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TEACHERS AWARENESS IN INNOVATIVE TEACHING AND LEARNING OF BIOLOGY IN SECONDARY SCHOOLS

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Abstract
This study investigated teachers' awareness in innovative teaching and learning of Biology in secondary schools in Anambra state, Nigeria. A descriptive survey research design was used. The sample for the study is 150 Biology teachers from 75 co educational schools. The instrument used was developed by the researchers known as Biology Teachers' Level of Awareness in Innovative Teaching and Learning Strategy Scale (BTLAITLSS) which was scrutinized by three experts from Department of Science Education, one from Nwafor Orizu College of Education Nsugbe, another from Federal College of Education (Technical) Umunze and Nnamdi Azikiwe University Awka. The questionnaires were distributed by the researchers. Mean were used to answer the research questions while t-test was used to test the hypotheses involving two mean, ANOVA was used to test the hypotheses involving more than two mean. The findings show that there is no significant difference between the mean ratings of teachers on the awareness of innovative teaching strategy that can be used in the teaching and learning of Biology in secondary schools based on gender and there is a significant difference between the mean ratings of teachers on the awareness of innovative teaching strategy that can be used in the teaching and learning of Biology in secondary schools based on academic qualification. Based on the findings, these recommendations were made, in order to improve the performance of students in Biology, teachers should consider using the innovative teaching strategies and this should as well be implemented in other levels where Biology is taught if performance in Biology exams is to be improved and school administrators should be encouraged to improve on management of academic programmes by providing necessary innovative tools required for instructional purposes.

Keywords: Teaching strategy, innovative strategy and awareness

Introduction

Teaching strategy is method or techniques that a teacher will use to support students through the learning process. Teaching strategy according to Onuchukwu (2015) is a designed interaction carried out in the classroom which could be carefully and systematically followed to teach a concept, topic or an idea. There are many strategies which when utilized by teachers will improve student's understanding, thus creates an innovative teaching and learning in secondary schools. An innovative strategy is referred to as a design that is full of new or purposively reconstructed existing ideas, methods and equipment or to combine various teaching strategies to develop a new one (Gbadamosi, 2013). In science education, innovation is greatly needed in order to foster greater scientific literacy. Innovation is a deliberate, systematic, novel, specific and persistent change in the system of a particular society which is aimed at improving the system or creating a new one for a more effective and efficient means of attending to the educational needs of the social group in their social environment (David, 2018).

The innovative strategies are as follows: Inquiry-Based learning (IBL), Quick Response Codes (QRC), Project-Based Learning (PBL),Wisely Managed Classroom Technology (WMCT), Jigsaws Strategy (JS), Computer Assisted Instruction (CAI), Ethno-Science Instruction (EI), Computer Supported Collaboration (CSC), Multimedia Integrated Instruction (MII) and Projected Video Packaged Instruction (PVPI) among others which are needed to prove teaching and learning in sciences (Obikezie & Abumchukwu, 2020). Many of these strategies take students to levels of learning they never thought possible when properly used by the teacher (Chikendu, Obikezie & Abumchukwu, 2021). Sometimes it appears impossible to fully utilize these innovative strategies due to poor orientation on the side of teachers, lack of facilities in schools, government policies (David, 2018).

It is the duty of the teacher to gain mastery of these strategies so as to be able to use it in teaching and learning. Therefore a teacher who is not aware of the variety of such innovative strategies can neither attempt nor use them accurately (Okafor, 2012). Innovative strategies in Biology were borne as a result of the fact that different situations, topics to be taught, learners' cognitive readiness, concept being taught, skills intended to be developed in learners, demand a different approach. Research have shown some factors that hinder effective innovative teaching and learning strategies which include; insufficiency of intellectual efforts in finding ways to improve educational activity efficiency, predominance of the desire to use the products of someone else's innovation over developing their own abilities, creating original educational products and lack of initiative (Nadezhda, 2019). The author further opined that if these factors are not addressed it may later lead to scientific academic declination. Could this be one of the reasons of secondary school students' poor performance in external examination? According to WAEC Chief Examiner report 2009-2018, students performed poorly in Biology compared to other science subjects such as Chemistry and Physics. This may be likely connected to poor embracing of innovative teaching strategies in teaching and learning of the subject which may come as a result of lack of its awareness to the teachers.

