UNIJERPS
Unizik Journal of Educational Research and Policy Studies VOL.21 (1);
January-June, 2026 https://unijerps.org
2023 Impact Factor: **6.834;** 2022 ***Impact Factor***: 5.156; ***2021 Impact Factor: 5.641;***
2020 Impact Factor: 5.355. *Indexing and Impact Factor URL: http://sjifactor.com/passport.php?id=21363*

BIOLOGY TEACHERS' AWARENESS, COMPETENCE AND ATTITUDE TOWARDS THE UTILIZATION OF INNOVATIVE TEACHING STRATEGIES IN SECONDARY SCHOOLS IN ANAMBRA STATE

[1]Evelyn Obianuju Egolum (PhD) eo.egolum@unizik.edu.ng

[2] **Angela Adanna Abumchukwu (PhD)** aa.abumchukwu@unizik.edu.ng

3Jachimma Nwekenta Jachimmanwekenta@gmail.com

[1,2]Department of Science Education, Nnamdi Azikiwe University, Awka, Anambra State

ABSTRACT

The persistent fluctuation in students' academic performance in Biology, despite curriculum reforms advocating student-centered and innovative pedagogies, necessitated an examination of biology teachers who are the key implementors of curriculum reforms. This study investigated biology teachers' awareness, competence, and attitude towards the utilization of innovative teaching strategies in secondary schools in Anambra State. Three research questions guided the study. Adopting a descriptive survey research design, a representative sample of 90 teachers was drawn from a population of 489 public secondary school Biology teachers using a multi-stage sampling procedure. Data were collected via a validated, structured questionnaire. The reliability coefficients of 0.85 was established for awareness, 0.94 for competence and 0.75 for attitude was established using the Cronbach Alpha technique. Weighted mean and standard deviations were used to analyze the research questions. Findings revealed that Biology teachers possess a high level of awareness and a generally positive attitude towards innovative strategies, yet demonstrate only a moderate level of competence in their utilization. The study concluded that while Biology teachers used for the study are aware and willing to utilize the innovative strategies in their teaching, gaps exist in practical competence. It was recommended that regular capacity-building programs, workshops, and in-service training be organized to strengthen teachers' competence in the effective utilization of innovative strategies for improved Biology instruction and learning outcomes.

Keywords: Innovative Teaching Strategies, Awareness, Competence, Utilization, Biology Teachers

Introduction

Science is a systematic and organized body of knowledge that aims to provide understanding and explanation of natural phenomenon through observation, experimentation and evidence-based reasoning. Science according to Njoku cited in Ibe, Obikezie and Chikendu (2021), is the rational and systematic study of the environment through observation and experimentation to understand the environment and manipulate the resources of nature for human development. Science as a human activity is interested in the functioning of the world. The world we live in

daily depends on discoveries in science for growth and development (Ihekwaba, Nwokocha and Onuike, 2020). Science is the foundation upon which modern technological advancements are built, driving innovations and economic growth (National Academy of Sciences, 2022). The contributions of science and technology to the overall development of nations cannot be overemphasized and these can be achieved through inculcations of skills through science education. (Egolum, Okonkwo and Ada-Uzoh, 2022). Such inculcation of scientific knowledge and skills is most effectively achieved through the systematic teaching of core science subjects such as, Chemistry Physics, Agricultural Science, Health Science, Mathematics, Computer Science and especially Biology using appropriate pedagogical approaches.

Biology is a natural science subject concerned with the study of life and living organisms including their structure, function, growth, evolution and distribution. Biology is one of the important subjects that form the building blocks of everything we understand when it comes to natural science. Biology which is the science of life, occupies a central position in the scientific and technological development of any nation. As one of the core fundamental science subjects taught in secondary schools in Nigeria, Biology is seen as the gateway to disciplines such as Medicine, Agriculture, Pharmacy, Nursing, Dentistry and so on. Furthermore, Biology literacy is crucial for various human activities such as food, health, agriculture, ecosystem management, conservation of natural resources and several other human activities necessary for sustainable national and economic development.

