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BIOLOGY TEACHERS' LEVEL OF AWARENESS AND UTILIZATION OF INNOVATIVE TEACHING STRATEGIES IN OYO SOUTH SENATORIAL DISTRICT, NIGERIA

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ABSTRACT

The study investigated Biology teachers' awareness and utilization of innovative teaching strategies in Oyo South Senatorial District, Nigeria. It further examined the differences in the utilization of selected twenty-five innovative teaching strategies on the bases of teachers' teaching experience, qualification and gender. In this survey, 300 Biology teachers were randomly and purposively selected from the six secondary schools in the district. A questionnaire was prepared, validated and used for collection of data from the biology teachers. Percentage and mean statistics were used to analyze the collected data. Six research questions and three hypotheses were formulated and tested. The findings revealed that the selected Biology teachers were aware of the innovative teaching strategies and that female teachers and qualified teachers had higher utilization of the innovative teaching strategies. Based on the results of this study, it is recommended among others that teachers training institutions should include the innovative strategies into their curricular package and make efforts to get teachers acquainted with the ways the strategies can be effectively put to use.

INTRODUCTION

Biology is defined as the "basic science that deals with the study of living things, it presents the teeming diversity of life on earth, a diversity of level we are all part of" (Adegbite, 2005). The teaching of biology is very important because the knowledge of biology helps in improving the quality of life, as it helps to solve many societal problems relating to health, poverty, food shortage, crop production and environmental conservation.

The learning of biology in real life context is necessary for personal development and also, the development of scientific and technological world. The use of multiple and relevant teaching and learning strategies, and assessment practices will provide a basis for this. In an attempt to ensure result oriented biology delivery in schools, Akubilo (2004) suggested the use of activity-oriented strategies such as guided-inquiry, cooperative learning, demonstration, thinks and do, use of analogy and many others. Thus, researchers in the field of science education in Nigeria have continued to seek better ways of teaching Biology in order to improve academic performance of students.

Despite the efforts of researchers, students' performance in biology at the Senior Secondary School Certificate Examinations (SSSCE) in Nigeria remains low (WAEC Chief Examiner's Report, 2012). These poor performances of students in science

subjects generally, has been blamed on teachers and students because of the inability of most of the students to cope with specific difficulties associated with teaching and learning of science (Achor, 2003; Ogbeba, 2009). Reason for this difficulty faced among science teachers is traceable to the fact that they are not properly informed of recent development and equipment with the relevant skills for new methods that showcase best practices, although this is said to be debatable (Olorundare, 2011). Maduabum (1994) discovered that students' poor performance is partly rooted in the difficulty of some concepts in Biology. In addition, Maduabum (1994) identified teachers' failure to use effective teaching strategies that would make the learning of these concepts easier.

A teaching strategy is a carefully designed classroom interaction that could be meticulously followed to teach a concept, topic or an idea. This brings out the idea of having numerous strategies. An innovative strategy is referred to a design that is full of new or purposively reconstructed existing ideas. This implies the use of new or reconstructed existing ideas, methods and equipment or to combine various teaching strategies to develop a new one. s. Ikeobi (1987) defined innovation as the introduction of something new at any point in time and that to be innovative is to break new grounds. Innovative teaching strategy can therefore be described as ways of assisting students to develop not just technical skills and a common core of generic skills, but ways to support a wider range of capabilities which can assist the individual in the wider world of work and the community.

In science, innovative strategy to teaching refers to a design full of new or reconstructed existing ideas. In order words, it implies that the approach does not have to be new, but it's use in that particular concept or topic may be novel. In biology, like any other science subject, innovation can be in form of using new teaching methods, addition of new ideas in the curriculum content, learning experiences, introducing new/modern instructional materials as well as adopting a new change in evaluating the outcomes of biology learning. Innovation in biology is therefore, the introduction of new ideas and methods, accompanied by an equally new change in the style of evaluating the outcomes of biology learning.

The need for innovative strategies in teaching biology is borne out by the facts that different situations which include teaching topics, learners' cognitive readiness, concept being taught, skills intended to be developed in learners, demands for different teaching strategies.. For instance, Achor (2008) considered some teaching strategies as learners centered, interest arousing and activity oriented. These include conceptual change strategy, concept mapping, field trip, guided discovery, experimental and demonstration strategies.

