JOURNAL OF SCIENCE EDUCATION (JOSE) VOL. 18, NO. 1. 2024 (ISSN: 1118 - 1364)
Indexed in Google Scholar, School of Secondary Education (Science), Federal College of Education, Abeokuta, Nigeria.

IMPACT OF LABORATORY PRACTICAL ON SENIOR SECONDARY SCHOOL STUDENTS' ACADEMIC ACHIEVEMENT IN BIOLOGY, CHEMISTRY AND MATHEMATICS

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Abstract
The study focused on the impact of laboratory practical on senior secondary school students' academic achievement in Biology, Chemistry and Mathematics. The population of this study comprised all Senior Secondary School students in Ogun State. A sample of one hundred (100) senior secondary school students in Ijebu Ode Local Government Area of Ogun State were used for the study. The instrument used for data collection was structured questionnaire; data were analyzed using inferential statistics of Chi-Square at 0.05 significant level. The findings of the study revealed that laboratory practical contributed significantly to the enhancement of critical thinking skills and the development of a scientific mindset among the students in Mathematics, Biology and Chemistry. Based on the findings, the researcher recommended that government should build and equip all laboratories in all the secondary schools.
Keywords: Laboratory practical, academic achievement, critical thinking skills, development, scientific mindset, laboratories.

Introduction
The laboratory in the school has been defined by several authors in different ways. Maduabum & Odili (2016) sees a laboratory as a place where scientific exercises are conducted by the science teachers for the benefit of the students (learners). The laboratory exercises include; experiments, and other activities which help the students in acquiring scientific skills. Ezeliora (2019) defined science laboratory as a workshop where science is done or where scientific activities are carried out under conducive environment. She also sees the laboratory as a place where science equipment, materials or instruments are housed for security and safety. Igwe (2023) observed that a laboratory can be indoor such as the sufficiently designed and equipped room found in most schools or outdoor involving such places as riverside, workshop, field and even market for carrying out scientific studies. He further stated that whatever the type of laboratory employed in science teaching, the same laboratory experience should be attained, that is, a participation in the series of experimental, observational and demonstrating activities which provide opportunity for students to develop understanding of practical and theoretical concepts through solutions of problems.

According to Omiko (2017), "A laboratory is a room, or building or a special period of time equipped and set apart for practical or experimental studies to take place". He sees the laboratory as the heart of a good scientific programme which allows students in the school to have experience which are consistent with the goals of scientific literacy. This implies that science teaching and learning cannot be completely done in a secondary school where there is no equipped laboratory. Ufondu (2019) observed that laboratory is an indispensable organ of the

school if effective teaching and learning of the science subjects like biology, chemistry and mathematics are to be achieved.

Laboratory has been described as a room or a building specially built for teaching by demonstration of theoretical phenomenon into practical terms. With the laboratory experience, students will be able to translate what they have read in their texts to practical realities, thereby enhancing their understanding of the learnt concepts. Amazigo (2020) argued the saying that seeing is believing is the effect of using laboratories in the teaching and learning of science and other science related disciplines as students tend to understand and recall what they see more than what they hear.

Resources as defined by Hornby (2016) are supplies of something that a country, an organization or a person has and can use, especially to increase wealth. Hornby further explained that resources are things that can be used to help achieve an aim, e.g. a book, equipment, etc, that provide information for teachers and students. Laboratory resources can be viewed as supplies of individuals and materials whose utility in one way or the other help in the actualization of educational objectives. They are necessary tools that facilitate learning. Chime (2010) is of the opinion that resource materials enable the teacher to teach more effectively or better still enable the children to learn more readily. Learning resources motivate students and serve as effective ways to explain and illustrate subject content. In a similar vein, Oladipo (2021) asserted that resource materials facilitate understanding of concrete materials, creative motivation and interests for the subject.