Despite the importance of Biology in natural development and given the popularity of the subject among secondary school students as revealed by the high enrolment of students in the subject in Senior School Certificate Examination, the performance does not compare with the popularity. Aniaku cited in Ukala (2018) reported that despite the high number of student's enrolment in Biology in the Senior Secondary School Examinations conducted by West African Examination Council (WAEC) and National Examination Council (NECO), students' achievement in the national examinations does not yet measure up to the popularity of the subject. Also, the Chief Examiner's report on students' performances in WAEC 2013-2023 revealed that there has been a fluctuation in the performances of students in Biology. This fluctuating academic performance is worrisome to stakeholders. Notably, Attamah and Okoli (2021) asserted that the continued fluctuating academic performance of student's calls for a closer look into how the subject is taught.

This unsatisfactory academic achievement in Biology could be attributed to many factors among which is the teacher's reliance on teaching strategies that do not fully align with the needs of contemporary students leading to diminished students' interest and understanding. The Chief Examiner in his report pointed out the need for Biology teachers to use better teaching strategies and teaching aids to help candidates to understand Biology concepts. This concern of the students' performance in Biology has substantiated Attamah and Okoli's (2021) call for a review on how students are being taught the subject especially in senior secondary schools. It is assumed that recent development in the field of

teaching methodologies especially the innovative teaching strategies would help to address this concern.

Innovative teaching strategies refer to new, creative and effective methods or approaches used by teachers to enhance student's learning engagement and outcomes. Kampen (2022) defines innovative teaching strategies as the use of new, creative and effective methods, techniques and tools to enhance student engagement, and improve teacher effectiveness. These strategies often depart from traditional teaching methods and incorporate technology, collaboration and hands-on experience. Innovative teaching strategies are a good way of reaching all the students. It entails plans or patterns that can be used to impart knowledge such that students are more engaged, lessons more interesting, understanding easily facilitated and student's learning and retention improved.

Innovative teaching strategies in Biology classrooms can be manifested as the use of new teaching methods, the addition of new ideas either in the curriculum content, learning experiences or introduction of new or modern instructional materials. It can be the adoption of new changes in evaluating the outcomes of teaching and learning. Innovative teaching strategies encourage contact between students and learning materials, develop reciprocity and cooperation among students, encourage active learning, give prompt feedback which can be used to evaluate the teaching and learning process, emphasize time on task, communicate teachers' expectations of the learning process as well as respects diverse talents in the students and their ways of learning (Zindel and Deane, 2020).These innovative teaching approaches are student-centered, open-ended and draws attention to the regular gains in terms of students' motivation and increased skill acquisition. Thus, innovative teaching strategies are activity-based and they help students to develop creativity and entrepreneurial skills. Innovative teaching strategies includes problem-solving based approach, collaborative learning, mastery learning approach, e-learning, Computer Assisted Instruction, problem and context-based approach, e-assessment, inquiry/discovery approach, multimedia instructional packages and so on (Egolum, Igboegwu and Okonkwo, 2015).

The need for innovative pedagogy arises partly out of the fact that the education system of the twentieth century is quite different from the twenty-first century of today. The focus of education has shifted from rote memorization of knowledge to mastery learning, from theory to practice, from teacher-centered to learner-centered and from memorization of scientific facts to its application to real-life situations. Also, Khairmar (2015) outlined the need to shift emphasis from teaching to learning and to embrace the numerous ways in which students can learn instead of relying on traditional methods. However, the success of these innovative strategies in enhancing students' achievement is largely dependent on the teachers' competence- their knowledge, skills and attitude toward using such approaches effectively.

However, despite the advocacy for a shift to innovative teaching strategies as a means of enhancing student's performance, many Biology teachers still rely heavily on traditional, teacher-centered approaches. This gap between policy and practice raises concerns about the preparedness of and disposition of

teachers to utilize innovative teaching strategies in their classrooms. Research revealed that various factors could account for this disconnect including teachers' lack of awareness of innovative teaching strategies (Akpan and Andrew, 2019), insufficient competence in applying them, or the negative attitudes towards adopting new instructional approaches. These factors if not adequately addressed can hinder the effectiveness of Biology teaching and limit students' academic achievement and interest in science-related careers.

