

Utilization of Innovative Teaching Strategies for Biology Teaching in Senior Secondary School

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Abstract

The paper examined biology teachers' level of utilization of innovative teaching strategies in classroom in Delta state. Four research questions and three null hypotheses guided the study. A descriptive survey design was adopted for the study and the population consisted of all biology teachers in Ika North-east LGA of Delta state with a total of 247 biology teachers in 47 secondary school. The sample was made up of 131 biology teachers drawn from 30 schools. The instrument for data collection was Standardized Innovative Teaching Strategies Questionnaire (SITSQ) adapted from Gbadamosi, (2013). Mean and standard deviation were used to answer the research questions while independent sample t-test was used to test the null hypothesis at 0.05 level of significance. The result revealed that biology teachers rarely utilized innovative teaching. It also shows significant influence of qualification and experience on biology teachers' utilization of innovative teaching strategies but no significance influence of gender was found. As a result of the findings, some recommendation was made.

Keywords: Biology Teachers, Innovative, Innovative Teaching Strategies, Innovative Teaching, Utilization.

Introduction

The need for research in teaching practices, instructional strategies and their mode of application in improving academic performance at different levels of education, especially at the secondary school level cannot be over emphasized. The need to strengthen the process of teaching and learning in secondary schools appears to be well recognized especially in biology teaching. Biology is a branch of natural science which deals with the study of living organisms (plants and animals), including their structures, functioning, evolution, distribution and interrelationships. The importance of biology as a science subject cannot be over emphasized as it stands as the bedrock upon which many professional courses like Medicine, Pharmacy, Nursing, Biochemistry, Genetic studies, Agriculture science etc., are laid.

These subjects' areas which are linked to biology has made it a subject that is in high demand and subsequently with very high enrolment of students in the external examination (Senior School Certificate Examination) this is more than what obtain in other science subjects such as Physics and Chemistry. Aniaku (2012) reported that despite the high number of students' enrolment in Biology in the senior secondary school examinations conducted by West African Examination Council (WAEC) and National Examination Council (NECO), students' achievement examinations are poor. Jacinta (2017) also reported that there is still a high rate of failure in biology as revealed by the analysis of the May/ June SSCE result of 2010- 2017. Educators are therefore, seeking for alternative ways to teach biology so as to change this situation (Lamidi, Oyelekan & Olorundare, 2015).

This poor academic achievement in biology could be attributed to many factors among which are the teachers' use of inappropriate teaching strategies or inability to use innovative teaching strategies. Researchers have blamed the poor achievement and performance of students in sciences especially biology on the use of inappropriate teaching strategies which might lead to lack of interest and retention of concepts (Ajaja, 2013, Ifeanacho, 2012, Jacinta, 2017 & Ige, 2010). Gbadamosi, (2013), Oyelekan, Igbokwe and Adekunle (2017), Ajaja (2013) suggested the use of activity-oriented strategies such as guided-inquiry, cooperative learning, demonstration, thinks and do, use of analogy

and many others to ensure result-oriented biology delivery in schools. This is supported by constructivist learning theory which states that learning is an active process wherein learners are able to form new ideas based on what their current knowledge is as well as their past knowledge using their cognitive structure. Jacinta (2017) agreed with the above statement by stating that student achieve better when teachers utilize student centered strategies or innovative teaching strategies.

Innovation, according to Hornby (2010) is the introduction of new things, ideas or a new way of doing things. Innovation in biology teaching is therefore the introduction of new ideas and methods and change in the style of evaluating the outcomes of biology teaching and learning. An innovative teaching strategy is referred to as a design that is full of new or the introduction of new ideas and methods or purposively reconstructed existing ideas (Gbadamosi, 2013). **Innovative teaching is a proactive approach to integrate new teaching strategies and methods into the classroom teaching and learning process.** The primary motive of innovative teaching is encouraging students to engage more in the learning process. When students interact with teachers and peers, they gain more practical experience and retain more information from a class. A teaching strategy is a carefully designed classroom interaction that could be meticulously followed to teach a concept, topic or an idea. Despite the importance of these innovative teaching strategies, it was found that many science teachers do not utilize it in discharging their classroom duties (Ofeimu & Kolawole, 2017). Achor, Samba and Ogbeba (2010) stated that the major problem or reasons for the above could be teachers' educational qualification, experience and gender.

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). This is determined in Nigeria by the degree a teacher has that enables him/her teach in any school. A qualified teacher is one who possess at least National Certificate in Education (NCE) or Bachelor's degree Science Education (B.Ed. or B.Sc. Ed) and is a registered member of Teachers Registration Council of Nigeria (TRCN) otherwise such teacher is termed unqualified teacher.

