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Effects of videotaped multimedia instruction (VMI) on the performance of students in basic technology in junior secondary schools in Lagos state, Nigeria.

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Abstract: *The study determined the effects of Videotaped Multimedia Instruction (VMI) on the performance of students in Basic Technology in junior secondary schools in Badagry, Ojo and Iba Local Government Area of Lagos State. Four research questions and four null hypotheses tested at 0.05 level of significance guided the study. The study adopted quasi-experimental research design, non-equivalent control groups which involved two groups. Simple random sampling technique by balloting was used to randomly assign two intact classes of Junior Secondary School class two students each to the two treatment groups. Each intact class comprised of male and female students. The instrument used for data collections were: Basic Technology Achievement Test (BTAT). The BTAT was a standardized test adopted from National Examination Council Junior Secondary Certificate Examination (NECO). The data collected were analysed using mean to answer the four research questions while analysis of covariance (ANCOVA) was used to test the four hypotheses at 0.05 level of significance. Recommendations were made based on the findings, of the study*

Key Words: *Multimedia Instruction, Performance, Conventional Teaching. Constructivist Teaching.*

1. INTRODUCTION:

The need for functional education led to the review of the National policy on Education which resulted to the introduction of Introductory Technology into the system of education in Nigeria in 1982. Introductory technology according to Okoro (1994) is a term that describes the study of the various fields which involve the knowledge and application of basic concept of technology. This subject is not limited to only one area, but provides a broad overview of several aspect of Technology. This include: Basic principles and practices in Technical Drawing, Woodwork/Building Construction, Mechanical/Metalwork Technology, and Basic Electricity/Electronics technology. As a pre- vocational training, introductory technology is offered in junior secondary school, to arouse the interest of the students in vocational training and also to train them to be self-reliant in the future. Introductory technology gives the students the opportunity to use hand tools and machines and this eventually help to develop good attitude towards technology and the industry. Today, the subject is known as Basic Technology.

Basic Technology can be seen as that education that aids students to explore the various area of technology towards making intelligent career choices and it is on this ground that introductory technology is made compulsory in junior secondary school (Uwameiye, (2013). In spite of the importance and popularity of introductory technology among Nigerian students, performance and interest of students in junior secondary school level has been poor. The implication of this failure in education is that Nigeria may have shortages of manpower in science and technology related disciplines. This may affect Nigeria's vision to become one of the 20 industrialized nations in the world by the year 2020. Owing to the importance of Basic technology as a pre-vocational training and its importance in encouraging vocational orientation into functional education, it may not be effectively learnt with the use of traditional approaches of teaching, such as, lecture method, and discussion methods. The method to be adopted to arouse the students' interest should be able to sustain students' participation during the instructional process, motivate students to learn actively, allow students to see practical demonstration for example, on how parts of machines work and how to operate the machines to do a work. With the advent of technology, multimedia presentations can be used to demonstrate the above mentioned concept. Aroh, (2006) stated that in classroom, learning could be made easier through the use of multimedia presentations.

Multimedia is defined as the combination of various digital media types such as text, images, sound and video into an integrated multi-sensory interactive application or presentation to convey a message or information to an audience. In other words, multimedia Instruction means an individual or a small group using a computer to interact with information that is represented in several media, by repeatedly selecting what to see and hear next (Agnew, Kellerman and Meyer, 2006). Reisman (2004) described multimedia as a ray of computer-driven interactive communication system, which create, store, transmit and retrieve textual graphic and auditory networks of information. Multimedia could be interpreted as a combination of data carriers, for example video, CD-ROM, floppy disks, Internet and software in which the possibility for an interactive approach is offered

The power of multimedia lies in the fact that it is multi-sensory, stimulating the many senses of the audience. It is also interactive, enabling the end users of the application to control the content and flow of information. This has introduced important changes in the educational system and impact the way we communicate information to the learners (Neo and Neo, 2010).

Multimedia in Education has been extremely effective in teaching individuals a wide range of subjects. Multimedia is changing the way we communicate with each other. The way we send and receive messages is more effectively done and better comprehended. While a lecture can be extremely informative, a lecture that integrates pictures or video images can help an individual learn and retain information much more effectively. A multi-sensory experience can be created for the audience, which in turn, elicits positive attitudes towards its application (Neo and Neo, 2010). Multimedia has also been shown to elicit the highest rate of information retention and result in shorter learning time (Ng K.H and Komiya, 2010). On the part of the creator, designing a multimedia application that is interactive and multi-sensory can be both a challenge and thrill. Multimedia application design offers new insights into the learning process of the designer and forces him or her to represent information and knowledge in a new and innovative way (Agnew, Kellerman, and Meyer 2006). This method can also increase the performance of students in performance test.

