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Effect of Multimedia Teaching Technology on SSS 1 Student's Interest and Achievement in Mechanics in Gboko, Benue State, Nigeria

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ABSTRACT

This work was carried out to determine the effect of multimedia teaching technology on SSSI student's interest and achievement in mechanics. 160 students were randomly selected from two secondary schools in Gboko Local Government Area of Benue State. The research design employed for this study was Quasi-Experimentation research of two groups pre-test, post-test control design. The study lasted for the period of one week due to the experimental nature of the research, the pre-test was administered to all the participants in order to sure of their equivalent entry behavior. The treatment was administered to the experimental class with the use of multimedia teaching approach. The pre-test and post-test scores of the students in the conventional and multimedia teaching group were used for the purpose of data analysis. The result were analysed using T-test, four hypothesis were postulated. The result showed that (a) t_{cal} (8.91)>$t_{critcal}$ (2.83) where the hypothesis is rejected which confirmed that there is no significant difference in the academic interest of student taught mechanics with multimedia method against the students taught mechanics with conventional method. (b) t_{cal} (0.56) <$t_{critcal}$(2.09) hence the hypothesis is not rejected, this implies there is no significant difference between the mean interest ratings of male and female student taught mechanics using multimedia teaching approach. (c) t_{cal} (9.01) >$t_{critcal}$ (3.02) the hypothesis is rejected, which implies that there is a significant difference in the academic achievement of student taught mechanics with multimedia method against the students taught mechanics with conventional method. (d) t_{cal} (0.60) <$t_{critcal}$ (2.10) hence hypothesis is not rejected, this implies that there is no significant difference between the achievement scores of male and female student in mechanics who were taught using multimedia. All at 0.05 level of significance. The findings therefore revealed that there is significance difference in the interest and achievement of students exposed to multimedia teaching approach than those that were conventionally taught and also there was no significant difference in the interest and achievement of male and female students taught using multimedia taching approach. It was therefore recommended that the use of multimedia taching approach should be adopted to encourage so as to complement other methods of teaching science in schools and colleges.

Keywords: *Multimedia Teaching Approach; Interest; Achievement; Mechanics.*

1.0 Introduction

Science is the tap root system upon which the bulk of present day technological breakthrough is built. All over the world, nations, including Nigeria are striving hard to develop technologically and scientifically, since the world is turning scientific and all the proper functioning of lives depend greatly on science. Owolabi in Emagbetere (2015), defines science as an integral part of human society. Its impact is felt in every sphere of human life, so much that it is intricately linked with a nation's development. Physics like other subjects performs some vital roles which help in the achievement of some national goals. In fact, Physics is the basic science subject that deals with those fundamental questions on the structure of matter and interaction of elementary constituents of nature that are susceptible to experimental investigation and theories.

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Vondeling in Okwo (2012), sees Physics as a natural phenomenon that occurs in our universe and the various changes, which this natural phenomenon undergoes in different condition of our life. Science and technology has made a tremendous impact in the development and advancement of nations today, and the importance of Physics being the overture for these developments cannot be overemphasized. Physics as science provides basic knowledge and understanding of principles whose application will contribute greatly to the quality of life, in a technologically based society.

Physics has always been taught in traditional way in every institution of learning, by which teachers illustrates on the blackboard or whiteboard through diagrams and symbols using markers, chalks and text books among others while the students copy the problem solved in their note books. The teacher then explains the diagrams and symbols to the student, making the learning process teacher centered. A practical study of Physics will aid the student to go on research so as to discover more solution to life problems. One of the problems which in the course of study of Physics have been able to solve is our means of communication.

One can live in Nigeria and communicate with someone in London through the radio set, E-mail and so on. The study of Physics has improved the method of food preservation; food can now be preserved through refrigerator. The study of Physics also solved the problem of man not being able to generate electricity, to light his environment. It was long ago, but with the study of Physics, the problem was solved (Guard in Kondom, 2011).