Ukoha (2008), described the problems affecting the effective use instructional materials. In his work, he mentioned that concept of utilization of instructional materials have not been properly identified, provided and selected for instruction. This statement can also be applied to teaching strategies because it implies that appropriate instructional materials have not been effectively utilized. According to Blair (1988), many things happen to students with learning difficulties when the difficulties remain unsolved. The

effect of difficulties in learning upon students may not be far out of proportion to the apparent seriousness of the problem, because emotional pressure usually build up around students' area of weakness. With this type of difficulty, students may fall behind expectation or standard set by teachers, parents and school administrators. However, this difficulty can be solved through the utilization of appropriate innovative strategies.

Awareness of policies usually forms the backbone of the utilization and productivity level of any programme (Olumorin, 2008). The researcher further asserted 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. In the teachers' awareness of the innovative strategies, the decision of the teacher on the utilization of the innovative strategies will be based on the teachers' knowledge on the existence of the innovative strategies. Therefore a teacher who is not aware of the innovative strategies will neither attempt to use them in the first place nor use them correctly and adequately.

Teachers are said to gain extensive experience of successful and unsuccessful performances throughout their years of teaching. This assumption has generated in-depth research into how teachers who have been involved in teaching for different periods of time perceived their teaching (Soodak & Podell, 1997; Fives & Lisa 2008; Fives, 2010). It has been argued that experience improves teaching skills while pupils learn better at the hands of teachers who have taught them continuously over a period of years (Ijaiya, 2000; Ahmed, 2008). Teachers' teaching qualification which is a variable in this study is another quality that enhance the skills of an experienced teacher. This means that the qualification of a teacher matters when it comes to effective teaching (Ahmed, 2012). The availability of adequate and qualified science teachers cannot be compromised for the success of any science programme. It has been commented that, however well conceived a programme is, however valid the theory that underlies it, and whatever the objectives of the plan are, will be determined by the nature, quality, attitudes, motivation and convictions of the classroom teacher (Obomanu & Akporehwe, 2011).

The sources of gender differences in educational outcomes have been the subject of considerable study and debate. One particularly contentious issue involves the possible role played by males and females in learning processes. One hypothesis is that male and female teachers have unique biases with respect to how they engage boys and girls in the classroom, similarly, cognitive process theories (Jones & Dindia, 2004), suggest that teachers may subtly communicate that they have different academic expectations of boys and girls.

STATEMENT OF THE PROBLEM

Biology has been defined by Sarojini (2011) as the study of living things. This subject is the gateway to many professions which include medicine, pharmacy, nursing and so on. Despite its importance to mankind, effort of researchers to improve its teaching and learning is still been jeopardized. Also, biology is seen as the most populous science subject offered by most Nigerian students, students' performance in

Biology compared to the other pure science subjects taught in Nigeria remains low. Furthermore, it has been observed that the present strategies used in teaching science in general and Biology in particular in Nigeria secondary schools do not produce maximum result.

Researchers in biology education have studied on the various innovative teaching strategies like, problem solving, field trips, individualism, cooperative learning, use of analogy, constructivism, computer assisted instruction, inquiry, among others and how they can be used to improve the teaching and learning of science in general and biology in particular, examples of such researchers are Yusuf and Adedeji (2010), Jiya (2011), Udeani and Okafor (2012) among others. Most of these researchers studied the effectiveness of new teaching strategies generally and compared these strategies with conventional approaches, without examining the awareness of in-service teachers on the existence of these strategies, the level of awareness and the degree of application of the ones they are aware of. Thus, this study was set out to investigate biology teachers' awareness and utilization of innovative teaching strategies in public schools in Oyo South Senatorial District, Nigeria.

PURPOSE OF THE STUDY

The main purpose of this study was to examine the level of awareness and utilization of the innovative teaching strategies by biology teachers in teaching of secondary school Biology. Specifically, the study sought to examine:

1. The biology teachers' awareness of the selected innovative teaching strategies.
2. The level of the Biology teachers' awareness of the innovative teaching strategies.
3. The level of use of the innovative strategies in the teaching of Biology.
4. The influence of teaching experience of the biology teachers on their utilization of the innovative teaching strategies.
5. The influence of the biology teachers' qualification on their utilization of the innovative teaching strategies.
6. The influence of gender of the biology teachers on their utilization of the innovative teaching strategies.

