Survey of Science Teachers' Use of Innovative Methods of Teaching

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***Abstract*: This paper investigated science teachers use innovative teaching methods in FCT senior secondary Schools, Abuja. Descriptive survey research design was adopted for the study. A sample of 242 was selected from the population of science teachers using simple random sampling technique. Three research questions and two hypotheses guided the study. A structured questionnaire made up of 30 items was used for the purpose of data collection. The questionnaire was validated by experts in Science Education and a reliability index of 0.91 was obtained using Cronbach Alpha. The data collected were analyzed with SPSS version 23 using mean, standard deviation and the hypotheses were tested using t-test. Findings of the study revealed that the extent to which science teachers in FCT senior secondary schools use innovative teaching methods is high. It was also found that there was no significant difference between male and female Science Teachers' use of innovative methods of teaching in Senior Secondary Schools of the Federal Capital Territory, Abuja. Based on the findings, it was recommended among others that Science Teachers should be encouraged to increase the use of innovative methods of teaching in senior secondary schools in the Federal Capital Territory, Abuja through attending of conferences, workshops and seminars.**

***Key Words*: Survey, teaching, innovative methods, Science Teachers**

I. INTRODUCTION

The quality of education is dependent on the teachers who are the implementers of the curriculum. Therefore, education cannot outgrow the quality and quantity of teachers in our educational system. Aderonmu (2014) cited in Olaiya (2018) pointed out that an effective teacher is one who demonstrates good knowledge of the curriculum, provides instruction in a variety of approaches to various students and measurably increases students' academic achievement. However, there are several factors that come into play in order for teachers to discharge their duties effectively to bring about the quality of education yearned for by the society. One of those factors is the instructional methods of teaching used by teachers in any discipline, be it Science or Arts. Alabi, Lasisi and Thaddeus (2016) stated that students' ability to achieve within the classroom setting has been largely adduced to the quality of instruction, personality of the teacher and availability of instructional materials among others.

Researchers maintain that inappropriate methods of teaching used by Science teachers are instrumental to students' poor academic achievement or performance. According to Aina and Langenhoven (2015), many teachers teaching Science in Nigerian secondary schools lacked appropriate instructional strategies for teaching and often used lecture method which has been criticized for lack of effective interactive approach and caused poor academic performance in Science Education. Gambari, Ezenwa and Anyawu (2014) asserted that poor teaching strategy is responsible for poor performance. Ajaja (2013) pointed out the method adopted for teaching and learning Science as one of the factors contributing to low interest in Science and hence expressed the need for a search for alternative instructional strategies that could stimulate students' interest and enhance their achievement. Therefore, success or failure of every teaching and learning process lies in the instructional strategies employed by the teacher. Hence, teachers have the responsibility of using most appropriate teaching method that can improve learners' ability to assimilate, retain and recall information when the need arises.

There are several methods of teaching Science as posited by Science educators. Aina and Langenhoven (2015) stated that the teaching methods commonly used in Science Education classes are lecture and demonstration methods. The prescribed methods for implementing the senior school science curricula are field trip, guided discovery, problem solving, and project based learning (Oyelekan, Igbokwe & Olorundare, 2017). Hence, the need for use of innovative methods for effective teaching and learning of Science cannot be overstated.

Innovative methods of teaching Science are the modern instructional strategies employed by the Science teacher to communicate and facilitate interactions with his/her students and the subsequent outcome of the whole teaching-learning process. Among the specific innovative methods targeted in this study are Science Text Cards, Peer to Peer Teaching, Enquiry, Discussion, Individualized Learning, Concept Mapping, Creative Illustration and Virtual Science Lab.

Science Text Cards: This is an innovative teaching method that conveys the science facts in an easy and organized way. In this activity, statements related to science concepts are written **on** index cards. Students can work individually, pairs or in groups to sort the cards based on the given format. The formats include true/false, agree/disagree, matching pairs, classification, sequencing and more (Tufail & Mahmood, 2020). Recent studies have shown that innovative strategies produce better result by improving students' learning. The problem then, is to what extent do Science teachers use innovative methods of teaching in senior secondary schools of the Federal Capital Territory, Abuja. It is against this background that this study sought to investigate Science

teachers' use of innovative methods of teaching in senior secondary schools of the Federal Capital Territory, Abuja.