The study of Physics has helped to solve some human problems. Hence it is important to enhance the study of Physics among students. Physics therefore serves as a flexible foundation and bedrock at the senior secondary school level of education for the inculcation of intellectual virtues and the natural science, at tertiary level (Adejoh in Okwo, 2012). Despite the importance of Physics to the technological development of one's nation, the situation in Nigeria secondary school generally and particularly in Gboko Local Government area of Benue State shows that enrolment and performance in the subject is reducing at an alarming rate. Physics is perceived to be a difficult course because of its abstract nature (Adeyemo, 2010). The level of students' interest and performance in Physics continues to decline and this Phenomenon seems to cut across culture. In fact, literature on Physics education worldwide confirms this observation (Kim in Benson, 2010),have shown that student will study and learn Physics better and more over, at the post-secondary level choose, courses that requires knowledge of Physics if they are interested in it.Thus because students' interest in Physics is so important to their present and future involvement in the subject, it is useful to know how Physics teaching should be developed and learning materials designed to be more interesting for them. How can we help students understand and learn Physics better and more importantly encourage their future involvement in Physics? 'One promising approach according to (Oz, 2010), is multimedia instruction'.

Multimedia according to Mayer in Akpan (2016) is defined as presenting both words and pictures that are intended to foster learning. To them, the word can be printed (on-screen text), or spoken (narration). These pictures can be static (illustration, graph, photos or maps), or dynamic (animation, video or interactive illustration),. Since our current teaching strategies have failed to enhance problem-solving skills, curiosity and logical thinking among students of science.

There is need to move from traditional approaches to more innovative information and communication technology (ICT), enriched approaches for meaningful learning the fast-placed, diverse and technologically advanced world has posed challenges for both teachers and learners. The use of ICT in the teaching and learning process has become an important feature. Multimedia – aided – teaching (MAT), is a means of instructional delivery usually used with the traditional method of teaching (Rolfe and Aray, 2011).

It is a presentation consisting of words, sound and pictures that is designed for meaningful learning (Mayer, 2015). The promise of multimedia learning is that students may learn more deeply from well – designed multimedia messages consisting of words and pictures than from more traditional modes of communication involving words alone. It certainly has the potential to extend the amount and type of information available to learners. Well – designed multimedia helps learners build more accurate and effective metal models than they do from text alone.

Kenyon in Akpan (2016), indicates that students enjoy attending classes that utilize multimedia presentations because they find these classes to be more interesting and exciting with multimedia.

According to Adegoke (2010), students' interest and retention could be aroused and retained through the use of multimedia instructional approach.

Interest is an important factor in learning because when one becomes interested in any activities one is likely to be more deeply involved in that activity. It is a subjective feeling of concentration or curiosity over something.

It is the preference for particular types of activities. Interest plays a vital role in learning and teaching process. At the classroom level and beyond, learning can be meaningfully achieved within the content of optimal disposition of the learner of the tasks in question closely related to interest is achievement.

Achievement is the measurement of accomplishment in a specific field of study. Nneji (2013), described academic achievement as the gain in knowledge of students as a result of participating in a learning programme.

Gender issues have been linked with achievement of student in academic tasks in several studies but without any definite conclusion. Buabeng (2012), found out in his studies that there were low interest and poor performance of students in the study of Physics, especially female. One major cause or attribute that surfaced in all their studies was how Physics content knowledge was taught and learned at all the academic levels.

Mechanics is an area of science concerned with the behaviour of physical bodies when subjected to forces or displacement, and the subsequent effects of the bodies on their environment. Classical mechanics is a branch of classical Physics that deals with particles that are either at rest or are moving with velocities significantly less than the speed of light.

It can be defined as a branch of science which deals with velocities significantly less than the speed of light.

It can be defined as a branch of science which deals with the motion of the forces on object.

It is an area of Physics where student find it difficult to learn and understand which may lead to low achievement.

2.0 Study Objectives and Research Questions

The main purpose of this study was to ascertain the efficacy of multimedia teaching approach when used in teaching mechanics at senior secondary school one. Specifically, this study is set to:

1. Determine whether the use of multimedia teaching approach at the senior secondary school one would improve students' interest in mechanics.
2. Ascertain whether the use of multimedia teaching approach at the senior secondary school one would improve male and female students' interest in mechanics.
3. Determine whether the use of multimedia teaching approaches at senior secondary school one would improve students' achievement in mechanics.
4. Ascertain whether the uses of multimedia teaching approach at senior secondary school one would improve male and female students' achievement in mechanics.

The study was guided by the following research question.

i. What is the extent of students' interest in the multimedia teaching?
ii. What are the mean interest ratings of male and female students of senior secondary school one taught mechanics using multimedia teaching approach?
iii. What is the mean effect on achievement scores of senior secondary school one students taught mechanics using multimedia teaching approach and those taught using conventional method?
iv. What is the mean effect on achievement scores of male and female students of senior secondary school one taught mechanics using multimedia teaching approach?

The following hypotheses were formulated and tested at 0.05 level of significance.