Awareness of innovative teaching and learning in educational policies usually form the backbone of the utilization and productivity level of any educational programme. It is when an individual is aware of the principles and context policy that such an individual can cultivate the right type of attitude that will result in improved productivity. Therefore, teachers' awareness of the innovative teaching strategies is a decision that could help in teaching and learning science subjects like Biology (Obiekezie and Abumchukwu, 2020). However, simply being aware of these strategies is not enough; teachers must also possess the competence to implement them effectively.

Competence refers to the ability of teachers to effectively design, implement and evaluate innovative teaching strategies in their classrooms. It involves a deep understanding of the strategies, as well as the skills and confidence to adapt and refine them in response to student's need. As research has shown, competence in utilization of innovative strategies is a crucial factor in achieving the desired learning outcomes and improving students' achievement (Darling-Hammond, 2017). Teachers' competence in utilizing innovative teaching strategies involves integrating innovative competencies and fostering openness to experiences crucial for enhancing education quality through creativity, experimentation, change awareness and collaboration.

The gap between knowledge and practice of innovative teaching strategies can be bridged through professional development opportunities that provide teachers with the skills and confidence to implement new strategies (Egolum, Onuigwe and Mbaegbu, 2023). Research has it that four core competencies are theorized as core competencies for innovative teaching and they are; learning competency, educational competency, social competency and technological competency (Ajani, 2024). Teacher competence is the backbone of successful innovative teaching strategies. However, while competence equips Biology teachers with the necessary skills and knowledge to employ innovative teaching strategies effectively, it may not guarantee Biology teachers' actual utilization of the strategies. A teacher may be well-trained and capable but may still chose not to implement them due to personal beliefs, reluctance to change, or lack of motivation. This highlights the importance of teachers' attitude towards the utilization of innovative strategies.

Attitude simply refers to a person's feelings, disposition or behaviour towards something or someone. It is a mindset or way of thinking that influences how they react or respond. It can also be seen as the accumulation of information about a person, object, situation or experience It is a predisposition to act in a positive or negative way toward some subject

(Bibi and Nawaz, 2020). Attitude is essential information obtained about someone or something that form an opinion or predisposition about that person. Okebukola and Jegede (2018) asserted attitude to be a positive or negative view of a person, place, thing, or event and that people can also be conflicted or ambivalent towards an object, meaning that they simultaneously possess both positive and negative attitude towards the item in question.

Attitude plays a critical role in determining how teachers engage with and implement innovative teaching strategies in the classroom. A teacher's positive attitude towards innovation often reflects a willingness to experiment, adapt, and incorporate new approaches into their teaching practice. Conversely, a negative attitude may manifest as resistance to change, skepticism about the effectiveness of innovations, or discomfort with technology and new methodologies (Yulin and Danso, 2025). In the context of secondary education, particularly in subjects like Biology that benefit from hands-on and inquiry-based learning, innovative teaching strategies such as flipped classrooms, digital simulations, collaborative learning, and problem-based learning are essential for enhancing student engagement and conceptual understanding. However, the extent to which these strategies are adopted is largely dependent on teachers' attitudes. Studies have shown that teachers who hold favourable attitudes towards innovation are more likely to integrate such strategies effectively into their classrooms (Ndrika, Orafu and Obasi, 2023). In contrast, unfavourable attitudes shaped by factors such as lack of training, perceived workload, or inadequate resources can hinder the adoption of even well-supported pedagogical reforms.

In view of all the issues raised, it becomes clear that the effectiveness of Biology teaching in secondary schools in Anambra State largely depends on teachers' awareness, competence and attitude towards innovative teaching strategies. This study is therefore set to investigate these variables in order to provide insights that will improve the teaching and learning of Biology.

Statement of the Problem

Science education plays a crucial role in fostering intentional societal transformation, as it equips learners with the knowledge and skills necessary for innovation. Recognizing its importance, researchers have explored diverse methods to enhance science teaching and learning in Nigeria, focusing on instructional strategies, curriculum reforms, teacher training and leaner engagement to improve academic outcomes.