Olumorin, (2010) asserts that awareness of innovative teaching and learning in educational policies usually forms the backbone of the utilization and productivity level of any educational programme. He further stated that it is when an individual is aware of the principles and content policy that such an individual can cultivate the right type of attitude that will result in improved productivity. Therefore, teachers' awareness of the innovative strategies is a decision that could help in teaching and learning of science concepts like

Chemistry, Biology and other science subject (Obikezie & Abumchukwu, 2020). When this Biology concept knowledge is internalized by the students, it may help in solving many societal problems relating to health, poverty, food shortage, crop production and environmental conservation which come as a result of innovative strategy like activity-oriented (Iwegne 2014). Akubuilo (2010) suggested the use of activity-oriented strategies such as guided enquiry, cooperative learning, demonstration, use of analogy etc. is very effective in teaching and learning. When all these are put in place, it may reduce the poor performance of students in Biology.

Onunkwo (2015) conducted a study on Teachers' level of awareness on the use of innovative teaching strategies in Chemistry. The sample was 105 teachers from 15 schools in Benue state. He used descriptive survey design and it shows that there was improvement in the teaching of students and their performances. Adesoji (2013) working on teachers' knowledge on the use of wisely managed classroom technology of innovative teaching strategies in Chemistry practicals class in Nigeria. The sample was 145 Chemistry teachers in public secondary schools in Ibadan metropolis. The research instrument was questionnaire. The result of the study showed that teachers do use wisely managed classroom technology to teach Chemistry attributing to the fact that the content of Chemistry needs a special attention.

Oludipe (2010) conducted a study on inquiry based teaching strategies on the academic performance of students in integrated science. They used a pretest, posttest and delayed posttest which was conducted after 2 weeks of the posttest to answer the question of whether the students memorization of facts or whether understanding of different concepts taught by the teacher using different instructional methods affected retention. The sample included 120 Junior Secondary School III Students randomly selected from four public secondary schools in Ijebu Ode Local Government of Ogun State. It was discovered that the students exposed to the inquiry based strategy had a higher mean score for both posttest and delayed posttest than those exposed to normal lecture method; they therefore concluded that consequently if inquiry based is used to teach students integrated science, there will be an improvement in the academic performance of students in the subject. Yusuf and Afolabi (2010) conducted a study on Quick Response (QR) Codes teaching strategies on secondary school students in biology. The sample included 120 first year secondary school students from 3 private schools in Oyo State. They used a pretest posttest control group design. The result of the findings showed that performance of students exposed to the Quick Response (QR) Codes either individually or collectively were better than those exposed to conventional classroom instruction, they recommended the need of Quick Response (QR) Codes for the teaching of biology in Nigerian secondary schools.

Adesoji and Arowosegbe (2010), working on the Project-Based Learning (PBL) of senior secondary chemistry practical in Nigeria. The sample was 145 chemistry teachers in public secondary schools in Ibadan metropolis. Based on the following factors, strategies for teaching chemistry, time allocated for the subject amongst others. The research instrument was questionnaire, this was administered to isolate and identify the major factors perceived by the teachers to hinder effectiveness in the learning of chemistry practical in their schools. The result of the study showed that teachers use project based learning to teach chemistry attributing this fact to the requirements in the content of chemistry curriculum being and the time allocated for the subject being too small. Omosewo (2012) studied the use of Jigsaws in teaching university undergraduate students' physics education. The sample was eighty-five (85) final year students of Educational Technology of University of Ilorin who majored in Introductory Technology. A structured questionnaire was used. It was found out that 96% of

the students supported that, the use of Jigsaws as a method of teaching will have accelerated cognitive development on the students while 88% supported that affective domain would be improved. 94% supported that psychomotor domain will be enhanced and 85% suggested that Jigsaws should be used because this is the age of innovations. Udeani & Okafor (2012), investigated the comparative effectiveness of the expository and concept mapping instructional strategy of presenting secondary school biology concepts to slow learners. They used 124 biology slow learners identified based on past promotion and terminal examinations, teachers' observation ratings and comments and student inter-ratings. The researchers also observed this group of slow learners in their respective biology lessons for two weeks. The students were divided into two groups. The first group was taught using expository method while the second group was taught using concept mapping method. The groups were post-tested after two weeks of teaching for any significant differences in their biology achievement. Analysis of post-test scores indicated that the group taught by the concept mapping instructional strategy performed significantly ($p<0.05$) better than their expository group counterparts this has implication for biology teacher in the adoption of effective methods of tackling problems encountered when teaching. Most all these study stated above were done outside Biology even the once done in Biology, to the researchers best of knowledge was not done in Anambra state. Secondly, with the numerous benefits of innovative teaching and learning strategies as shown by many researchers in other areas like Chemistry and in other location which is not Anambra state, this study try to investigate the extent of teachers level of awareness of innovative teaching and learning of Biology in senior secondary schools in Anambra state.