1. There is no significant difference in the level of interest in multimedia teaching.
2. There is no significant difference between the mean interest ratings of male and female of SSS 1 students taught mechanics using multimedia teaching approach.
3. There is no significant difference between the mean achievement scores of SSS 1 students

taught mechanics using multimedia teaching approach and those taught using conventional method.

4. There is no significant difference between the mean achievement scores of male and female of SSS 1 students taught mechanics using multimedia teaching approach.

3.0 Methods

3.1 Sampling

The study adopted quasi experimental design because it establishes a cause and effect between the independent and dependent variables. Precisely, this study used non – randomized pre – test, post-test control group design. This type of research is non – equivalent control group design as both the experimental and control group may not necessary, be equal in size and treatment. The subjects in the study was not be randomized into experimental and control groups but used intact classes in order to avoid disrupting the school programmes, hence, intact classes were assigned into experimental and control groups. The independent variables were multimedia teaching approach and gender while dependent variables were interest and achievement.

Sample size for this study is made of 160 senior secondary school one students comprising of 93 male and 57 female selected from two schools; one serves as an experimental group while the other serves as control group. 70 (42 male and 28 female), students were participated in the experimental group while 90 (51 male and 39 female), students were used in control group.

In considering the schools that were used for this study, purposive sampling was used to sample co- educational schools, the schools must have at least two classes,

the schools must have a computer laboratory with a projector and other necessary accessories, the students must have qualified teachers (NCE, B. Sc, B. Sc (Ed), Physics teachers), the schools must have been presenting candidates for SSCE for over four years. Out of 14 schools, about 8 schools met these conditions. Simple random sampling was used to select two schools for the study. Simple random sampling of hat and draw was used to assign experimental and control schools, one for each of them.

3.2 Instrument development

The instrument used in this study were mechanics interest inventory (MII), and Mechanics Achievement Test (MAT), each consisting of two section; section A and B. section A was for students' bio data information and Section B was made of twenty five multiple choice items based on the topic considered for the study. The Mechanics Interest Inventory had twenty five items constructed by the researcher which sought to know the interest and feeling of student about mechanics. The items were designed on the basis of a four point scale. The four – point scale ranges from Strongly Agree, Agree, Disagree and Strongly Disagree. These items contained both positive and negative statements of feelings and interest with a positive item earning the respondent four marks. Similarly, a strongly disagree to a negative statement would earn the respondent four marks. Thus, responses to a positive statement were scored 4, 3, 2, 1 and those of negative statement were scored 1, 2, 3, 4.

Mechanics Achievement Test (MAT) was used to assess the level of students' achievement in mechanics. The MAT items covered mechanics topics that were taught during the period of the study. The MAT has four option in which student chose one, A, B, C and D. The MAT comprised of twenty five items which contained 15 lower order questions (questions that tested students' ability on knowledge, comprehension and application) and 10 higher ore questions (questions that tested students' ability on analysis, synthesis and evaluation). These items are developed in accordance with the instructional objectives is contained in the senior secondary one textbook written by the Physics Association of Nigeria.

3.3 Data analysis

The study was undertaken to determine the effect of multimedia approach on SS1 students' interest and achievement in mechanics in Gboko Local Government Area of Benue state. Nigeria. Four research questions and four hypotheses were formulated and tested. A review of theories and concepts as well as empirical studies related to this study was done. The study adopted quasi experimental research design. Two instruments were used mechanics interest Inventory (MIl) and mechanics Achievement Test (MAT) were used for

data collection. The instruments were validated by four experts.

Fifty multiple choice questions were initially constructed for the MAT while thirty five items constructed for MII were given to an expert in Test and Measurement. One physics educator and two physics teachers in secondary schools in Gboko for the face and content validation.

The treatment was carried out within one week during which data were also collected lat various intervals using the Mll and MAT.

The data collected were analyzed using mean and standard deviations to answer the research questions while analysis of variance (ANOVA) was used in testing the hypotheses at 0.05 level of significance.

From the analysis of the data, the following findings were obtained:

i. There was a significant difference in the mean interest rating score of the students taught mechanics using multimedia teaching approach and those taught using the conventional method, with those taught using multimedia teaching approach having higher mean interest rating score.
ii. There was no significant difference between the mean interest rating scores of male and female students taught mechanics using multimedia teaching approach.
iii. There was a significant difference between the mean achievement scores of students taught mechanics using multimedia teaching approach and those taught using the conventional method with those in the multimedia teaching approach having higher mean achievement scores.
iv. There was no significant different between the mean achievement scores of male and female students taught mechanics using multimedia teaching approach.