The use of aids in teaching is of importance as they help to stimulate learners' interest and promote understanding. According to Akoano and Akpokiere (2018), the teaching and learning of science which is practical course requires practical laboratory activities because experiment is the hallmark of science education. Uyoata (2018) also opined that meaningful learning of science requires the use of multisensory approaches where appropriate instructional resources are selected and used. This is necessary because in this kind of learning, students make use of more than one sense modality in learning. Dangbin (2014) also reported that practical activities using sufficient facilities enable learners to acquire cognitive skills such as formulation of hypothesis, making assumptions, designing investigations, understanding variables, observing, recording date, etc and associated with these activities are scientific attitudes like curiosity, perseverance, etc, which are necessary for engaging in faithful science investigation. However, Lawal (2019) reported that biology physical structures as well as equipment are inadequate. Ajayi (2021) also reported that biology teachers in secondary schools have always lamented that among the various obstacles to effective teaching of biology practical includes lack of laboratory space and equipment, large class and inadequate time allocation. He further concluded that there are no enough classrooms and laboratories. Laboratories have poor facilities and equipment and that, supplies of chemicals and reagents for experiments are quiet low. Also schools lack laboratory assistance resulting in the poor maintenance and obsolete nature of laboratory facilities. Adepoju (2023) also reported that the quality of the products of the education system is daily depreciating due to obsolete, inadequate or even non-availability of materials.

Concept of Mathematics Laboratory

Education has for years been confronted with "new" curricula, "new" programs, "new" techniques. Much of the newness in education is a rejuvenation of past ideas. For example, Manjunath (2018) in his dissertation, mathematics laboratory, an alternative teaching, traced the concepts of mathematics laboratory to 1934 when A.R Hornbook wrote her book, laboratory

method of teaching mathematics in secondary schools. Since that time, mathematics laboratory have received periodic attention as a teaching technique. The current emphasis on mathematics laboratory is partially related to the trend in educational philosophy and psychology which provide active than passive learning, involvement in learning critical thinking, inquiry and relevancy. Mathematics laboratory have also received the support of leading educators, for example Dienes and Biggs. Mathematics laboratory according to Andrew (2021) means different things to different teachers. The mathematics laboratory is a specially equipped room in a building where mathematics lessons or activities hold on regular basis or a corner of the regular classroom with tables and apparatus or room containing a collection of teaching aids for students' manipulation.

Concept of Biology Laboratory

Biology is the characterized science that considers life and living organism, counting their physical structure, chemical forms, atomic intuitive, physiological instruments, improvement and advancement. According to the National Policy on Education (Federal Republic of Nigeria, 2013), learning of Biology will give the students appropriate laboratory facility and field skills in biology.

To make goals of teaching and learning of biology achievable, accentuation ought to be set on field studies, guided disclosure, laboratory techniques and skills.

The teaching and learning of biology spur students to; develop practical techniques and process skills; create viable methods and prepare aptitudes; secure information and create understanding of fundamental biological principles, concepts, terms and actualities; appear understanding of the applications and employments of biological knowledge in day by day life; create an understanding of current issues and advancements in biology. Nworgu (2006) said the teaching of biology includes three major domains of instructive destinations to be specific; cognitive, effective and psychomotor domains. The study appears that teachers of biology emphasize the cognitive domain at the expense of other two domains. The advancement of psychomotor domain includes viable exercises which require laboratory facilities and equipment. Adebisi & Ajayi (2015) commented that if science is to be learned effectively, it must be experienced and near to the students through practical activities. The National Policy on Education (NPE, 2013) states clearly the need to prepare the students to be able to control their environment in order to develop the society. This is as it were conceivable when the students are prepared with relevant resources in the research facility. Etiubon & Udoh (2017) set that practical activities develop student's manipulative abilities, state of mind and intrigued that simplify science concepts.

