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Effects of Case-Based and Experiential Learning Strategies on Attitude of Biology Student's in Ekiti State Secondary School Nigeria

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Abstract
This study investigated the effects of Case-based and experiential learning strategies on student's attitude to Biology in Ekiti State Secondary School Nigeria. One research question was raised and four hypotheses were generated. The study adopted a quasi-experimental research design. The population for the study was 12,508 Senior Secondary School two students in Ekiti State and the sample consisted of 152 Students who were selected using multistage sampling procedure. One research instrument was used for the study. Biology attitudinal Scale (BAS) was used to test the attitude of students. The validity of the instrument was established through face and content validity. Cronbach's alpha method was used to establish the reliability of the Instrument (BAS), which was used to compare the variance of one item with variance of other item. The data obtained were analyzed using descriptive analysis (mean and standard deviation) and inferential statistic (t-test) at 0.05 level of significant. The results of the findings revealed that no significant difference in the attitude of students in the experimental and control groups toward respectively in Biology before treatment. It was also revealed that the interaction effect of treatment and gender significantly influenced the attitude of students towards Biology, with male students achieving higher mean scores. Again, one of the findings of the study showed that there is no significant difference in the effects of case-based, experiential learning and conventional strategies respectively on the attitude of students to Biology. Based on the findings it's recommended that government should organize seminars for teachers on the use of more than one teaching strategies in teaching and learning process.

Introduction
Science constitutes a domain of scholarly inquiry that involves the methodical exploration and comprehension of the natural universe through observation, experimentation, and analytical reasoning. It entails the examination of the attributes, behaviors, and foundational principles that regulate natural phenomena. This characterization aligns with the viewpoint articulated by Jegede and Omotayo (2011) [8], which posits that "science encompasses knowledge of facts and principles acquired through systematic study. The significance of science in the technological progression of a nation is widely acknowledged. Scientific innovations and technological developments are intricately linked, with science providing the essential groundwork for technological advancement. Through meticulous scientific research, novel knowledge and insights are generated, which subsequently contribute to the creation of varied technologies that improve diverse facets of human existence. Science plays a pivotal role in a nation's evolution from developing to developed status. The aim of science education is to cultivate skills, talents, attitudes, and work habits, alongside an appreciation for the knowledge and information vital for a functional community (Ayeni & Oladunjoye, 2023).

Experiential learning strategy refers to an educational approach where students actively engage in hands-on experiences, experiments, simulations, or real-world applications to enhance their understanding of academic content (Gijlers, de Jong, & Berthold, 2018) [6]. This approach emphasizes learning through direct involvement and practical encounters with the subject matter, allowing students to apply theoretical knowledge in real-life situations.

Experiential learning involves students directly interacting with the learning materials, manipulating objects, conducting experiments, and exploring real-world scenarios. This active involvement deepens their understanding (Gijlers, de Jong, & Berthold, 2018) [6]. Experiential learning emphasizes applying classroom knowledge to solve real-world problems. Students

engage in authentic tasks and experiences, bridging the gap between theoretical learning and practical application (Kolb & Kolb, 2017) [11].

Students actively explore concepts through experiments, field trips, case studies, and group projects. By participating in these activities, they gain practical insights and develop critical thinking skills (Kolb, 2015) [12]. Experiential learning includes reflecting on experiences. After engaging in activities, students analyze outcomes, identify patterns, and consider the implications, enhancing their metacognitive skills (Moon, 2013) [13].

Experiential learning often involves collaborative efforts. Students work together, share ideas, and learn from one another, fostering a cooperative learning environment (Vygotsky, 1978) [17]. Through experiential learning, students not only grasp academic content but also develop essential life skills such as problem-solving, communication, and teamwork, preparing them for future challenges (Aldridge & Rowley, 2018) [2]. Experiential learning strategy encourages active exploration, real-life application, collaborative efforts, and reflective thinking, fostering a holistic learning experience that goes beyond traditional classroom instruction.

