

# **INNOVATIVE PEDAGOGIES FOR TEACHING BIOLOGY IN A PERIOD OF ECONOMIC UNCERTAINTY**

By

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## Abstract

1. The consistent poor achievement of students in Biology has continued to generate reactions from both the government and stakeholders in education sector. Against this background, several efforts have been made to find solutions to the problem. It is on this note that this study investigated innovative pedagogies for teaching Biology in a period of economic uncertainty in Enugu East L. G. A. Enugu State, Nigeria. Three research questions guided the study. Descriptive survey research design was used for this study. The total of 213 Biology teachers in the 10 public secondary schools in Enugu East L.G.A. made up the population of the study. There was no sampling because the population was manageable. The instrument for data collection was a structured questionnaire adapted by the researcher titled Innovative pedagogies for teaching Biology (IPFTB). It consists of Sections A and B. Section A consist the demographic information about the respondent while section B consist 20 items of innovative pedagogies used in teaching Biology. The respondents were requested to indicate by responding either "yes" or "no" from the listed pedagogies the ones they use in teaching Biology. The instrument was validated by three experts. The reliability coefficient was determined to be 0.82 using Cronbach alpha formula. The data generated were analysed using percentages. After the data analysis, the following findings among others were made: that experienced educators demonstrated a greater willingness to experiment with innovative teaching approaches, drawing upon their accumulated knowledge and expertise to adapt these methods to their instructional contexts. This is shown in the higher percentage scores in almost all the innovative pedagogies assessed. Secondly, teachers with higher qualifications, such as advanced degrees or specialized training in education, have higher percentages in employing most of the innovative pedagogies in their biology instruction. Based on the findings, the researcher recommended among others that, Innovative Pedagogical approaches should be incorporated into biology instruction by educators. This is to create dynamic learning experiences that inspire curiosity, deepen understanding and prepare students for success in the field of biology and beyond.

**Keywords:** Innovative, Innovative pedagogies, teaching, Biology and economic uncertainty.

## Introduction

Education is an engine for the growth and progress of any society (Inyang 2021). According to Inyang (2021), education not only imparts knowledge, skills and inculcates values, but is also responsible for building human capital which breeds, drives and sets technological innovation and economic growth. The traditional/conventional teaching pedagogies/ methods often used by teachers in teaching Biology include the lecture expository method, demonstration and direct instrument. According to Enebechi (2021), these traditional teaching methods involve unidirectional flow of information/knowledge from teacher to students and do not encourage twenty first (21<sup>st</sup>) century skills needed for proper understanding of Biology principles, concepts and facts. Okoli (2023) referred to these traditional teaching methods as teacher-centered approaches to learning in the sense that the teacher and those up in the educational hierarchy are considered as the possessor of knowledge to be transferred to the student, and as such decides how the knowledge transfer takes place. The unidirectional flow of information in the traditional teaching method makes students passive and unable to construct meaningful knowledge in the teaching and learning of Biology. These traditional methods of teaching stress more on the transmission of knowledge in a manner that emphasizes demonization hence they have been characterized as a poor method of teaching Biology and other science subjects (Enebechi, 2021). According to Okoli (2023), the word pedagogy might sound like a complicated concept, but put simply, it is just the method and practice of teaching in general, especially in relation to academic subjects or theoretical concepts. In a significant number of classrooms all around the world, teachers continue to rely predominately on methods that are centered on the teacher, particularly in settings with more than fifty students. Thus, the teacher plays the role of an instructor, pumping ideas into learners. Here, the teaching-learning process is planned, prepared for, and conducted by the teacher. According to Nwosu (2015), the mind is not a vessel to be filled but a fire to be lighted. This should be realized by teachers. Biology education needs teachers who are capable of teaching and enhancing the acquisition of deep knowledge, skills, values and broad competencies that are required for the 21<sup>st</sup> century educational demands/globalized world.