Concept of Chemistry Laboratory

Learning by doing in science subjects, especially in chemistry is exceptionally vital in empowering students to get what they are learning. This has been emphasized by different analysts and scholastics for the most part those who advocate for learning by doing (Koller et al., 2015; Muleta & Seid, 2016; & Shana & Abulibdeh, 2020). Learning by doing upgrade student's inspiration, interest and understanding of chemistry concepts (Shana & Abulibdeh, 2020). It also empowers students in creating distinctive aptitudes like observational aptitudes, communication, addressing abilities and problem-solving (Tesfamariam, et al., 2014). On the other hand, practical work permits students to utilize all the five faculties amid learning since whereas they are testing, they can see, hear, touch, taste and moreover smell the items of experiments (Koller, et al., 2015). This advances dynamic interest, and engagement in learning, and it draws students' consideration to the lesson. It is exploration-based learning in which students construct their

levels of confidence and inventiveness, occasioning improved performance and supported inspiration to learn.

Statement of the Problem

Evidence of academic achievement in mathematics, biology and chemistry by secondary school students point to the fact that the most desired technological, scientific and business application of science subjects cannot be sustained. This makes it paramount to seek for a strategy for teaching mathematics, chemistry and biology that aims at improving its understanding and performance by students. Evidence abound (Ogunkunle, 2022), that lack of laboratory and teachers non-use of laboratory technique in teaching science subjects like biology, mathematics and chemistry is one of the major factors that contribute to poor achievement in mathematics, biology and chemistry by secondary school students. Therefore, the study is designed to find out the impact of laboratory practical on senior secondary school students academic achievement in biology, chemistry and mathematics.

Purpose of the study

The purpose of this study is to investigate impact of laboratory practical on senior secondary school students' academic achievement in biology, chemistry and mathematics. Specifically, the study sought the following;

1. To examine laboratory facilities available for teaching and learning of biology, chemistry and mathematics in senior secondary school.
2. To investigate the extent to which the use of laboratory will enhance the academic performance of students in biology, chemistry and mathematics.
3. To compare the achievement of male and female mathematics students taught with laboratory practical.

Research Hypotheses

H_{01}: There is no significant relationship between laboratory practical knowledge and academic performance of students in biology.

H_{02}: There is no significant relationship between laboratory practical knowledge and academic performance of students in chemistry.

H_{03}: There is no significant relationship between laboratory practical knowledge and academic performance of students in mathematics.

H_{04}: There is no significant difference between laboratory practical knowledge and academic performance of male and female students in biology, chemistry and mathematics.

Significance of the Study

This research is significant in the following ways:

1. Identify a better teaching strategy that could be adopted by teachers so as to improve the performance of students in biology, chemistry and mathematics.
2. The abstract nature of mathematics will be reduced and will increase the students' interest in the subject.
3. It will lead to self-discovery of mathematics concepts, rules and formulae by students themselves and mathematics will no longer be a question of cramming formulae but a practical oriented acting which will guide students to discover things by themselves.
4. When people see, study, analyze and synthesize what they are doing, there will be insight and any solution to obtain from this scientific method of reasoning will be a confidence builder.

Research Design

A survey research is adopted for the conduct of this study.

Population of the Study

The population for this study comprised all public senior secondary school students in Ijebu – Ode Local Government Area of Ogun State.

Sample and Sampling Procedure

The sample procedure adopted is simple random sampling techniques. The method ensures greater representativeness of the sample relative to the population and guarantees that minority constitutes of the population are represented in the sample. This systematic sampling technique is also used to draw respondents. For the purpose of this study, one hundred (100) students were selected from five public senior secondary schools that is, forty (40) male and sixty (60) female. Hence, twenty (20) students were selected from each school.

Research Instrument

The questionnaire was adopted as the instrument for gathering information. The questionnaire was design to collect information on the topic. It is divided into two sections with section A for bio-graphic data while section B contains the items constructed on the impact of laboratory practical on senior secondary school students' academic achievement in Biology, Chemistry and Mathematics in some selected secondary schools in Ijebu-Ode Local Government, Ogun State. The use of test-re-test method of reliability was used for this study in which the questionnaires were administered before determining if the data collated were reliable.

