance using Statistical Package for Social Science (SPSS). The findings show that there was significant difference in the effect of practical method and lecture method on students' academic achievement in biology.

Oludipe (2012) investigated the influence of gender on Junior Secondary students' academic achievement in basic science using cooperative learning teaching strategy. Total number of one hundred and twenty (120) students obtained from the intact classes of the three selected Junior Secondary Schools in the three selected Local Government Areas of Ogun State, South-west Nigeria, participated in the study. This study employed a quasi-experimental design. Lesson notes based on the jigsaw II cooperative learning strategy and Achievement Test for Basic Science Students (ATBSS) were the instruments used to collect the relevant data. The data collected was analyzed using descriptive and independent samples t-test statistical methods. Findings of this study revealed that there was no significant difference in academic achievement of male and female students at the pretest, posttest, and delayed posttest levels respectively.

Akani (2015) aimed at investigating the roles of the laboratory in students' academic achievement in chemistry in secondary schools in Ebonyi State of Nigeria. A sample of 240 students selected through simple random sampling techniques from ten secondary schools in the 3 Education Zones in Ebonyi State was used for the study. A questionnaire instrument developed by the researcher was used for data collection. The instrument was validated by three experts, one from measurement and evaluation and the other 2 from chemistry education. The data collected were analyzed using mean and standard deviation statistics. t-test was used in testing the hypotheses. The findings revealed that there is no significant difference between the mean response of students on development of scientific attitudes and scientific skills as roles of the use of the chemistry laboratory in learning chemistry.

Adigun et al. (2015) examined the relationship between students' gender and academic performance in computer science in New Bussa, Borgu local government of Niger state. Questionnaire which consists of 30 multiple-choice items drawn from Senior School Certificate Examination past questions as set by the West African Examination Council in 2014 multiple choice past questions was used as the research instrument. The questionnaire was administered to 275 students from both private and public schools in the study area. The students' responses were marked and scored, afterward analysed using independent t-test. The results of the study showed that better performance was found to be pronounced in the private school which was shown to possess the best. Yet the result indicated that there was no significant difference.

Yara and Wanjobi (2011) reiterated that the type of schools, (private and public) has effect on the academic performance of students. The study finds out that a relationship exists in types of school and academic performance. Hence this study intends to know the impact of Laboratory practical on senior secondary school students' performance in Biology in Ilorin South LGA, Kwara State. The moderating variables involved in the study were the gender and school types. Sabitu et al. (2012) investigated school types, facilities and academic performance of students in senior secondary schools in Ondo State, Nigeria and reported that there is significant difference in facilities available in public and private schools and in spite of this, no significant difference in academic performance of students existed in the two types of secondary schools.

Okafor (2014) investigated relationships between utilization of laboratory facilities and academic performance of students in Biology in Senior Secondary Schools in Zamfara State, Nigeria. A total of sixty-three (63) schools were sampled from the four Educational Zones of the State. Three hundred and seventy-five (375) students and one hundred and fifty-five (155) teachers were selected using stratified sampling technique. The research instruments were Biology laboratory facility Checklist (BLFCL) for teachers and students utilization of Biology laboratory facilities (SUBLF). The students' utilization of Biology laboratory facilities has a reliability coefficient of 0.71 which was used. Descriptive survey design was used. The result indicated that there was no significant difference in the availability of Biology laboratory facilities in public and private schools.

Purpose of the Study

The main purpose of this study investigated the effects of laboratory practical on senior secondary school students' academic performance in Biology in Ilorin South LGA, Kwara State. Specifically, the study determined:

1. The effect of laboratory practical in senior secondary school students academic performance in Ilorin South LGA, Kwara State.
2. The effect of laboratory practical in Biology on academic performance of students based on gender.
3. The effect of laboratory practical in Biology on students academic performance based on school type.

Research Questions

1. What is the effect of laboratory practical in biology on senior secondary school students in Ilorin South LGA, Kwara State?
2. Does laboratory practical in Biology have an effect on academic performance based on their gender?
3. Does laboratory practice have an effect on academic performance of students in Biology based on their school type?

Research Hypotheses

1. There was no significant difference in the effect of laboratory practical in Biology on academic performance of students based on their gender.
2. There was no significant difference in the effect of laboratory practical in Biology on academic performance of students based on school type.