However, it is obvious and researchers (Nwosu, 2015, Enebechi, 2019, Okoli 2023.) confirm that students learn much better when they are encouraged to discover their own knowledge of the surrounding world. It is about experiential learning. In order to improve students' biology and their skills, biology teachers should have the freedom and ability to develop and apply innovative pedagogical approaches that give students the opportunity to discover new knowledge and apply the skills to everyday life. From the researcher's point of view, innovation could be seen as a deliberate change geared towards achieving a desired goal. According to Onyegebu (2018), innovation could be seen as a deliberate change geared towards achieving a desired goal. Innovation in education according to Okoli (2023), might include an educator recognizing a need for ideas to be better shared among other teachers in their district and developing processes that more easily facilitate; a practitioner identifying a gap in understanding among the students in their classroom and brainstorming new, creative ways to approach that topic and an administrator identifying the need for better communication between teachers and parents, and working to create an online system that allows for more transparency into their student's progress. While each of these forms of innovation is very different, each involves an educator following the innovation activities in an effort to improve the ways in which the education system functions. Innovation in

education thus, is similarly focused on making positive changes, for instance, changes in protecting the land we live on, the water we drink, the air we breathe, and the resources we use as well as major contemporary challenges like climate change and loss of biodiversity among others.

The need for innovative pedagogical approaches for teaching biology arises partly out of the fact that the education system of the twenty-first (21<sup>st</sup>) century demands for mastery learning, practice, learner-centered, active-learning of science contents and methods and its application in real life situation. The focus of education has shifted from rote memorization of knowledge to mastery learning, from theory to practise, from being teacher-centred to learner-centred, and from memorization of scientific facts and principles to active learning of science contents and methods and its application in real life situation. Over the course of the last century, there has been a significant shift towards new didactics and pedagogical practices. The educational systems are changing and learners can now access practically any piece of knowledge at any time through the internet, and the scope of education has grown beyond the four walls of the classroom. Learning has been revolutionized as a result of the flexibility offered by digital media as opposed to traditional media. Thus, the need for innovative pedagogical approaches in biology education becomes inevitable if students must improve their performance in biology in this very technologically advanced world of today (Ofeimu & Kolawole, 2017).

The short comings inherent in these traditional teaching methods coupled with the need for effective methods of teaching and learning Biology made it expedient for the introduction of innovative pedagogies in the teaching and learning of biology. Innovation in education encourages teachers and students to explore research and use all the tools to uncover new frontiers and generate ideas. Innovative teaching strategies do not always mean introducing the latest and greatest technology into the classroom. Instead, innovative teaching is the process of proactively introducing new teaching strategies and methods into the classroom. The purpose of introducing these new teaching strategies and methods is to improve academic outcomes and address real problems to promote equitable learning. It involves a different way of looking at problems and solving them. The thinking process that goes into it will help students develop their creativity and their problem-solving skills. Thus, innovation is a vital component of progress across industries, and education is not different. Innovation is difficult to spread across school and academia because it disrupts the established routine and pushes implementers out of their comfort zone. Teachers and school administrators are commonly cautious about a threatening change and have little tolerance for the uncertainty that any major innovation causes. Of course there are schools and even districts that are unafraid to innovate and experiment but their success depends on individual leaders and communities of educators who are able to create an innovative professional culture. Pockets of innovation give hope but we need a total, massive support for innovations across society. Biology education badly needs effective innovations of scale that can help produce the needed high-quality learning outcomes across the system. This study therefore wants to determine the innovative pedagogies of teaching biology in a period of economic uncertainty in secondary school in Enugu East Local Government Area of Enugu state. Determine equally, if years of teaching experience has any influence in determining the innovative pedagogies used by biology teachers in teaching biology. In addition, the study equally wants to find out if teaching qualification has any influence in determining the innovative pedagogies used by biology teachers in teaching biology in Enugu East Local Government Area of Enugu state.