Experiential learning in biology offers students the opportunity to engage directly with the subject matter, fostering a deeper understanding of complex concepts through hands-on experiences and real-world applications. In the context of Ekiti State, Nigeria, where the educational landscape benefits from incorporating experiential learning in the biology curriculum, several key aspects should be considered. According to Adeyemo and Akinbobola (2010) [1] in Nigerian secondary schools emphasized the significance of practical laboratory experiments in biology education. Practical sessions enable students to explore biological phenomena, enhancing their understanding of theoretical concepts (Adeyemo & Akinbobola, 2010) [1]. Ekiti State's rich biodiversity offers ample opportunities for field excursions. A study by Ogunniyi (2012) [16] highlighted the effectiveness of field trips in enhancing students' ecological knowledge. Visits to local ecosystems, farms, or botanical gardens can provide valuable experiential learning experiences (Ogunniyi, 2012) [16].

Case-Based Learning (CBL) is an instructional strategy that presents students with real-life scenarios or cases, often derived from actual events or situations, related to the subject matter being studied. These cases are complex and require students to analyze, synthesize information, and apply their knowledge to solve problems within a specific context. In the context of biology education, CBL involves presenting students with biological phenomena, medical cases, environmental challenges, or ethical dilemmas, encouraging them to explore and understand the underlying biological principles and their real-world implications.

CBL in biology provides a bridge between theoretical knowledge and practical application. By immersing students in authentic biological scenarios, CBL helps them see the real-world relevance of the concepts they are learning. For example, students might analyze a case related to environmental pollution and its impact on local ecosystems, requiring them to apply their understanding of biology to propose sustainable solutions (Smith et al., 2020) [18].

One of the key benefits of CBL in biology education is its ability to enhance critical thinking and problem-solving skills. Students are challenged to critically analyze the

information presented in the case, identify relevant biological concepts, and develop reasoned solutions. This process encourages active engagement, deepens understanding, and fosters analytical skills crucial in biology-related professions (Johnson & Smith, 2018).

In Nigeria's pursuit of technological progress, all disciplines of science, including Biology, assume critical roles. Sarojinni (2018) identifies Biology as a scientific discipline concentrating on the examination of living organisms, from microscopic entities to the entire biosphere, which includes the Earth's surface and all forms of life. Owing to its characteristics and significance, Biology is a core subject in the senior secondary school curriculum in Nigeria and is incorporated into the Secondary School Certificate Examination (SSCE) syllabus (Akindele, 2019). The objective of Biology education is to equip students with pertinent concepts and scientific skills while fostering broader competencies such as problem-solving, communication, critical thinking, and objective reasoning, which are indispensable for their readiness in the workforce and self-sufficiency in the global economy (Federal Ministry of Education FME, 2018).

However, despite the vital role of Biology, many students tend to view and study the subject as abstract, which often contributes to their poor academic performance (Ezechi, 2014) [4]. The adverse perceptions regarding and subpar achievements in Biology can be attributed to a multitude of factors, encompassing insufficient teacher qualifications, limited teaching experience, inadequate remuneration and benefits, as well as ineffective supervision. Additionally, students' reluctance to engage in learning and the influence of their peers have also played a significant role in this dilemma. Moreover, the pedagogical methods utilized by educators, the gender of students, and the geographical location of the educational institution can significantly impact students' attitudes towards the discipline.

The attitude of students may be influenced by gender and school location. The attitude of students towards a specific discipline will affect their learning. Shonfeld and Magen-nagar (2018) opined that Students attitude towards education significantly alter achievement in education, therefore identification and influence of attitude became to be an essential part of educational research. Attitudes are one of the most studied aspects of social functioning. An attitude is a mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations to which it's related. Students learning experience affects their attitude positively; increase their motivation for learning, as result which leads to higher achievement in learning. Several types of scales have been developed to measure attitudes. One of the most recognized scales for measuring attitudes is the likert – type scale. The scale demands that individuals make decision on their level of agreement.

Gender issue is one of the most discussed topics in recent times. This is premised on the facts that female constitutes more than half of the world population (UNICEF, 2021) and as such, no meaningful scientific and technological advancement can really take place if woman is absent or under- represented in science and technology related courses. (Jegede 2023) [9].

Gender factor in academic attainments has been the concern of educational researchers and administrators over the years. Different researchers have offered varying hypotheses to

explain their observed gender differences in academic attainment.