Scope of the Study

This study examined the effects of laboratory practical in Biology on the performance of senior secondary school students in Ilorin South LGA, Kwara State. There are 639 secondary schools in Kwara state; 382 are public secondary schools and 257 are private senior secondary schools. Ilorin South LGA has 87 senior secondary schools; 66 private senior secondary schools and 21 public senior secondary schools. This study was carried out in senior secondary schools in Ilorin South local government area of Kwara state. This study covered 3 selected private schools and 3 public senior secondary schools in Ilorin South LGA, Kwara state. Thus the effect of laboratory practical in Biology on senior secondary school students' academic performance as well as their gender and school type was examined.

Methodology

This study is the descriptive research of survey type. The population of the study consisted of all Senior Secondary School students in Kwara State. The target population comprised all Senior Secondary students in Ilorin South LGA, Kwara State. There are 87 senior secondary schools in Ilorin South Local Government Area; 21 public senior secondary schools and 66 private senior secondary schools. Simple random sampling technique was adopted to draw samples for the study in public and private schools. The sample consisted of 6 private and public schools from Ilorin South LGA, Kwara State. From the sampled schools, a total number of one hundred and fifty (150) students of Senior Secondary School 2 (SSS2) were sampled. The research instrument was designed by the researcher. The questionnaire was administered to SS2 students in the sample population. The questionnaire had 2 sections: Section 1 covered the students' demographic data. Section 2 covered the Biology Practical Achievement Test (BIOPAT), the achievement test was 20- item, 4-option multiple choice test based on senior secondary school two (SS2) biology curriculums and it was used to measure the impact of laboratory practical on students' performance.

The researcher visited the sampled schools with an introductory letter seeking the permission of the principals to carry out the collection of data on the research work. The questionnaire was administered personally by the researcher to the respondents in the sampled schools. The researcher explained the method of responding to the students and guided the respondents appropriately. The filled questionnaires by the students were collected after completion. Data analysis techniques are analyzed using descriptive and inferential analysis employed in the study. Hypotheses 1 and 2 were tested by t-test.

Table 1. Demographic Data of Respondents

Variable	Frequency	Percentage
Gender		
Male	87	58.0%
Female	63	42.0%
Total	150	100.0%
School Type		
Private	84	56.0%
Public	66	44.0%
Total	150	100.0%

Table 1 shows the classification of demographic data of respondents. Based on gender, 87(58.0%) are male while 63(42.0%) are female. This implies that the majority of the respondents are male. Based on school type, 84(56.0%) are in private school while 66(44.0%) attend public school. This implies that the majority of the respondents attend private school.

Research Question 1

What is the effect of laboratory practical biology on senior secondary school students in Ilorin South LGA, Kwara State?

Table 2. The effect of laboratory practical in biology on senior secondary school students in Ilorin South LGA, Kwara State

Laboratory Practicals in Biology and Academic Performance	Mean	Rank
Laboratory practical makes learning easier	3.61	1st
Practical experiments in the laboratory help students observation and interpretation skills	3.37	2nd
Performing practical in biology promotes understanding of the topics better	3.29	4th
The practical laboratory helps me to understand the theory class	3.19	6th
Practical procedures in the laboratory have been more impactful to my performance in biology than theoretical class work	3.14	7th
I face challenges during biology practicals	2.75	10th
I understand the procedures before taking a practical lesson	3.09	8th
Laboratories are used frequently for biology practical	2.94	9th
Laboratory practically promotes my interest in biology	3.22	5th
Group practical works improve students understanding better than individual practical	3.32	3rd
Average Mean	3.19	

Table 2 shows the effect of practical in Biology on the performance of students. Items with mean values greater than 2.5 show the agreement of respondents to the questionnaire items. The effects of practicality in Biology include making learning easier (3.61), helping students observation and interpretation skills (3.37), promoting understanding of the topics better (3.29), to aid the understanding of theory class (3.19), and to aid better academic performance (3.14). Although respondents face challenges during biology practical (2.75) and understand the procedures before taking a practical lesson (3.09). Laboratories are used frequently for biology practical (2.94). Laboratory practical promotes my interest in biology (3.22) and group practical works improve students' understanding better than individual practical (3.32). Based on the ranking of the impact, the result indicates that the laboratory makes learning easier, improves observation and interpretation skills of students and improves understanding of students. The average means of 3.19 shows that laboratory practical has an impact on the academic performance of students.

Research Question 2

Does laboratory practical in Biology have effect on academic performance based on their gender?