Innovative pedagogies in teaching biology aim to engage students actively, promote critical thinking, and enhance understanding of complex biological concepts (Gbadamosi, 2013). The researcher investigated so many innovative pedagogies such as: Blended learning approach, Think- pair share, Simulation approach, Brainstorming, Guided discovery, Constructivist approach, Graphic organizer approach, Peer teaching, Project based approach, Team teaching approach, Animation approach, Power point presentation, Integrative approach, Concept mapping, Reflective approach, Collaborative approach Jigsaw method, Models, Inquiry-Based approach, cooperative learning. **Project-Based Learning (PBL)**: involves students working on an extended project that addresses a real-world issue or question related to biology. Projects can range from designing experiments to creating educational materials or conducting community outreach. This approach encourages students to take ownership of their learning and develop problem-solving skills. **Game-Based Learning** incorporates elements of games into biology instruction to make learning more interactive and engaging. This can include educational games, simulations, or gamified quizzes that challenge students to apply their knowledge, compete with peers, and receive immediate feedback, enhancing motivation and retention of biological concepts. **Inquiry-based learning** involves guiding students through the process of asking questions, investigating phenomena, and drawing conclusions in biology. Students may design and conduct experiments, analyze data, and communicate their findings. This approach promotes curiosity, critical thinking, and scientific reasoning skills. **Integrative Approaches** involve integrating biology with other disciplines such as technology, art, or social sciences. This can provide a broader context for learning and foster creativity. For example, students might explore the ethical implications of biotechnology, create multimedia presentations on ecological concepts, or use computational tools to analyze biological data. By incorporating these innovative pedagogical approaches into biology instruction, educators can create dynamic learning experiences that inspire curiosity, deepen understanding, and prepare students for success in the field of biology and beyond.

Teaching experience is a multifaceted construct encompassing the knowledge, skills, and insights accumulated by educators over their careers in the classroom. It represents the culmination of years of practice, reflection, and professional development, shaping teachers' instructional practices, classroom management techniques, and overall approach to teaching and learning. From the researcher's point of view, teaching experience is the number of years a teacher has put in service as a classroom teacher. In this study, one to ten years (1-10) experience is regarded as less experience while eleven (11) years and above is regarded as experienced teachers. According to Achor et al. experienced science teachers had higher mean utilization scores of the innovative teaching strategies than the less experienced teachers. Similarly, Khurshid and Zahur (2013) also found that experienced teachers were more aware of and utilised innovative strategies more than the less experienced ones. But on the contrary Oyelekan et al. found in their study teachers' experience and qualifications have no influence in their utilisation of the innovative teaching strategies.

Within the realm of biology education, teaching experience plays a pivotal role in shaping pedagogical choices, influencing educators' decisions regarding the adoption and implementation of innovative teaching methods. Teaching experience encompasses various dimensions, including: Content Knowledge: Experienced biology educators typically possess a deep understanding of core biological concepts, as well as familiarity with emerging trends,

research findings, and technological advancements in the field. This content expertise informs their instructional strategies and enables them to effectively convey complex biological principles to students. **Pedagogical Knowledge:** Over time, teachers develop a repertoire of instructional techniques, assessment strategies, and classroom management skills tailored to the needs of their students. They draw upon pedagogical theories, evidence-based practices, and personal experiences to create engaging and effective learning environments conducive to student success. **Reflection and Adaptation:** Experienced educators engage in ongoing reflection on their teaching practices, seeking opportunities for improvement and growth. They are adept at analyzing student feedback, assessing the efficacy of instructional methods, and making adjustments as needed to optimize student learning outcomes. **Institutional and Contextual Factors:** Teaching experience is also influenced by institutional contexts, such as school policies, curricular requirements, and available resources. Experienced teachers navigate these factors adeptly, leveraging institutional support and collaborating with colleagues to enhance the quality of biology instruction. **Biology education is profound.** Experienced educators may demonstrate a greater willingness to experiment with innovative teaching approaches, drawing upon their accumulated knowledge and expertise to adapt these methods to their instructional contexts. Conversely, novice teachers may initially rely on more traditional instructional methods as they familiarize themselves with the content and develop their pedagogical skills. Furthermore, teaching experience can influence educators' perceptions of the effectiveness and feasibility of innovative pedagogies. Educators with extensive teaching experience may possess a nuanced understanding of the strengths and limitations of various instructional methods, enabling them to make informed decisions about their implementation. They may also be more attuned to the needs and preferences of their students, tailoring pedagogical choices to accommodate diverse learning styles and abilities. In summary, teaching experience serves as a cornerstone of effective biology instruction, shaping educators' pedagogical choices and contributing to the continuous improvement of teaching and learning practices. Understanding the dynamic interplay between teaching experience and pedagogical decision-making is essential for promoting innovation and excellence in biology education.

