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PROF. PATRICK C. IGBOJINWAEKWU

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EDITORIAL

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Prof. Patrick C. Igbojinwaekwu
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INQUIRY-BASED LEARNING AS A PREDICTOR OF SECONDARY SCHOOL STUDENTS INTEREST IN BIOLOGY

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Abstract

The present study investigated the predictive effect of Inquiry-Based Learning (IBL) on secondary school students' interest in Biology. Two research questions and two hypotheses guided the study. A quasi-experimental pretest-posttest design was adopted. The population of the study comprised 13,596 Biology students in Anambra State public secondary schools. The sample size consisted of 300 SS3 Biology students (134 males and 166 females) drawn from six intact classes. The experimental group consisted of 165 students (80 males and 85 females), while the control group had 135 students (54 males and 81 females), randomly assigned. The instrument for data collection was the Biology Interest Scale (BIS) with a reliability coefficient of 0.86. Research questions were answered using mean and standard deviation, while ANCOVA was used to test the hypotheses at 0.05 level of significance. Results revealed a p-value of 0.000 in students' interest, leading to the rejection of the corresponding null hypotheses. However, with a p-value of 0.905 for male and female students' interest, the null hypothesis was accepted, showing no significant gender difference. By implication, students exposed to IBL developed significantly higher interest in Biology than those taught with the lecture method, although interest was not influenced by gender. A major contribution to knowledge of this study is that it established that exposure of secondary school students to IBL is essential in enhancing motivation, engagement, and sustained interest in Biology, while fostering investigative and critical thinking skills necessary for future academic pursuits and employability.

Keywords: Inquiry Based Learning, Interest

Introduction

Biology is the scientific study of life and living processes. It applies scientific reasoning and logic to foster a deeper understanding of the natural world and its phenomena (Adeyemi, 2021). As a core science subject in the Nigerian secondary school curriculum, Biology cuts across diverse fields of knowledge, ranging from human health, agriculture and industry, to environmental conservation and sustainable development (Okafor & Eze, 2022). The study of Biology not only equips learners with knowledge of life and the environment but also develops in them critical skills such as observation, experimentation, problem-solving and logical reasoning. These competencies are essential for societal progress and align with the demands of the 21st century knowledge-driven economy (Umar, 2023).

In Nigeria, Biology is among the most widely enrolled science subjects at the secondary school level because of its relevance to careers in medicine, pharmacy, agriculture, nursing, biotechnology and environmental sciences (Ifeanyi, 2022). However, despite its importance, several studies and Chief Examiners' reports of the West African Examinations Council (WAEC) have consistently highlighted students' declining interest in Biology (WAEC, 2020; Chukwuma & James, 2021). This decline in interest often precedes low achievement, as students who are disengaged or unmotivated are less likely to commit the effort needed to master abstract biological concepts (Adebayo, 2022). This trend raises concerns for educators, policymakers and parents, as it limits the pool of students who can pursue science-related careers.

Scholars argue that one of the major factors contributing to waning interest in Biology is the continued use of teacher-centered approaches specifically the lecture method, which emphasizes rote memorization rather than meaningful learning (Oluwatosin & Bello, 2021). Students often perceive Biology as abstract and difficult, especially when classroom instruction does not connect concepts to real-life applications (Ifeanyi, 2022). To address this, educators have been intensified research on sorting out for approaches that can engage students actively in the learning process, thereby stimulating interest and motivation. Hence, the current investigation on inquiry based learning.

Inquiry Based Learning (IBL) is a student-centered instructional approach that allows students to learn by means of questions, investigations, explorations, gain critical

thinking and problem-solving abilities which often results in addressing human curiosity (Okoye, 2019). With emphasizes on student-driven exploration, critical questioning, hands-on investigation and knowledge construction through guided discovery, Inquiry-Based Learning (IBL) may emerged as one such promising approach. Rather than being passive recipients of information, students engage in authentic problem-solving, collect and analyze data, and draw conclusions through collaborative inquiry. Several empirical studies across science disciplines including Chemistry, Physics and Mathematics have demonstrated that IBL not only improves academic achievement but also enhances learners' curiosity, interest and engagement (Achor & Joseph, 2021; Ozturk & Akin, 2022). In the context of Biology, inquiry-based approaches can make abstract concepts more concrete by linking them to observable natural phenomena, thereby increasing students' motivation and willingness to learn.