Gender differences have become critical issues of concern around the world most especially to educators and researchers. The males are also assigned leadership positions a female president or governor (Ezendu and Obi, 2013) [5]. For years now, the expectations for boys have differed from that of girls in biology, thus enhancing gender stereotyping academic activities which has seriously influenced student's academic performance especially in senior school certificate examinations. One cannot draw any meaningful conclusion on the influence of gender on academic achievement of students since studies on gender differences in achievement are still inconclusive. The researcher therefore considers it worthwhile to also investigate the influence of gender in senior secondary school student's achievement in Biology.

Another important factor to consider is school location. This refers to the geographical setting of the school, whether in rural or urban areas. In Nigeria, rural environments tend to be more uniform and less complex than urban areas, which are more diverse and usually better resourced. Urban schools often enjoy better infrastructure and access to essential services such as potable water, electricity, and healthcare, unlike many rural schools that struggle with inadequate facilities and teaching resources. These disparities suggest that students in urban schools might have more educational advantages than those in rural settings.

However, research on this issue has produced mixed findings. Some studies have highlighted positive influences of school location on academic achievement, while others have reported negative impacts. For example, Nwogu (2014) found that students in rural areas faced more difficulties learning Biology concepts related to angles compared to their urban peers.

Statement of the problem

The attitude of secondary school students towards Biology in Ekiti State, Nigeria, have become a matter of concern for curriculum planners and educational stakeholders. Students' challenges and their attitude towards learning of biology lies on their inability to understand most of the concept of the subject taught. Students attitude could either be a negative or positive attitude, depending on the method of the teacher and this determines their levels of interest in learning. In order to achieve these objectives of Biology, the teaching strategy should promote students to assume responsibility and control over their acquisition of knowledge and skills. Thus students should become masters of their learning thereby controlling what, how, why and when they learn. Therefore, the use of active learning strategies such as case-based learning and experiential learning strategies may be used to achieve this objective.

There are different innovative teaching methods or strategy which helps to improve the teaching of subjects (such as biology). Such as discussion, group method and others. Other method of teachings is conventional method, lecture method etc. The mostly common method used is convention method which is not too effective in teaching and learning.

The prevailing utilization of traditional teaching methods in senior secondary schools seems to be a restricting factor impacting Biology learning outcomes. The reliance on conventional approaches has been correlated with students 'attitude to learning of Biology. In response to these

challenges, researchers have advocated for the adoption of case based and experiential learning strategy in teaching and learning of Biology, to see the effectiveness in the attitude of students to Biology in Ekiti State.

Purpose of the Study

The study specifically intended to:
1. investigate the attitude of students in Biology before and after being exposed to case -based experiential and conventional learning strategies respectively;
2. determine the effect of gender on the attitude of students after being exposed to case- based, experiential and conventional learning strategies respectively;
3. to determine the pre – attitudinal mean scores of scores in experimental and control groups;
4. determine the effects of location on the attitude of students after being exposed to case – based learning, experiential learning and conventional method in Biology.

Research Question

1. What attitude do students cultivate towards learning of Biology before and after exposure to treatments?

Research Hypotheses

1. There is no significant difference in the attitude of male and female students exposed to case-based learning, experiential learning and conventional strategies towards Biology.
2. There is no significant effect of cased based learning, experiential learning and conventional strategies respectively on the attitude of students in Biology after treatment.
3. There is no significant difference in the attitude of students in experimental and control groups in Biology before treatment.
4. There is no significant effect of location on the attitude of students exposed to case -based, experiential learning and conventional strategies respectively towards Biology.

Significance of the study

It is projected that the results of this investigation may yield advantages for a diverse range of stakeholders within the education sector: "students, educators, curriculum developers, guardians, resource authors, and other entities involved in the execution of the curriculum.

For learners, the study's outcomes promise to augment their educational experiences and achievements in the field of Biology. It is hoped that the findings of this study would be of immense benefit to students, Biology Teachers, Curriculum planners and policy makers.

Parents play a crucial role in their children's education, and understanding the evolving teaching methods empowers them to offer informed support. By gaining insights into how innovative teaching strategies (such as cased - based and experiential learning strategies) benefit their children, parents would actively engage in their children's learning journeys. This knowledge would enable parents to provide targeted assistance, encouragement, and motivation, ultimately contributing to their children's educational growth and success.

