

COMPARATIVE EFFECT OF LECTURE, DEMONSTRATION AND GUIDED DISCOVERY METHODS ON STUDENTS' ACHIEVEMENT IN SENIOR SECONDARY SCHOOL PHYSICS

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ABSTRACT

The study was to determine the comparative effects of Lecture, Demonstration and Guided-Discovery Instructional methods in facilitating secondary school students' achievement in the concept of waves in Physics in Uyo Senatorial District of Akwa Ibom State. To achieve this, three research questions were raised and three hypotheses were formulated to guide the study. The study adopted a quasi-experimental research, using non-randomized pretest, post-test design. The study sample comprised one hundred and eighty senior secondary two (SS2) Physics students (108 male, 72 female) in six intact classes in six co-educational secondary schools in Uyo Senatorial District of Akwa Ibom State selected using criterion sampling technique. The Population size of the study was three hundred and seventy two (372) SS2 Physics students of the twelve schools that met the criteria. Two public co-educational schools were selected using simple random sampling and assigned to experimental group one, experimental group two and experimental group three. The instrument used for collecting data was a researcher-made fifty (50) item multiple choices test tagged: Physics Achievement Test on Waves (PATW). This instrument was developed to measure the students' pre-test, post-test achievement on the concept of waves. Pearson's Product Moment Correlation (PPMC) was used to establish a reliability index of 0.82 for achievement. Mean, Standard deviation, independent t-test and Analysis of Covariance (ANCOVA) were used to analyse the data obtained. The finding obtained showed that, Demonstration Teaching Method is the most effective in enhancing students' academic achievement in the concept of waves in Physics. The findings further show that gender and school location had no statistically significant influence on students' achievement. Based on the findings it is recommended among others that Physics teachers should make effective use of Demonstration teaching method in teaching the concept of waves in Physics to enhance students' academic achievement.

Keyword: Lecture Method, Demonstration Method, Guided-Discovery Method, Physics, Academic Achievement.

INTRODUCTION

Physics is a science subject that all other science subjects evolved. The application of its principles has tremendously helped in the modern inventions and discoveries. It is the bedrock for scientific and technological development in local, national and global environments. To be ignorant of the basic roles, ideas, concepts, principles, and laws of physics is to live in a world of total darkness. What is physics? Physics is "matter". This is the only subject known to study matter in three phases: solid, liquid and gas with their abundant behaviours. According to Adeoye (2010)

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High level of scientific and technological attainment is dependent on the physics education of the citizenry, hence the knowledge of physics concepts at all levels of education are indeed essential ingredients for developing strong foundation and sound academic achievement in the subject as well as its applications on other science and technology fields. The knowledge of physics helps to transform the global world through entrepreneurial skills creating job opportunities, improving national economy and improving standard of living of the people. Therefore, the study of physics offers opportunity in developing and understanding of scientific methods and processes and the ability for man to discover himself. Achieving proficient in physics should be a global concern.

The study of physics cannot be effective without skillful selection of teaching methods that will foster an effective understanding by the students. The researcher skillfully select three teaching methods: guided lecture, demonstration and discovery to measure their relative effectiveness on students academic achievement in wave motions of physics.

Lecture method of teaching is a verbal presentation of ideas, facts, concepts, theories, principles and laws by a teacher to the students. The students listen to the teacher and obtain the information with less options of no or yes. Lecture method of teaching is a teacher-centered, what the teacher says seems to be the ultimate. In most of the times lecture method of teaching is based on the premise that the learner must have been acquainted with certain facts and knowledge and there is no need in wasting time to deliberate more on a topic. Lecture method summarizes a topic, concepts, ideas, facts, theories, principles, laws and practices in a more shorter time and assumes the students to cover the missing grounds. It is particularly more effective in teaching a myriad number of learners. It is the method that the teachers do the talking and the students do the listening. It is often made use by the teachers, speakers and trainers. According to Auwal (2013) lecture method remains one of the most popular methods for transmitting information and ideas by teachers, trainers and speakers. He further asserted that lecture method is one-way communication and allows for little or none audience participation, that the result is the audience missing understanding, loss of information and poor retention. Veselinovska (2011) remarked that oral presentation to a large group of passive students contributes very little to real learning.

