

## ASSESSMENT OF BIOLOGY TEACHERS' LEVEL OF AWARENESS AND UTILISATION OF INNOVATIVE TEACHING STRATEGIES IN SENIOR SECONDARY SCHOOLS IN NORTH-EAST, NIGERIA.

**Adamu Umar MOHAMMED, Robert Goebognaan DAJAL**

Department of Science and Environmental Education, Faculty of Education University of Abuja,  
Abuja

umarlamesco@gmail.com, Bobbydajal12@gmail.com

**ABSTRACT** The research was motivated by the need to find the level of awareness and Utilizations of innovative teaching strategies so as to improve the level of utilization of innovative teaching strategies in order to enhance the academic performance students in the subject of Biology, which has progressively declined over time. This paper investigated Biology teachers' level of awareness and utilization of innovative teaching strategies in secondary schools North-East Nigeria. The study employed descriptive survey research design. The population of the study consisted of all Biology teachers in public secondary schools in North-East Nigeria. A sample size of 458 Biology teachers were selected using multi-stage sampling procedure. The instrument for data collection was a questionnaire "Biology Teachers Level of Awareness and Utilization of Innovative Teaching Strategies in North-East, Nigeria and it was validated by the three expert 2 were from Department of Science and Environmental Education while the other expert was from Department of Educational Foundation. The reliability of the instrument was determined by conducting a pilot test using 30 Biology teachers and the reliability index of 0.92 was obtained using Cronbach alpha statistics. The data collected for this study was analysed using descriptive statistics of frequency count, mean score and standard deviation in answering the research questions. The result of the analysis revealed that Biology teachers were highly aware of innovative teaching strategies and Utilization was low. Also, the result revealed that gender had no significant influence on level of awareness and utilization of innovative teaching strategies. Based on the findings, it was recommended among others that; State ministries of education in conjunction with relevant professional bodies such as Science Teachers Association of Nigeria (STAN) should organize workshops, seminars and conferences for Biology teachers to sensitize them on the effectiveness of teaching with innovative teaching strategies.

**KEYWORDS:** Awareness, Utilization, Innovative, Teaching Strategies, Biology

### I. INTRODUCTION

Biology is one of the most important subjects in Nigerian secondary schools. It is taught to students in the last three years of senior secondary school in an effort to get them ready for their future employment and uncover and nurture their hidden abilities and potential. (Federal Republic of Nigeria, 2013). It is a required subject in numerous academic disciplines, such as Medicine, Pharmacy, Nursing, Biochemistry, Agriculture, Anatomy, Physiology, Botany, Zoology, Micro Biology, Molecular Biology, Evolutionary Biology, Genetics and Population Dynamics, Forestry, Biotechnology, Nanotechnology, and many others (Ghumdia & Adams, 2017). The objectives of the Biology curriculum in secondary schools are to teach students how to do well in the laboratory and in the field, to learn important and useful things about Biology, to be able to use scientific knowledge in everyday life for things like personal and community health and agriculture, and to have a

reasonable and functional scientific attitude (Federal Ministry of Education, 2013). To actualize the above stated curriculum objectives, curriculum developers and science educators had recommended the used of learner-centered teaching strategies for the effective teaching and learning of the subject so as to bring the expected desired learning outcomes. These recommended strategies include; inquiry-based teaching strategy, concept mapping, Laboratory teaching strategy and discovery teaching strategy among others, (Oka & Abba, 2020).

In spite of the huge benefits that Biology has brought to national development and mankind, the performance of students in Biology is below expectation especially in public examinations such as the West African Examinations Council (WAEC), National Examinations Council (NECO) and Unified Tertiary Matriculation Examinations (UTME). Evidence from West African Examinations Council (WAEC) showed poor performance in biology as the number of students that passed Biology at credit level (A1-C6) is observed to be consistently less than 50% for instance in 2016 (38.38 %), 2017 (36.64%), 2018 (26.08%), 2019 (39.65%), 2020 (36.39%) and 2021 (71.20%) for many years. This observable problem has been blamed on a number of factors namely; inadequate qualified teachers, inadequate instructional resources, and inappropriate used of teaching strategies to be able to cope with some specific difficulties associated with the teaching and learning, (Oyelekan, Igbokwe & Olorundare, 2017). Furthermore, there is a presumption that the majority of Biology teachers in secondary schools in the North -East of Nigeria may be unaware of or unwilling to use innovative teaching strategies because they view it as a difficult and uninteresting task or because they avoid undertaking the various technicalities and skills required.