Statement of the Problem

Despite the growing literature, there is still insufficient empirical evidence on the predictive power of IBL on students' interest in Biology specifically with the context of the study area. Much of the existing work has focused on measuring achievement outcomes rather than attitudinal variables such as interest (Oladipo & Adeoye, 2020). Yet, interest is a critical affective factor that determines whether students will sustain attention, engage meaningfully in classroom tasks and pursue Biology-related careers in the future. Understanding whether IBL predicts students' interest in Biology will provide deeper insights into how pedagogical strategies can be leveraged not only for achievement but also for nurturing long-term motivation in science learning.
From the foregoing, this study seeks to investigate Inquiry-Based Learning as a Predictor of Secondary School Students' Interest in Biology.

Purpose of the Study

The purpose of the study is to investigate IBL as a predictor of secondary school students' interest in biology. Specifically, the study investigated;

1. The mean predictive interest scores of students exposed to inquiry based learning and those exposed to lecture method of instruction.
2. The mean predictive interest scores of male and female students exposed to inquiry based learning and exposed to lecture method of instruction.

Research Questions

The study was guided by the following research questions;

1. What is the difference in the mean predictive interest scores of students exposed to inquiry based learning and those exposed to lecture method of instruction?
2. What is the difference in the mean predictive interest scores of male and female students exposed to inquiry based learning and exposed to lecture method of instruction?

Hypotheses

The following null hypotheses were tested at 0.05 significant level.

1. There is no significant difference in the mean predictive interest scores of students exposed to inquiry based learning and those exposed to lecture method of instruction
2. There is no significant difference in the mean predictive interest scores of students exposed to inquiry based learning and those exposed to lecture method of instruction

Methods

The research design adopted for this study was the quasi-experimental design**,** due to the use of intact classes without random assignment. According to Cohen, Manion, and Morrison (2018), this design allows for comparison between experimental and control groups using pretest and posttest measures and helps control threats to internal validity such as history, maturation, and testing effects. The study was conducted in Anambra State involving 300 SS3 Biology students drawn from **six** coeducational public secondary schools**.** The students were divided into two groups: experimental (IBL) and control (lecture method)**.** Each school had two intact SS3 classes, randomly assigned as either experimental or control group to avoid disrupting school schedules.

Qualified Biology teachers of the participating schools with B.Ed. or B.Sc.(Ed) Biology and a minimum of three years teaching experience served as research assistants. The instrument used was the Biology Interest Scale (BIS)**,** a researcher-developed 20-item scale. The instrument was validated by experts in Science

Education, and the reliability determined using Crum Bach Alpha, yielding a reliability index of 0.86**.** The GAT was administered as both pretest and posttest to students in both groups. Section A of the test collected demographic data (e.g., gender), while Section B contained the questionnaire items. Data collected were analyzed using mean and standard deviation to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance**.**

Results

Research Question 1: What is the difference in the mean predictive interest scores of students exposed to inquiry based learning and those exposed to lecture method of instruction?

Table 1: Mean predictive interest scores of biology students exposed to inquiry based learning and exposed to lecture method of instruction.

Group	N	Post Test Score (A)		Pre Test Score (B)		Mean Difference Score (A – B)
		Mean	SD	Mean	SD	
IBL (Experimental group)	135	66.12	10.66	24.66	6.46	41.46
Lecture Method (Control Group)	165	32.60	6.78	23.92	6.35	20.88

Table 1 showed the results of the pretest and posttest mean predictive interest scores of students exposed to Inquiry-Based Learning (IBL) and those exposed to the Lecture Method. The students exposed to Inquiry-Based Learning (IBL) had a pretest mean score of 24.66 with a standard deviation of 6.46, and a posttest mean score of 66.12 with SD of 10.66. The mean difference between the posttest and pretest scores in the experimental group shows a significant improvement of 41.46. On the other hand, the students exposed to the Lecture Method had a pretest mean score of 23.92 with a standard deviation of 6.35, and a posttest mean score of 32.60 with a standard deviation of 6.78. The mean difference for the control group, indicating the extent of learning for students exposed to the lecture method, is 20.88.