In most cases lecture method is adopted by teachers to overcome the bulky content of the syllabus and to make sure they cover it in less time. Ogwuche and Kurumeh (2012) suggested that lecture method has the potential of increasing dept of understanding, the quality of reasoning and the accuracy of long term retention and should be accommodated along with other means to avoid boredom. Lecture method is a commonly used traditional method and is characterized as a one-way-flow of information from the active instructor to the passive learners. According to Hassen (2014) making use of lecture method means that there is a fixed body of knowledge the learners must know and the students are expected to blindly accept the information they are given without questioning the instruction. The teacher seeks to transfer thoughts and meanings to the passive students, leaving little room for students initiated questions. Bellow (2014) noted that lecture method is an approach to teaching where the teacher's role is to present information that is to be learned to direct the learning process of students. The teacher identifies the lesson objectives and takes the primary responsibility for guiding the interaction and instructions by explanation and modeling. Lecture method is primarily used to build upon the learner's existing base of knowledge.

Demonstration method is a method of teaching concept, principles of real things by combining explanation with manipulation of real things, materials or equipments (Akinbobola and Ikitde, 2011). The demonstration method is effective for long term memory retention and appropriate to college study skills (McCabe, 2014). According to Hadim and Esche (2012) demonstration method has emerged to become an instructional approach that is gaining interest within the educational community.

Demonstration provides a multi-sensory means to discuss ideas or products that may otherwise be difficult to grasp by verbal description (Cabibihan, 2013). According to Abdulahi (2010) demonstration can be used as attention inducer and a powerful motivator when employed to start a lesson. He also asserted that demonstration method helps to stimulate learners interest, create desires in learners, help to illustrate a fact or principles, visualize process i.e. develop an appeal to the sense of vision, show materials, portray method, developed manipulative skills in learners and evaluate achievement in learners immediate process as a result of effort.

Nkang (2012) opined that demonstration methods aids the students to develop the skill of asking meaningful questions, develop the skill of observations and explorations. He stressed the need of demonstration method as a good teaching method because it gives students the sense of involvement in findings or constructions of knowledge. Daluba (2013) studied the effect of demonstration method using working models in an aspect of Agricultural science and reported that this teaching method brought about the most significant positive impact on the students' academic achievement. Cabibihan (2013) used working models for in-class demonstrations and reported that a multi-background, multi-disciplinary, and multi-national students' audience had responded favourably to the in-class demonstrations. It was also reported that the students' academic achievement could be attributed to the immediate appreciation of concepts from the practical examples that the students experienced from the demonstrations. Ramatu (2012) examined the effect of demonstration and discussion methods on the academic performance of biology students among senior secondary school Zaria Educational zone. He stated that there is a significant difference of students exposed to demonstration, that is the students taught using demonstration method performed better than those taught using discussion method. Maizuwo (2010) investigated the effectiveness of demonstration teaching method on students' misconceptions of concept in organic chemistry and academic performance of chemistry students. The researcher reported that there was a significant difference in academic achievement of students when exposed to demonstration teaching method which implies that demonstration teaching method is an effective teaching method. The outcome of demonstration based teaching with significant success in physics and mathematics education is widely reported by the researchers; it is also evident that a large body of education literature reveal positive impact of demonstration on students' performance (Kini and Padolsky, 2016; Maizuwo, 2011; Obeka, 2010 and Ramatu 2012). Jaksa (2009) used a number of demonstration models in his teaching in geotechnical engineering. The author confirmed the effectiveness of demonstration models as a tool to improving learning and to engage students for meaningful learning experience.

Guided discovery is an inductive method of directing learners (students) by a teacher to discuss, investigate, organize ideas, thoughts and processes information on a given matter to discover fact by themselves. Klausmeier (2010) upheld that providing each student with opportunity to find solution to a problem personally or in groups increases the students' responsibility for what they do. Guided discovery method of learning can be effective if the learners can find out the new learning experiences and knowledge by themselves. This ensures that the guidance (the teacher) should consider the learners background knowledge, experience, techniques and understanding of what is expected of them. Guided discovery assumes that learning is a process requiring effort such that the learner should actively construct his meaning that is in consonant with the already known idea, knowledge or experience; such that the ability of a learner to learn well depends on his/her ability to connect or integrate the previous knowledge with the new ones and to also apply it in real life situation. Abdisa and Getnet (2012) observed that guided discovery method of learning is an approach that encourages understanding rather than memorizing and judging of facts and is capable of demystifying physics and making it more interesting and less dreaded to students.