Research Questions

1. Are the biology teachers in Oyo South Senatorial District, Nigeria, aware of the selected innovative teaching strategies?
2. To what level are the biology teachers in Oyo South Senatorial District, Nigeria, aware of the innovative teaching strategies?
3. To what level are the innovative strategies put into use in the teaching of biology in Oyo South Senatorial District, Nigeria?
4. To what level does the utilization of the innovative teaching strategies differ based on the teaching experience of the biology teachers in Oyo South Senatorial District, Nigeria?

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5. Does qualification of the biology teachers in Oyo South Senatorial District, Nigeria, influence their utilization of the innovative teaching strategies?
6. How does the utilization of the innovative teaching strategies differ based on the gender of the biology teachers in Oyo South Senatorial District, Nigeria?

Research Hypotheses

- HO₁:** There is no significant difference in the level of utilization of the innovative teaching strategies by experienced and less experienced biology teachers in Oyo South Senatorial District, Nigeria.
- HO₂:** There is no significant difference in the level of utilization of the innovative teaching strategies by qualified and unqualified biology teachers in Oyo South Senatorial District, Nigeria.
- HO₃:** There is no significant difference in the utilization level of the innovative teaching strategies by gender in biology teachers in Oyo South Senatorial District, Nigeria.

RESEARCH METHODOLOGY

This study was a descriptive research of the survey type. The population for the study comprised all the biology teachers in Oyo South Senatorial District, Nigeria. The sampling techniques utilized included random and purposive sampling method as all the biology teachers in the three out of the six science secondary schools in the target population were purposively considered and biology teachers were randomly sampled. The sample included three hundred (300) biology teachers in public schools in Oyo South Senatorial district, which is made up of three Educational Zones which are Ibarapa Educational Zone, Ibadan 1 and Ibadan 11 Educational Zones. At least twenty schools from each of the nine (Ibadan North, Ibadan North East, Ibadan North West, Ibadan South East, Ibadan South West, Ibarapa Central, Ibarapa North, Ibarapa East, Ido) Local Government Areas making up the senatorial district were randomly sampled.

The research instrument was a structured questionnaire known as the Innovative Teaching Strategies Questionnaire (ITSQ) designed by the researcher. The questionnaire was made up of sections A and B. Section A was based on the awareness of the 25 identified innovative teaching strategies, having a 2-option rating scale of Aware and Not Aware. Section B was based on the extent of utilization of the innovative strategies by the biology teachers. It had a 3- option rating scale of Frequently Used, Seldom Used, and Never Used.

The instrument was subjected to content and face validity and was tested for reliability using test-retest reliability procedure. The reliability coefficient of 0.71 was established. Percentage and mean statistics were used to analyze the data. In making decisions, awareness level of 50% and above was considered as adequate while any awareness below 50% was considered as inadequate.

ANALYSES OF RESULTS

Research Question 1: Are the Biology Teachers in Oyo State aware of the selected innovative teaching strategies?

Table 1: *Awareness of the Innovative Teaching Strategies among the Biology Teachers*

S/N	Teaching strategy	Unaware	%	Aware	%
A1	Acronym Memory	72	24%	228	76%
A2	Active Learning	39	13%	261	87%
A3	Analogy	39	13%	261	87%
A4	Checklist	147	49%	153	51%
A5	Choral Response	72	24%	228	76%
A6	Classification	15	5%	285	95%
A7	Computer Assisted Instruction	30	10%	270	90%
A8	Constructivism	114	38%	186	62%
A9	Cooperative Learning	18	6%	282	94%
A10	Demonstration	9	3%	291	97%
A11	Field Trip	63	21%	237	79%
A12	Individual Learning	81	27%	219	73%
A13	Laboratory	36	12%	264	88%
A14	Mind Map	156	52%	144	48%
A15	Minimalism	210	70%	90	30%
A16	Models	27	9%	273	91%
A17	Multimedia	72	24%	228	76%
A18	Problem Solving	6	2%	294	98%
A19	Project Based Learning	48	16%	252	84%
A20	Role Playing	54	18%	246	82%
A21	Socratic Method	180	60%	120	40%
A22	Study Aids	0	0%	300	100%
A23	Team Teaching	15	5%	285	95%
A24	Unknown-known	87	29%	213	71%
A25	Vee Mapping	132	44%	168	56%

Table 1 above shows the percentage of awareness of each of the listed twenty-five innovative teaching strategies based on the responses of the biology teachers. The average awareness of the innovative teaching strategies is gotten to be 77.04% while the 22.96 of the innovative teaching strategies had no awareness. This implies that most biology teachers in Oyo Senatorial District are aware of the innovative teaching strategies.