Despite these concerted efforts, students continue to struggle especially in subjects like Biology as there are reports of fluctuations in students' performances in Biology by West African Examination Council. Over a decade of West African Senior Certificate Examination (WASSCE) results in Biology has consistently exposed a worrying pattern of underperformance among school candidates in Nigeria. Between 2013 and 2023, mean scores in Biology Paper 2 fluctuated between 25 and 37 out of a possible 60, with standard deviations indicating wide disparities in students' understanding. Notably, in 2023, mean scores dropped again to 31 for Paper 2 and 29 for Paper 3, reversing the brief improvement seen in 2022. This persistent

challenge can be largely attributed to the use of inadequate instructional strategy which hinder effective learning. Other contributing factors include lack of instructional materials, limited practical exposure, poor learning environments and student-related issues such as low interest and motivation.

In spite of the global shift towards student-centered and technology-driven pedagogies, and various curriculum reforms promoting innovative approaches, Biology instruction in many Nigerian classrooms remain dominated by convectional teacher-centered methods such as rote learning and demonstrations. This gap between policy and classroom practice continues to impede students' engagement, conceptual understanding and application of biological knowledge. Furthermore, although previous studies in biology education have examined innovative teaching strategies such as problem solving and cooperative learning among others, much of the existing literature has primarily focused on their impact on students' achievement. Limited attention has been directed towards the preparedness, awareness and attitudes of teachers who are responsible for implementing these strategies. This gap is particularly critical since teachers are the primary agent in translating educational innovations into effective classroom practice. It is against this background that the present study seeks to critically examine Biology teachers' awareness, competence, and attitude towards the utilization of innovative teaching strategies in secondary schools in Anambra State.

Purpose of the Study

The study seeks to;

1. Determine the level of awareness of innovative teaching strategies among Biology teachers in Anambra State
2. Assess the level of competence of Biology teachers in utilizing innovative teaching strategies in secondary schools in Anambra State.
3. Examine the attitude of Biology teachers towards the utilization of innovative teaching strategies in secondary schools in Anambra State.

Research Questions

This study was guided by the following research questions;

1. What is the level of awareness of innovative teaching strategies among Biology teachers in Anambra State?
2. What is the level of competence of Biology teachers in the utilization of innovative teaching strategies in secondary schools in Anambra State?
3. What is the attitude of Biology teachers towards the utilization of innovative teaching strategies in secondary schools in Anambra State?

Methods

The research design adopted for this study was descriptive survey research design of the cross-sectional type. According to Creswell (2014), survey research design is a type of research design that is used to describe the characteristics of a population, explore relationships among variables and identify trends and patterns. Survey research design is suitable for this work because it enabled the researcher to collect self-report data from a

large sample of teachers, provided insights into their awareness, competence, and attitude towards the utilization of innovative teaching strategies.

The study was carried out in Anambra State which is made up of six Education Zones namely; Aguata, Awka, Ogidi, Nnewi, Otuocha and Onitsha Education Zones. These zones encompass a wide range of urban and rural communities providing a diverse educational landscape for research. Anambra has a long-standing reputation for academic excellence and educational innovation making it a relevant and strategic location for investigating teachers' awareness, competence and attitude towards utilization of innovative teaching strategies in Biology education.

The population of the study comprised 489 biology teachers from the six education zones in Anambra State. The sample of the study consisted of 90 biology teachers (37males and 53 females) drawn from 3 Education Zones selected from the 6 Education Zones in Anambra State. The validated research instruments for the study were researcher-modified questionnaires titled Biology Teachers' Awareness, Competence and Attitude Towards the Utilization of Innovative Strategies in Teaching (BTACATUITS),

Data collected for the study were analyzed using mean and standard deviation to answer the research questions on Biology teachers' awareness, competence, and attitude towards the utilization of innovative teaching strategies in secondary schools in Anambra State. A criterion mean of 2.50 was used for decision-making; mean scores of 2.50 and above indicated high awareness, high competence, or positive attitude, while mean scores below 2.50 indicated low awareness, low competence, or negative attitude.

Results

Research Question One: What is the level of awareness of innovative teaching strategies among Biology teachers in Anambra State?

Table 1: Mean Ratings and Standard Deviations of Biology Teachers' Level of Awareness of Innovative Teaching Strategies.