"Teaching qualification" typically refers to the credentials, certifications, or degrees that individuals acquire to become qualified educators. These qualifications vary depending on the educational jurisdiction and the level at which one intends to teach. Academically qualified teachers refer to those who have academic training as a result of enrolment into educational institution and obtained qualifications in various areas of endeavour such as HND, B.Sc., B.A, and Master of Art (M.A.) and so on; while professionally qualified teachers are those who got professional training that gave them professional knowledge, skills, techniques, aptitudes as different from the general education. They hold degrees like, B.Ed., B.Sc. Ed, B.A. Ed, and M.Ed. degrees and so on (Ofeimu & Kolawole, 2017). In this study, the researcher considered the following: Polytechnic/ college of Education, **Bachelor's Degree in Education (B.Ed.)/first degree, Master's Degree in Education (M.Ed.)/Ph.D.** Overall, teaching qualifications play a crucial role in preparing educators to effectively teach subjects like biology. They provide individuals with the necessary knowledge, skills, and credentials to create engaging and meaningful learning experiences for students, ultimately contributing to the quality of education in schools and other educational settings. The world today is experiencing an economic uncertainty. The global economic crisis illustrates deficiency in economic and financial governance especially in the developing countries of the world like

Nigeria. The economic uncertainties and recession ravaging Nigeria has resulted in notable imbalances including the depletion of the country's external reserves. According to Adeoye et al (2020), the education sector, due to the present economic recession in Nigeria are not adequately funded, equipped and staffed by the federal and the various governments. The educational system is almost completely dependent on government budgetary allocations and with the economic recession, the sector will no doubt witness its fair share of budget cuts which will affect not only the teachers but also the students and families. Teacher's salaries represent one-third of public expenditure on education, which explains why in some countries the first sign of a slowdown had a direct impact on pay. The significant salary reductions due to economic recession can have a negative impact on a country's attempt to attract the best individuals to the teaching profession. As a consequence, countries will find it more difficult to maintain the quality of learning in the future.

Biology is the scientific study of life. It is a natural science with a broad scope but has several unifying themes that tie it together as a single, coherent field. For instance, all organisms are made up of cells that process hereditary information encoded in genes, which can be transmitted to future generations. The present economic recession has numerous effects on the teaching and learning of biology ranging from exorbitant cost of necessary teaching and learning materials, unavailability of materials, brain drain, insufficient textbooks, other textual materials, and poor environment. That is, the number of students venturing into science has been very low due to economic uncertainties and this crisis has also led to poor student performances. This is because poor performance in biology by students is attributed to the problem of non-availability of necessary facilities for practical work. Furthermore, the reduction in adult income makes it harder for the parents to bear the direct costs of education such as tuition, fees, books, supplies, uniforms, and private tutoring. Educational outcomes are consequently harmed because the child is either withdrawn from school or inadequately prepared for it. In Nigeria, the traditional teaching method has been applied in the teaching of biology in schools with very little innovation in the teaching strategy. The situation has been made worse by economic uncertainties that rendered the different levels of government and the education authorities unable to bring about innovations in the teaching strategies in biology in Nigerian schools. This study therefore wants to determine the innovative pedagogies of teaching Biology in secondary schools in Enugu state in a period of economic uncertainty.