Biology education scholars have conducted numerous studies on innovative teaching methods, such as problem solving strategy, group investigation strategy, guided discovery method, and cooperative learning, and how they can be used to improve the teaching and learning of science in general, and Biology teaching and learning in particular. For instance Dajal and Mohammed (2019) investigated the effects of guided discovery method on students' attitude to and academic achievement in biology in senior secondary schools, Bauchi state. The research design was quasi experimental non- equivalent control group; the study was carried out in two randomly selected co-educational secondary schools in Bauchi state. The sample size of 94 biology students from two randomly selected intact classes in the sampled schools was used. The results of the analysis showed that there was significant difference between the mean achievement scores of students' in experimental group taught biology using Guided discovery method than their counterpart in control group taught biology using conventional method. Based on the study it was concluded that guided discovery method has positive effect on students' achievement as well as improving their attitude towards biology and it is gender friendly. In another study by Dajal, Apochi and Paul- Fiase (2022) investigated the effects of Sequential Teaching Methods on senior secondary school Biology students' achievement in Niger State, Nigeria. The research design used was quasi-experimental using pre-test and post- test control group approach. The population of the study consisted of 165,034 SS II Biology students in the twenty-five Local Government Areas of Niger State. The sample size consisted of 100 SSII Biology students from two selected senior secondary schools in Tafa Educational Zone. The results of the analysis showed that there was significant difference in students' academic achievement in Biology between those exposed to sequential teaching methods and their counterparts taught with conventional method. It was also shown that there was no significant difference in students' academic achievement of male and female taught Biology using sequential teaching methods. The research concluded that sequential teaching method has positive effect on students' academic achievement and is gender friendly. It was recommended among others that: regular workshops, seminars and conferences should be held for Biology teachers to make them familiar with the knowledge of sequential teaching methods and should be encouraged to use it in their classroom teaching and learning. Most of these Biology education scholars compared the effects of these teaching method with conventional teaching methods without examining the existence or level of awareness of the ones they were aware of with respect to the studied methods.

However, most of the teachers teaching sciences in secondary schools, biology included, may not be using these recommended teaching strategies but may rely on the conventional lecture method, which is a teacher-centered method and does not in any way increase students' attitude/interest, motivation, achievement, or retention of science concepts. (Dajal and Mohammed, 2019) The conventional instructional approaches adopted by most teachers have been identified to be the main cause of students' poor achievement and low interest in science

(Igboanugo & Njoku, 2015). This method does not produce optimal results for the students' acquisition of science process skills; consequently, there is a need for the use of multiple teaching strategies by all teachers to meet the different learning styles in the classroom. So, it is important for biology teachers to be aware and use different innovative teaching strategies for introducing topics and ideas that are more effective and efficient in enhancing students' achievement. Teaching strategies are methods used by teachers to teach content in different ways which keep students interested and help them practice different set of skills. An innovative teaching strategy is one that emphasizes learner-centered and activity-based instruction. This method is implemented to enhance the teaching and learning process and foster greater student engagement within the classroom. In other words, an innovative teaching strategy is a teaching strategy that is designed with new ideas or combine various teaching strategies to develop a new one (Gbadamosi, 2013).