S/N	Items	$\bar{x}$	SD	Remark
1	Constructivism	3.29	0.77	Aware
2	Flipped classroom	2.74	1.06	Aware
3	Concept mapping	2.94	0.93	Aware
4	Mind mapping	2.48	1.12	Not aware
5	Blended learning	2.91	1.16	Aware
6	Individualized instruction	3.29	1.04	Aware
7	Think-pair-share	2.56	1.17	Aware
8	Jigsaw team work/puzzle	2.61	1.18	Aware

9	Use of models	3.52	0.75	Aware
10	Simulation	3.38	0.94	Aware
11	Peer tutoring	3.61	0.49	Aware
12	Collaborative learning	3.66	0.60	Aware
13	Cooperative learning	3.58	0.69	Aware
14	Role play	3.13	0.94	Aware
15	Gamification	2.41	1.15	Not aware
16	Inquiry-based learning	3.46	0.75	Aware
17	Project-based learning	3.66	0.64	Aware
18	Google classroom	2.83	1.00	Aware
19	Artificial intelligence	3.34	0.98	Aware
20	Crossover learning	2.24	1.13	Not aware
21	Computational thinking	2.57	1.11	Aware
22	QR codes	2.41	1.20	Not aware
23	Use of analogies	2.93	1.00	Aware
24	Scaffolding	2.38	1.13	Not aware
25	Interactive whiteboards	3.53	0.75	Aware
26	Virtual labs	3.10	0.92	Aware
27	Augmented and virtual realities	2.79	1.04	Aware
28	Brainstorming	3.27	1.00	Aware
29	Virtual thinking strategies	2.92	1.05	Aware
30	Use of YouTube and educational videos	3.33	0.95	Aware
	Grand Mean	**3.02**		**Aware**

Table 1 shows the mean responses of biology teachers on their level of awareness of innovative teaching strategies. The grand mean of 3.02 indicates that on average, biology teachers are generally aware of most innovative teaching strategies. Items with mean scores of 2.50 and above show awareness among biology teachers. These include; collaborative learning, project-based learning, peer tutoring, use of models, interactive whiteboards, inquiry-based leaning, cooperative learning, simulation, artificial intelligence, YouTube/educational videos, brainstorming and constructivism. These results show that teachers are quite familiar with modern participatory and technology-supported strategies.

On the other hand, items with mean scores below 2.50 show no awareness. They include mind mapping, gamification, QR codes, crossover and scaffolding. These areas represent gaps in teacher awareness, especially regarding digital and emerging instructional tools like QR codes and Gamification, which are increasingly relevant to modern classrooms.

Research Question Two: What is the level of competence of Biology teachers in the utilization of innovative teaching strategies in secondary schools in Anambra State?

Table 2: Mean Ratings and Standard Deviations of Biology Teachers' Level of Competence in the Utilization of Innovative Teaching Strategies.

S/N	Items	$\bar{x}$	SD	Remark
1	Constructivism	2.89	1.10	Competent
2	Flipped classroom	2.81	1.03	Competent
3	Concept mapping	2.87	0.96	Competent
4	Mind mapping	2.40	1.10	Not competent
5	Blended learning	2.83	1.09	Competent
6	Individualized instruction	3.32	0.82	Competent
7	Think-pair-share	2.70	1.06	Competent
8	Jigsaw team work/puzzle	2.46	1.14	Not competent
9	Use of models	3.22	0.91	Competent
10	Simulation	2.38	1.11	Not competent
11	Peer tutoring	3.44	0.77	Competent

12	Collaborative learning	3.57	0.72	Competent
13	Cooperative learning	3.71	0.71	Competent
14	Role play	3.28	0.85	Competent
15	Gamification	2.42	1.10	Not competent
16	Inquiry-based learning	3.28	0.81	Competent
17	Project-based learning	3.60	0.75	Competent
18	Google classroom	2.82	1.00	Competent
19	Artificial intelligence	3.18	1.01	Competent
20	Crossover learning	2.30	1.14	Not competent
21	Computational thinking	2.39	0.96	Not competent
22	QR codes	2.24	1.10	Not competent
23	Use of analogy	2.80	0.92	Competent
24	Scaffolding	2.36	1.12	Not competent
25	Interactive whiteboards	3.20	0.90	Competent
26	Virtual labs	2.88	0.92	Competent
27	Augmented and virtual realities	2.68	0.96	Competent
28	Brainstorming sessions	3.13	0.97	Competent
29	Virtual thinking strategies	3.09	0.87	Competent
30	Use of YouTube and educational videos	3.30	0.94	Competent
	Grand Mean	**2.91**		**Competent**

Table 2 shows that biology teachers demonstrated a generally high level of competence in the use of innovative teaching strategies as indicated by the mean scores

across the items. Out of the 30 innovative strategies assessed, teachers are competent in 23 strategies which include constructivism, flipped classroom, concept mapping, blended learning, individualized instruction, peer tutoring, collaborative learning, cooperative learning, inquiry-based learning, project-based learning, artificial intelligence, interactive whiteboards and the use of YouTube and educational videos.