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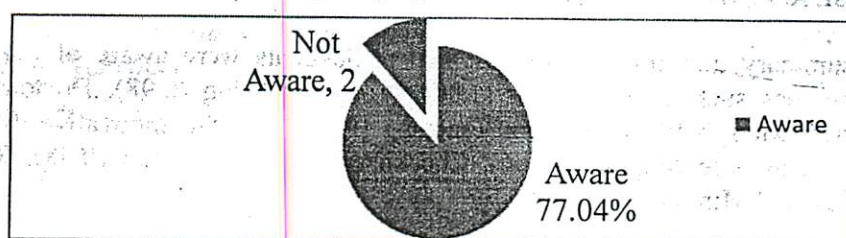


Figure 1: Prevalence Level of Awareness of the Innovative Teaching Strategies among the Biology Teachers

Research Question 2:

To what level are the Biology Teachers aware of the innovative teaching strategies?

In response to this, Mean Statistics was conducted to show the level of awareness of innovative teaching strategies.

Table 2: Ranked Response to Awareness of the Innovative Teaching Strategies among the Biology Teachers

Item	Mean Score	Rank
Study Aids	1.00	1
Problem Solving	0.98	2
Demonstration	0.97	3
Classification	0.95	4
Team Teaching	0.95	4
Cooperative Learning	0.94	6
Models	0.91	7
Computer Assisted Instruction	0.90	8
Laboratory	0.88	9
Active Learning	0.87	10
Analogy	0.87	10
Project Based Learning	0.84	12
Role Playing	0.82	13
Field Trip	0.79	14
Acronym Memory	0.76	15
Choral Response	0.76	15
Multimedia	0.76	15
Individual Learning	0.73	18
Unknown- known	0.71	19
Constructivism	0.62	20
Vee Mapping	0.56	21
Checklist	0.51	22
Mind Map	0.48	23
Socratic Method	0.40	24
Minimalism	0.30	25

In summary, the findings suggest that respondents were aware of innovative teaching strategies such as Study aids (1.00), Problem solving (0.98), Demonstration (0.97), Classification (0.95) and Team Teaching (0.95) than the Innovative Teaching Strategies such as Vee Mapping (0.56), Checklist (0.51), Mind map (0.48), Socratic Method (0.40), and Minimalism (0.30).

Research Question 3:

To what level are the innovative strategies put into use in the teaching of Biology in Oyo State?

In response to this, percentage and Mean Statistics were carried out and the result showed that there was a high level of utilization of innovative teaching strategies among respondents. In particular, the result showed that 58.84% of the innovative teaching strategies had high level of utilization, 31.04% of the innovative teaching strategies were seldom utilized while 11.50% were not utilized.

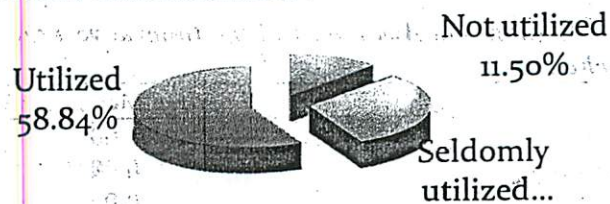


Figure 2: Prevalence Level of Utilization of the Innovative Teaching Strategies among the Biology Teachers

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Table 3: Ranked Response to Utilization of the Innovative Teaching Strategies among the Biology Teachers

Item	Mean Score	Rank
Demonstration	1.95	1
Classification	1.89	2
Problem Solving	1.86	3
Study Aids	1.83	4
Active Learning	1.82	5
Analogy	1.71	6
Acronym Memory	1.67	7
Cooperative Learning	1.62	8
Laboratory	1.62	8
Team Teaching	1.55	10
Role Playing	1.54	11
Choral Response	1.49	12
Models	1.47	13
Project Based Learning	1.46	14
Checklist	1.39	15
Field Trip	1.36	16
Individual Learning	1.35	17
Multimedia	1.34	18
Constructivism	1.30	19
Unknown- known	1.29	20
Computer Assisted Instruction	1.28	21
Mind Map	1.18	22
Minimalism	1.12	23
Vee Mapping	1.10	24
Socratic Method	0.99	25