There are various innovative teaching strategies in teaching science these includes; cooperative learning, concept mapping, problem base learning, flipped classroom among others which when utilized effectively by teachers might improve students understanding, attitude and achievements. An instructor can choose any innovative teaching strategy to teach students in order to meet the goals of teaching and learning and help different kinds of students. Review of literature has shown inconsistency in the results on awareness and utilization of innovative teaching strategies for instance in a study conducted by Oguguo, Chigbo, Ezechukwu, Ene, Okeke and Nzeadibe (2020) on teachers' utilization of innovative teaching strategies in enhancing students' achievement in Mathematics among secondary school in Enugu State. The study employed descriptive survey research design in which a population 192 (118 males and 74 females) Mathematics teachers was used for the study. Purposive sampling technique was used to select all the Mathematics teachers. The instrument for data collection was a structured questionnaire on utilization of innovative teaching strategies in enhancing achievement in Mathematics. The research questions were answered using mean scores while the hypothesis was tested using independent Chi-square statistics. The results of the analysis showed that mathematics teachers rarely use innovative teaching strategies during their lessons. It was observed that out of the fourteen innovative strategies in Mathematics teaching, only four strategies namely: discussion web, manipulative and project-based learning strategies were frequently used by mathematics teachers. It was also revealed that the gender of mathematics teachers does not influence their utilization of innovative teaching strategies.

Nwankwo, Ugwu and Ngwu (2020), conducted study to examine Biology teachers' awareness and level of application of blended learning approach in classroom instruction. The study adopted descriptive survey design. The population of the study was all Biology teachers in the study area in which a sample size of 93 Biology teachers formed the sample of the study. The results revealed that: Biology teachers used for the study had low level of awareness to blended learning approach, applied blended learning to a low extent in classroom instruction and updating the through in- service training on blended learning were to a low extent. The result also revealed that the extent of challenges encountered by Biology teachers in application of blended learning was high. Musa, Mahmud and Kamba (2020), examined the level of awareness and extent of utilization of innovative instructional strategies by science teachers for teaching science in senior secondary schools in Kebbi State, Nigeria. Descriptive survey research design was adopted. The population of the study comprised of all science teachers in public secondary schools in Kebbi State, Nigeria. A sample size of 252 science teachers was drawn from the population of science teachers in secondary schools in Kebbi State, using stratified sampling and simple random sampling procedure to select the science teachers. The findings from the study revealed that 19 of 28 innovative instructional strategies were not known by science teachers, while five were known but not utilized by the teachers.

Mbonu-Adigwe, Umate, Onu, Ezugwu, Okebanama, Okoye, Ugwuanyi, and Okeke, (2021) conducted a research to investigate lecturers' level of awareness of e-learning classroom strategies in two colleges of education and two universities in south east Nigeria. The study adopted descriptive survey research design. The sample size comprised one hundred and forty nine lecturers teaching integrated science courses. The instrument used for data collection was a questionnaire titled Lecturers' Awareness Level of E-learning Strategies

(LALES). The instrument was validated by experts and the reliability index of the items was calculated at 0.897 using Cronbach's Alpha method. The data collected were analyzed using mean and standard deviation to answer the research questions while the hypotheses were tested using t-test. The results of the study revealed among others, that the lecturers were partially aware of strategies to facilitate e-learning. Therefore, the objectives of the study were to determine the level of awareness and utilization of innovative teaching strategies in senior secondary schools in North –East Nigeria and to find the differences between the level of awareness and utilization of innovative strategies by male and female Biology teachers in senior secondary schools in North - East, Nigeria