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They also noted that students with high reasoning ability exhibit positive effective achievement profiles learning approaches that brought the best in them. Abubaka and Dokubo (2011) explained that guided discovery assists learners to understand problem solving as they learn by experiment.

Guided discovery method is student-centered and activity oriented. It gives learners the opportunity to discover facts about a particular problem by themselves. It is a way of being inquisitive, seeking knowledge or information or finding out facts about events or phenomena. It involves investigation, searching, defining a problem, and formulating hypothesis in a bid to providing solution to a given problem (Ibrahim, Hamza and Adamu, 2018). Guided discovery falls in the middle of the instructional spectrum. It is based on the assumption that it is activity-based that encourages students to take a more active role in their learning process, by performing, solving problems and answering questions by themselves. The method is believed to enable students to get experience in using facts and principles, processes by using their mental calculations to solve physics problems.

Statement of the Problem

The most important goal of employing a method during teaching is to enhance effective learning on the part of the students. Despite the innovations and technological development in the teaching and learning system, teachers are still key deciders in educational practices. They are at the center of the educational process. Therefore, teachers of physics are everyday searching which instructional methods could be used for effective teaching/learning that would improve better academic achievement of students in physics education. Teaching methods are the means identified to contribute greatly to level of students' academic achievement in science. It is against this observation that the researchers deem fit to provide empirical data in supplement of the observation by undertaking this study on comparative effect of Lecture, Demonstration and Guided-Discovery teaching methods on Students' Academic Achievement in Senior Secondary School Physics with a view to identify the most facilitating method.

Purpose of the Study

Considering the achievement of students as priority of educational goal, the purpose of the study seeks to:

- Determine the effect of Lecture, Demonstration and Guided-discovery methods of teaching on students' academic achievement in the concept of waves in Physics.
- Examine the academic achievement of students in the concept of waves in Physics when taught with lecture, demonstration and guided-discovery by gender.
- Investigate the academic achievement of Physics students taught the concept of waves in physics with Lecture, Demonstration and Guided-discovery by school location.

Research Question

- What are the achievement mean scores of students in the concept of waves in Physics when taught with Lecture, Demonstration and Guided-discovery methods?
- What are the achievement mean scores of male and female students in the concept of waves in Physics when taught using Lecture, Demonstration and Guided-discovery teaching methods?
- What are the achievement mean scores of Urban and Rural students in the concept of waves in Physics when taught using Lecture, Demonstration and Guided-discovery methods?

Research Hypotheses

- There is no significant difference among the achievement mean scores of students in the concept of waves in Physics when taught using Lecture, Demonstration and Guided teaching methods.
- There is no significant difference in the mean achievement scores of male and female students in the concept of waves in Physics taught using the three teaching methods.
- School location has no significant effect on students' achievement mean scores in the concept of waves in Physics when taught using Lecture, Demonstration and Guided-discovery methods of teaching.

METHODOLOGY

Research Design

The researcher adopted a Quasi-experimental design with non-randomised pre-test-posttest experimental group. The research was carried out in Uyo Senatorial District. The researchers chose the area for the study because they are quite familiar with the educational problems (poor academic performance, achievement and poor retention ability of secondary school students in Physics) in the area and it is assumed that at the end of then study they will be able to provide some useful suggestions and guidelines on how to solve the problems. The population of the study consisted of all the Physics students in senior secondary two (SS2) in all the 12 co-educational schools in Uyo Senatorial District during the 2019/2020 school year. The population size was three hundred and seventy two (372) SS2 Physics students. This data was the aggregate of all the SS2 Physics students in the twelve schools from respective school records.

A total of One hundred and eighty (180: male 108 and female 72) SS2 Physics students took part in the study from six selected schools in the area of study. Criterion sampling technique was used to select schools from the target population. The criteria were:

- (i) Schools that are currently presenting candidates for the Senior Secondary School Certificate Examination (SSSCE).
- (ii) Schools that have at least one professional graduate physics teacher with at least five years of teaching experience.
- (iii) Schools that have well equipped and functional physics laboratories; and
- (iv) School that have physics students not less than twenty-five (25) in SS2.

Twelve (12) co-educational secondary schools in the study area met the stated criteria. Out of the 12 schools that met the criteria, 6 schools were randomly selected. Nine Local Government Areas constitute Uyo Senatorial District, three (3) Local Government Areas were randomly selected. Six (6) schools, three from urban and three from rural areas were randomly selected from the three selected Local Government area.