However, the result also revealed areas where teachers lacked competence. Seven strategies recorded mean scores below the cutoff point of 2.50 indicating low competence. These include mind mapping, jigsaw team work/puzzle, simulation, gamification, crossover learning, computational thinking, Q.R code and scaffolding. These strategies require higher levels of digital literacy or more specialized pedagogical training which may explain the lower competence levels observed. This signifies the need for additional training, support and exposure to ensure that teachers can effectively integrate them into Biology education.

ResearchQuestion 3: What is the attitude of Biology teachers towards the utilization of innovative teaching strategies in secondary schools in Anambra State?

Table 3: Mean Ratings and Standard Deviations of Biology Teachers' Attitude Towards the Utilization of Innovative Teaching Strategies.

S/N	Items	$\bar{x}$	SD	Remark
1	Innovative teaching strategies enhance students' understanding of Biology concepts	3.67	0.47	Positive
2	Using innovative methods makes Biology lessons more engaging	3.65	0.65	Positive
3	I believe that innovative strategies improve students' academic performance in Biology	3.58	0.67	Positive
4	I am willing to try new teaching strategies in my biology class	3.68	0.65	Positive
5	I regularly look for new teaching strategies to improve my class delivery	3.60	0.76	Positive
6	I encourage my colleagues to use innovative teaching strategies in teaching Biology	3.48	0.57	Positive
7	I feel confident in my ability to implement innovative teaching strategies	3.57	0.50	Positive
8	I have the necessary skills to use innovative teaching strategies effectively	3.24	0.62	Positive
9	I find it easy to adapt innovative strategies to my biology lessons	3.31	0.79	Positive
10	Innovative teaching strategies are too time-consuming to implement	2.40	0.99	Negative
11	I prefer traditional methods of teaching because they are more straightforward	2.73	1.04	Positive
	Grand Mean	**3.36**		**Positive**

Table 3 indicate that biology teachers have a strong positive attitude toward utilizing innovative teaching strategies. The Grand Mean of 3.36 is well above the 2.50 cut-off point for a positive attitude. This positive disposition is consistent across most factors, showing teachers generally agree that these strategies enhance understanding, improve engagement, and boost academic performance (with mean scores consistently near 3.60). Also, teachers reported high confidence and willingness to implement these methods. On the other hand, the low mean score for Item 10 (2.40) reveals that teachers generally disagree with the notion that innovative methods are too time-consuming, suggesting that they view the benefits of student engagement and academic performance as outweighing the effort required for implementation

Discussion

The findings from Table 1 revealed that biology teachers in Anambra State demonstrated a high level of awareness of innovative teaching strategies. The grand mean scores for most of the thirty identified strategies were above the cut-off mean, indicating that teachers are familiar with both pedagogical (learner-centred) innovative approaches such as constructivism, inquiry-based learning, collaborative learning, and modern technology-driven strategies like virtual laboratories, google classroom, and artificial intelligence.This finding aligns with the work of Kayode (2020), who reported a high level of awareness of innovative teaching strategies among biology teachers in South-Western Nigeria. Similarly, Obiekezie, Okpala, and Amobi (2022) found that biology teachers in Anambra State were largely aware of various innovative instructional strategies, suggesting that awareness of modern pedagogical practices among biology teachers is gradually improving across different regions of Nigeria. The high level of awareness observed in this study may be attributed to increased access to professional development programmes, workshops organized by professional bodies such as STAN, and exposure to digital platforms for teaching and learning. From a theoretical standpoint, this finding supports Bandura's Social Cognitive Theory, which emphasizes that exposure and observational learning enhance individuals' knowledge and awareness of new practices (Bandura, 1986). When teachers are exposed to innovative strategies through training or peer interaction, they become more knowledgeable about their potential classroom applications.