## II. METHODOLOGY

The study adopted a descriptive survey research design to assess Biology teachers' level of awareness, competence and utilization of innovative teaching strategies in teaching Biology concepts. Descriptive survey research design according to Nworgu (2015), is one in which large or small group of population is studied by collecting and analyzing data from the group through the use of questionnaire or interview for the purpose of generalizing the findings to the entire population. This design was therefore considered appropriate for this study since it solicited information using questionnaire, and findings could be generalized to the general population. The population of this study was two thousand, four hundred and eighteen (2,418) Biology teachers categorized according to gender; Male (1, 376) and Female (1,042) from one thousand, one hundred and thirty nine (1,139) public senior secondary schools across the six states of North- east, Nigeria which comprises Adamawa, Bauchi, Borno, Gombe, Taraba and Yobe States. A sample size of four hundred and fifty eight (458) Biology teachers formed the sample for this study. Multistage sampling procedure was adopted in selecting the sample size. The instrument used for data collection was questionnaire designed by the researcher titled: Biology Teachers' Level of Awareness of Innovative Teaching Strategies Questionnaire (BTLAITSQ). The instrument was divided into two (2) sections A and B. Section A sought information on personal data of respondents (Biology teachers) such as Gender, Highest Educational Qualification, and Years of Teaching Experience, while section B comprised of twenty five (25) selected innovative teaching strategies which sought Biology teachers' level of awareness and utilization on the selected teaching innovative strategies, A four-point modified rating scale was used which are; Very High Level (VHL = 4), High Level (HL= 3), Low Level (LL = 2), Very Low Level (VLL = 1). The instrument for data collection was subjected to face and content validity by three experts, two from Department of Science and Environmental Education and one from Department of Educational Foundation, an expert in measurement and evaluation also knowledgeable in statistical analysis for validation all from University of Abuja. The reliability of the instrument was determine using internal consistency method and Cronbach Alpha statistics using SPSS version 23 and the result obtained showed a reliability coefficient of 0.91. The questionnaires were administered to fill and return on the spot, although those that could not respond immediately were given a day interval to complete it. This was to ensure high retrieval rate of the questionnaire. Descriptive statistics of mean and standard deviation were used in analyzing the research questions

### A. RESEARCH QUESTIONS

The following research questions were raised to guide this study:

- What is the level of awareness of innovative teaching strategies by Biology teachers in senior secondary schools in North-East, Nigeria?
- What is the difference in the level of awareness of innovative teaching strategies by male and female Biology teachers in senior secondary schools in North -East, Nigeria?
- What is the level of Utilization on innovative teaching strategies by Biology teachers in senior secondary schools in North -East, Nigeria?
- What is the difference in the level of utilisation of innovative teaching strategies by male and female Biology teachers in senior secondary schools in North -East, Nigeria?

### III. RESULTS AND DISCUSSION

**Research Question One:** What is the level of awareness on innovative teaching strategies by Biology teachers in senior secondary schools in North -East, Nigeria?

Table 1: Mean and Standard Deviation on Level of Awareness of Innovative Teaching Strategies by Biology Teachers N= 458

S/N	Innovative Teaching Strategy	Mean	SD	Rank	Remark
1.	Analogy teaching strategy	2.76	0.86	5 <sup>th</sup>	HL
2.	Blended Learning teaching strategy	2.73	0.77	7 <sup>th</sup>	HL
3.	Brainstorming teaching strategy	2.81	1.01	3 <sup>rd</sup>	HL
4.	Computer assisted instruction teaching strategy	2.67	0.98	14 <sup>th</sup>	HL
5.	Concept mapping teaching strategy	2.70	0.82	12 <sup>th</sup>	HL
6.	Cooperative learning teaching strategy	2.97	0.75	2 <sup>nd</sup>	HL
7.	Differentiated teaching strategy	2.41	0.88	21 <sup>st</sup>	LL
8.	Field Trip teaching strategy	2.71	1.02	9 <sup>th</sup>	HL
9.	Flipped classroom teaching strategy	2.64	0.79	16 <sup>th</sup>	HL
10.	Gamification teaching strategy	2.43	0.89	20 <sup>th</sup>	LL
11.	Group investigation teaching strategy	2.64	0.92	16 <sup>th</sup>	HL
12.	Guided discovery teaching strategy	2.67	0.99	14 <sup>th</sup>	HL
13.	Inquiry based teaching strategy	2.70	0.94	12 <sup>th</sup>	HL
14.	Jig saw teaching strategy	2.13	0.99	25 <sup>th</sup>	LL
15.	Mastery Learning Strategy	2.72	0.93	8 <sup>th</sup>	HL
16.	Mind Mapping teaching strategy	2.37	0.93	23 <sup>rd</sup>	LL
17.	Multimedia Animation teaching strategy	2.57	0.93	19 <sup>th</sup>	HL
18.	Peer tutoring teaching strategy	2.76	0.96	5 <sup>th</sup>	HL
19.	Problem based learning teaching strategy	2.80	1.09	4 <sup>th</sup>	HL
20.	Project based strategy	3.10	0.79	1 <sup>st</sup>	HL
21.	Reciprocal teaching strategy	2.59	1.05	18 <sup>th</sup>	HL
22.	Simulation teaching strategy	2.71	0.82	9 <sup>th</sup>	HL
23.	Team teaching strategy	2.71	1.10	9 <sup>th</sup>	HL
24.	Think pair share teaching strategy	2.41	0.92	21 <sup>st</sup>	LL
25.	Vee mapping teaching strategy	2.21	0.98	24 <sup>th</sup>	LL
<b>Sectional Mean</b>		<b>2.64</b>	<b>0.92</b>		<b>HL</b>