Three schools each, from urban and three each from rural were randomly assigned experimental groups I taught with Lecture method, experimental group II taught with Demonstration method and experimental group III taught with Guided-discovery method.

A researchers-made instrument tagged: Physics Achievement Test on Waves (PATW) was developed for pre-test, post-test measurements. The PATW was a fifty (50) item multiple choice questions drawn from the concept of waves in Physics. Each question had four (4), options A, B, C, and D with only one correct answer and three distractors. The test comprises, the pre test, a reshuffled version of the Physics Achievement Test on wave. To ensure content coverage and equal distribution of items on the PATW, test blue-print or table of specification was used in preparing the test based on the six levels of cognitive domains of Bloom's taxonomy of educational objectives. The instrument was face validated by two secondary school physics teachers with at least eight (8) years teaching experience, and two other lecturers in the department of science education university of Uyo.

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Using Lecture method, the researchers presented a topic in physics and verbally do the talking of explaining and at the end ordered the students to read up other related aspects of the topic to cover up the missing and the remaining grounds. Demonstration involves illustrating a point in a lecture or a lesson by a teacher adopting the experimental procedures of “see as I or watch a I do”. In this study, the researchers performed the experiment involving waves on the watch of the students and afterwards asked the students related questions to measure their understanding. In a problem involving calculations, the researchers first do the calculation to the students than asked them to use the same formula and procedure to calculate a similar problem. During the process the researchers was in a close watch to ensure effective compliance. Doing these the researchers observed that the working principles of demonstration essentially helps to foster interaction between the teacher and the students and as well promotes active participation in the cause of the study. It minimizes time wastage and boast cordial relationship among learners. Guided discovery is practically activity method. In this study guided discovery method was used. Students were given topics and materials. They developed reasoning and mental skills to find answers to the given problems.

RESULTS

Research Question 1

What are the achievement mean scores of students in the concept of waves in Physics when taught with Lecture, Demonstration and Guided-discovery methods?

Table 1: Mean (\bar{X}) scores and standard deviation of students'. Pre-test and Post-test scores classified by treatment groups.

Treatment Groups	N	Pre-test		Post test		Mean Gain Scores
		\bar{X}	SD	\bar{X}	SD	
Lecture Method	60	48.24	5.18	61.1	3.61	12.86
Demonstration Methods	60	51.13	7.56	72.90	6.88	21.77
Guided-discovery Methods	60	50.10	6.82	66.42	5.34	16.32

Table 1 shows the pre-test and the post test mean gain scores and standard deviation of the scores of the three groups of students used. The mean gain scores show that Demonstration group had the highest mean gain score (21.77), followed by Guided-discovery group (16.32) and lastly by Lecture group (12.86). Table 1 also indicates that the post-test standard deviation scores of the three groups decreases in the same order as the post-test mean scores: Demonstration group (SD = 6.88), Guided-discovery group (SD = 5.34) and Lecture group (SD = 3.61). This shows that the scattering of the post-test raw scores from the mean is highest in Demonstration group. However, testing the hypothesis will indicate whether the observed differences are statistically significant..

Hypothesis One: There is no significant difference among the achievement mean scores of students in the concept of waves in Physics when taught using Lecture, Demonstration and Guided-discovery Teaching Methods.

Table 2: One way Analysis Covariance (ANCOVA) of post-test scores of Physics students taught the concept of waves with Lecture, Demonstration and Guided-discovery methods using pre-test scores as covariates.

Sources of Variation	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision at P < .05
Corrected model	125612.06 ^a	3	41870.69	146.58	.000	S
Intercept	12318.32	1	12318.32	401.36	.000	S
Pre-test	891.76	1	981.76	30.66	.000	S
Method	8112.68	2	4056.34	187.86	.000	S
Error	5450.36	178	30.62	-	-	-
Total	865842.14	180	-	-	-	-
Corrected Total	18662.43	179	-	-	-	-

a = R. Square = .763 (Adjusted R. Square = .758)

From Table 2, it is observed that the effects of teaching methods on academic achievement of physics students in the concept of waves was statistically significant (F=187.86, p=.000). Hence hypothesis one stating that a non-significant difference in the mean achievement scores of Physics students taught the concept of waves using Lecture, Demonstration and Guided-discovery teaching methods was rejected. This implies that, the three types of teaching methods (Lecture, Demonstration and Guided-discovery) differ significantly in their enhancement of academic achievement of students in the concept of waves in Physics. Sheffe's Post hoc test was used to determine the direction of significance.