### **Statement of Problem:**

Students' achievement in Biology has consistently been poor over the years. Many students find Biology too vast, boring and sometimes time wasting. As a result, many students are frustrated, distracted, and hence, lost interest in the subject, which affected achievement adversely. In the light of this situation, the nation is at the verge of collapsing if something urgent is not done to ameliorate this poor achievement. This poor achievement becomes so worrisome in this present-day world, ruled by science and technology. It would be noted that, at least a credit pass is required of the students to gain admission into tertiary levels of education to study any science related course of their choice. Several reports have noted that students' achievement, interest and retention are closely related to the effectiveness of the strategies the teachers use, especially in Biology class. Such strategies as the Use of Blended learning approach, Think- pair share, Simulation approach, Brainstorming, Guided discovery, Constructivist approach, Project based approach, Team teaching approach, etc.

have been advocated for. But there is limited study on the efficacy of the use of most of these innovative strategies for the improvement of students' academic achievement. In essence, the study sought to find out the innovative strategies mostly used by biology teachers for teaching biology in a period of economic uncertainty in Enugu East L. G. A. of Enugu State.

### **Purposes of the Study**

The main purpose of this study was to determine the innovative pedagogies for teaching biology in a period of economic uncertainty in Enugu East Local Government Area of Enugu State. Specifically, the study sought to:

1. Determine the level to which biology teachers utilise innovative pedagogies in teaching biology in a period of economic uncertainty in secondary school in Enugu East Local Government Area of Enugu state..
2. Determine if years of teaching experience has any influence in determining the innovative pedagogies used by biology teachers in teaching biology in a period of economic uncertainty in Enugu East Local Government Area of Enugu
- 3 Determine if teaching qualification has any influence in determining the innovative pedagogies used by biology teachers in teaching biology in a period of economic uncertainty in Enugu East Local Government Area of Enugu state.

### **Research Questions**

The researcher formulated the following research questions for the study:

1. What are the levels of utilization of innovative pedagogies for teaching biology in a period of economic uncertainty in secondary school in Enugu East Local Government Area of Enugu State.
2. Do years of teaching experience have any influence in determining the innovative pedagogies used by biology teachers in teaching biology in a period of economic uncertainty in Enugu East Local Government Area of Enugu State
3. Does teaching qualification have any influence in determining the innovative pedagogies used by biology teachers in teaching biology in a period of economic uncertainty in Enugu East Local Government Area of Enugu state

### **Methods**

The study was quantitative study which aimed to identify innovative Pedagogies for teaching Biology in a period of Economic Uncertainty. The study was carried out in Enugu East Local Government Area of Enugu state. Three research questions guided the study. Descriptive survey research design was used for this study. The total of 213 Biology teachers in the 10 public secondary schools in Enugu East L.G.A. made up the population of the study (Statistics and Record Department of Post Primary School Management Board 2022/2023 Academic year). There was no sampling because the population was manageable. The instrument for data collection was a structured questionnaire adapted by the researcher titled Innovative pedagogies for teaching Biology (IPFTB). it consists of Sections A and B. Section A consist the demographic information about the respondent while section B consist 20 items of innovative pedagogies used in teaching Biology. The respondents were requested to indicate by responding either "yes" or "no" from the listed pedagogies the ones they use in teaching Biology. The instrument was validated by three experts. The reliability coefficient was determined to be 0.82 using Cronbach alpha formula. The data generated were analysed using percentages.

