

**EFFECT OF BIOLOGY PRACTICAL ACTIVITIES ON INTEREST OF  
SENIOR SECONDARY SCHOOL STUDENTS IN BIOLOGY IN KOGI  
STATE, NIGERIA**

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***Abstract***

*An investigation was conducted to assess the impact of biology practical activities on the interest*

*among senior secondary school students in Kogi State, Nigeria. The investigation was directed by three research questions and three null hypotheses. An approach of quasi-experimental pretest posttest non quavailent control group design. The research population consisted of 11,391 SS1 students from public secondary schools in Kogi State. The sample of the study included 95 SS1 biology students selected from 4-schools in each senatorial district of Kogi State using a multistage sampling technique. A single instrument employed in the study was the Biology Interest Scale (BIS). An assessment of the reliability of the BIS was conducted using Cronbach Alpha, resulting in a value of 0.88. Data analysis was conducted using Mean and Standard Deviation to examine the research questions Hypotheses testing was performed using Analysis of Covariance (ANCOVA) at a significance level of 0.05. The data indicated a notable disparity in the average interest rating of biology among students when taught via practical activities compared to the lecture approach, with practical activities technique favouring the former. The results also indicated a notable correlation between gender and the average interest ratings in biology among students, with male showing a higher level of interest. Furthermore, there is no statistically significant interaction impact between teaching approaches and gender on the average interest scores of students in Biology. To augment student engagement and enthusiasm in biology, it is advised to promote the use of practical activities in biology courses delivered in senior secondary schools.*

**Keywords:** Biology practical, teaching method, Interest, gender, laboratory

## Introduction

Science is the study of the natural world and plays a vital role in the social, economic, and technological development of nations. It involves dynamic human activities aimed at understanding environmental functions (Attiji, 2018). Achimugu (2016) defines science as encompassing a broad range of knowledge, skills, and activities related to the natural world, focusing on investigative processes that develop and regulate knowledge, skills, and attitudes. Many students pursue science to intellectually explore nature. Kolani (2015) describes science as a systematic endeavor that organizes knowledge into testable explanations and predictions about the universe. Science can be categorized into formal sciences like mathematics, social sciences examining societal interactions, and natural sciences studying the physical world. As a way of thinking, investigating, and establishing knowledge, science drives technological advancement and is emphasized in education (Achimugu, Achufusi, Negedu, & Salami, 2023). In secondary schools, science is taught as Physics, Chemistry, and Biology.

Biology is a major science subject in Nigerian secondary schools, appealing to both arts and science students due to its less mathematical nature. It serves as a foundation for science-based careers such as medicine, pharmacy, nursing, microbiology, and agriculture. Despite its importance, the percentage of students excelling in biology has been declining (Okebukola, 2016). According to WAEC (2023), only about 50% of students pass biology at the credit level in the SSCE. This low success rate highlights students' struggles with foundational biology concepts, hindering their ability to grasp advanced topics.

The Chief Examiners' Reports (2019-2022) indicate poor performance in sciences, including biology. This trend, if unaddressed, challenges Nigeria's ability to meet the growing demand for scientific knowledge and skills. Factors contributing to this include ineffective teaching methods, poor classroom organization, and language barriers. To improve students' performance and interest, practical teaching methods that engage students actively are essential. These methods foster cognitive and psychomotor competencies, enhancing understanding and enthusiasm for biology. Interest and enthusiasm are critical for academic success, as high performance often stems from heightened interest.

Interest reflects a desire and passion for learning, manifested through attention and focus on academic activities. Okoro (2016) explains that interest serves as a motivational factor driving learners to engage deeply in academic pursuits, influencing their value system. Passion for a subject encourages critical thinking

and perseverance, leading to academic success. Renninger (2015) emphasizes that curiosity plays a pivotal role in learning outcomes, as interested students are more likely to engage and succeed.

Senior secondary school biology courses prepare students for diverse careers, from medicine to conservation biology. However, students' intrinsic interest in biology may not always align with their career aspirations (Awolaju, 2016). While good performance can generate interest, low interest diminishes learning and leads to poor outcomes. Estelami and Maladi (2021) note that intelligence and interest are interconnected, with teaching methods significantly influencing students' interest levels. Constructivist philosophy supports practical activities, advocating for active student engagement to facilitate knowledge acquisition. Hands-on laboratory exercises allow students to explore biological concepts independently, fostering deeper understanding and interest (Gilbert & Weiman, 2015). Practical experiences make abstract concepts relatable, enhancing comprehension and engagement (Watts, 2013). Using diverse instructional materials, teachers can create tangible learning experiences that bridge the gap between theory and practice. Practical activities are indispensable in biology education, providing students with opportunities to apply scientific concepts in real-world scenarios. However, many schools lack adequate biology laboratories, limiting students' ability to connect theory with practice (Nworgu, 2015). Practical projects enable active science application, honing laboratory skills and scientific knowledge (Schwichow, Zimmerman, Cracker, & Harig, 2016). Okam and Zakari (2017) emphasize that practical activities inspire curiosity and drive effective learning, significantly influencing student performance.