The result in table 4 showed analysis of level of awareness of innovative teaching strategies by Biology teachers in senior secondary schools in North-East, Nigeria. The analysis indicated a sectional mean score of level of awareness was 2.56 with standard deviation of 0.234. This shows that biology teachers' level of awareness of the innovative teaching strategies was high. Further analysis shows that items 20, 6, 3, and 4 had a mean scores of 3.10, 2.97, 2.81 and 2.80 respectively with standard deviation of 0.79, 0.75, 1.01 and 1.09 respectively which

were rank 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup>. This shows that biology teachers were highly aware of the following innovative teaching strategies: project based learning, cooperative learning, brainstorming, problem based learning. On the other hand, items 14, 25, 16, 24 and 25 had a mean score of 2.13, 2.21, 2.37 and 2.41 respectively with standard deviation of 0.99, 0.98, 0.93 and 0.92 respectively which were ranked 25<sup>th</sup>, 24<sup>th</sup>, 23<sup>rd</sup> and 22<sup>nd</sup> less respectively. This shows that Biology teachers had low level of awareness of the following innovative teaching strategies: differentiated, gamification, jig saw, think-pair-share and vee-mapping.

**Research Question Two:** What is the difference in the level of awareness of innovative teaching strategies by male and female Biology teachers in senior secondary schools in North -East, Nigeria?

Table 5: Mean and Standard Deviation on Level of Awareness of Innovative Teaching Strategies by Biology Teachers based on Gender N=458

Gender	N	Mean	SD
Male	196	2.69	0.459
Female	262	2.60	0.526
Total	458		

The result in table 2 showed the analysis of level of awareness of innovative teaching strategies by Biology teachers in senior secondary schools based on gender. The analysis indicated that male Biology teachers had an average mean of 2.69 with standard deviation of 0.459 while female biology teachers had an average mean of 2.60 with standard deviation of 0.526; based on the acceptance limit of 2.5 mid-point on a 4-point Likert scale. The result therefore, indicates that male and female biology teachers did not differ in their level of awareness of the innovative teaching strategies. In other words, both male and female Biology teachers had high level of level of awareness of the innovative teaching strategies.

**Research Question Three:** What is the level of Utilization on innovative teaching strategies by Biology teachers in senior secondary schools in North -East, Nigeria?

**Table 3:** Mean and Standard Deviation on Level of Utilization of Innovative Teaching Strategies

S/N	Innovative Teaching Strategy	Mean	SD	Rank	Remarks
1.	Analogy teaching strategy	2.96	0.982	3 <sup>rd</sup>	HL
2.	Blended Learning teaching strategy	2.26	0.961	21 <sup>st</sup>	LL
3.	Brainstorming teaching strategy	3.09	0.960	1 <sup>st</sup>	HL
4.	Computer assisted instruction teaching strategy	2.38	0.885	17 <sup>th</sup>	LL
5.	Concept mapping teaching strategy	2.84	0.919	4 <sup>th</sup>	HL
6.	Cooperative learning teaching strategy	3.00	0.717	2 <sup>nd</sup>	HL
7.	Differentiated teaching strategy	2.48	0.973	11 <sup>th</sup>	LL
8.	Field Trip teaching strategy	2.62	0.894	8 <sup>th</sup>	HL
9.	Flipped classroom teaching strategy	2.46	0.742	13 <sup>th</sup>	LL
10.	Gamification teaching strategy	1.68	0.776	24 <sup>th</sup>	LL
11.	Group investigation teaching strategy	2.59	0.792	10 <sup>th</sup>	HL
12.	Guided discovery teaching strategy	2.80	0.915	5 <sup>th</sup>	HL
13.	Inquiry based teaching strategy	2.60	0.951	9 <sup>th</sup>	HL
14.	Jig saw teaching strategy	2.00	0.917	24 <sup>th</sup>	LL