Research Hypothesis 1

There was no significant difference in the effect of laboratory practical in Biology on academic performance of students based on their gender.

Table 3: Effect of Laboratory Practical in Biology on Students' Academic Performance Based on Gender

Variable	N	Mean	SD	Df	t Calc	t Crit	Sig.	Decision
Male	87	42.82	3.32	148	1.645	1.73	0.085	Not Significant
Female	63	42.76	3.00					
Total	150	42.80	3.18					

Table 3 shows the difference in the academic performance of students in the effect of laboratory practical based on gender. The result indicated that laboratory practical has a higher influence on the performance of male students whose mean value (42.82) is greater than that of the female (42.76) and also greater than the average mean (42.80) with a degree of freedom of 148, calculated t value of 1.645, a critical t value of 1.73 and a sig value of 0.085 which is greater than the p value of 0.05. The hypothesis is hereby not rejected. This means that there is no significant difference on academic performance of students on laboratory practicals based on gender.

Research Question 3

Does laboratory practical in Biology have effect on academic performance of students in Biology based on their school type?

Research Hypothesis2

There was no significant difference in the effect of laboratory practical in Biology on academic performance of students based on school type.

Table 4: Effect of Laboratory Practical in Biology on academic performance of students based on School Type

Variable	N	Mean	SD	Df	t Calc	t Crit	Sig.	Decision
Private	84	17.96	2.22	148	1.957	6.47	0.052	Not Significant
Public	66	17.17	2.72					
Total	150	17.52	2.48					

Table 4 shows the difference in the academic performance of students in the effect of laboratory practical in Biology based on school type. The result indicated that effect of laboratory practical has a higher influence on the performance of private school students whose mean value (17.96) is greater than that of the public school (17.17) and also greater than the average mean (17.52) with a degree of freedom of 148, calculated t value of 1.957, a critical t value of 6.47 and a sig value of 0.052 which is greater than the p value of 0.05. The hypothesis is hereby not rejected. This means that there was no significant difference in the effect of laboratory practical in Biology on the academic performance of students based on school type.

Discussion

The study investigated the effect of laboratory practical in Biology on senior secondary school students' academic performance in Biology in Ilorin South LGA, Kwara State. The effect of laboratory practical in biology in senior secondary schools was significant to their performance of students. This may be due to the fact that the laboratory practical in Biology provides the students with an opportunity to learn and improve on their performance. This is in line with the findings of Ihejiamazu et al. (2020) who investigated the effect of Biology practical activities on the academic performance of secondary school students in cross river state. The result indicated that there was significant difference in the biology practical and academic performance of students.

The findings of this study show that there was no significant difference on the effect of laboratory practical in Biology on senior secondary school students' academic performance in Ilorin South LGA, Kwara State based on their gender. This may be as a result that both the male and female students pay attention to Biology practical lessons. This is in line with the findings of Akani (2015) aimed at investigating the roles of the laboratory in students' academic achievement in chemistry in secondary schools in Ebonyi State of Nigeria. The result indicated that there was no significant difference in the performance of male and female.

The finding of the study also indicated that there is no significant difference on the effect of laboratory practical in Biology on senior secondary school students' academic performance in Ilorin South LGA, Kwara State based on school type. It may be due to the fact that, both the students in public and private school are able to concentrate on the Biology practical class. The findings agree with Adigun et al. (2015) examined the relationship between students' gender and academic performance in computer science in New Bussa, Borgu local government of Niger state. The result indicated that there was no significant difference in the performance of students based on School type.

Conclusion

Effect of Laboratory Practical in Biology was significant on the performance of students in Ilorin South LGA, Kwara State. There was no significant difference in the effect of practical in Biology on the performance of students based on gender. There was no significant difference in the effect of practical in Biology on the performance of students based on school type.

Recommendations

The following recommendations are made

1. Adequate laboratory equipment should be provided for senior secondary school students to ease the learning difficulty experienced in learning Biology practical.
2. School authorities as well as teachers should ensure that both male and female students engage in the carrying out Biology practical exercise in the laboratory.
3. Government and private school owners should ensure the provision of well-structured infrastructural facilities and equipment that would improve practical work.
4. This study can also be carried out in other parts of Kwara State and other Geo-political zones in Nigeria. The variables can be replicated.

Limitation

This study is limited to Senior Secondary Schools in Ilorin South LGA, Kwara State, Nigeria. The variables involve the gender and the school type of the students.

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