Biology practicals develop emotional, psychomotor, and cognitive skills. Agbowuro (2016) and Eze and Ezeamagu (2018) stress that practical work is irreplaceable in biology education, advocating for its mandatory adoption. Nwagbo (2016) asserts that integrating practical activities into biology curricula ensures students acquire the skills required to meet national demands. Alison (2013) highlights that practical activities enable problem-solving and establish cause-effect relationships, with laboratories offering ideal environments for observation and inference.

Gender, a social construct encompassing psychological, cultural, and behavioral traits, influences education. Although gender differences do not affect physical characteristics, they shape students' interactions and perceptions of science (Edo, 2016). Several studies have explored the relationship between interest and biology education. Ibenegbu, Nzewi, and Aniaku (2020) found that blended teaching approaches significantly increase students' interest in biology, irrespective of

gender. Similarly, Audu (2018) observed that teaching styles influence students' performance and interest, with cooperative instructional strategies yielding positive outcomes. Umaru (2014) reported that low-achieving students benefited from practical activities, improving interest and performance.

Badayi, Gwarzo, Garba, and Kado (2022) examined the impact of practical activities on science students in Kano State, noting significant improvements in intellectual ability and performance. Ogunkola and Bilesanmi-Awoderu (2020) found no gender sensitivity in students' performance, while Pandian (2014) highlighted significant post-test gains among students taught using practical methods. However, studies by Tukura (2015) and Allahnana et al. (2018) revealed higher interest levels among male students. Croxford (2020) observed better performance among male students, emphasizing the need for further research on the impact of practical activities on student interest. This study investigates the effectiveness of practical activities in enhancing biology teaching and learning in senior secondary schools in Kogi State, Nigeria. It explores how teaching methods and gender influence students' interest and performance in biology.

### **Research Questions**

This research was guided by the following research questions and hypotheses

1. What is the mean interest ratings scores of students taught biology using practical activities and those taught using lecture method?
2. What is the mean interest ratings of male and female students taught Biology using practical activities?
3. What is the interaction effect of gender and teaching methods on students mean interest ratings in Biology?

### **Hypotheses**

**H<sub>01</sub>.** There is no significance difference in the mean interest ratings of students taught biology using practical activities and those taught with lecture method

**H<sub>02</sub>.** There is no significance influence of gender on the mean interest rating of students taught biology using practical activities

**H<sub>03</sub>.** There is no significant interaction effect of teaching methods and gender on the mean interest rating of students in Biology

### **Methodology**

The study adopted a quasi-experimental research design, specifically a non-equivalent group design by Achimugu et al (2024). The study was carried out in Kogi State. The study population comprised of 11,391 SS 1 students offering biology in public senior secondary schools in Kogi State for the 2023/2024 academic session. This consists of 6,082 males and 5,309 females. The sample size for the study was 95 senior secondary school (SSI) students who offering

biology as one of their science subjects in Kogi State. The study adopted multi-stage sampling procedures which was carried out in stages; Firstly, a simple random sampling technique by balloting (without replacement) was used to select two out of the three Senatorial District in Kogi State; East, Central and West to ensure that each member of the population had an equal chance of being selected. Secondly, a purposive sampling technique was used to select two schools from each of the two senatorial Districts earlier selected giving a total of four schools. The criteria for selecting the four schools included: Schools that is co-educational due to the gender variable in the study, Schools that have Biology teachers with a minimum of B.Sc or B.Sc (Ed) Biology qualification, Schools that have been participating in WAEC and NECO examinations for the past five years with experienced Biology teachers, schools that have one arm. Thirdly, a simple random technique (balloting with replacement) was used to select two schools each for experimental and control groups, respectively. An instrument was used for data collection in this study, the Biology Interest Scale (BIS). The researcher developed the BIS. The Biology Interest Scale (BIS) consisted of two sections: A and B. Section A contained the demographic data of the respondents, while Section B contained 25 test items which had a four-point modified Likert-type response scale of strongly agree (SA), agree (A), disagree (D), and strongly disagree (SD) were respectively. The instrument was subjected to both face and content validation. While the internal consistency reliability of BIS was obtained using Cronbach Alpha method and a reliability coefficient of 0.88 was obtained. The Biology Interest Scale (BIS) was administered as a pretest to the students, and the scores served as the pretest scores. No feedback was given to the students about the test. Treatment was given for a period of four weeks, after which a post-test was administered. The research questions were analyzed using mean and standard deviation. The hypotheses were tested using Analysis of Covariance (ANCOVA) at 0.05 level of significance.