### **Research Question 1:**



What are the innovative pedagogies for teaching biology in a period of economic uncertainty in secondary school in Enugu East Local Government Area of Enugu State

**Table 1: Percentage Scores of teachers in the various innovative pedagogies used in teaching Biology**

S/N	Innovative pedagogies	Yes (%)	No (%)
1	Blended learning approach	58.7	41.3
2	Think- pair share	72.6	27.4
3	Simulation approach	44.1	55.9
4	Brainstorming	68.9	31.1
5	Guided discovery	73.0	27.0
6	Constructivist approach	71.7	28.3
7	Graphic organizer approach	35.2	64.8
8	Project based approach	80.8	19.2
9	Team teaching approach	84.0	16.0
10	Animation approach	42.3	57.7
11	Peer teaching	81.2	18.8
12	Power point presentation	63.4	36.6
13	Integrative approach	82.5	17.5
14	Concept mapping	82.1	17.9
15	Reflective approach	59.6	40.4
16	Collaborative approach	70.6	29.4
17	Jigsaw method	14.1	85.9
18	Models	34.3	65.7
19	Inquiry-based approach	86.9	13.1
20	Cooperative learning	91.1	8.9

Table 1 shows that items 20 (Cooperative learning), item 19 (Inquiry-based approach), item 9 (Team teaching approach), item 13(Integrative approach), item 14 (Concept mapping), item 11(Peer teaching), and item 8 (Project based approach) had percentage scores of 91.1%, 86.9%, 84%, 82.5%, 82.1%, 81.2% and 81% respectively. This shows a high percentage score, it equally implies that biology teachers are more conversant in using these innovative pedagogies when compared with other innovative strategies.

**Research Question 2:** Do years of teaching experience have any influence in determining the innovative pedagogies used by biology teachers in teaching biology in a period of economic uncertainty in Enugu East Local Government Area of Enugu State

**Table 2:** Percentage scores of the Innovative pedagogies according to years of teaching experience of Biology teachers.

S/ N	Innovative pedagogies	1-10 years		11-20 years		21-30 years		31-40 years		41-50 years	
		Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
1	Blended learning approach	5.0%	5.4%	25.2%	20.3%	19.8%	11.4%	7.2%	5.0%	.005%	0%
2	Think- pair share	6.5%	4.0%	32.3%	12.9%	24.4%	7.0%	9.5%	3%	0%	.005%
3	Simulation approach	5%	5.5%	27.8%	23.8%	11.9%	19.3%	11%	5.4%	0%	.005%
4	Brainstorming	7.9%	2.0%	32.8%	12.9%	19.9%	13.4%	9.5%	3%	0%	.005%
5	Guided	6%	4.5%	33%	12%	21.6%	10%	11%	1.5%	0.5%	0%

6	discovery Constructivist approach	7%	3.5 %	32.3 %	12.9 %	22.9 %	8.5%	9.5 %	3%	0%	.005%
7	Graphic organizer approach	3.1%	7.8 %	17.7 %	30.2 %	11.5 %	21.4%	3.1 %	4.7 %	0%	.005%
8	Project based approach	7.9%	2.5 %	39.6 %	5.9%	23.3 %	7.9%	9.4 %	3%	.005 %	0%
9	Team teaching approach	8.4%	1.9 %	40.1 %	5.44 %	24.8 %	6.5%	10.4 %	2%	0%	.005%
10	Animation approach	2.2%	5.6 %	14.1 %	20.1 %	10.4 %	13 %	14.1 %	20.1 %	0%	.005%
11	Peer teaching	8.4%	2%	35.6 %	10%	25.7 %	5.4%	10.9 %	1.5 %	0%	.005%
12	Power point presentation	4.5%	5.9 %	28.8 %	16.8 %	19.3 %	11.9%	11.4 %	1%	0%	.005%
13	Integrative approach	7.1%	1.7 %	31.4 %	6.7 %	21.8 %	4.6%	21.8 %	4.6 %	.005 %	0%
14	Concept mapping	6.6%	3.3 %	37.4 %	6.2 %	25.6 %	3.8%	9%	7.6 %	0%	.005 %
15	Reflective approach	5.4%	5%	24.8 %	20.8 %	20.8 %	10.4 %	7.9 %	4.5 %	0%	.005 %
16	Collaborative approach	5.8%	3.6 %	28.9 %	12%	18.7 %	8.9%	8.4 %	2.7 %	8.4 %	2.7%
17	Jigsaw method	.005 %	10%	5.9%	39.6 %	4%	27.2%	3%	9.4 %	0%	.005 %
18	Models	4%	6.4 %	15.8 %	29.7 %	11.4 %	19.8%	2.5 %	10%	0%	.005 %
19	Inquiry-based approach	7.4 %	3%	39.1 %	6.4 %	28.2 %	3%	11.9 %	.005 %	.005 %	0%
20	Cooperative learning	8%	2.5 %	42.1 %	3.5 %	29.2 %	2%	11.9 %	.005 %	.005 %	0%