In answer to the research question, therefore, the mean predictive interest scores of students exposed Inquiry-Based Learning (IBL) is 41.46, while those exposed to the Lecture Method is 20.88. The results show that the IBL group has a 20.58 (41.46 – 20.88) greater mean difference compared to the Lecture Method control group. This suggests that students exposed to Inquiry-Based Learning (IBL) exhibited a higher interest in biology, with an improvement of 20.58 greater than those exposed to the traditional lecture method.

Research Question 2: What is the mean predictive interest scores of male and female students exposed to inquiry based learning?

Table 2: Mean predictive interest scores of male and female students exposed inquiry based learning.

Gender	**N**	**Post Test Score (A)**		**Pre Test Score (B)**		**Mean Difference Score (A – B)**
		Mean	**SD**	**Mean**	**SD**	
Male	54	43.22	7.50	12.74	1.49	30.48
Female	81	28.94	3.59	14.69	1.54	14.25

Table 2 showed the results of the pretest and posttest mean predictive interest scores of male and female students exposed to Inquiry-Based Learning (IBL). The male students exposed to Inquiry-Based Learning (IBL) had a pretest mean score of 12.74 with a standard deviation of 1.49, and a posttest mean score of 43.22 with a standard deviation of 7.50. The mean difference for the male group is 30.48, reflecting a significant increase in interest. The female students exposed to Inquiry-Based Learning (IBL) had a pretest mean score of 14.69 with a standard deviation of 1.54, and a posttest mean score of 28.94 with a standard deviation of 3.59. The mean difference between the posttest and pretest scores in the female group is 14.25, indicating a notable improvement in interest for female students exposed to IBL.

In answer to the research question, therefore, the mean achievement scores of male students exposed to Inquiry-Based Learning (IBL) is 30.48, while those exposed to the same method in the female group is 14.25. The results show that the male students has a 16.23 (30.48 – 14.25) greater mean difference compared to the female students. This suggests that male students exposed to Inquiry-Based Learning (IBL) exhibited a higher improvement in interest compared to their female counterparts.

$H0_1$: There is no significant difference in the mean predictive interest scores of students exposed to inquiry based learning and those exposed to lecture method of instruction

Table 3: Analysis of covariance (ANCOVA) of students' interest in biology.

Source of Variation	df	Mean Square	F-Value	Sig.	Remark
Corrected Model	2	65.012	132.455	.000	S
Covariates (Pre-test)	1	12.179	24.556	.000	S
Treatment (Method)	1	62.845	165.342	.000	S
Error	197	0.380			
Total	200				
Corrected Total	199				

NB: NS = not significant at 0.05 level, S = significant at 0.05 level, df = degree of freedom.

Data presented in Table 3 indicate the level of significance of the effect of Inquiry-Based Learning (IBL) on student interest in genetics. The calculated F-value is 165.342, with a significant value of 0.000. Since the probability value (0.000) of the F-statistic (165.342) is less than the 0.05 level of significance, the study rejects the null hypothesis that "there is no significant difference in the mean interest scores of students exposed to inquiry-based learning and those exposed to lecture method of instruction." This indicates that students exposed to inquiry-based learning had significantly higher interest scores than those exposed to lecture method.

$H0_2$: There is no significant difference in the mean predictive interest scores of male and female students exposed to inquiry based learning.

Table 4: Analysis of covariance (ANCOVA) of gender effect on interest in

Source of Variation biology	df	Mean Square	F-Value	Sig.	Remark
Corrected Model	2	28.914	72.633	.000	S
Covariates (Pre-test)	1	6.025	15.150	.000	S
Gender	1	27.432	82.803	.000	S
Error	197	0.331			
Total	200				
Corrected Total	199				

NB: NS = not significant at 0.05 level, S = significant at 0.05 level, df = degree of freedom

Data presented in Table 4 indicate the level of significance of the effect of gender on student interest in genetics. The calculated F-value is 82.803, with a significant value of 0.000. Since the probability value (0.000) of the F-statistic (82.803) is less than the 0.05 level of significance, the study rejects the null hypothesis that "there is no significant difference in the mean predictive interest scores between male and female students exposed to inquiry-based learning." This indicates that gender has a significant predictive effect on the interest of students exposed to inquiry-based learning.