4.0 Results

4.1 Research questions one

What is the extent of student's interest in the multimedia teaching?

In Table 1, the mean for pre-test in both experimental and control group are 14.20 and 13.90 respectively indicating that both groups had equivalent entry behaviour.

However, the mean gain of students in taught with multimedia teaching approach is 15.74 while that of the student in the conventional method is 0.12.

This indicates that students that learned physics with multimedia system have higher interest in physics than those that learned Mechanics using conventional method.

Table 1: Presents the Answer to Question One

Method	N	Type of test	$\bar{X}$	Mean gain
Multimedia	70	Pre-test	14.2	15.74
		Post-test	29.94	-
Conventional	90	Pre-test	13.9	0.12
		Post-test	14.02	-
Total	160	-	-	-

4.2 Hypothesis one

There is no significant difference in the level of interest in multimedia teaching.

Table 2: Presents Answers to Hypothesis One

Method	$\bar{X}$	N	t_{cal}	$t_{critical}$
Multimedia	29.94	70	8.91	2.82
Conventional	14.02	90	-	-

Since t_{cal}=8.91> 2.82, the hypothesis is rejected. This implies that there is a significant difference in the academic interest of student taught mechanics with multimedia method against the students taught mechanics with conventional method.

4.3 Research question two

What is the mean interest rating of male and female students of senior secondary school one taught using multimedia teaching approach?

In Table 3, the male and female students in the multimedia method had high interest scores of 14.18 and 15.56 respectively in the pre-test. The male students scored 28.94 in the post-test while the female students scored 30.94. The mean difference of the male is 14.76 while that the female students is 15.38 respectively.

To test the significance of the difference in the level of interest scores of male and female students, hypothesis two will be tested

Table 3: Presents the Result for Research Question Two

Method	Gender	N	type of test	$\bar{X}$
Multimedia	Male	42	Pre-test male	14.18
			Post-test male	28.94
	Female	28	Pre-test female	15.56
			Post-test female	30.94

4.4 Hypothesis two

There is no significant difference in the mean interest ratings of male and female of SS1 students taught using multimedia teaching approach.

Table 4: Hypothesis Two Test Results

Method	Gender	N	$\bar{X}$	t_{cal}	t_{cri}
Multimedia	Male	42	28.94	0.56	2.09
	Female	28	30.94	-	-

From Table 4, t_{cal}= 0.56 <$c_{ritical}$=2.09, hence the hypothesis is not rejected. This implies that there is no significant difference between the mean interest ratings of male and female students one taught mechanics using multimedia teaching approach.

4.5 Research questions three

What are the mean effect achievement scores of senior secondary school one students taught mechanics using multimedia teaching approach and those taught using conventional method? In Table 5, the mean for pre-test in both experimental and control group are 14.20 and 14.0 respectively indicating that both groups had equivalent entry behaviour. However, the mean gain of students in taught with multimedia teaching approach is 16.0 while that of the student in the conventional method is 4.99. This indicates that students that learned mechanics with multimedia system achieved higher than those that learned Mechanics using conventional method.

4.6 Hypothesis three

There is no significant difference between the mean achievement scores of SS1 students taught mechanics using multimedia teaching approach and those taught using conventional method.

Table 5: Presents the Answer to Question One.

Method	N	Type of test	$\bar{X}$	Mean gain
Multimedia	70	Pre-test Post-test	14.0 30.0	16.0
Conventional	90	Pre-test	14.51	4.99
		Post-test	19.5	-
Total	160	-	-	-

Table 6: Presents Answers to Hypothesis One

Method	$\bar{X}$	N	tcal	tcritical
Multimedia	**30**	**70**	**9.01**	**3.02**
Conventional	**19.5**	**90**	**-**	**-**

Since t_{cal}=9.01> 3.02 the hypothesis is rejected. This implies that there is a significant difference in the academic achievement of student taught mechanics with multimedia method against the students taught mechanics with conventional method.

4.7 Research question 4

What is the mean effect on achievement of male and female students of senior secondary school one taught using multimedia teaching approach?

In Table 7, the male and female students in the multimedia method had achievement scores of 15.01 and 14.04 respectively in the pre-test.

The male students scored 29.04 in the post-test while the female students scored 31.12 The mean gain of the male 14.76 while that the female students is 16.72. To test the significance of the difference in the achievement scores of male and female students, hypothesis four will be tested.

4.8 Hypothesis four

There is no significant difference in the mean achievement scores of SS1 male and female students taught using multimedia teaching approach.