Objectives of the Study

In order to achieve the purpose of this study "Science teachers' use of innovative methods of teaching in senior secondary schools of the Federal Capital Territory, Abuja", the following specific objectives are formulated to guide the study. They are to determine:

1. The extent to which Science teachers use innovative methods of teaching in senior secondary schools of FCT, Abuja
2. The difference between male and female Science teachers' use of innovative methods of teaching in senior secondary schools of FCT, Abuja.
3. The difference between Science teachers' use of innovative methods of teaching on the basis of teaching experience in senior secondary schools of FCT, Abuja.

Research Questions

The following research questions were raised to the guide the study:

1. To what extent do Science teachers use innovative methods of teaching in senior secondary schools of FCT, Abuja?
2. What is the difference between male and female Science teachers' use of innovative methods of teaching in senior secondary schools of FCT, Abuja?
3. Is there difference in Science teachers' use of innovative methods of teaching based on teaching experience in senior secondary schools of FCT, Abuja?

Research Hypotheses

The following hypotheses were formulated to guide the study and were tested at a 0.05 level of significance

HO_1: There is no significant difference between male and female Science teachers' use of innovative methods of teaching in senior secondary schools of the Federal Capital Territory, Abuja.

HO_2: There is no significant difference between Science teachers' use of innovative methods of teaching on the basis of teaching experience in senior secondary schools of the Federal Capital Territory, Abuja.

II. LITERATURE REVIEW

The teaching and learning of Science can be teacher-centred or learner-centred. Whichever a Science teacher uses should be geared towards improving students' understanding of the content. However, teachers' idea of holding on to the traditional approaches such as teacher-centered strategies has not sufficiently helped the learners. According to Aina and Langenhoven (2015), research shows that students' retention in a lecture-based Science courses is weak. Instructional methods of teaching that are learner-centered must be employed by Science teachers. Miles (2014) supported this assertion by saying that Science teachers should incorporate methodologies that require a greater level of students' activity. Miles (2015) asserted that it is expected of a teacher to implement a range of instructional strategies that will bring academic success to all the Science students.

Oyelekan, Igbokwe and Olorundare (2017) asserted that persistent poor performance in Science subjects at school certificate level has given rise to an assumption that most Science teachers in secondary schools in Nigeria probably do not make use of varied forms of teaching strategies to be able to cope with some specific difficulties associated with the teaching and learning of Science by both the teachers and the students. Ogbonne and Offorma (2013) observed that traditional method of teaching has failed to promote genuine Mathematical understanding, students' active participation and independent work. Hence, there is need for teachers' use of innovative instructional strategies or methods that stress the processes of learning and students' involvement.

According to Afolabi and Lawal (2021) classroom interaction needs to be improved upon, well structured in such a way that appropriate teaching and learning strategies should be employed as classroom situation demands. Innovative methods of teaching Science facilitate interactions with students and bring about positive learning outcomes. Sabiru (2014) used one of these innovative instructional methods in Katsina State on the topic balancing of chemical equations and it proved effective in improving the academic achievement of students in Chemistry. Lamidi, Oyelekan and Olorundare (2015) carried out a similar study to determine the effects of mastery learning instructional strategy on secondary school students' achievement in mole concept, a topic perceived difficult for understanding by students. The result showed that students taught using the mastery learning instructional strategy did excellently well.

Moreso, Gambari, Yusuf and Thomas (2015) studied the effectiveness of computer-assisted instruction on Student Team Achievement Division (STAD) and Learning Together Model (LTM) cooperative learning strategies on Nigerian secondary school students' achievement and motivation in Physics. The study discovered that these innovative instructional methods bring about students' achievement and motivation in Physics. Abdulwahab, Oyelekan and Olorundare (2016) further investigated the effects of cooperative instructional strategy on senior secondary school students' achievement in electrochemistry and it proved very effective.

III. METHODOLOGY

The study adopted descriptive survey design. According to Nworgu (2015), it is the one that describes the present status of circumstances or phenomena. The population of the study consisted of all Science teachers in public senior secondary

schools in the six (6) Area Councils of the Federal Capital Territory, Abuja. The sample of the study is 242 Science teachers selected using simple random sampling technique. This comprised 121 males and 121 females as well as 129 experienced and 113 less experienced Science teachers. The sample was drawn using Krejcie and Morgan table for determining sample size from population (Krejcie & Morgan, 1970) as cited in Okpaje (2021).