In addition to the response to research question 3, Table 3 shows rank responses on the level of utilization of the innovative teaching strategies, as indicated by respondents

Research Question 4:

To what extent does the utilization of the innovative strategies differ based on the Biology teachers' teaching experience? This translates to the corresponding hypothesis 1 (HO₁) which states that:

Research Hypothesis 1:

There is no significant difference in the utilization of the innovative teaching strategies between experienced and less experienced biology teachers. A t-test analysis was conducted to determine whether the level of utilization of the innovative teaching strategies significantly differs for respondents based on their teaching experience. The findings are presented in Table 4.

Table 4: t-test Analysis Output for Significant Difference in the Utilization of the Innovative Teaching Strategies on the Basis of Biology teachers' Teaching Experience

Variable	N	Mean	SD	df	t_{cal}	Sig	Decision
Less experienced Teachers	201	36.61	8.671	298	0.908	0.365	Fail to reject
Experienced teachers	99	37.46	7.151				

* Significant at $p < .05$

The result in Table 4 shows that the difference in utilization level for less experienced teachers (36.61) and experienced (37.46) yielded a t-statistics of 0.908 and p-value of 0.365; this result was not significant since the t-test shows significant at 0.365 which was not less than p-value 0.05 level of significance. Therefore, there was no significant difference in the level of utilization of innovative teaching strategies based on teaching experience of the biology teachers.

This implies that the level of utilization of innovative teaching strategies is similar for respondents irrespective of their different teaching experience

Research Question 5:

Does the qualification of the Biology teachers influence the Utilization of the Innovative teaching strategies?

Research Hypothesis 2:

There is no significant difference in the utilization of the innovative teaching strategies based on the qualification of the biology teachers.

In response to this, an Analysis of Variance (ANOVA) test was conducted to determine whether level of utilization of the innovative teaching strategies is significantly different for respondents based on their academic qualification. The findings are presented in Table 5

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Table 5: Analysis of Variance (ANOVA) Output for Significant Difference in the Utilization of Innovative Teaching Strategies on the Basis of Teachers' Academic Qualification

Source	Sum of Squares	df	Mean Square	F_{cal}	P_{value}	Decision
Academic Qualification	1,185.56	3	395.19	7.108	0.000	Reject H_0
Error	16,456.72	296	55.60			
Corrected Total	17,642.28	299				

* Significant at $p < .05$

The result in Table 5 shows that the ANOVA analysis yielded $F(3, 296) = 7.108$ and p -value of 0.000; this result was deemed to be statistically significant since the obtained p -value (0.000) was less than 0.05 level of significance. Therefore, there was a significant difference in the level of utilization of the innovative teaching strategies based on the academic qualification of the biology teachers. As such, in order to identify the academic qualification of the respondents based on the different groups, a Duncan Multiple Range post-hoc test was conducted. The result showed that the respondents with NCE (41.57) and B. Sc (Ed) (39.56) had significantly higher level of utilization than their counterparts with either HND (37.77) or B. Sc (35.34). Thus, utilization level seems to be higher for respondents having a certification in Education, as against those without any certification in education. The results are presented in Table 6.

Table 6: Duncan Multiple Range Test (DMRT) Showing Mean Utilization Scores Based on Academic Qualification of Respondents

Academic Qualification	N	Mean	Group
B. Sc	141	35.34	BC
HND	48	37.77	B
B. Sc (Ed)	90	39.56	AB
NCE	21	41.57	A

Research Question 6:

How does utilization of the innovative teaching strategies differ based on the Biology teachers' gender? This translates to the corresponding hypothesis 3 (H_0) which states that:

Research Hypothesis 3:

There is no significant difference in the utilization of the innovative teaching strategies between male and female biology teachers.

In response to this, a t-test analysis was conducted to determine whether the level of utilization of innovative teaching strategies was significantly different between the respondents based on their gender. The findings are presented in Table 7.