Table 3: Result of Scheffe's Post hoc test for multiple comparison of teaching methods on students achievement in Physics.

Instructional Methods (I)	Instructional Methods (J)	Mean Diff. (I-J)	Std. Error	Sig.	95% Confidence Interval lower Board	Upper Bound
LECT	DEM	-7.68*	.87	.000	-6.97	-9.63
	GD	-9.28*	.91	.000	-11.64	-6.49
DEM	LECT	13.48*	.86	.000	12.48	18.12
	GD	15.13*	.83	.000	6.68	9.56
GD	LECT	-8.45*	.79	.000	-9.17	-5.40
	DEM	5.48*	.92	.000	4.92	7.81

* = The mean difference is significant at the alpha level (P = 0.05). Lecture = LECT, Demonstration = DEM, Guided-discovery = GD.

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Table 3 shows that the mean different between Demonstration and Lecture was 13.48. The mean difference between Demonstration and Guided-Discovery was 15.13 and between Guided-Discovery and Demonstration 5.48. This shows that Demonstration teaching method is the most effective in enhancing students' academic achievement in the concept of waves in Physics. This is followed by Guided-discovery teaching method while the Lecture method is the least effective.

Research Question 2: What are the achievement mean scores of male and female students in the concept of waves in Physics when taught using Lecture, Demonstration and Guided-discovery teaching methods.

Table 4: Mean and Standard Deviation of students' Pre-test and Post-test scores classified by treatment groups and gender.

Treatment Groups	Gender	N	Pre-test		Post test		Mean Gain Score
			\bar{X}	SD	\bar{X}	SD	
Lecture	Male	30	42.61	6.54	64.60	4.66	21.99
	Female	30	40.92	5.35	62.72	4.89	21.80
Demonstration	Male	30	45.42	6.99	73.45	5.61	28.03
	Female	30	44.01	4.48	71.21	4.28	27.20
Guided Discovering	Male	30	44.22	5.55	68.44	6.21	24.22
	Female	30	43.80	5.62	67.35	7.05	23.55

Table 4 shows the pre-test and post-test mean scores and standard deviation of scores of the male and female students in the three groups taught using Lecture, Demonstration and Guided-discovery methods. The pre-test mean scores and standard deviations for male and female students in Lecture group were: 42.61 (SD = 6.54) and 40.92 (SD = 5.35) respectively. Students in the Demonstration group had 45.42 (SD = 6.99) and 44.01 (SD = 4.48) respectively. While students in the Guided-discovery group had 44.22 (SD = 5.55) and 43.80 (SD = 5.62) respectively.

The post-test mean scores and their standard deviations for male and female students in the lecture group were 64.60 (SD = 4.66) and 62.72 (SD = 4.89) respectively. Students in the Demonstration group had 73.45 (SD = 5.61) and 71.21 (SD = 4.28) respectively. And students in Guided-discovery group had 68.44 (SD = 6.21) and 67.35 (SD = 7.05) respectively. The observations showed that the male students in the Demonstration group had the highest main gain score (28.03) followed by their female counterparts in the same group (27.20). The scattering of the raw scores about the post-test mean was widest for the female in the Guided-discovery group (7.05). Whether the difference between the mean gain scores of the three groups taught using the three teaching methods by gender were statistically significant was tested using the ANCOVA results used in testing hypothesis three.

Hypothesis Two: There is no significant difference in the mean achievement scores of male and female students in the concept of waves in Physics taught using the three teaching methods.

Table 5: One way Analysis of Covariance (ANCOVA) of male and female Physics students' achievement scores using pre-test scores as covariates.

Sources of Variance	Type III Sum of Squares	Df	Mean Squares	F	Sig.	Decision at P < .05
Corrected Model	5228.34	2	2614.17	41.21	.000	S
Intercept	6941.99	1	6941.99	88.62	.000	S
Pretest	5614.97	1	5614.97	68.94	.000	S
Gender	76.21	1	76.23	.12	.79	NS
Error	11489.90	178	64.55	-	-	-
Total Corrected	861295.45	180	-	-	-	-
Total	19548.11	179	-	-	-	-

a = R. Square = .248 (Adjusted R. Square . 223)

S = Significant at P < .05, NS = Not significant at P < .05

The result in Table 5 shows that the main effect of gender on students' achievement in the concept of waves in Physics was significant at ($F_{(1,178)} = .12, P = .78$). Therefore, the null hypothesis stating a non-significant difference in the mean achievement scores of male and female Physics students in the concept of waves in Physics was accepted. This implies that, gender does not significantly influence students' achievement in the learning of Physics. The table also shows a multiple regression squared index (R^2) of .223. This means that only 22.3% of the total variance in the achievement of students in the concept of waves in Physics is attributed to the influence of gender.