Table 2 shows that Biology teachers between 11-20years of teaching experience had 42.1% in item 20 (cooperative learning), 40.1% in item 9 (team teaching), 39.6% in item 8(Project-Based approach), and 39.1% in item 19 (Inquiry-based approach). Similarly, biology teachers between 21-30years of teaching experience had 29.2% in item 20 (cooperative learning), 24.8% in item 9 (team teaching approach), 23.3% in item 8 (Project-Based approach), 28.2% in item 19 (Inquiry-based approach), items, 5, 6, 11, 13, 14 and 15 scored above 20%. In almost all the items, teachers between the ages of 11-20years have a high percentage scores in almost all the innovative pedagogies invested. Correspondingly, teachers between the ages of 21-30years equally scored higher in the same pedagogies with those between 11-20years. This simply shows that younger and more experienced biology teachers use innovative pedagogies in teaching. However, Simulation approach, power point presentation and models are the least used.

**Research Question 3:** Does teaching qualification have any influence in determining the innovative pedagogies used by biology teachers in teaching biology in a period of economic uncertainty in Enugu East Local Government Area of Enugu state.

**Table 3:** Percentage scores of Biology teachers on the use of innovative pedagogies according to their qualifications.

S/N	Innovative Pedagogies	Polytechnic/College of Education		B.Sc/First Degree		Masters/Ph.D	
		Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
1	Blended learning approach	7.2%	7.2%	35.1%	24.5%	16.3%	9.6%
2	Think- pair share	10.1%	4.3%	43.5%	15.9%	19.3%	6.8
3	Simulation approach	6.3%	8.2%	27.4%	32.4%	10.6%	15.5%
4	Brainstorming	10.2%	4.4%	41%	18%	18.5%	7.8%
5	Guided discovery	9.5%	4.8%	44%	15.9%	18.8%	6.8%
6	Constructivist approach	10.1%	4.3%	44%	15.5%	17.9%	8.2%
7	Graphic organizer approach	4.8%	9.6%	21.1%	38.5%	9.1%	16.8%
8	Project based approach	11.6%	2.9%	47.6%	12%	21.2%	4.8%
9	Team teaching approach	13%	1.4%	49.5%	10.1%	21.6%	4.3%
10	Animation approach	4.8%	9.6%	25%	34.6%	13%	13%
11	Peer teaching	11.1%	4.8%	49%	10.6%	21.2%	4.8%
12	Power point presentation	8.7%	4.9%	37.4%	22.8%	17.5%	8.7%
13	Integrative approach	13.5%	0.97%	47.8%	11.6%	20.8%	5.3%
14	Concept mapping	12.1%	2.4%	49.3%	10.6%	20.8%	4.8%
15	Reflective approach	6.7%	7.7%	38.5%	21.2%	14.4%	11.5%
16	Collaborative approach	9.1%	4.8%	42.3%	16.8%	18.3%	7.7%
17	Jigsaw method	2.4%	12%	7.7%	51.9%	3.8%	22.1%
18	Models	4.3%	10.1%	21.2%	38.5%	9.1%	16.8%
19	Inquiry-based approach	12%	2.4%	51%	8.7%	24%	1.9%
20	Cooperative learning	11.5%	2.9%	54.3%	5.3%	25%	1%

Table 3 above shows that Biology teachers with B.Sc/ First degree had a high percentage scores in 15 items: 1, 2, 4, 5, 6, 8, 9, 11, 12, 13, 14, 15, 16, 19 and 20 than those with Polytechnic/College of Education and Masters/Ph.D teachers. This shows that Biology teachers with first degree are more conversant with the new innovative approaches and they apply it in their teachings.