Table 7: t-test Analysis Output for Significant Difference in the Utilization of the Innovative Teaching Strategies on the Basis of Gender

Variable	N	Mean	Std. Dev.	df	t_{cal}	Sig	Decision
Male	120	35.55	7.35	298	3.042*	0.003	Reject H_0
Female	180	38.27	7.72				

*Significant at $p < .05$

The result in Table 7 shows that the difference in utilization level for male (35.55) and female (38.27) yielded a t-statistics of 3.042 shows a level of significant at 0.003 which is lesser than the p-value of 0.05; this result was deemed to be statistically significant since the obtained value (0.003) was less than 0.05 level of significance. Therefore, there was a significant difference in the level of utilization of innovative teaching strategies based on gender with female teachers having a higher mean of utilization than the male teachers.

DISCUSSION

The study comprehensively focused on the awareness and utilization of twenty five (25) innovative teaching strategies by biology teachers in the teaching of the subject in Oyo South Senatorial District, Nigeria with special emphasis on the role of gender, experience, and educational qualification on the teachers' level of utilization of these innovative teaching strategies

The study found out that the respondents surveyed had more awareness of the selected innovative teaching strategies with the awareness level of 77.04%. Significantly, this puts the average teacher at an advantage position to impart upon students; the knowledge of biology since he/she has a number of strategies to utilize. This finding agrees with that of Crocker and Algina (1986), who asserted in their work that the individual needs of the students could not be achieved with a traditional teaching method, like lecture method, as each student comes from different background, possesses different questions about things being taught and have different focus towards the environment. Hence, there is need for teachers to be aware of different strategies that can bring clarity to what is taught to each student. Thus, it is not outlandish to infer that the effective learning and understanding of scientific concepts and theories, including the area of Biology, is premised on the teachers' knowledge of the existence of the innovative teaching strategies.

However, on a more specific note, the study findings revealed that the use of Study aids, Problem solving, Demonstration, Classification and Team teaching were the

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most popular innovative teaching strategies among Biology teachers, whereas Mind map, Socratic method, and Minimalism were least popular with the respondents.

Consequently, on the high level of awareness of the innovative teaching strategies amongst Biology teachers, the study found out that majority of respondents actually utilized these strategies in the teaching of Biology. Put at 58.84% utilization level, it could be inferred that rather than claiming to be aware of the innovative teaching strategies, the teachers were actually utilizing the strategies. Although, this finding does not correspond with the studies of Achor (2003), Umoren and Ogong (2007), Ogbeba (2009) which inferred that most science teachers in Nigeria do not make use of varying strategies to cope with the difficulties associated with the teaching of science. However, the study identified Demonstration, Classification, and Problem solving, Study Aids and Active Learning as the most utilized innovative teaching strategies, while Mind Map, Minimalism, Vee mapping, and Socratic Method, were least utilized.

This study found out that female teachers had a significantly higher utilization level of innovative teaching strategies than their male counterparts. This finding supports the research result of Khurshid and Zahur (2013) which found out that female teachers were more aware and utilized innovative teaching strategies than male teachers. However, on the contrary, study by Olagunju and Abiona (2008) revealed that male teachers' perception of utilization of instructional materials in teaching was higher than that of the female teachers.

This study also found out that teachers with a background in educational qualification had a significantly higher utilization level of the innovative teaching strategies than their counterparts without any background in educational studies. This finding is supported by Samba, Achor and Ogbeba (2010), and Khursid and Zahur (2013) who found that qualified teachers are aware of the innovative teaching strategies than unqualified counterparts.

In terms of teaching experience, the study discovered that there was no significant difference in the utilization of innovative teaching strategies based on biology teachers' experience. This implies that the level of utilization of innovative teaching strategies is similar for respondents irrespective of their different years of experience. This finding is in disagreement with the studies of Samba, Achor and Ogbeba (2010) and Khurshid and Zahur (2013) who discovered that experienced teachers utilized innovative strategies more than the less experienced ones.

CONCLUSION

With the results findings obtained in this study, it is clear that Biology teachers were aware of different innovative teaching strategies they could use to improve their teaching; thereby making learning more interesting, challenging as well as improving students' ability to apply school knowledge to real life problems.

On the awareness of the innovative teaching strategies, it is concluded that the level of awareness was high but teachers needed to improve in this area as there were some of the strategies that have low level of awareness, such strategies include Mind Map, Socratic Method, and Minimalism. On the utilization of the innovative teaching

strategies, it was discovered that the level of utilization of the strategies by the biology teachers was high as it was discovered that 58.84.0% of the innovative teaching strategies were utilized especially strategies such as Demonstration, Classification, Problem Solving, Study Aids and Active Learning, 31.04% of the strategies were seldom utilized while 11.50% of the innovative teaching strategies were not utilized. The issue of concern now is how effective these listed strategies are put to use.