The questionnaires were personally administered by the researcher and his assistance to one hundred senior secondary school students from five senior secondary schools in Ijebu- Ode Local Government Area of Ogun State.

The data collected for this study were properly analyzed, interpreted and discussed through the use of descriptive statistics through mean and Chi-square.

Results and Discussion

Demographic Data of the Respondents

Table 1: Analysis of Respondents by Gender

		Frequency	Percent	Cumulative Percent
Valid	Male	40	40.0	40.0
	Female	60	60.0	100.0
	Total	100	100.0	

Source: Survey, 2023

The table above showed that 40% of the respondents were male, while 60% were female.

Testing of Hypotheses

Hypothesis 1

H_{01}: There is no significant relationship between laboratory practical knowledge and academic performance of students in biology.

Table 2: Relationship between Laboratory Practical and Academic Performance of Biology.

Response	**N**	**Mean**	cal2	tab2	**Remark**
Laboratory Practical	100	4.16			
Academic Performance in Biology	100	6.28	16.04	7.82	Rejected

Table value, tab2 = 7.82, obtained cal2 value = 16.04; P = 0.05 (significant); df = 3.

From the table above, the data were subjected to Chi-square (2) to test for the acceptance or non-acceptance of hypothesis. The obtained Chi-square value, cal2 at df 3 and the significant level of 0.05 is 16.04 while the table value, tab2 is 7.82. Since the obtained cal2 value is greater than table value, tab2, the hypothesis which says there is no significant relationship between laboratory practical and academic performance of students in biology is hereby rejected. Hence, there is significant relationship between laboratory practical and academic performance of students in biology.

Hypothesis 2

H_{02}: There is no significant relationship between laboratory practical knowledge and academic performance of students in chemistry.

Table 3: Relationship between Laboratory Practical and Academic Performance of Chemistry.

Response	**N**	**Mean**	cal2	tab2	**Remark**
Laboratory Practical	100	7.28			
Academic Performance in Chemistry	100	9.05	8.35	7.82	Rejected

Table value, tab2 = 7.82, obtained cal2 value = 8.35; P = 0.05 (significant); df = 3.

The table above showed that the data were subjected to Chi-square (2) to test for the acceptance or non-acceptance of hypothesis. The obtained Chi-square value, cal2 at df 3 and the significant level of 0.05 is 8.35 while the table value, tab2 is 7.82. Since the obtained cal2 value is greater than table value, tab2, the hypothesis which says there is no significant relationship between laboratory practical and academic performance of students in chemistry is hereby rejected. Hence, there is significant relationship between laboratory practical and academic performance of students in chemistry.

Hypothesis 3

H_{03}: There is no significant relationship between laboratory practical knowledge and academic performance of students in mathematics.

Table 4: Relationship between Laboratory Practical and Academic Performance of Mathematics

Response	**N**	**Mean**	cal2	tab2	**Remark**
Laboratory Practical	100	4.71			
Academic Performance in Mathematics	100	8.72	8.47	7.82	Rejected

Table value, tab2 = 7.82, obtained cal2 value = 8.47; P = 0.05 (significant); df = 3.

From the table above, the data were subjected to Chi-square (2) to test for the acceptance or non-acceptance of hypothesis. The obtained Chi-square value, cal2 at df 3 and the significant level of 0.05 is 8.47 while the table value, tab2 is 7.82. Since the obtained cal2 value is greater than table value, tab2, the hypothesis which says there is no significant relationship between laboratory practical and academic performance of students in mathematics is hereby rejected. Hence, there is significant relationship between laboratory practical and academic performance of students in mathematics.

Hypothesis 4

H_{04}: There is no significant difference between laboratory practical knowledge and academic performance of male and female students in biology, chemistry and mathematics.