The findings from Table 2 showed that biology teachers are generally competent in the utilization of innovative teaching strategies, as reflected by grand mean scores above the benchmark of 2.50. However, it also revealed that competence varied across specific strategies. Teachers showed higher competence in commonly used innovative strategies such as brainstorming, constructivism, blended learning, and the use of educational videos, while lower competence was recorded in more advanced strategies like computational thinking, mind mapping, and gamification.This finding validates earlier studies by Mohammed., Dajal and Haruna (2024), who reported that while teachers often possess high competence in commonly used innovative strategies, they experience challenges in implementing more technologically

sophisticated approaches. The gap in competence across strategies may be due to inadequate hands-on training, limited access to technological resources, and insufficient institutional support. Building on the observed gaps, it is evident that while teachers are confident with strategies that are widely integrated into routine teaching, they face challenges with methods that require advanced digital literacy and pedagogical innovation. This report is in alignment with the findings of Shambare and Jita (2024) which revealed that successful adoption of complex strategies such as gamification, computational thinking, and mind mapping depends not only on teacher willingness but also on structured professional development programs that provide practical experience with these approaches. Without such targeted support, even competent teachers may struggle to implement these strategies effectively, limiting the potential benefits for student engagement and learning outcomes.

The findings presented in Table 3 revealed that biology teachers exhibited a strong and positive attitude towards the utilization of innovative teaching strategies. Biology teachers agreed that innovative strategies enhance students' understanding, engagement, and academic performance in Biology. They also expressed willingness to try new methods and confidence in their ability to implement them. This finding is consistent with Apata (2022), who found that teachers with positive attitudes towards innovative teaching strategies are more likely to adopt learner-centered instructional approaches. Furthermore, the positive disposition observed among biology teachers suggests a readiness to embrace change in instructional practices, which is essential for improving classroom effectiveness. Such attitudes can foster a more interactive and student-centered learning environment, thereby promoting critical thinking and deeper understanding of biological concepts. In addition, a positive attitude may reduce resistance to the integration of new technologies and methodologies, ultimately enhancing the overall quality of teaching and learning in Biology classrooms. The positive attitude observed in this study also supports the Social Cognitive Theory, which posits that positive beliefs and self-efficacy influence behavioural intentions and actual practice (Bandura, 1986). Teachers who believe in the effectiveness of innovative strategies are more inclined to experiment with and adopt such methods in their classrooms.

Conclusion

Based on the findings of this study, it can be concluded that biology teachers in Anambra State possess a high level of awareness, demonstrate appreciable competence, and exhibit a positive attitude towards the utilization of innovative teaching strategies. This indicates that teachers are generally knowledgeable about modern pedagogical approaches and are willing to adopt methods that enhance students' understanding, engagement, and academic performance in Biology.However, despite this overall readiness, variations in competence across specific strategies reveal that teachers are more proficient in commonly used approaches than in advanced and technology-driven methods. This suggests that awareness and positive attitude alone are not sufficient for effective implementation. Therefore, the successful integration of innovative teaching strategies in Biology classrooms depends

largely on continuous professional development, improved access to technological resources, and practical training that equips teachers with the necessary skills to utilize more complex instructional approaches effectively.

Recommendations

Based on the findings and conclusions of this study, the following recommendations were made:

1. The Anambra State Ministry of Education, in collaboration with professional bodies such as STAN, TRCN, and NERDC, should organize regular workshops, seminars, and in-service training focused on practical application of innovative teaching strategies.
2. Schools should be adequately equipped with ICT facilities, internet access, virtual laboratory tools, and instructional materials to support the effective implementation of innovative teaching strategies.
3. School administrators should encourage peer mentoring and professional learning communities where teachers can share experiences and best practices in innovative teaching.
4. Teacher education institutions should strengthen the integration of innovative teaching strategies into pre-service teacher training programmes, ensuring that graduating teachers are adequately prepared

REFERENCES

Akpan, B., & Andrew, E. (2019). Teachers' awareness of innovative instructional strategies in science education. *Journal of Science Education in Africa*, 7(2), 21–34.