15.	Mastery Learning Strategy	2.39	0.910	16 <sup>th</sup>	LL
16.	Mind Mapping teaching strategy	2.37	0.740	19 <sup>th</sup>	LL
17.	Multimedia Animation teaching strategy	2.38	0.881	17 <sup>th</sup>	LL
18.	Peer tutoring teaching strategy	2.69	1.012	7 <sup>th</sup>	HL
19.	Problem based learning teaching strategy	2.70	0.931	6 <sup>th</sup>	HL
20.	Project based strategy	2.36	0.899	20 <sup>th</sup>	LL
21.	Reciprocal teaching strategy	2.45	0.923	14 <sup>th</sup>	LL
22.	Simulation teaching strategy	2.44	0.827	15 <sup>th</sup>	LL
23.	Team teaching strategy	2.47	0.808	12 <sup>th</sup>	LL
24.	Think pair share teaching strategy	2.19	0.896	22 <sup>nd</sup>	LL
25.	Vee mapping teaching strategy	2.12	0.972	23 <sup>rd</sup>	LL
<b>Sectional Mean</b>		<b>2.49</b>	<b>0.880</b>		<b>LL</b>

The result in table 3 showed the analysis of level of utilization of innovative teaching strategies by Biology teachers in senior secondary school in North -East Nigeria. The result indicated a sectional mean score of level of utilization was 2.49 with standard deviation of 0.234. This means that the level of utilization of most of the innovative teaching strategies by biology teachers was low. Further analysis indicated that items 3, 6, 1 and 5 with a mean score of 3.09, 3.00, 2.62, 2.96 and 2.48 with standard deviation of 0.96, 0.72, 0.98 and 0.92 respectively which were rank 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup>. This shows that biology teachers are highly utilizing brainstorming, cooperative learning, analogy and concept mapping innovative teaching strategies. On the other hand, items 10, 54, 25, and 24 with a mean scores 1.68, 2.00, 2.12 and 2.19 with standard deviation of 0.78, 0.92, 0.97 and 0.89 which were rank 25<sup>th</sup>, 24<sup>th</sup>, 23<sup>rd</sup> and 22<sup>nd</sup>. This shows that gamification, jig saw, Vee mapping and think pair share innovative teaching strategies were not utilized by Biology teachers.

**Research Question Four:** What is the difference in the level of utilization of innovative teaching strategies by male and female Biology teachers in senior secondary schools in North -East, Nigeria?

**Table 4:** Mean and Standard Deviation on Level of Utilization of Innovative Teaching Strategies based on Gender

Gender	N	Mean	Std. Deviation
Male	196	2.51	0.326
Female	262	2.56	0.298
Total	458		

The result in table 13 showed the analysis of level of utilization of innovative teaching strategies by Biology teachers in senior secondary schools based on gender. The result of the analysis revealed that male Biology teachers had an average mean of 2.51 with standard deviation of 0.33 while female biology teachers had an average mean of 2.56 with standard deviation of 0.30; based on the acceptance limit of 2.5 mid-point on a 4-point Likert scale, the result indicates that male and female Biology teachers did not differ in their level of utilization of innovative teaching strategies. The findings of the study reveal that biology teachers were aware of most of the innovative teaching strategies. This confirmation was obtained from the result of research question one on level of awareness of innovative teaching strategies by biology teachers in senior secondary schools in North -East Nigeria. The result indicated that biology teachers are highly aware of the following innovative teaching strategies: project-based learning, cooperative learning, brainstorming, problem-based learning innovative teaching. The result further revealed that the level of awareness of the following innovative teaching strategies: differentiated, gamification, jig saw, think-pair-share and vee-mapping by biology teachers was low. This finding is in agreement with Gbadamosi (2014), Musa, Mamuda and Kamba, (2020), Kayode (2020) and Oguguo, Chigbo, Ezechukwu, Ene, Okeke and Nzeadibe (2020) who in their studies revealed that majority of teachers were aware of 80% innovative teaching and learning strategies. The reason could be as a result of attending seminars, conferences and workshop by Biology teachers. The implication of this findings