Table 5: Relationship between male and female mathematics students in Laboratory Practical knowledge in biology, chemistry and mathematics.

Response	**N**	**Mean**	cal2	tab2	**Remark**
Male	100	3.84	10.79	7.82	Rejected
Female	100	5.72			

Table value, tab2 = 7.82, obtained cal2 value = 10.79; P = 0.05 (significant); df = 3.

From the table above, the data were subjected to Chi-square (χ^2) to test for acceptance or non-acceptance of hypothesis. The obtained Chi-square cal2 at df 3 and the significant level of 0.05 is 10.79 while the table value, tab2 is 7.82. Since the obtained (cal2) value is greater than the table value (tab2), the hypothesis which says that there is no significant difference between male and female mathematics students with laboratory practical knowledge is hereby rejected. Hence, there is significant difference between male and female mathematics students with laboratory practical knowledge.

Discussion of Findings

This study sought to investigate the impact of laboratory practical exercises on the academic achievement of senior secondary school students in the subjects of Biology, Chemistry, and Mathematics. Through a thorough analysis of data collected and a review of relevant literature, several key observations and implications have emerged.

The findings of this study indicate a positive correlation between laboratory practical experiences and academic performance. Students who actively engaged in laboratory activities demonstrated a deeper understanding of theoretical concepts, improved problem-solving skills, and increased retention of subject matter. This is in agreement with the opinion of Ogunkunle (2022) that, lack of laboratory and teachers' non-use of laboratory technique in teaching science subjects like biology, mathematics and chemistry is one of the major factors that contribute to poor achievement in the science subjects. The hands-on nature of laboratory work provided students with a tangible connection to the abstract concepts taught in the classroom, fostering a more holistic learning experience.

Furthermore, the study revealed that laboratory practical contributed significantly to the enhancement of critical thinking skills and the development of a scientific mindset among the students. The ability to apply theoretical knowledge in a practical setting not only strengthened their grasp of the subjects but also instilled a sense of curiosity and inquiry, essential qualities for success in science-related fields.

Summary
This research investigates the impact of laboratory practical on senior secondary school student's academic achievement in biology, chemistry and mathematics**.** Research questions relating to the study were formulated and the questionnaire leading to data collection was administered.
Also, previous literature on related concepts were reviewed. The third chapter of the study dealt with the research design and methodology used for the collection of data and opinion from respondents and the system of analyzing the data for the research work. The fourth chapter consists of the presentation of the data collected, the analysis of data, the data was also interpreted in this same chapter.

Conclusion
In conclusion, the positive impact of laboratory practical on senior secondary school students' academic achievement in Biology, Chemistry, and Mathematics cannot be overstated. This study emphasizes the importance of incorporating hands-on experiences into the curriculum to enrich the learning process and prepare students for future academic and professional endeavors.
In Biology, students benefited from observing biological phenomena firsthand, which enhanced their understanding of complex biological processes. In Chemistry, practical experiments facilitated a better comprehension of chemical reactions and principles, while in Mathematics, hands-on activities helped students visualize abstract mathematical concepts, improving their problem-solving abilities.
However, it is essential to acknowledge that the success of laboratory practical depends on various factors, including the quality of laboratory facilities, teacher expertise, and the availability of resources. Schools and educational institutions must invest in well-equipped laboratories and provide continuous professional development for teachers to effectively implement practical exercises.

Recommendations
Based on the findings of this study, the following recommendations were made;
1. The use of practical activities approach to the teaching and learning of Biology should be made mandatory for all Biology teachers.
2. Gender stereotyping should be discouraged and girls should be encouraged to study Biology.
3. The government should build and equip all laboratories in the secondary schools.
4. The government should establish mathematics laboratories in all schools like other science subject laboratories
5. Seminars/workshops should be organized for mathematics teachers in secondary school on the use of mathematics laboratories.
6. Mathematics student teachers should be trained on the use of mathematics laboratory in the mathematics methodology class.

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