Piaget's cognitive theory of learning refers to the stage theory of cognitive development. According to Piaget, children develop knowledge by inventing or constructing reality out of experience and thus mix their observation with their ideas about how the world works. Piaget observed that people of the same age level (especially children) have a similar line of reasoning. This indicates that cognition develops stage by stage. Piaget used the terms 'Assimilation' and 'Accommodation' to explain his views.

Assimilation: It means a process of interpreting actions or events in relation to one's schemas. This refers to a means of fitting reality into one's existing structures of knowledge. The term 'schemas', for Piaget, refers to a well-defined sequence of physical and mental actions.

Accommodation: This is the modification of existing schemas to fit reality. The organism is capable of learning when it can modify its schemas. As the organism continues to accommodate, it continues to learn. Piaget believes that cognition develops from age to age and from level to level. According to him, the driving force for cognitive development is equilibration. By equilibration, Piaget means balancing assimilation and accommodation to adapt to the demands of the environment. He believes that for people to learn, they must assimilate and accommodate. Piaget also opined that at each stage of development, people use a distinctive underlying logic or structure of reasoning to guide their thinking. Piaget identified four stages of cognitive development – sensorimotor, pre-operational, concrete operational and formal operational to explain cognitive development from infancy to adolescence. However, we should be concerned with the 'formal operational stage'. This stage occurs within the adolescence stage.

At this stage, the young individual can start to think more abstractly. This stage of cognitive learning is characterized by ability to manipulate abstract as well as concrete objects, ideas,

and events. At formal operational stage, the young individual acquires more ability to deal with abstractions and may engage in hypothetical reasoning based on logic. At the adolescence stage, individuals can easily carry out practical experiments and demonstrations. Formal operational stage offers the ability for the individual to use abstract symbols for representational purposes. For instance, the individual, if taught, could understand that H_2O is water and may abstractly understand why it represents water. Piaget's theory of intellectual development holds that cognitive development takes place from active interaction of the child with his environment. This means that the basis of learning is the child's own ability as he interacts with his physical and social environment.

Piaget is of the opinion that a child must act on the objects in his environment for him to learn. This means that he should be actively involved not be passive. The active involvement of the child may be in form of direct manipulation, visual observation or through mental or internal transportation or change. Piaget believed that mental activity, which is involved in cognitive organization, is a process of adaptation, which is divided into two opposing but inseparable processes of assimilation and accommodation. Accommodation means to modify self to fit the new materials, while assimilation means to modify the materials to fit the self (David 2018).

The Piaget theory places the child as the principal agent in the teaching/ learning situation. This being the case, the teacher's job is to provide the individual with situations that encourage experimentation and manipulation of objects and symbols. The theory has direct implication on the present study: Teachers' level of Awareness of Innovative teaching and learning Biology in Secondary Schools in Anambra State.

Purpose of the Study

The main purpose of the study is to ascertain the teachers' level of awareness of innovative teaching and learning Biology in secondary schools. Specifically, the study sought to:

1. determine the level of secondary school biology teachers' awareness of innovative teaching and learning.
2. determine the difference in secondary school Biology teachers' level of awareness of innovative teaching and learning based on gender and academic qualification;

Research questions

The following research questions guided the study:

1. To what extent are Biology teachers aware of the innovative teaching and learning that can be used to teach biology in secondary schools?

2. To what extent are Biology teachers aware of innovative teaching and learning based on gender and academic qualification?

Research Hypotheses

The following research null hypotheses guided the study:

H_{O1}: There is no significant difference between the mean ratings of teachers on the awareness of innovative teaching strategy that can be used in the teaching and learning of Biology in secondary schools based on gender.

H_{O2}: There is no significant difference between the mean ratings of teachers on the awareness of innovative teaching strategy that can be used in the teaching and learning of Biology in secondary schools based on academic qualification.