On teachers' experience, it is concluded that the experience of the teachers had no effect on their use of the innovative teaching strategies and that both experienced and less experienced teachers ascribed the same attitude towards the use of the innovative teaching strategies. The effect of teachers' qualification on the use of the innovative teaching strategies is investigated to be positive and teachers with teaching qualifications were discovered to utilize the selected strategies more than the teachers without any teaching qualification. It is further concluded that female biology teachers utilized the innovative teaching strategies more than the male biology teachers. This may be because female teachers are said to be more concerned about the academic achievement of their student and also participate more in professional development than the male teachers.

RECOMMENDATIONS

As a consequence of this study, the following recommendations are advanced:

1. Since the biology teachers were familiar with almost all the strategies, workshops, seminars and symposia should be organized for in-service science teachers on the awareness of the innovative teaching strategies with low level of awareness as each of the strategies have specific areas where effective.
2. In the area of utilization of the innovative teaching strategies, workshops, seminars and in-service training should be organized for teachers on the ways they can effectively put the innovative teaching strategies to use.
3. Authors of Science textbooks in general and biology in particular should illustrate carefully in their books how to effectively make use of all the strategies and especially the non-adequately utilized innovative teaching strategies.
4. Teacher training institutions should include the least and non-utilized strategies found in this study - specifically CAI, Minimalism, Socratic Method, Mind Maps, Project Based, Acronym Memory, Vee Mapping, Constructivism, Field Trip, Individualized Learning, Checklist, Unknown to Known, and Analogy into their curricular packages and make deliberate efforts to get the biology teachers acquainted with the use of each of the strategies effectively.

REFERENCES

- Achor, E. E. (2003). Cognitive correlates of physics achievement of some Nigerian senior secondary students. *Journal of the Science Teachers Association of Nigeria*, 38(1&2), 10- 15.
- Achor, E. E. (2008). *Repositioning physics teaching and learning in secondary schools in Benue State: Focus on strategies for teaching difficult concepts*. Workshop material on retraining for maximum efficiency in secondary schools by Benue State Ministry of Education, 178 – 187.
- Ahmed, M. A. (2009) Faculties'/Lecturers' assessment of difficulty levels of genetics concepts in Nigeria Colleges of Education. *Journal of curriculum and Instruction*.
- Ahmed, M. A. & Abimbola, I. O. (2011). Influence of teaching experience and school location on biology teachers' ratings of the difficulty levels of nutrition concepts in Ilorin, Nigeria. *Journal of Science, Technology, Mathematics and Education*. 7(2), 52-61.
- Ahmed, M. A; Abimbola, I. O; Omosewo, E. O. & Akanbi, A. O. (2012). Availability and utilization of instructional resources for teaching basic science in junior secondary schools in Ilorin, Nigeria. *Science Teachers Association of Nigeria Journal*, 53rd Annual Conference, 203-214.
- Adegbite, A. J. (2005). *General biology for management students*. Abeokuta: Ebensun Publishing and Printing Press.
- Akubuilu, D. U. (2004). The effects of problem solving instructional strategies on students' achievement and retention in biology with respect to location in Enugu State. *Journal of Science Teachers Association of Nigeria*, 39(1&2), 94-100.
- Blair, G. M., Jones, R. S., & Simpson, R. H. (1988). *Educational Psychology* (4th Edition). USA: Macmillan Publishers. Co. Inc.
- Crocker, L., & Algina, J. (1986). *Introduction to classical and modern test theory*. Fort Worth, Harcourt: Brace Jovanovich College Publishers.
- Fives, H., & Lisa, L. (2008). College instructors' sense of teaching and collective efficacy. *International Journal of Teaching and Learning in Higher Education*, 20, 182-191.
Retrieved from <http://www.isetl.org/ijtlhe/pdf/IJTLHE330.pdf>

GBADAMOSI, A. F., ABIMBOLA, I. O. & AHMED, M. A.

Fives, H. (2010). Examining the factor structure of the teachers' sense of efficacy scale. *Experimental Education*, 78, 118-134.
<http://dx.doi.org/10.1080/00220970903224461>

Ijaiya, N. Y. S. (2000). Failing schools and national development: Time for reappraisal of school effectiveness in Nigeria. *Nigeria Journal of Educational Research and Evaluation*, 2(2), 37-44.