might lead Biology teachers to a greater implementation of several innovative teaching strategies in their classrooms, there by promoting students' engagement in learning. In addition, this awareness can contribute to research studies examining the effectiveness of these strategies, leading to the development of evidence-based practices and curriculum enhancements in biology.

The findings of the study reveal that biology teachers rarely utilized most of the innovative teaching strategies that were selected for this study. This confirmation was obtained from the result of research question three on level of utilization of innovative teaching strategies by biology teachers in senior secondary schools in North - East Nigeria. This finding is in line with the findings of Kayode (2020), Musa, Mahmuda and Kamba (2020) and Ukala (2018), who in their study concluded that many teachers were aware of different innovative teaching strategies, only few of these strategies were effectively utilized. However, the findings also contradict the findings of Gbadamasi (2013), who in his study found that biology teachers utilized different innovative teaching strategies to teach different topics. The reason for non-utilization of innovative teaching strategy could be inadequate instructional resources that can be use to implement the selected innovative teaching strategies. The implication of this finding is that School administrators can provide support and resources to encourage the teachers in adopting and implementing innovative teaching strategies

The findings also revealed that male and female biology teachers did not differ in their level of awareness of innovative strategies selected for this study. This finding was obtained from the result of research question two and null hypothesis one on level of awareness of innovative teaching strategies by biology teachers in senior secondary schools based on gender. The findings indicated that male and female biology teachers did not differ in their level of awareness of innovative strategies selected for this study. This finding is in line with the findings of Musa, Mamuda and Kamba (2020) and Kayode (2020) who in their study found out that there was no significant difference in the level of awareness of innovative teaching strategies based on gender. This finding also contradicts the findings of Khurshid and Zahur (2013) who stated that female teachers are more aware of innovative teaching strategies than the male teachers. The reason for non-significant difference in the level of awareness based on gender could be as a result of both male and female Biology teachers were having the same qualification and years of teaching experience. The implication of this finding is that School administrators can provide support and resources to encourage the teachers in adopting and implementing innovative teaching strategies

#### IV. CONCLUSION

Based on the findings of the study, it was concluded that biology teachers' level of awareness of innovative teaching strategies was high while the level of utilization was low. The findings further revealed that gender had no significant influence in their level of awareness and utilization of innovative teaching strategies. The study recommended that; State ministries of education, in conjunction with relevant professional bodies such as the Science Teachers Association of Nigeria (STAN), should organize workshops, seminars, and conferences for biology teachers to sensitize them to the effectiveness of teaching with innovative teaching strategies, especially those like mind mapping, Vee mapping, and Jigsaw with the lowest level of awareness. School administrators should offer continued professional development opportunities for males and females that focus on the latest trends and research in innovative teaching strategies. This helps teachers stay updated and motivated to integrate new approaches into their instructional deliveries.

#### REFERENCES

- Dajal, R.G & Mohammed, A.U (2019). Effects of guided discovery method on students' attitude and achievement in senior secondary schools in Bauchi state. *International Journal of Research Scientific Innovation* 6(7), 105-110
- Dajal, R.G. Apochi, M.A. & Paul-Fiase, R.U (2022). Effects of Sequential Teaching Method on Senior Secondary School Biology Students' Achievement in Niger State, Nigeria. *Ilorin Journal of Education* 42(2), 75-82.