Research Design

The design adopted for the study was descriptive survey. The design is appropriate for the study because the findings of the study can be generalized using the sample which is representative of the enter population. The study was carried out in Anambra state which is made up of six education zones. The state has six education zones namely, Aguata, Awka, Nnewi, Onitsha, Ogidi and Otuocha with 256 public secondary schools. Anambra state is in the South-Eastern part of Nigeria. The indigenous ethnic groups in Anambra state are predominantly Igbos. Its name is an anglicized version of the original 'Oma Mbala', the native name of the Anambra River. The capital and seat of government is Awka. Onitsha, Nnewi, and Ekwulobia are the biggest commercial and industrial cities respectively. The area was chosen because of the need to improve secondary school students' achievement in Biology as the subject is one of the common subjects enrolled by students in external examinations. One hundred and fifty (150) Biology teachers were used in the study. Using purposive sampling method, 75 coeducational schools were sampled. The rationale behind the sampling was to ensure greater coverage of all the education zones in Anambra state and because there are not too many Biology teachers.The instruments developed for the study was on Biology Teachers' Level of Awareness in Innovative Teaching and Learning Strategy Scale (BTLAITLSS) which was used to assess the level of teachers' awareness in innovative teaching and learning Biology in secondary schools in Anambra state and was validated by three experts. One from Nwafor Orizu College of Education Nsugbe, one from Faculty of education Nnnamdi Azikiwe University Awka and one from Federal College of Education (Technical) Umunze with reliability of 0.78 using Cronbach Alpha. BTLAITLSS was composed of three sections: namely sections A, B, C, D and E. Section A was designed to generate demographic information while section B and C elicited information on Biology teachers' level of awareness in innovative teaching and learning strategies respectively. Section B was designed on a four point scale of Very much Aware (VMA), Much Aware (MA), Aware(A), and Not Aware (NA). Section C was designed also on a four point scale of Very Often (VO), Often (O), Rarely (R) and Very Rarely (VR).Sections D and E determined the challenges surrounding the use of innovative teaching and learning strategies and the solutions to the challenges respectively. Both sections D and E are designed on a four scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) all in grade point of 4, 3, 2 and 1.

The data obtained from the respondents were analyzed using the mean and standard deviation for research questions. The decision of acceptance or rejection of the items in the questionnaire based on items means which are above the grand mean of 2.5. For the hypotheses, while t-test was used to test the hypotheses involving two mean, ANOVA was used to test hypotheses involving more than two mean. The hypotheses were tested at 0.05 Alpha level.

Research Question One: To what extent are Biology teachers aware of the innovative teaching and learning that can be used to teach biology in secondary schools?

Table 1Biology Teachers' Extent of Awareness of Innovative Teaching and Learning Strategies

S/N	**Innovative Strategies**	$\bar{x}$	**SD**	**Remarks**
1.	Inquiry-Based Learning (IBL)	3.40	1.86	Aware
2.	Quick Responses Codes (QRC)	1.84	1.01	Not Aware
3.	Project –Based Learning (PBL)	2.96	1.50	Aware
4.	Wisely Managed Classroom Technology(WMCT)	2.28	1.10	Not Aware
5.	Jigsaws Strategy (JS)	3.36	1.46	Aware
6.	Computer Assisted Instruction (CAI)	3.29	1.11	Aware
7.	Ethno-Science Instruction (EI)	2.06	0.94	Not Aware
8.	Computer Supported Collaboration (CSC)	2.41	0.88	Not Aware
9.	Multimedia Integrated Instruction (MII)	1.00	0.34	Not Aware
10.	Projected Video Packaged Instruction (PVPI)	2.81	1.22	Aware
	Grand Mean	**2.54**		

Cut-Off mean = 2.50

Table 1 shows that the mean of items 1, 3, 5, 6 and 10 are above the cut-off mean of 2.50. Thus, teachers' level of awareness in innovative teaching and learning of Biology in secondary school in strategies as inquiry-based learning, project-based learning, jigsaw strategy, computer assisted instruction (CAI) and projected video packaged instruction is accepted because the point is above 2.50. The grand mean of 2.54 shows that secondary school teachers of biology cognizant of innovative teaching and learning strategies to a 'much aware' extent.

Research Question Two: To what extent are Biology teachers aware of innovative teaching and learning based on gender and academic qualification?