From Table 8, t_{cal}= 0.60 <$c_{ritical}$=2.10, hence the hypothesis is not rejected. This implies that there is no significant difference between the achievement scores of male and female student in mechanics who were taught using multimedia.

Table 7: Presents the result for research question two

Method	Gender	N	type of test	Mean
Multimedia	**Male**	42	Pre-test male	15.01
		-	Post-test female	29.04
	Female	28	Pre-test male	14.04
		-	Post-test female	31.12

Table 8: Hypothesis two is tested

Method	Gender	N	$\bar{X}$	tcal	tcri
Multimedia	**Male**	42	29.04	0.60	2.10
	Female	28	31.12		

5.0 Discussion

Result In Table 1 shows that the mean interest scores of students taught mechanics with multimedia teaching approach was 29.94, while those student taught mechanics with conventional method was 14.02.

The mean interest ratings difference between students taught mechanics with multimedia teaching approach and those taught mechanics with conventional method is 15.92.

This implies that the experimental group improved on their interest more than the control group. In this case, the study concludes that learning mechanics using multimedia teaching approach improved student's interest in the subject. The result of test of hypothesis in Table 2 affirms that, there is a significant difference between the mean interest rating of students taught mechanics using multimedia teaching approach then those taught using conventional method.

The implication is that, teaching mechanics using multimedia teaching approach improved students interest more than using conventional method. The findings revealed that students taught using multimedia teaching approach develop more interest in mechanics more than those taught using the conventional method. These findings gave credence to what was earlier found by IMOKO and AJAI (2010) that student's interest in mathematics can be improved through the use of appropriate teaching approach. Multimedia teaching approach is expected to be highly stimulating thereby increasing student's interest in the subject.

Result in Table 3 shows that the mean interest ratings of male and female in experimental group were 28.94 and 30.94. However the mean gain of male and female students was 14.76 and 15.38 respectively. Therefore, the difference in mean interest rating between the male and female students in mechanics was 0.62. This shows that both male and female students in the experimental group who were taught mechanics using multimedia teaching improved on their interest in mechanics. These ratings are affirmed by the test of hypotheses result of Table that, theres no significant gender difference between male and female students of experimental group. The findings support the views of Bernett (2006) and Nasr (2005) who found that teaching and learning of mechanics can be made interesting irrespective of gender difference.

Results in Table 5 shows that the pre-test mean score of the experimental group was 14.0 and the pre-test score of the control group was 14.51. From the mean scores, it is revealed that the subject of the study were almost at the same entry level in their knowledge of mechanics before the commencement of the treatment. However, the mean score of post-test for the experimental group was 30 and the post test scores of the control group was 19.5. From the mean scores for both groups, it could be seen that multimedia teaching approach group has the highest mean scores in mechanics than conventional groups.

The corresponding hypothesis is presented in Table 6 which research that t_{cal}= 9.01 while $t_{critical}$ is 3.02. Thus, the hypothesis is rejected. This indicate that there is a significant difference in the achievement scores of students in mechanics who were taught using multimedia approach than those taught using conventional method. These findings agree with Brown (2006) who asserted that through multimedia teaching, students learn fast and are able to retain their memory to improve listening, understanding and reading comprehension. Result in Table 7 showed that in the pre-test of male and

female students in the experimental group have a mean achievement scores of 15.01 and 14.04. In the post-test, the male and female students taught mechanics using multimedia teaching approach have a mean achievement scores of 29.01 and 31.12 respectively.

This implies that, the male and female students' scored a similar level of achievement, as the mean given in mechanics achievement of the students14.03 while that of the female students is 17.08.

The presented hypothesis thus in Table 8, which tested that there is no significant difference in the mean achievement scores of SS1 male and female students taught using multimedia teaching approach as t_{cal} = 0.6 and $t_{critical}$ = 2.10, hence $t_{cal}<t_{critical,}$ the hypothesis is not rejected. Implying that there was no significance difference between male and female students taught mechanics using multimedia method. This finding agree with Edward (2004) who found out that female students can do as well as male students in science subjects provided that right methods are adopted in the teaching approach.

6.0 Conclusions

Findings revealed that there is significance difference in the interest and achievement of students exposed to multimedia teaching approach than those that were conventionally taught and also there was no significant difference in the interest and achievement of male and female students taught using multimedia teaching approach. It was therefore recommended that the use of multimedia teaching approach should be adopted to encourage so as to complement other methods of teaching science in schools and colleges.

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