## Discussion of the Findings

Based on the findings of the study, it was revealed that biology teachers are more conversant in using the following innovative pedagogies (Cooperative learning, Inquiry-based approach, Team teaching approach, Integrative approach, Concept mapping, Peer teaching, Project based approach in the discharge of their classroom duties. However, out of the twenty innovative teaching strategies, three (Jigsaw method, Models and graphic organizer) were Used less.

The findings of the study generally showed that, teachers with higher qualifications, such as advanced degrees or specialized training in education, are more likely to employ innovative pedagogies in their biology instruction. This could be attributed to their exposure to pedagogical theories, research on effective teaching methods, and opportunities for professional development. The finding still agreed with Khurshid and Zahur (2013) who in their studies found out that qualified and experienced teachers utilizes innovative teaching strategies more than the inexperienced teachers but disagreed with Oyelekan et. al, (2017) who found out that qualification and experience have no influence on the level of utilization of innovative teaching strategies.

The findings also indicated that experienced educators demonstrated a greater

willingness to experiment with innovative teaching approaches, drawing upon their accumulated knowledge and expertise to adapt these methods to their instructional contexts. Conversely, novice teachers may initially rely on more traditional instructional methods as they familiarize themselves with the content and develop their pedagogical skills. The finding still agreed with Khurshid and Zahur (2013) who in their studies found out that qualified and experienced teachers utilizes innovative teaching strategies more than the inexperienced teachers but disagreed with Oyelekan et. al, (2017) who found out that qualification and experience have no influence on the level of utilization of innovative teaching strategies. Furthermore, teaching experience can influence educators' perceptions of the effectiveness and feasibility of innovative pedagogies. Educators with extensive teaching experience may possess a nuanced understanding of the strengths and limitations of various instructional methods, enabling them to make informed decisions about their implementation. They may also be more attuned to the needs and preferences of their students, tailoring pedagogical choices to accommodate diverse learning styles and abilities. Moreover, teaching experience may also play a significant role in the use of innovative pedagogies, independent of formal qualifications. Experienced teachers may have developed a repertoire of instructional strategies over time, regardless of their initial qualifications. Institutional support and resources however, may mediate the relationship between teaching qualifications and pedagogical choices. Teachers working in environments that prioritize innovation and provide access to training and technology may be more inclined to adopt innovative pedagogies, regardless of their qualifications.

### **Conclusions of the Findings**

Based on the analyses, the following findings were made:

1. The most used innovative pedagogies according to the highest percentage scores are; Cooperative learning (91.1%), Inquiry-based approach (86.9%), Team Teaching approach (84%), Integrative approach (82.5%), Concept mapping (82.1%), Peer teaching (81.2%) and project based approach (81%). However, Jigsaw method scored the least (14.1%)
2. In almost all the innovative pedagogies assessed, teachers between the ages of 11-20years have a high percentage scores in almost all the innovative pedagogies investigated. Correspondingly, teachers between the ages of 21-30years equally scored higher in the same pedagogies with those between 11-20years. This simply shows that younger and more experienced biology teachers use innovative pedagogies in teaching. However, Simulation approach, power point presentation and models are the least used.
3. In conclusion, teachers with higher qualifications, such as advanced degrees or specialized training in education, have higher percentages in employing most of the innovative pedagogies in their biology instruction.

### **Recommendations**

1. There should be periodic seminars, conferences, workshops, formal training and retraining of Biology teachers in new pedagogical developments.
2. Educators and policy makers should promote the adoption of innovative pedagogies in Biology education
3. Educators and policy makers should identify strategies to support the adoption of effective teaching methods and enhance the quality of biology education.

4. Innovative Pedagogical approaches should be incorporated into biology instruction by educators. This is to create dynamic learning experiences that inspire curiosity, deepen understanding and prepare students for success in the field of biology and beyond.

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