Ikeobi, I. O. (1987). A presidential address presented at the 29th annual conference of the Science Teachers Association of Nigeria held at Tafawa Balewa College, Bauchi from 17th to 22nd August, 1987; (7-15).

Jegede, J. O., Lagoke, B. A., & Oyeibanji, P. K. (1995). *The use of environmental analogs to enhance biology learning among senior secondary school students*. Unpublished research paper.

Jiya, A. (2011). *Effects of teaching-with-analogy on academic performance and retention of evolution concepts among Nigeria Certificate in Education biology Students*. Unpublished

M. Ed. project. Department Of Education, Faculty of Education, Ahmadu Bello University, Zaria. Nigeria.

Jones, S. M., & Dindia, K. (2004). "A meta-analytic perspective on sex equity in the classroom." *Review of Educational Research*, 74(4), 443-71.

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 (2013) 12242-12245. Retrieved, 28th December 2012 online from <http://www.elixirpublishers.com>

Maduadum, M. A. (1994). Teachers' perception of difficult topics in the Nigerian Senior Secondary Certificate biology. *Gobarau Bi-Annual Multi-Discipline Journal of Education Katsina*, 1 (1) 161-165.

Obomanu, B. J., & Akporehwe, J. (2011). Resources for teaching secondary school biology in Bayelsa State of Nigeria. *Information and Knowledge Management*, 1(2) 2011. Available online @ www.iiste.org

Ogbeba, J. A. (2009). *Effect of prior knowledge of instructional objectives on senior secondary school students' motivation and achievement in biology*. Unpublished Ph.D. thesis, Faculty of Education, Benue State University, Makurdi.

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- Okebukola, P. A. (1998). Concept maps as instructional tools for promoting meaningful learning in biology. Science Teachers Association of Nigeria. Biology Panel Workshop Proceeding, Osogbo.
- Olagunju, A. M., & Abiona, O. F. (2008). Production and utilization of resources in biology education: A case study of South West Nigerian secondary schools. *International Journal of African and African American Studies*, 7(2), 49-56.
- Olorundare, A. S. (2011). *Correlates of poor academic performance of secondary students in the science in Nigeria*, Paper presented at the International Institute for Capacity Building in Higher Education, Virginia State University, Petersburg Virginia, USA. (June, 20-31, 2011).
- Oludipe, B., & Oludipe I. D. (2010). Effect of constructivist-based teaching strategy on academic performance of students in integrated science at the junior secondary school level. *Educational Research and Reviews*, 5(7), 347-353. Retrieved July 2010. <http://www.academicjournals.org/ERR2>
- Olumorin, C. O. (2008). *Lecturers' attitude to, competence in, and use of computers in tertiary institutions in Kwara state, Nigeria*. Unpublished doctoral dissertation submitted to the department of science education, University of Ilorin, Ilorin Nigeria.
- Samba, R. M., Achor, E. E., & Ogbeba, J. A. (2010). Teachers' awareness and utilization of innovative teaching strategies in secondary school science in Benue State, Nigeria. *Educational Research*, 1(2), 32-38. Retrieved March, 2010. <http://www.interestjournals.org/ER>.
- Soodak, L. & Podell, D. (1997). Efficacy and experience: Perceptions of efficacy among pre- service and practicing teachers. *Journal of Research and Development in Education*, 30, 214-219.
- Udeani, U., & Okafor, P. N. (2012). The effect of concept mapping instructional strategy on the biology achievement of senior secondary school slow learners. *Journal of Emerging Trends in Educational Research and Policy Studies (JETERAPS)*, 3 (2), 137-142.
Retrieved 2012 from jeteraps.scholarlinkresearch.org
- Ukoha, U. A. (2008). *Problems affecting effective utilization of instructional materials in Nigerian primary schools*. Paper presented at the camping orientation workshop for UBE Federal Teachers held at FCE Obudu, January.

- Umören, G. O., & Ogong, A. S. (2007). Prior presentation of behavioral objectives and students' achievement in biology. *Educational Research Revision*, 2(2), 22-25.
- Yusuf, M. O., & Adedeji, O.A. (2010). Effect of computer assisted instruction on secondary school students performance in biology. *The Turkish Online Journal of Educational Technology*, 9(1), 62-69.