Research Question 3: What are the achievement mean scores of urban and Rural students in the concept of waves in Physics when taught using Lecture, Demonstration and Guided-discovery methods?

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Table 6 Mean and Standard Deviation of Students' Pre-test and Post-test scores classified by treatment groups and school location.

Treatment Groups	Location	N	Pre-test		Post test		Mean Gain Score
			\bar{X}	SD	\bar{X}	SD	
Lecture	Urban	30	40.17	6.582	60.25	3.77	20.08
	Rural	30	36.26	5.64	56.32	4.82	20.06
Demonstration	Urban	30	44.23	5.82	69.62	5.94	25.39
	Rural	30	41.35	5.10	64.35	4.66	23.00
Guided Discovering	Urban	30	40.48	4.81	62.96	3.25	22.48
	Rural	30	39.62	4.00	61.16	4.40	21.54

The mean gain scores in Table 6 show that Urban students taught using Demonstration method had the best mean gain (25.39), followed by those taught using Guided Discovery (22.48), while Lecture method group had the least mean gain score (20.08). The standard deviation scores for the students in urban however, show that of Demonstration is 5.94; while those of Lecture and Guided-Discovery were 3.77 and 3.25 respectively. This observation shows that the distribution of the mean gain scores from the central mean was widest in Demonstration group.

The mean gain scores for Rural students show that students taught using Demonstration method had the best mean gain (23.00), followed by those taught using Guided-Discovery (21.54), while students in lecture group had the least mean gain score (20.06). the standard deviation scores for students in Rural location however shows that of Lecture 4.82, while those of Demonstration and Guided-Discovery were 4.66 and 4.40 respectively. This observation shows that the distribution of the mean gain scores from the central mean was widest in lecture group.

The analysis of covariance summary in Table 7 was used to determine whether the observed differences were statistically significant.

Research Hypothesis Three: School location has no significant influence on students' achievement mean scores in the concept of waves in Physics when taught using Lecture, Demonstration and Guided-discovery methods of teaching.

Table 7: Summary of Analysis of Covariance (ANCOVA) on urban and Rural Students Achievement, post-test scores classified by treatment groups with pre-test scores as covariate.

Sources of Variance	Sum of Squares	DF	Mean Squares	F	Sig	Decision at P < .05
Pre-test	388.96	1	388.96	16.20	.00	S
Treatment	5025.60	1	5025.60	208.76	.00	S
School Location	0.36	1	0.36	0.12	.61	NS
Treatment*						
School Location	14.69	1	14.69	0.52	.38	NS
Error	4289.80	178	24.10	-	-	-
Total	654128.41	180	-	-	-	-
Corrected Total	7998.99	179	-	-	-	-

a = R squared = .568 (Adjusted R Square = .548)

In Table 7, the calculated F ratio for the main effect of school location at df 1, 178 is 0.12 while its significant level is .61. This significant level is greater than 0.05 alpha level on which the decision was based, indicating that the influence of school location on the students' achievement was not statistically significant. With this observation, null hypothesis stating that school location has no significant effect on the students' academic achievement when taught Physics using Lecture, Demonstration and Guided-discovery methods was upheld.

SUMMARY OF FINDING

Following the observations of the results of the findings in Table 1-7, the researchers summarize as follows:

- The influence of the three teaching methods (lecture, demonstration and guided-discovery on students' achievement on waves Physics was statistically significant. Students taught the concept of waves in Physics using Demonstration method had the best performance than those taught using Guided-discovery and those taught using Lecture method. Based on this hypothesis one is rejected.
- The influence of gender on students' achievement on the concept of waves in Physics when taught using Lecture, Demonstration and Guided-discovery was statistically not significant. This means that hypothesis two is accepted.
- School location had no statistically significant on students' achievement when taught the concept of waves in Physics using Lecture, demonstration and guided-discovery methods of teaching. With this hypothesis three is sustained.