## **Results**

### **Research Question One**

What is the mean interest rating of students taught biology using practical activities and those taught using lecture method?

**Table 1: Mean and Standard Deviation on the Mean Interest Scores of Students Taught Biology Using Practical Activities and Those Taught Using Lecture Method**

<i>Teaching Method</i>	<i>Pre-Test</i>			<i>Post-Test</i>			<b>Mean Gain</b>	<b>Mean Difference</b>
	<b>N</b>	$\bar{X}$	<b>SD</b>	$\bar{X}$	<b>SD</b>			
<b>Practical Activities</b>	44	28.77	4.06	63.41	10.41	34.64	13.32	
<b>Lecture Method</b>	51	26.84	4.10	48.16	12.65	21.32		

Table 1 presents the average interest scores of students who were instructed in biology using practical activities compared to those who were taught using the lecture technique. According to the findings, students who were instructed in biology using practical exercises reported an average interest score of (n=44, X = 28.77, SD = 4.06) for the pre-test and (n=44, X = 63.41, SD = 10.41) for the post-test, resulting in an average gain of 34.64. Furthermore, Table 1 indicates that students who were exposed to the lecture approach had an average interest score of (n=51, X = 26.84, SD = 4.10) for the pre-test and (n=51, X = 48.16, SD = 12.65) for the post-test, resulting in an average increase of 21.32 unit. The outcome yielded a mean difference of 13.32. Such evidence suggests that the use of practical activities with the lecture technique is effective in enhancing the interest scores of biology students. Nevertheless, practical activities shown more efficacy in boosting the interest levels of biology students compared to the lecture technique.

### **Research Question Two**

What is the mean interest ratings of male and female students taught biology?

**Table 2: Mean and Standard Deviation on the Mean Interest Ratings of Male and Female Students taught Biology**

<i>Gender</i>	<i>Pre-Test</i>			<i>Post-Test</i>			<b>Mean Gain</b>	<b>Mean Difference</b>
	<b>N</b>	$\bar{X}$	<b>SD</b>	$\bar{X}$	<b>SD</b>			
<b>Male</b>	40	28.75	4.12	60.78	15.06	32.02	7.84	
<b>Female</b>	55	27.00	4.08	51.18	12.58	24.18		

Table 2 displays the results, including the standard deviation, of the interest ratings given by male and female biology students. According to the results, male students who took biology classes had an average pre-interest rating score of 28.75 (standard deviation=4.12) and an average post-interest rating of 60.78 (standard deviation=15.06) with a gain of 32.02. On the other hand, female students who took biology classes had an average pre-interest rating score of 27.00 (standard deviation=4.08) and an average post-interest score of 51.18 (standard deviation=12.58) with a gain of 24.18. The results were consistent with an average difference of 7.84. As a result, male students' interest rating scores in biology classes were higher than female students' scores.

**H<sub>01</sub>.** There is no significance difference in the mean interest ratings of students taught biology using practical activities and those taught with lecture method

**H<sub>02</sub>.** There is no significance influence of gender on the mean interest rating of students taught biology using practical activities

**H<sub>03</sub>.** There is no significant interaction effect of teaching methods and gender on the mean interest rating of students in Biology

### **Research Question Three**

What is the interaction effect of gender and teaching methods on students mean interest ratings in Biology?