Teachers can adapt these methods by incorporating case-based learning and experiential learning into their

classrooms. This adaptation would enhance their teaching skills and fosters a dynamic learning environment where students actively participate, leading to more fulfilling teaching experiences.

School administrators could utilize the successful strategies identified in the study to enhance the institution's curriculum. By integrating these innovative teaching methods into the academic framework, schools could elevate their teaching standards. This integration could ensure that students across the institution benefit from engaging and impactful learning experiences, contributing to the overall educational excellence of the school.

Delimitation of the study
The study was delimited to one senatorial district in Ekiti State, so that the research can be manageable by the researcher. It's also delimited to three local governments and to three concepts in Biology.

Methodology
The study adopted a quasi-experimental research design. the population of the study consisted of 12,508 SS11 Students offering Biology in Ekiti State Secondary School as at the time for this study. Samples were selected using multi stage sampling procedure. The first stage involves the selection of one senatorial district in Ekiti State Nigeria through random sampling techniques. Stage two involves the selection of three local governments from the senatorial district selected through purposive sampling techniques. Stage three involves the selection of two schools each from the local governments selected through stratified sampling techniques. One instrument was used for the study. Biology attitudinal scale, (BAS). This was designed by the researcher to elicit attitudinal response from the students in biology. The instrument is in two sections A and B. Section A contains respondents` Bio – data while Section B contains 20 items used to elicit information from the students. Two methods were used to established the validity of the instruments, face and content validity. Cronbach Alpha Method was used to establish the reliability of the instrument (BAS). This was done by comparing the variance of one item with the variance of other item. The research question was answered using Mean and standard deviation and the Hypotheses were tested using ANCOVA. All hypotheses were tested at 0.05 level of significant.

Results
Research Question
What attitude do students cultivate towards learning of Biology before and after exposure to treatments?

Table 1: Effects of cased based, experiential and conventional learning strategies on students' attitude towards Biology

| Treatment | N | Pre-Attitude | | Post-Attitude | | Mean Difference |
		Mean	S.D	Mean	S.D	
Case based learning strategy	56	65.61	8.07	66.07	8.28	0.46
Experiential learning strategy	46	66.91	9.29	65.85	7.92	-1.06
Conventional strategy	50	64.28	8.34	65.00	8.19	0.72
Grand Mean	**152**	**65.56**	**8,53**	**65.65**	**8.14**	**0.74**

Table 1 shows that case-based learning strategy showed a slight positive change, with a mean difference of 0.46 between the pre-test 65.61 (8.07) and post-test 66.07 (8.28) scores. Conversely, the experiential method recorded a negative mean difference of -1.06, indicating a slight decline in attitude from the pre-test 66.91 (9.29) to the post-test 65.85 (7.92). The conventional method yielded the highest positive change, with a mean difference of 0.72 between pre-test 64.28 (8.34) and post-test 65.00 (8.19) scores. Despite these variations, the grand mean difference (0.74) was marginal, suggesting that none of the methods significantly impacted students' overall attitude toward Biology. Victual representation of the data is presented in Fig 1.
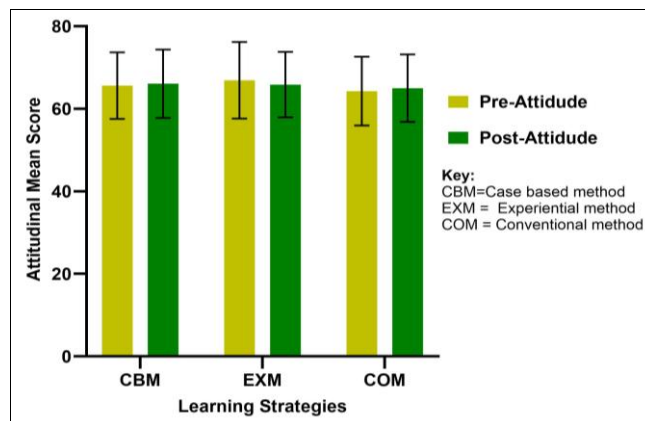
Fig 1: Learning Strategies and Students' Attitude towards Biology

Hypothesis Testing
Hypothesis 1 There is no significant difference in the attitude of male and female students exposed to case-based, experiential and conventional learning strategies towards Biology.