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DISCUSSIONS

Tables 1-7 are discussed in this section in the order of research questions and hypothesis as well as Scheffe's post hoc test (analysis). The primary aim of this study was to find out the effect of Lecture, Demonstration and Guided-discovery teaching methods on students' academic achievement in Senior Secondary school Physics.

Instructional Methods and Students' Achievement: the findings with respect to hypothesis one showed that there is a significant difference in the students' means achievement scores when taught using Lecture, Demonstration and Guided-discovery teaching methods. Students taught using demonstration method had the best achievement in the concept of waves in Physics. This means that Demonstration method of teaching gains advantage over Guided-discovery and Lecture methods in decreasing order. This is in line with the findings of Obeka (2010) and Igboegwu (2012), who held that Demonstration method is a performance method of instruction that involve the teacher teaching the students to perform according to the set roles and principles and recommend Demonstration method for teaching skills for the fact that it covers all the necessary steps in an effective order as well as promoting students' academic achievement.

The best enhancing effect of Demonstration on the Students academic achievement, which is consistent with Achinugu (2018) and Uwak (2019), could be attributed to consistent observation of what the teacher demonstrate in the class by the students. When the students observe and pay more attention to their teachers, learning becomes exiting, attractive, interactive and sustains interest and curiosity in the concept taught.

The findings with respect to hypothesis two indicated that there is no significant difference in the mean achievement scores of male and female students when taught the concept of waves in Physics using Lecture, Demonstration and Guided-discovery teaching methods. The study showed that gender is not a strong factor in determining students' academic achievement in Physics, therefore, both male and female students given equal opportunity to learn any concept in Physics may perform equally well. Therefore, in using any appropriate method in the teaching of Physics, male and female students will perform competitively the same. Thus gender does not place advantage or disadvantage on any student academic achievement. This finding are in line with the findings of Maizuwo (2011) that, no significant gender difference exists in the achievement of male and female students in science and Mathematics. Also, the findings of Karademir and Ucak (2009) showed that, a significant difference was not found among achievement scores of the male and female students in ability grouping classes, however, this study disagrees with Adeoye (2010) that, there was a significant difference in the achievement of male and female students in Physics concept in favour of the female students.

In this study, female student compete favourably with their male counterpart when taught using any of the methods (Lecture, Demonstration, or Guided-discovery). Therefore, Physics is both masculine and feminine area of study in the field of science. This finding contradicts the findings of Abduraheem (2012) that male students perform better than the female students in Mathematics, Science and Social Sciences.

Instructional Methods, School Location and Students Achievement: hypothesis three which states that there is no significant difference in the mean scores achievement of Urban and Rural students taught using the concept of waves in physics using Lecture, Demonstration and Guided-discovery was sustained. This implies that school location does not have a strong effect on the achievement of Physics students, taught using Lecture, Demonstration and Guided-discovery. This is a clear indication that whether the school is located in the Urban or Rural area, students of Physics be it male or female can perform equally well provide equal learning opportunities are provided to all.

The important factor is that the students should be given educational treatment to learn any concept in Physics both in Urban and Rural areas. Every student in the rural areas as well as those in urban areas need adequate provision and availability of well equipped laboratories and power to be able to learn and practice certain concepts in Physics. Therefore, every student should be made to have equal educational opportunity and treatment. When this is done students in the rural schools can achieve as much as their counterpart in urban schools. Teachers of Physics should practice the use of demonstration method to teach Physics in all Physics classes to facilitate high level of students' academic achievement. Finding of this study on school location and student academic achievement agree with Wikipedia (2015) which hold that the achievement of students in Physics, irrespective of location, is enhanced when Physics is taught and learnt using appropriate instructional methods.

CONCLUSION

Based on the findings, it is hereby concluded that demonstration method is more effective in improving students' achievement followed by guided discovery while the lecture method is the least effective. This might be that learners always need to learn by example. The study also revealed that there is no significant difference in the achievement of male and female students in physics after being taught with GD, DM and LT. The implication of this might be that every learning conditions being constant boys and girls of the same age bracket and class will learn at the same space and produce equal output.

RECOMMENDATIONS

- Physics teachers should make effective use of discovery method of teaching physics.
- Curriculum planners should emphasis on important and the use of demonstration method to teach science subjects.
- Educational bodies such as STAN should endeavour to organize and sponsor regular seminars and workshops to train science teachers on the use of demonstration method of teaching.
- For the fact that not all teachers no how to employ the use of demonstration method of teaching, the government of Akwa Ibom State should embark on training teachers on how to make use of demonstration method.

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