**Table 3: Mean and Standard Deviation of the Interaction Effect of Teaching Methods and Gender on Students` Interest Rating in Biology**

<i>Teaching Methods</i>	<b>Gender</b>	<i>Pre-Test</i>			<i>Post-Test</i>			<b>Mean Gain</b>	<b>Mean Difference</b>
		<b>N</b>	$\bar{X}$	<b>SD</b>	$\bar{X}$	<b>SD</b>			
<b>Practical Activities</b>	Male	19	30.05	3.84	68.11	7.43	37.61	5.57	
	Female	25	27.80	4.03	59.84	11.15	32.04		
<b>Lecture Method</b>	Male	21	27.57	4.11	54.14	17.19	26.57		
	Female	30	26.33	4.08	43.97	8.56	17.64	8.93	

The interaction effect of teaching technique and gender on students' interest rating in biology is summarized in Table 3. The findings indicate that male students who were instructed in biology using a practical approach had an average score of 30.05 on the pre-test, with a standard deviation of 3.84. After the exam, their average interest rating was 68.11, with a standard deviation of 7.43. A mean gain of 37.61 was achieved among male students. A mean interest rating of 27.80 with a standard deviation of 4.03 and a post-test score of 59.84 with a standard deviation of 11.15 were seen among female students exposed to practical activities. An average increase of 32.04 was achieved for female students, with a mean difference of 5.57. Furthermore, the results indicate that practical activities enhanced the average interest level of both male and female students. Nevertheless, the average level of curiosity among male students slightly exceeded that of female students. The data presented in Table 4 indicates that male students who were instructed in biology utilizing the lecture technique had a mean interest rating of 27.57 with a standard deviation of 4.11. The post test score for these students was 54.14 with a standard deviation of 17.19. The calculated average gain was 26.57. In a similar vein, female students who were exposed to the lecture approach had an average interest rating of 26.33 and a standard deviation of 4.08 for the pre-test. The average score for the post-test was 43.97, although the standard deviation was 8.56. The calculated mean gain was 17.64. The obtained result also indicated a mean difference of 8.93. Indications suggest that the lecture style enhanced the average interest rate of both male and female students who were instructed in biology. Nevertheless, the lecture method proved to be more efficacious in enhancing the average interest of male students compared to female students. The results suggest that there is no statistically significant relationship between teaching methods and gender in influencing the average interest rating of students in Biology.



**H<sub>01</sub>.** There is no significance difference in the mean interest ratings of students taught biology using practical activities and those taught with lecture method

**H<sub>02</sub>.** There is no significance influence of gender on the mean interest rating of students taught biology using practical activities

**H<sub>03</sub>.** There is no significant interaction effect of teaching methods and gender on the mean interest rating of students in Biology

**Table 4: ANCOVA Result on the Significant Difference in the Mean Interest Ratings of Students Taught Biology Using Practical activities and Those taught with Lecture Method**

<i>Source</i>	<i>Type III Sum of Squares</i>	<i>Df</i>	<i>Mean Square</i>	<i>F</i>	<i>Sig.</i>	<i>Partial Eta Squared</i>
Corrected Model	7906.722 <sup>a</sup>	4	1976.681	15.310	.000	.405
Intercept	9325.612	1	9325.612	72.232	.000	.445
Preinterest	395.052	1	395.052	3.060	.084	.033
Treatment	5518.653	1	5518.653	42.745	.000	.322
Gender	2254.579	1	2254.579	17.463	.000	.163
Treatment * Gender	11.020	1	11.020	.085	.771	.001
Error	11619.635	90	129.107			
Total	309216.000	95				
Corrected Total	19526.358	94				

a. R Squared = .405 (Adjusted R Squared = .378)

Table 4 displays the ANCOVA result for the substantial variation in the mean interest ratings of students taught biology using practical activities and those taught with lecture approach in relation to hypothesis one (H<sub>01</sub>). The obtained F-ratio (1, 90) = 42.745, p 0.000 indicates. The related precise probability value of 0.000 acquired is less than the predetermined 0.05 level of significance for decision-making. As so, the null hypothesis was rejected. Inference derived is that, when taught using Practical Activities Method and Lecture Method in favour of practical activities with higher mean score, the mean interest score of students in biology differs significantly. More especially, Table 4 displays a partial eta square ( $\eta^2_p$ ) = 0.322. This implies that the teaching approach was responsible for 32.2% of the rise in the mean interest levels among biology students.

Regarding hypothesis two (H<sub>02</sub>), also Table 4's presentation of the mean rating of students taught biology depending on gender reveals the notable variation. The F-value (1, 90) = 17.463, p = 0.05 was found to be attained. The null hypothesis is rejected since the precise probability value of 0.003 is less than

the 0.05 level of significance designated for decision-making. Consequently, it is found that students' mean rating in biology favours male with higher mean score depending on gender significantly. Based on the partial eta square ( $\eta^2_p$ ) of 0.163 found in Table 4, gender clearly accounted for 16.3% of the variance in mean rating of biology students.