Teaching experience is the number of years a teacher has put in service as a classroom teacher. In this study, one to seven years (1-7) experience is regarded as less experience while eight (8) years and above is regarded as experienced teachers. According to Anchor 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 that teachers' experience and qualifications have no influence in their utilisation of the innovative teaching strategies. In addition to teachers' teaching qualification and experience, Onoja (2014) pointed out that another quality of the teachers that scholars found to have effect on utilization of innovative teaching strategies is gender.

Gender simply means the character or characteristics of being male or female, man or woman, boy or girl (male or female student). Gender is by this attribute seen as the categorization in the world of matter into sex (Onoja, 2014). Oguniyi (2008) defined gender as a learned socially constructed condition ascribed to male and female. Studies shows that gender has no significant influence in teachers' utilization of innovative teaching strategies (Aniaku, 2014; Ajaja, 2013; Oludipe, 2012; Jacinta, 2017 & Ige, 2010). Other studies (Yong, 2009, Nasr and Asghar, 2011 and Okoro, 2011) showed that gender has a significant influence in teachers' utilization of innovative teaching strategies.

It is based on the above contradictory findings by scholars and the fact that to the knowledge of the present researcher, no study has been carried out in Delta state to find out the level of teacher's utilization of innovative teaching strategies such as Demonstration, Classification, Field trip,

Constructivism, Guided discovery, Peer tutoring, Active learning, Computer assisted instruction, Cooperative learning, Multimedia, Role play among others, that this study became necessary.

Purpose of The Study

The main purpose of this study was to find out the level of utilisation of innovative teaching strategies by biology teachers' in Ika North-East L.G.A. of Delta state. Specifically, the study was to determine;

1. The level to which biology teachers utilise innovative teaching strategies in teaching.
2. If biology teachers' qualification influence their level of utilisation of innovative teaching strategies.
3. If biology teachers' teaching experience influence their level of utilisation of innovative teaching strategies.
4. If biology teachers' gender influence their level of utilisation of innovative teaching strategies.

Research Questions

The following research questions guided the study:

1. What is the level of utilisation of innovative teaching strategies by biology teachers?
2. What is the influence of qualification on biology teachers' level of utilisation of innovative teaching strategies?
3. What is the influence of experience on biology teachers' level of utilisation of innovative teaching strategies?
4. What is the influence of gender on the level of utilisation of innovative teaching strategies by biology teachers?

Hypotheses

The following null hypotheses guided the study:

1. There is no significant difference in the level of utilization of innovative teaching strategies by qualified and unqualified biology teachers.
2. There is no significant difference in the level of utilization of innovative teaching strategies by experienced and inexperienced biology teachers.
3. There is no significant difference in the level of utilization of innovative teaching strategies by male and female biology teachers.

Methods

The study adopted descriptive survey design. A survey design according to Nworgu (2006) is one in which a group of people or items is studied by collecting and analysing data from only a part considered to be representative of the entire group. The population of the study comprises of all two hundred and forty-seven (247) biology teachers from forty-seven (47) secondary school in Ika North-East L.G.A. of Delta state. One hundred and thirty-one (131) out of the two hundred and forty-seven (247) biology teacher were selected using purposive sampling techniques from thirty (30) out of forty-seven (47) secondary schools in the area. The use of purposive sampling techniques was to make sure the study covers the qualification and experience variable for the study. The instrument for data collection was Standardized Innovative Teaching Strategies Questionnaire (SITSQ) adapted from Gbadamosi, (2013).

The instrument has two sections A and B. Section A contain the respondent bio-data, qualification and years of experience while section B contain items to determine extent of utilization of the innovative strategies by the biology teachers. It has a 3-point rating scale of Frequently Used (FU=3), Rarely Used (RU=2), and Not Used (NU=1) and mean utilization value which ranges between 1 and 3. Therefore, items with the mean utilization value ranging from 0.01-1.4, 1.5-2.4 and 2.5- 3.0 were rated as follows: Not Used, Rarely Used and Frequently Used respectively.

The instrument was validated by three experts from Department of Science Education, University of Nigeria, Nsukka. It was then administered to twenty biology teachers from four

secondary schools in Ika South L.G.A outside the study area and the reliability of the instrument was determined using Cronbach alpha technique and a reliability coefficient of 0.83 was obtained. The choice of Ika South LGA was anchored on the fact that both areas share similar characteristics. The instrument was administered by the researcher to the biology teachers in each of the selected schools and collected on the spot to enhance high return. Mean and standard deviation were used to answer the research questions while the null hypothesis was tested using independent sample t-test at 0.05 alpha level.

Results

The data collected were analyzed based on the four research questions and three null hypotheses and the results are presented below:

Research Question 1: What is the mean score of biology teachers utilisation of innovative teaching strategies?