Performance can be seen as an act of taking up a task and excelling in it when rated with others. The student who was made to undergo a psychomotor or cognitive test after undergoing a training and comes out successful may be adjudged to have performed well. This good performance can only come when the student has really learned well. According to Athson (2007) for the student to learn well, it will really depend on several factors such as instructional method, the learning environment and the learner.

Learning theorists stated that to reach an objective or to acquire a skill, the learner must be actively involved through practice to cognitively incorporate it into long term memory (Jinaidu, 2008). Video, as an electronic device, provides audio and visual stimuli as well as motion thereby making possible a more realistic presentation of event, situation and phenomenon. Video can be used to demonstrate the process of skill development and facilitate practical skills acquisition. The use of multimedia video package in teaching and learning of technical drawing skills in Basic technology in junior secondary school will enhance students' achievement in junior secondary school examination and also increase interests of the students and enthusiasm of teachers. Furthermore, it simplifies and gives vividness to explanations than talking; it also provides a cognitive "bridge" between abstraction and reality to students.

Multimedia instructional video could integrate text, audio, static and motion pictures for presentation of information. Jinadu (2008) stated that multimedia draws upon more than one of the five human senses, utilizing the two fundamental senses vital for information reception-sight and sound. Due to motion and sound, it can also spark attention, interest and motivation in the process (Junaidu, 2008). Multimedia instructional video can be used to show motion pictures alongside synchronized audio. Basic technology concept such as Geometrical construction and Maintenance of tools and equipment can be effectively demonstrated with the use of multimedia video instruction. The motion pictures display the types of lines,

Hence, the use of multimedia instruction as compared with traditional teaching approach in this study will be a worthwhile exercise in establishing if there are significant differences in the performance of students.

2. STATEMENT OF THE PROBLEM:

Educators are always in constant tune of how to disseminate information that will really catch the attention of the students during learning and also increase learning outcomes. This has led to an urgent need to improve the quality of education through the use of appropriate instructional modes. Basic technology, which is one of the subjects offered at the junior secondary school, seems not to have yielded a positive outcome in the way it is being delivered to students. In Nigeria educational system, Basic technology is mostly taught and learned conventionally, using the talk and chalk or marker method. At present, Basic technology which is offered for three years in junior secondary school as a preparatory aspect of pre-vocational training is geared towards theory and memorization of concept for the passing of examination.

Due to the abstract nature of this subject and the inability of teachers to carry out practical's in some aspects of the subject and also the need to improve on the achievement of students, it becomes necessary to explore other methods that could be used for effective delivery of instruction in this subject. This study therefore, investigates the effect of Multimedia Video Instruction on the Performance and Interest of students in Introductory Technology in Junior Secondary Schools in Lagos State.

3. PURPOSE OF STUDY:

The main purpose of this Study was to:

1. Determine the mean performance scores of students' taught Basic Technology with videotaped multimedia and conventional teaching method in Basic Electricity/electronics Component of Introductory Technology.
2. Determine the mean performance scores of students' taught Basic Technology with videotaped multimedia and conventional teaching method in Mechanical/ Metalwork Component of Introductory Technology.
3. Determine the mean performance scores of students' taught Basic Technology with videotaped multimedia and conventional teaching method in Technical Drawing Component of Introductory Technology.

4. RESEARCH QUESTIONS:

The following research questions guided the study:

1. What are the mean performance scores of students' taught Basic Technology with videotaped multimedia and conventional teaching method in Basic Electricity/electronics Component of Introductory Technology?
2. What are the mean performance scores of students' taught Basic Technology with videotaped multimedia and conventional teaching method in Mechanical/ Metalwork Component of Introductory Technology?
3. What are the mean performance scores of students' taught Basic Technology with videotaped multimedia and conventional teaching method in Technical Drawing Component of Introductory Technology?