Furthermore with regard to hypothesis three (H03), Table 4 presents the significant of the interaction effect of teaching approaches and gender of students' mean interest rating in biology. The outcome led to an F-value (1, 90) = 0.085,  $p > 0.000$ . At 0.05 level of significance, the p-value of 0.771 exceeds it. The null hypothesis hence was not disproved. Inference made shows no appreciable connection between teaching strategies and student gender of mean interest rating in biology. The partial eta square,  $\eta^2_p$  (effect size) of 0.001 shows that the interaction effect of gender and teaching strategies accounts for just 0.1% variance increase in the mean interest rating of biology students.

### **Discussion of Findings**

Tables 1 and 4 exhibit the results of the study, which demonstrated that students were more engaged when taught biology through hands-on activities rather than lectures. The results of the study in Table 4.7 show that students' interest in biology is significantly higher when they participate in practical activities rather than listening to lectures. Accordingly, the null hypothesis was rejected, indicating that students' interest in biology is significantly higher when they participate in practical activities rather than listening to lectures. One possible explanation for this finding is that students learn more effectively when they participate in hands-on activities, where they can see processes and get first-hand knowledge of the concepts being covered. This study's results corroborate those of Obi (2017), who also discovered that students' performance improved when they were involved in more hands-on activities. This study supports the findings of Audu (2018), which state that students' interest and achievement in biology are improved when teachers utilise appropriate teaching approaches during the teaching-learning process.

Tables 2 and 4 reveal that compared to female biology students, male students rated their interest in the subject higher. Additional study of statistical differences showed that there is a gender effect that favours male students when it comes to their interest ratings in biology. This led to the rejection of the null hypothesis. The findings of this study could be explained by differences in teaching methods. For example, while female students may be more hesitant to participate in hands-on activities, male students may find them engaging and entertaining when it comes to constructive argumentation and other such activities. Because of this, male students showed more curiosity than female

students. Additionally, due to the fact that various people have varied learning styles, a specific approach to instruction could be gender-sensitive, piquing a student's interest in biology. This study's results corroborate those of Okoro (2016), who also found that male students' interests in biology were significantly higher than female students' (Alake, 2021). The results of this study contradict those of Aniaku (2016), who claimed that students' interest in biology is unaffected by gender. Oludipe (2015) also found no statistically significant difference between the sexes when it comes to biology interest. Dissimilarities in pedagogy and the amount of hands-on experience may explain the discrepancy.

When exposed to the practical activities technique, male students rated their interest higher than female students, according to the study's findings in Tables 3 and 4. The male students also showed a greater mean interest rating compared to the female students when exposed to the lecture teaching approach. Students' mean interest ratings in biology were unaffected by the interaction effect of teaching technique and gender, according to the analysis of significant differences. One possible explanation for the study's findings is that the two approaches to education are gender sensitive, which means they actively involve students of both sexes in the learning process. As a result, students of either sex may acquire an interest in the subject matter. Consistent with previous research, this study found no significant effect of gender or instructional technique on students' interest (Igboanugo, 2018). Simultaneously, Obi (2017) also discovered that students' interest mean ratings were unaffected by the interaction impact of instructional styles and gender. The study's results, however, run counter to those of Allahnana et al. (2018), who discovered a substantial interaction impact between gender and instructional approach on students' interest. Research by Igboanugo (2018) and Oluwatosin et al. (2017) reached a similar conclusion: there was no significant interaction effect of gender and science, technology, and society instructional strategy on students' interest.

### **Conclusion**

Conclusively, compared to students who were taught using the lecture approach, those who were taught using the practical activities technique showed a much higher mean level of interest in the subject of biology. A considerable difference may be observed in the mean interest rating of students in biology when the subject is taught using either the lecture technique or the practical activities method, with the emphasis being placed on the practical activities method. The gender of the students has a substantial impact on the mean interest rating that they have in biology, with male students having a higher interest rating.

### **Recommendations**

Based on the findings of this study, the following recommendations were made.

1. In other to enhance students' and interest of students in biology, the use of practical activities should be encouraged in biology classes in senior secondary schools.
2. Seminar and workshops should be organized for teachers so as to; update their knowledge in the use of practical activities in teaching and learning.
3. Teachers should manage the time allocated well to accommodate the use of practical during teaching-learning process so as to foster proper comprehension.
4. Schools' curriculum should be overhauled to accommodate practical activities in teaching and learning biology.
5. For effective transaction of practical activities as method of teaching, teachers should be trained in the skill of effective carrying out practical activities in the classroom.

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