Table 2: Biology Teachers Extent of Awareness in Innovative Teaching and Learning Strategies

S/N	**Innovative Strategies**	$\bar{x}$	**SD**	**Remarks**
1.	Inquiry-Based Learning (IBL)	1.35	0.63	Very rare
2.	Project –Based Learning (PBL)	3.61	1.13	Often
3.	Jigsaws Strategy (JS)	2.55	1.33	Rare
4.	Computer Assisted Instruction (CAI)	1.05	1.18	Very rare
5.	Projected Video Packaged Instruction (PVPI)	1.21	1.39	Rare
	Grand Mean	**1.95**		

Table 2 shows that biology teachers are aware of inquiry-based learning to a very rare extent, project-based learning often, jigsaw strategy rarely, computer assisted instruction to a very rare extent and projected video packaged instruction to a rare extent. The grand mean of 1.95 shows that secondary school biology teachers are aware of innovative teaching and learning to a 'very rare' extent.

H_{O1}: There is no significant difference between the mean ratings of teachers on the awareness of innovative teaching strategy that can be used in the teaching and learning of Biology in secondary schools based on gender.

Table 3: T-test on Difference between Mean Rating of Biology Teachers on Awareness of Innovative Teaching Strategies based on Gender

Source of Variation	N	Mean	SD	df	t-calculated	Pvalue	Decision
Male	36	29.15	2.83	148	0.19	0.100	Do not reject null
Females	114	30.07	5.02				

Table 3 shows that at 0.05 level of significance, 148 df, the t-calculated was 0.19 with ap-value of 0.100 which is greater than 0.05. The null hypothesis was not rejected. Therefore, there is no significant difference between the mean ratings of teachers on the awareness of innovative teaching strategy that can be used in the teaching and learning of Biology in secondary schools based on gender.

H_{O2}: There is no significant difference between the mean ratings of teachers on the awareness of innovative teaching strategy that can be used in the teaching learning of Biology in secondary schools based on academic qualification.

Table 4: Anova on Difference between Mean Rating of Biology Teachers on Awareness of Innovative Teaching Strategies based on Academic Qualification

Source of Variation	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	6036.040	3	2012.013	890.726	.001
Within Groups	467.581	147	2.259		
Total	6503.621	150			

Table 4 shows that at 3df numerator and 150 df denominator, the F-value was 890.726 with a Pvalue of 0.001 which is less than 0.05. The null hypothesis was rejected. Therefore, there is a significant difference between the mean ratings of teachers on the awareness of innovative teaching strategy that can be used in the teaching and learning of Biology in secondary schools based on academic qualification.

DISCUSSIONS

The findings of the study are discussed thematically under the following sub-headings:

Awareness Level of Innovative Teaching Strategies (ITS)

From the findings on table 1, it was revealed that secondary school Biology teachers are much aware of innovative teaching strategies. Biology teachers were aware of such innovative teaching strategies as inquiry-based learning, project-based learning, jigsaw strategy, computer assisted instruction (CAI) and projected video packaged instruction. These findings do not agree with the work done by Adesoji and Arowosegbe (2010) who worked on teachers' knowledge on the use of wisely managed classroom technology of innovative teaching strategies in chemistry practical class in Nigeria. The result of the study showed that 80.5% of the teachers are fully knowledgeable and are ready to use the wisely managed classroom strategy due to its effectiveness and high productivity in the teaching and learning of chemistry. The findings of the study however have a corresponding agreement on the work done by Omosewo (2018) who used 100 science teachers to ascertain the level of awareness of teachers on the implementation of jigsaw teaching strategy in the learning of basic technology in Bomadi education zone. Their findings show that there was a low level of science teachers on the implementation of jigsaw strategy due to lack of confidence on themselves to effectively control and manage their classroom during the lesson delivery.

Summary of Major Findings

The study revealed the following findings which have been presented as per the study hypothesis. The first hypothesis showed that there is no significant difference between the mean ratings of teachers on the awareness of innovative teaching strategy that can be used in the teaching and learning of Biology in secondary schools based on gender. The second hypothesis indicated that there is a significant difference between the mean ratings of teachers on the awareness of innovative teaching strategy that can be used in the teaching and learning of Biology in secondary schools based on academic qualification.

Recommendations for Practice

1. In order to improve the performance of students in biology, teachers should consider using the innovative teaching strategies and this should as well be implemented in other levels where Biology is taught if performance in Biology exams is to be improved.

2. School administrators should be encouraged to improve on management of academic programmes by providing necessary innovative tools required for instructional purposes.

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