5. HYPOTHESES:

The following null hypotheses were tested at 0.05 level of significance

1. There is no significant difference in the mean performance scores of students' taught Basic Technology with multimedia and conventional teaching method in Basic Electricity/Electronics Component of Basic Technology performance test.
2. There is no significant difference in the mean performance scores of students taught Basic Technology with multimedia and conventional teaching method in Mechanical/Metalwork Component of Basic Technology performance test
3. There is no significant difference in the mean performance scores of students' taught Basic Technology with multimedia and conventional teaching method in Technical Drawing Component of Basic Technology performance test.

6. METHODOLOGY:

The study was carried out in four junior secondary schools in Badagry, Ojo and Iba Local Government area of Lagos State The research design adopted was the quasi-experimental non-randomized control group design. The multi-stage sampling technique was used. The first stage involved the selection of four schools for the experiment. The second stage involved the use of simple random sampling technique by balloting to sample two schools for the experimental and control group respectively. Therefore, intact class of the two secondary school each was randomly assigned to either experimental or control group. The experimental group comprised of 182 students while the control group comprised of 118 students.

6.1 INSTRUMENTS FOR DATA COLLECTION:

The instrument that was used for data collection was the Basic Technology Achievement Test (BTAT) The test was based on standardized test items from the National Examination Council Junior Secondary Certificate Examination (NECO JSCE). The BTAT (Theory) contained 60 multiple- choice items for the pre-test and reshuffled for the post-test Lesson plan structured using the conventional teaching method was adopted for the control group while a constructivist lesson plan based on the use of multimedia instruction was adopted to teach the experimental group.

6.2 EXPERIMENTAL PROCEDURE :

The study was conducted during the normal school lesson period after the permission to conduct the study has been obtained from the school principals. Basic technology teachers teaching in the same schools who have at least a minimum of five years teaching experience were used for teaching both the treatment and control groups. The teachers received one-week training on how to use or administer the instruments as well as how to use the instructional guides before the commencement of the lessons. Out of the four schools involved in the study, two were randomly assigned to treatment group Group A was taught with constructivist Multimedia Instructional guide while group B was taught with the conventional lesson plan. The treatment was made up of five multimedia lessons carried in five weeks. Each group met once a week for a period of 90 minutes (two periods). The treatment lasted for five weeks and one week was used for the training of the teachers and conduct of the pre and post-tests.

The two groups were however, subjected to a pre-test before the treatment which was conducted by the teachers teaching these groups. The answer scripts were marked to obtain students' scores on achievement. After five weeks of treatment, post-tests (BTAT and BTII) were administered to obtain students' scores in Basic Technology Achievement Test

7. METHOD OF DATA ANALYSIS:

The research questions were answered using mean and standard deviation of post-test scores. The Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance under the condition that if F-calculated is more than F-critical the null hypotheses was accepted, and if the F-calculated is less than F- critical, then the null hypotheses was rejected. While mean scores of 3.5 and above was regarded as agreed and mean scores below 3.5 was regarded as disagreed.

8. RESULTS AND DISCUSSIONS:

The presentations were organized according to research questions and the null hypotheses that guided the study

RESEARCH QUESTION 1

What are the mean performance scores of students taught with multimedia and conventional teaching method in Basic Electricity/ Electronics component of introductory technology performance test?

Table 1: ***Pretest and Posttest Mean Scores of Experimental and control Group in the cognitive Performance Test in Basic Electricity/ Electronics Component of Introductory Technology***.

Group	N	Pre-test	Post-test	Mean Gain
Experimental	**182**	**2.90**	**45.60**	**42.70**
Control	**118**	**2.92**	**24.60**	**21.68**

The data presented in Table 2 shows that the experimental group had a mean score of 2.90 in the pre-test and a mean score of 45.60 in the post-test making a pre-test, post-test mean gain in the experimental group to be 42.70. The control group had a mean score of 2.92 in the pre-test and a post-test mean of 24.60 with a pre-test, post-test mean gain of 21.68. With this result, the students in the experimental group performed better in the Basic Electricity/ Electronics Component of Introductory Technology than the students in the control group.

RESEARCH QUESTION 2

What are the mean performance scores of students taught with multimedia and conventional teaching method in Mechanical/ Metal work component of introductory technology?

Table 2*: *Pretest and Posttest Mean Scores of Experimental and control Group in the cognitive Performance Test in Mechanical /Metal Work Component of Introductory Technology performance test.