Table1. Result of mean and standard deviation analysis of biology teachers utilisation of innovative teaching strategies in teaching

S/N	Items	Mean	SD	Decision
1.	Acronym Memory	2.55	.68	Frequently Used
2.	Active Learning	2.13	.88	Rarely Used
3.	Classification	2.27	.77	Rarely Used
4.	Computer Assisted Instruction	2.07	.67	Rarely Used
5.	Constructivism	1.66	.48	Rarely Used
6.	Cooperative Learning	1.52	.50	Rarely Used
7.	Demonstration	1.21	.56	Not Used
8.	Field Trip	1.27	.52	Not Used
9.	Graphic Organizers	1.48	.76	Not Used
10.	Guided Discovery	1.27	.45	Not Used
11.	Manipulatives	1.41	.65	Not Used
12.	Models	2.73	.49	Frequently Used
13.	Multimedia	2.33	.71	Rarely Used
14.	Peer Tutoring	1.37	.73	Not Used
15.	Problem Solving	2.69	.70	Frequently Used
16.	Project Based Learning	1.46	.67	Not Used
17.	Role Playing	1.59	.49	Rarely Used
18.	Socratic Method	1.37	.49	Not Used
19.	Study Aids	2.79	.49	Frequently Used
20.	Team Teaching	2.52	.73	Frequently Used
TOTAL		2.12	.29	Rarely Used

The result in **Table 1** above showed that, Acronym Memory, Models, Problem Solving, Study Aids and Team Teaching has the highest mean utilization scores of innovative teaching strategies of 2.55,

2.73, 2.69, 2.77 and 2.52 with standard deviation of .68, .49, .70, .49 and .73 respectively. This analysis showed that biology teachers frequently use these innovative teaching strategies. On the other hand, Active Learning, Classification, Computer Assisted Instruction, Constructivism, Cooperative Learning, Multimedia and Role Playing has the mean utilization scores of innovative teaching strategies of 2.14, 2.27, 2.07, 1.66, 1.52, 2.33 and 1.59 with standard deviation of .89, .77, .67, .48, .50, .71 and .49 respectively. This result showed these innovative teaching strategies are rarely used by biology teachers. While, Demonstration, Field Trip, Graphic Organizers, Guided Discovery, Manipulatives, Peer Tutoring, Project Based Learning and Socratic Method has the mean utilization scores of innovative teaching strategies of 1.21, 1.27, 1.48, 1.27, 1.41, 1.37, 1.46 and 1.37 with standard deviation of .56, .52, .76, .45, .66, .73, .67 and .45 respectively. The result shows they are not used by biology teachers. The overall mean score of biology teachers' utilization of innovative teaching strategies is 2.12 with a standard deviation of .28. The result indicated that biology teacher rarely used innovative teaching strategies.

Research question 2: What is the mean score of the influence of biology teachers' qualification on their level of utilisation of innovative teaching strategies?

Table 2: Result of mean and standard deviation analysis of the influence of qualification on biology teachers' utilization of innovative teaching strategies.

Qualification	N	Mean	SD
Qualified	73	1.93	.167
Unqualified	58	1.88	.156

The result in **Table 2** showed that the mean score of qualified biology teachers on their level of utilisation of innovative teaching strategies is 1.93 with a standard deviation of .167 while unqualified biology teachers has a mean score of 1.88 with a standard deviation of .156 on their level of utilization of innovative teaching strategies. Based on the level of acceptance for the study, the result indicates that both qualified and unqualified biology teacher rarely use innovative teaching strategies.

Table 3: Summary of t-test for significance difference between qualified and unqualified biology teachers' level of utilization of innovative teaching strategies mean score.

Qualification	N	Mean	SD	df	Std. Er	t-cal	P.value	Decision
Qualified	73	1.93	.167	129	.028	1.94	0.05	Rejected
Unqualified	58	1.88	.156					

The result in **Table 3** above showed a significant value of t-cal of 1.936 and P-value of 0.05. The result showed a significant P-value of 0.05 which is equal to 0.05 level of significance of the study. The null hypothesis which states that there is no significant difference in the level of utilization of innovative teaching strategies by qualified and unqualified biology teachers is therefore rejected. Qualified biology teacher utilizes innovative teaching strategies more than unqualified biology teachers.

Research question 3: What is the mean score of experienced and less experienced biology teachers' level of utilisation of innovative teaching strategies?

Table 4: Result of mean and standard deviation analysis of the influence of experience on biology teachers' utilization of innovative teaching strategies.

Experience	Number	Mean	SD
Experienced	74	1.94	.181
Less Experienced	57	1.87	.142

The result in **Table 4** showed that the mean score of experienced and less experienced biology teachers are 1.94 and 1.87 with a standard deviation of .181 and .142 respectively on their level of utilization of innovative teaching strategies. The result indicates that both experienced and less experienced biology teacher rarely use innovative teaching strategies.