- Eriba, O. J. & Samuel, I. R. (2018). Effect of STAD and jigsaw IV cooperative learning strategies on students' interest and achievement in Basic Science in Nasarawa State, Nigeria. *Case Studies Journal*, 7(4), 6-14.
- Federal Ministry of Education. (2013). Science, technology, and innovation policy. Federal Ministry of Science and Technology.
- Federal Republic of Nigeria. (2013). National policy on education (6th ed.). Government Press.
- Gbadamosi, A. F. (2013). Biology teachers' awareness and utilization of innovative teaching strategies in Oyo, South Senatorial district, Unpublished M.Ed. Thesis. University of Ilorin, Ilorin, Nigeria.
- Ghumdia & Adams, A. (2017). Effects of inquiry-based teaching strategies on students' science process skills acquisition in some selected Biology concepts in secondary schools in Borno State. *International Journal of Scientific Research*, 1(2).
- Igboanugo, B. I. and Njoku, Z.C. (2015). Effects of cooperative learning and peer-teaching on senior secondary school students' achievement in some difficult Chemistry concepts. *Journal of Science Teachers Association of Nigeria* 50 (1), 151-162
- Kayode, O. O. (2020). *Biology teachers' awareness and utilization of innovative teaching strategies in senior secondary schools in South West Nigeria* (Unpublished doctoral dissertation). University of Ilorin, Ilorin, Kwara State, Nigeria..
- Khurshid, F., & Zahur, B. (2013). Comparison of teachers' awareness and utilization of innovative teaching strategies in private and public sector secondary schools. *Elixir Psychology* 54 (2) 12242-12245
- Mbonu-Adigwe, B. U.; Umate, B. A., Onu, W. O., Ezugwu, I. J. Okebanama, C. I., Okoye, M. N., Ugwuanyi, C. S. & Okeke, C. I.O. (2021) Assessment of Awareness Level of e-Learning Classroom Strategies of University Lecturers: Implication for Evaluation of Library and Information Science Resources. *Library Philosophy and Practice (e-journal)*. 6155.
- Musa, U. Mamuda, S Kamba, A.H (2020) Assessment of Level of awareness and extent of Utilization of Innovative Instructional Strategies for teaching science in secondary schools in Kebbi State, Nigeria. *African Educational Research Journal* 8 (3) 491 – 498
- Nwankwo, A. L, Ugwu, T. U. & Ngwu, A. N. (2020), Biology Teachers' Awareness and Application of Blended Learning Approach: Implication for Entrepreneurship Development. *International Journal of Studies in Education*. 16(2), 222-235
- Nworgu, B. G. (2015). Educational Research: Basic Issues and Methodology (3rd Ed). University Trust Publishers, Nsukka. 67-68.
- Obikezie, C.M., Okpala, C. C. & Amobi, V.U (2022) Biology teachers' level of utilization and awareness of innovative teaching strategies in the teaching and learning of biology in secondary schools. *Journal plus Education* 30, (1), 141-154
- Oguguo, Chigbo, Ezechukwu, Ene, Okeke and Nzeadibe (2020) investigated teacher's utilization of innovative teaching strategies in enhancing achievement in Mathematics among secondary school students in Enugu State. *Journal of engineering and applied science*, 15(5), 1165-1169
- Oka, & Abba (2020) Effects of Explicit Learning Strategy and Learning Styles on Students' Achievement in Biology in Nasarawa State, Nigeria. *International Journal of Innovative Education Research* 8(4), 76-84,
- Oyelekan, O. S., Igbokwe, E. F. & Olorundare, A. S. (2018). Science teachers' utilisation of innovative strategies for teaching senior school science in Ilorin, Nigeria. *Malaysian Online Journal of Educational Sciences*, 5(2), 49-65.
- Ugwu T.U. and Nwagbo. C. (2019). Enhancing students' interest in Basic Science using Guided inquiry instructional method. *Journal of science teachers association of Nigeria*. 54(1), 121-128
- Ukala, G. (2018) Utilization of Innovative Teaching Strategies for Biology Teaching in Senior Secondary School. *African Journal Science Technology Mathematics Engineering*, 4, (1), 30-37