The instrument used for data collection was a questionnaire structured on 4-point modified Likert type rating scale with response options of Never, Rarely, Occasionally and Always with the weighing of 1, 2, 3 and 4 respectively. The instrument was validated by three senior university lecturers who are experts in Science Education**.** A pilot study was conducted on thirty (30) Science teachers in private senior secondary schools who are not part of the respondents. The data collected were analysed using Cronbach Alpha coefficient and the reliability coefficient obtained was 0.93 which shows that the research instrument is appropriate for the study. The questionnaire was administered and collected by the researchers. Data collected were analyzed with SPSS version 23.0 using mean, standard deviation and the hypotheses were tested using t-test. The decision rule is that when the mean is equal or above 2.50 bench mark, it means high and when it is less, it means low.

IV. RESULTS

The results are presented based on the order of research question one and hypotheses

Answer to Research Question.

Research Question 1: To what extent do Science teachers use innovative methods of teaching in senior secondary schools of FCT, Abuja?

Table 1: Science Teachers' extent of Use of Innovative Methods of Teaching

S/N	Item Description	$\bar{X}$	S.D	Response
1.	Peer to peer Teaching	3.33	0.71	High
2.	Demonstration Method	3.60	0.80	High
3.	Discovery Method	3.45	0.92	High
4.	Collaborative Teaching	2.51	0.89	High
5.	Laboratory Method	3.63	0.77	High
6.	Enquiry Method	1.87	0.51	Low
7.	Field Trip/Excursion	1.55	0.92	Low
8.	Group Discussion Method	2.50	0.60	High
9.	Individualized Learning	1.57	0.86	Low
10.	Concept Mapping	1.70	0.60	Low
11.	Science Kits	2.62	0.79	High
12.	Computer Assisted Instruction	2.58	0.70	High
13.	Project Method	3.35	0.76	High
14.	Role Playing Method	3.22	1.47	High
15.	Problem Solving Method	2.38	0.54	Low
16.	Creative Illustration	2.61	1.19	High
17.	Virtual Science Lab	2.12	1.07	Low
18.	Instructional Conservations	1.79	1.02	Low
19.	Visual Clues	2.90	0.96	High
20.	Social Media	2.19	1.21	Low
21.	Multimedia Approach	2.73	1.11	High
22.	Video Clips	2.46	0.99	Low
23.	Flipped Classroom	1.98	1.04	Low
24.	Science Quiz	3.54	0.62	High
25.	Interactive Science Journal	1.87	1.13	Low
26.	Science Exhibition	2.57	0.89	High
27.	Mobile Apps for Science	1.78	1.22	Low
28.	Science Text Cards	2.04	1.12	Low
29.	Science Fair	3.46	0.98	High
30.	Power Points	2.02	1.02	Low
Grand Mean ($\bar{X}$)		2.53	0.91	High

Table 1: shows the extent to which Science teachers use innovative teaching methods in FCT senior secondary schools, Abuja. The result indicates that the extent to which Science teachers use innovative teaching methods is averagely high. Item 5 which lists 'Laboratory Method' has the highest Mean ($\bar{X}$) of 3.63 with a Standard Deviation of 0.77. The grand Mean ($\bar{X}$) of 2.53 of the thirty (30) items on respondents questionnaire indicated that the extent to which Science Teachers in FCT senior secondary schools use innovative teaching methods is high

HO_1: There is no significant difference between male and female Science teachers' use of innovative methods of teaching in senior secondary schools of the Federal Capital Territory, Abuja.

Table 2: Summary of independent t-test Analysis of the difference between male and female Science teachers' use of innovative method of teaching

Variable	N	$\bar{X}$	S.D	*df*	t-value	p-value
Male	121	38.01	13.80	240	0.03	0.44
Female	121	37.96	13.61			

Table 2 shows the summary of independent t-test analysis of the difference between male and female Science teachers' use of innovative methods of teaching in senior secondary schools (t = 0.03, df = 240 and P > 0.05). Hence, the null hypothesis was accepted. Therefore, there was no significant difference between male and female Science teachers' use of innovative methods of teaching in senior secondary schools of the Federal Capital Territory, Abuja. This implies that gender does not influence Science teachers' use of innovative methods of teaching in senior secondary schools.