Table 2: ANCOVA showing effect of treatment and gender on the attitude of students towards Biology

Source	SS	Df	MS	F	Sig.
Corrected Model	766.626ª	6	127.771	2.026	.066
Intercept	9446.617	1	9446.617	149.768	.000
Covariate (Pre-attitude)	27.720	1	27.720	.439	.508
Treatment	33.364	2	16.682	.264	.768
Gender	12.250	1	12.250	.194	.660
Treatment * Gender	699.091	2	349.545	5.542	.005
Error	9145.894	145	63.075		
Total	665047.000	152			
Corrected Total	9912.520	151			

Table 2 shows that for the treatment ($F_{(6, 145)}$, = 0.264, p =0.768, indicating that there is no significant difference in the attitude of students exposed to case-based, experiential, and conventional learning strategies in Biology. Similarly, the main effect of gender ($F_{(1, 145)}$, = 0.194, p = 0.660) was not statistically significant. However, the interaction effect of treatment and gender ($F_{(2, 145)}$, = 5.542, p = 0.005) was significant at 0.05 level of significance, indicating that gender interaction with treatment has influence on the attitude of students towards students in Biology. In order to locate the sources of the difference, Post Hoc Analysis was carried out. The result is presented in Table 10.

Table 3: Post Hoc Analysis of Gender Differences in the Attitude students towards Biology when exposed to case-based, experiential and conventional learning strategies

Learning Strategy	Gender	N	Mean	S.D	T	p-Value
Case based	Male	27	69.15	7.64	2.852	0.006
	Female	29	63.21	7.93		
Experiential	Male	24	63.79	6.99	-1.982	0.065
	Female	22	68.09	8.41		
Conventional	Male	29	64.93	8.92	-0.069	0.945
	Female	21	65.10	7.27		

Table 10 shows that the case-based learning strategy revealed a statistically significant gender disparity (t = 2.852, p = 0.006), with male students achieving notably higher mean scores 69.15 (7.64) compared to their female counterparts 63.2 (17.93). In contrast, the experiential strategy exhibited a non-significant gender difference (t = −1.982, p = 0.065), despite females attaining slightly higher mean scores 68.09 (8.4) than males 63.79 (6.99). The conventional strategy showed no significant gender difference (t = −0.069. p = 0.945), with comparable mean scores for males 64.93(8.92) and females 65.10 (7.27). The above analysis underscores the potential of the case-based learning strategy to amplify gender-specific attitudinal outcomes in biology, while experiential and conventional approaches appear less susceptible to such variations.

Hypothesis 2: There is no significant effect of cased based, experiential and conventional learning strategies respectively on attitude of students to Biology after treatment.

Table 4: ANOVA of the effect of cased based, experiential and conventional learning strategies on the attitude of students to Biology after treatment

Source	SS	Df	MS	F	Sig.
Corrected Model	38.033ᵃ	3	12.678	.190	.903
Intercept	10249.655	1	10249.655	153.623	.000
Covariate (Pre-attitude)	5.162	1	5.162	.077	.781
Treatment	30.313	2	15.156	.227	.797
Error	9874.487	148	66.720		
Total	665047.000	152			
Corrected Total	9912.520	151			

The data contained in Table 4 shows that $F_{(2, 148)} = 0.227$, p > 0.05). The null hypothesis is not rejected because the p-value of 0.797 was greater than the 0.05 level of significance. This implies that there is no significant difference in the effects of case-based learning, experiential learning, and conventional strategies respectively on the attitude of students to Biology after treatment.

Hypothesis 3: There is no significant difference in the attitude of students in experimental and control groups in Biology before treatment.

Table 5: ANOVA summary of students' attitude in experimental group and control group before treatment

Source	SS	df	MS	F	Sig.
Between Groups	166.253	2	83.126	1.139	.323
Within Groups	10877.089	149	73.001		
Total	11043.342	151			

p>0.05

Table 5 shows that the critical F-value was 1.139 and the corresponding p-value of 0.323 (which is greater than the 0.05 significance level). Thus, the null hypothesis was not rejected, indicating that there is no statistically significant difference in the attitude of students in experimental and control groups toward Biology before treatment subject. Therefore, it can be inferred that the three groups were homogeneous at the beginning of the experiment.