Table 5: Summary of t-test for significance difference between experienced and less experienced biology teachers' level of utilization of innovative teaching strategies mean score.

EXPERIENCE	N	Mean	SD	df	Std. Er	t-cal	Pvalue	Decision
Experienced	74	1.94	.18	129	.028	2.45	0.02	Reject H ₀
Less Experienced	57	1.87	.14					

The result in **Table 5** above showed a significant value of t-cal of 2.45 and P-value of 0.02. The result showed a significant P-value of 0.02 which is less than 0.05 level of significance of the study. The null hypothesis which states that there is no significant difference in the level of utilization of innovative teaching strategies between experienced and less experience biology teachers is therefore reject. Experience biology teachers utilize innovative teaching strategies more than less experienced teachers.

Research question 4: What is the mean scores of gender on utilisation of innovative teaching strategies by biology teachers?

Table 4: Result of mean and standard deviation analysis of the influence of gender on biology teachers' utilization of innovative teaching strategies.

Gender	Number	Mean	SD
Male	55	1.88	.167
Female	76	1.91	.159

The result in **Table 6** showed that the mean score of male biology teachers is 1.88 with a standard deviation of .167 while the female biology teachers has a mean score of 1.91 with a standard deviation of .159 on their level of utilization of innovative teaching strategies. The result indicates that both male and female biology teacher rarely use innovative teaching strategies.

Table 7: Summary of t-test for significance difference between male and female biology teachers' level of utilization of innovative teaching strategies mean score.

Gender	N	Mean	SD	df	Std. Er	t-cal	Pvalue	Decision
Male	55	1.88	.17	129	.029	1.12	0.27	Not rejected
Female	76	1.91	.16					

The result in **Table 7** above showed a significant t-cal of 1.12 and Pvalue of 0.27. The result showed a significant P-value of 0.27 which is more than 0.05 level of significance of the study. The null hypotheses which states that there is no significance influence of gender on biology teachers' level of utilization of innovative teaching strategies is therefore, not rejected.

Discussion

The study revealed that biology teachers rarely use innovative teaching strategies in classroom teaching. It further showed that teachers' qualification and teachers teaching experience have influence on the level of utilization of innovative teaching strategies among biology teacher. Qualified and experienced biology teacher were found to utilize innovative teaching strategies more than unqualified and less experienced biology teachers. The researcher believe that the result of the study was so

because experience as they say is the best teacher and qualification make biology teachers' mastering of content knowledge and pedagogical knowledge a priority. This makes qualified and experienced teachers always seeking to know the best strategies for effective teaching. The finding agreed with Achor, et al, Khushis and Zahur (2013), Hanna and Abdullahi, (2016), Akin (2013), Van and Roos (2014) and Abe and Adu (2013) who in their studies found out that qualified and experienced teachers utilizes innovative teaching strategies than but disagreed with Oyelekan et. al, (2017) who found out that qualification and experience have no influence on the level of utilisation of innovative teaching strategies.

The study also showed that gender has no influence on biology teachers' utilization of innovative teaching strategies. The findings confirmed the findings of Ige, (2009), Opara, (2011), Chukelu (2011), Oludipe, (2012) and Aniaku, (2014) but disagreed with the findings of Yong, (2009) Nasr and Asghar, (2011) and Okoro, (2011) who found out that gender has a significant influence in teachers' utilization of innovative teaching strategies.

Conclusion

Based on the findings of the study, it was revealed that biology teacher rarely uses innovative teaching strategies in the discharge of their classroom duties. However, out of the twenty innovative teaching strategies, five (Acronyms memory, Model, Problem solving, Study aid and Team teaching) were Frequently Used (FU), seven were Rarely Used (RU) while eight were not used (NU) by biology teachers. The mean score for FU, RU and NU ranging between 2.5 to 3.0, 1.5 to 2.4 and .01 to 1.4.

Summary

1. Biology teacher rarely use innovative teaching strategies in classroom
2. Qualification has significance influence on biology teachers' utilization of innovative teaching strategies
3. Experience has significance influence on biology teachers' utilization of innovative teaching strategies
4. Gender has no significance influence on the level utilization of innovative teaching strategies by biology teachers'

Recommendation

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

1. The government at all level should organize seminar, workshop and conferences for science teachers especially biology teacher, to be trained on the new pedagogies and the importance of using them in classroom teaching and learning.
2. The government should employ more qualified biology teachers in our school to teach biology.
3. Experience teachers should always organize a training programme in their various schools with the assistance of the school administrators to train the less experience teachers on the need to use innovative teaching strategies in teaching and learning of biology.
4. Unqualified biology teacher (those teaching biology but has no educational background) should be mandated to enroll for diploma programme in educational subject so as to gain pedagogical knowledge.
5. Both male and female biology teachers should be open and ready to learn from each other.

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