HO_2: There is no significant difference between Science teachers' use of innovative methods of teaching on the basis of teaching experience in senior secondary schools of the Federal Capital Territory, Abuja.

Table 3: Summary of independent t-test analysis of the difference between Science teachers' use of innovative methods of teaching based on teaching experience

Variable	N	$\bar{X}$	SD	*df*	t-value	p-value
Experienced	129	45.83	16.92	240	8.52	0.00*
Less experienced	113	30.14	10.49			
***Significant**						

Table 3 shows the summary of independent t-test analysis of the difference between Science teachers' use of innovative methods of teaching based on teaching experience (t = 8.52, df = 240, and P < 0.05). Hence, the null hypothesis was rejected. Therefore, there was a significant difference in Science teachers' use of innovative methods of teaching on the basis of teaching experience in senior secondary schools of the Federal Capital Territory, Abuja. It means teaching

experience of Science teachers greatly influence the use of innovative methods of teaching.

V. DISCUSSION OF THE FINDINGS

Table 1 shows the extent to which Science teachers use innovative methods of teaching in FCT senior secondary schools, 30 items were raised and teachers' use of innovative methods of teaching was high in sixteen (16) items (1, 2, 3, 4, 5, 8, 11, 12, 13, 14, 16, 19, 21, 24, 26 and 29) with a grand mean ($\bar{X}$) of 2.53. This indicates that the extent to which Science teachers in FCT senior secondary schools use innovative methods of teaching is high. This disagrees with the earlier submission of Oyelekan, Igbokwe and Olorundare (2017) who stated that most of the Science teachers frequently utilized only two (2) innovative teaching strategies out of the thirty six (36) that were selected, while the remaining thirty four (34) strategies were rarely utilized as the mean utilization for each of the strategies was below 2.5.

Again, when gender was compared on the extent of Science teachers' use of innovative methods of teaching in Table 2, the result of the null hypothesis at a 0.05 level of significance shows that there was no significant difference between male and female Science teachers' use of innovative methods of teaching. The finding agrees with the result of Achufusi and Ezenduka (2017) which revealed that there was no significant difference between male and female teachers on the extent of utilization of devices in Biology laboratory during classroom instruction. This is probably because both male and female teachers were exposed to similar training in the institution of learning. However, the finding disagrees with that of Oyelekan, Igbokwe and Olorundare (2017) which showed a significant difference between male and female science teachers' utilization of innovative teaching strategies.

It was also found that there was a significant difference in Science teachers' use of innovative methods of teaching based on teaching experience as indicated in table 3. This implies that teaching experience of Science teachers influences the use of innovative methods of teaching in senior secondary schools of FCT, Abuja. The finding is in agreement with that of Achor, Samba and Ogbeba (2010) that experienced teachers effectively used these strategies than less experienced teachers. This also agrees with the finding of Khurshid and Zahur (2013) who asserted that more experienced teachers utilized innovative teaching strategies than the less experienced ones.

VI. CONCLUSION

The study which investigated Science teachers' use of innovative methods of teaching in senior secondary schools of the Federal Capital Territory, Abuja revealed that the extent to which Science teachers use innovative methods of teaching was high and there was no significant different between male and female Science teachers' use of innovative methods of teaching in senior secondary schools. It was also found that teaching experience of Science teachers influenced the use of innovative methods of teaching in senior secondary schools of the Federal Capital Territory, Abuja.

VII. RECOMMENDATIONS

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

1. Science teachers should be encouraged to increase the use of innovative methods of teaching through several incentives.
2. All Science teachers including male, female, experienced and less experienced ones should have a synergy through conferences, workshops and seminars to enable them keep abreast and improve on their knowledge and use of innovative methods of teaching.
3. Science teachers, irrespective of the extent to which they use innovative methods of teaching should be involved in regular in-service training or routine retraining and symposia on the use of innovative methods and other instructional resources for effective teaching of Science.
4. Ministry of education should provide an enabling environment for Science teachers to use various innovative methods and instructional resources suitable for teaching and learning of Science. This includes the provision of school laboratories and training of Science teachers to ensure quality Science teaching.

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