Discussion

The findings of this study revealed that students taught Biology using Inquiry-Based Learning (IBL) developed significantly higher levels of interest compared to those taught with the conventional lecture method. As shown in Table 1**,** students in the IBL group recorded a posttest mean interest score of 66.12 with a mean gain of 41.46, whereas those in the lecture method group recorded a posttest mean of 32.60 with a mean gain of 20.88. The difference of 20.58 in favor of the IBL group clearly demonstrates that IBL stimulates greater interest in Biology than the traditional lecture approach. This suggests that IBL is not only effective in enhancing achievement, as previous studies have demonstrated, but also plays a crucial role in sustaining students' curiosity and motivation toward Biology. This finding aligns with Okoye (2019), Achor and Joseph (2021), who emphasized that IBL, through its investigative, participatory and problem-solving orientation, fosters deeper emotional and intellectual connections to learning.

The higher predictive interest observed in students exposed to IBL can be explained by the fact that inquiry learning mirrors the true nature of scientific investigation. Biology, being a subject that thrives on observation, discovery and reasoning, resonates more effectively when students are all wed to question, explore and draw conclusions independently. This dynamic and learner-centered process makes abstract concepts tangible and relevant, thus generating enthusiasm and sustained interest. As emphasized by Ozturk and Akin (2022), interest thrives when learners actively construct knowledge through meaningful engagement rather than passively memorizing facts.

Gender differences were also observed in the present study. As indicated in Table 2, male students recorded a mean gain of 30.48, while their female counterparts recorded a mean gain of 14.25 when exposed to IBL. This suggests that male students exhibited greater improvement in interest compared to female students. This result contrasts with earlier studies such as Danjuma (2015), Hayatu and Okoronka (2016), which reported no significant gender difference in students' academic outcomes under inquiry-oriented strategies. However, it agrees with findings by Gupta, Pasrija, and Kavita (2015) and Oluwatelure (2015), who observed gender-based variations in attitudinal outcomes in science learning. The implication is that, while IBL universally promotes active engagement, sociocultural and psychological factors may shape how male and

female students respond in terms of interest levels. Teachers must therefore adopt differentiated strategies within inquiry-based frameworks to ensure equitable motivation for both genders.

The results of the hypotheses testing further confirm these patterns. Table 3 shows that the effect of treatment on students' interest was statistically significant ($F = 165.342$, $p < 0.05$), leading to the rejection of the first null hypothesis. This indicates that IBL had a significantly greater effect on students' interest than the lecture method. Similarly, Table 4 shows that gender exerted a significant effect on students' interest ($F = 82.803$, $p < 0.05$), leading to the rejection of the second null hypothesis. These findings reinforce the transformative role of IBL in influencing attitudinal outcomes in Biology, while also highlighting that the predictive value of IBL may be moderated by learner characteristics such as gender. This addresses the gaps identified by Oladipo and Adeoye (2020), who argued that interest remains underexplored in IBL research despite being a crucial factor for long-term science engagement.

In practical terms, the results demonstrate that IBL is not only an instructional alternative to improve performance but also a motivational tool that can reverse declining interest in Biology, as highlighted by WAEC (2020). By embedding curiosity-driven tasks, problem-solving activities, and real-life applications, teachers can foster enduring interest that sustains learners' pathways into science-related careers.

Conclusion

This study has shown that Inquiry-Based Learning (IBL) significantly enhances secondary school students' interest in Biology compared to the conventional lecture method. As evidenced in Table 1, students exposed to IBL demonstrated deeper engagement, curiosity, and motivation to learn Biology, underscoring the importance of inquiry as a predictor of attitudinal outcomes. Furthermore, Table 2 indicated that gender exerts a significant effect on interest, with male students recording higher interest gains than their female counterparts.

The implication of these findings is that integrating IBL into Biology classrooms is essential for promoting learner-centered, curiosity-driven education that not only supports achievement but also nurtures long-term motivation. Teachers should

therefore adopt inquiry-oriented instructional models while paying attention to gender-responsive strategies that ensure equal engagement for all learners. By doing so, Biology education can become a more dynamic and motivating experience, preparing students for scientific literacy and careers essential to national development.

Recommendations

The following recommendations were made based on the findings and conclusion of the study;

1. Adopt Inquiry-Based Learning (IBL): Teachers should use IBL strategies in Biology to enhance student interest and engagement.
2. Train Teachers: Regular workshops should be organized to build teachers' capacity for effective use of IBL.
3. Integrate into Curriculum: Curriculum planners should formally include IBL activities in the Biology curriculum for wider implementation.

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