Apata, O. (2022). Teachers' attitude and adoption of learner-centred instructional approaches. *Journal of Educational Innovation*, 9(1), 55–67.

Attamah, C.P. & Okoli, J.N. (2021). Self- efficacy and locus of control as correlates of senior secondary school students' academic achievement in Biology in Ebonyi State, Nigeria. *Journal of Research and Innovation in Social Sciences*, 5(10),768- 773.Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall.

Bibi, F., & Nawaz, A. (2020). Attitude formation and behavioural disposition in education. *International Journal of Psychology and Education*, 5(2), 44–56.

Darling-Hammond, L. (2017). Teacher education around the world: What can we learn from international practice? *European Journal of Teacher Education*, 40(3), 291–309.

Egolum, E. O.., Igboegwu, E. N., & Okonkwo, C. (2015). Innovative teaching strategies in science education. *Nigerian Journal of Curriculum Studies*, 22(1), 67–78.

Egolum, C., Nwokocha, P., & Onuike, N. (2020). Science, technology and national development. *Journal of Science and Technology Education*, 8(2), 14–26.

Egolum, E. O., Okonkwo, I. G. A., & Ada-Uzoh, C. (2022). Science education and skill acquisition for national development. *African Journal of Science Education*, 14(2), 1–12.

Egolum, E. O., Onuigwe, B.U., & Mbaegbu, C. A. (2023). Professional development and teacher competence in innovative

pedagogy. *Journal of Educational Research and Practice*, 10(4), 77–89.

Ibe, F., Obikezie, C., & Chikendu, P. (2021). Foundations of science education in Nigeria. *Journal of Educational Foundations*, 6(1), 23–35.

Ihekwaba, C., Nwokocha, P., & Onuike, N. (2020). Science and technological development in modern society. *International Journal of Science Education*, 9(1), 10–22.

Kampen, M. (2022). Innovative teaching strategies and student engagement in modern classrooms. *Journal of Educational Innovation and Technology*, 13(2), 88–99.

Kayode, O.O (2020). Biology teachers' awareness and utilization of innovative teaching strategies in South-west, Nigeria. University of Ilorin, Ilorin Nigeria.

Khairmar, S. (2015). Shifting paradigms in education: From teaching to learning. *Educational Review Journal*, 27(3), 40–52.

Mohammed, A., Dajal, B., & Haruna, I. (2024). Gender and teachers' awareness of innovative teaching practices in science education. *Journal of Science Education and Practice*, 14(1), 25–38.

National Academy of Sciences. (2022). *Science, technology and economic development report*. National Academies Press.

Ndrika, J., Orafu, C., & Obasi, F. (2023). Teachers' attitudes and adoption of innovative instructional practices. *Journal of Educational Development Studies*, 11(2), 101–113.

Njoku, cited in Ibe, F., Obikezie, C., & Chikendu, P. (2021). Science education and environmental understanding. *Journal of Science Education*, 6(1), 23–35.

Obikezie, M.C and Abumchukwu, A.A. (2020). The challenges of eLearning faced bysecondary school Chemistry students during COVID-19 lockdown in Awka South Local Government Area. *BSU Journal of Science, Mathematicsand Computer Education*, 1(2), 151-159.

Obiekezie, C., Okpala, C., & Amobi, I. (2022). Teachers' awareness and utilization of innovative teaching strategies in Anambra State. *Journal of Curriculum and Instruction*, 14(2), 45–60.

Okebukola, P., & Jegede, O. (2018). Attitude formation and science learning outcomes. *African Journal of Educational Studies*, 12(1), 33–47.

Shambare, R., &Jita, L. (2024). Teacher competence and adoption of digital pedagogies. *Technology in Education Journal*, 19(1), 66–79.

Ukala, C. (2018). Gender and educational outcomes in Nigeria. *Journal of Social Science Education*, 10(1), 19–30.

Yulin, K., & Danso, E. (2025). Teachers' attitudes toward educational innovation in secondary schools. *International Journal of Educational Psychology*, 20(1), 55–68.

Zindel, P., & Deane, R. (2020). Active learning and innovative pedagogy in science classrooms. *Journal of Learning and Teaching*, 15(2), 70–82.