Hypothesis 4:
There is no significant of location on the attitude of students exposed to case- based, experiential learning and conventional learning strategies respectively towards biology.

Table 6: ANCOVA showing interaction effect of treatment and school location on attitudinal mean scores of students in Biology

Source	SS	Df	MS	F	Sig.
Corrected Model	245.625ᵃ	6	40.937	.614	.719
Intercept	10065.204	1	10065.204	150.974	.000
Covariate (Pre-attitude)	9.177	1	9.177	.138	.711
Treatment	34.656	2	17.328	.260	.771
Location	149.261	1	149.261	2.239	.137
Treatment * location	66.793	2	33.397	.501	.607
Error	9666.895	145	66.668		
Total	665047.000	152			
Corrected Total	9912.520	151			

Table 6 shows that main effect of treatment ($F_{(6, 145)}$, = 0.260, p =0.771), school location ($F_{(1, 145)}$, = 2.239, p = 0.137) and interaction effect of treatment and school location ($F_{(2, 145)}$, = 0.501, p = 0.607) were not statistically significant. This implies that the combined effect of treatment and school location did not significantly influence students' attitudes toward Biology.

Discussion
The findings of the study showed that there is no significant difference in the attitude of students in the experimental and control groups toward respectively in Biology before treatment. Therefore, it can be inferred that the three groups were homogeneous at the beginning of the experiment. If there are any positive changes in the attitude of students toward Biology, it could be as a result of the treatment other than previous disposition. It is also an indication that the conventional learning strategy that students are used to lacks the potency to stimulate their interest in Biology.
Again, one of the findings of the study showed that there is no significant difference in the effects of case-based, experiential learning and conventional strategies respectively on the attitude of students to Biology. This finding aligned with that of Awolere (2015), who found no influence of experiential learning strategy on the attitude of students in Biology in the Oke-Ogun area of Oyo State. In contrast, Ogunleye (2015) [15] found that the case-based learning strategy significantly improved students' chemistry achievement and attitude, with the case-based group showing high adjusted posttest mean scores in attitude to chemistry. Similarly, Joshua, Mercy, and Juster (2023) [10] found a significant difference in students' attitudes towards biology between experiential and conventional teaching methods, suggesting that experiential learning can improve students' attitudes and academic performance in biology.

It is interesting to discover that the interaction effect of treatment and gender significantly influenced the attitude of students towards Biology, with male students achieving higher mean scores. Consequently, the case-based learning strategy has the potential to amplify gender-specific attitudinal outcomes in biology, while experiential and conventional approaches appear less susceptible to such variations. This finding is in random with that of Husssaini, Froog & Kamar (2016) [7] who found a significant difference between the attitudes of male and female students towards Biology with most male students having positive attitude towards Biology but in contrast with that of Nasir (2020) [14] who found an overall positive attitude towards biology, with females having slightly more positive attitudes, with a stronger correlation. furthermore, in in contrast, with the findings of this study Casmir (2019) and Boris (2015) [13] found in their respective studies, that there is no significant difference between the attitude of male and female students towards biology.

Further, the findings from the study revealed that there is no significant interaction effect of treatment and school location on the attitudinal mean score of students in Biology. This signifies that the combined effect of treatment and school location did not significantly influence students' attitude toward Biology. This suggests that gender is not a condition for attitudinal changes in students toward biology when exposed to case-based, experiential, and conventional learning strategies. However, the finding contradicted that of Onyeachu (2016) and Morakinyo (2013) who in their respective studies found that the location of schools has significant impact on the attitude of students' towards' learning Biology.

Conclusion

Based on the results of the findings, it can be concluded that location has no effect on the attitude of students. The interaction effect of treatment and gender significantly influenced the attitude of students towards Biology, with male students achieving higher mean scores.

Recommendation

Government should organize seminars for teachers on the important of using more than one method of teaching Biology courses.
Teachers should inculcate the use of case based and experiential learning strategies on teaching and learning of Biology in Ekiti State Secondary School Nigeria.

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