Group	N	Pre-test	Post-test	Mean Gain
Experimental	**182**	**3.82**	**35.68**	**31.86**
Control	**118**	**3.92**	**25.49**	**21.57**

The data presented in Table 3 shows that the experimental group had a mean score of 3.82 in the pre-test and a mean score of 35.68 in the post-test making a pre-test, post-test gain in the experimental group to be 31.86. The control group had a mean score of 3.92 in the pre-test and a post-test mean of 25.49 with a pre-test, post-test gain of 21.57. With

this result, the students in the experimental group performed better in the Mechanical/ Metal Work Component of Introductory Technology than the students in the control group

RESEARCH QUESTION 3

What are the mean performance scores of students taught with multimedia and conventional teaching method in Technical Drawing Component of Introductory Technology Performance test?

Table 3: ***Pretest and Posttest Mean Scores of Experimental and control Group in the cognitive Performance Test in Technical Drawing Component of Introductory Technology.***

Group	N	Pre-test	Post-test	Mean Gain
Experimental	**182**	**4.75**	**37.60**	**32.85**
Control	**118**	**4.67**	**21.71**	**17.04**

The data presented in Table 3 shows that the experimental group had a mean score of 4.75 in the pre-test and a mean score of 37.60 in the post-test making a pre-test, post-test gain in the experimental group to be 32.85. The control group had a mean score of 4.67 in the pre-test and a post-test mean of 21.71 with a pre-test, post-test gain of 17.04. With this result, the students in the experimental group performed better in the cognitive performance test than the students in the control group.

HYPOTHESES 1

H_{O1}: There is no significant difference in the mean performance scores of students taught with multimedia and conventional teaching method in Basic Electricity/Electronics Component of Basic Technology performance test.

Table 4: Summary of Analysis of Covariance (ANCOVA) for Test of Significance between the Mean Scores of Experimental and Control group in the Cognitive Performance Test of Basic Electricity/Electronics Component of Basic Technology performance score.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	2090.442[a]	4	522.610	14.218	.000
Intercept	12024.523	1	15024.523	408.740	.000
Pretest	3.801	1	3.801	.103	.748
Methods	156.309	1	156.309	8.564	.000
Error	4815.316	131	36.758		
Total	588779.000	127			
Corrected Total	5905.757	138			

*Significant at sig of F<.05

The data presented in table 4 shows that the F-cal value for method is 8.564 with a significance difference of F at .000, which is less than 0.05. The null-hypotheses is therefore rejected at 0.05 level of significance. With this result, there is a significant difference between the mean performance scores of students taught Basic Electricity/Electronics component of Basic Technology using the multimedia approach and those taught using the conventional teaching method.

HO_2: There is no significant difference in the mean performance scores of students taught with multimedia and conventional teaching method in Mechanical/Metalwork Component of Basic Technology performance test.

Table 5: Summary of Analysis of Covariance (ANCOVA) for Test of Significance between the Mean Scores of Experimental and Control group in the Cognitive Performance Test of Mechanical/Metalwork Component of Basic Technology performance score.

Source	Type 111 Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	7015.737[8]	26	269.836	5.081	.000
Intercept	24113.370	1	24113.370	454.075	.000
METHOD	5404.216	16	337.764	6.360	.000
Error	5044.919	95	53.104		
Total	490500.000	122			
Corrected Total	12060.656	121			

The data presented in table 5 shows that the F-cal value for method is 6.360 with a significance difference of F at .000, which is less than 0.05. With this result, the null-hypotheses is therefore rejected at 0.05 level of significance. Therefore, there is a significant difference between the mean performance scores of students taught Mechanical/Metalwork component of Basic Technology using the multimedia approach and those taught using the conventional teaching method.

HYPOTHESES 3

H_{O1}: There is no significant difference in the mean performance scores of students taught with multimedia and conventional teaching method in Technical Drawing Component of Basic Technology.

Table 6: Summary of Analysis of Covariance (ANCOVA) for Test of Significance between the Mean Scores of Experimental and Control group in the Cognitive Performance Test of Technical Drawing Component of Basic Technology performance score.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	2090.442[a]	4	522.610	14.218	.000
Intercept	15024.523	1	15024.523	408.740	.000
Pretest	3.801	1	3.801	.103	.748
Methods	256.309	1	256.309	7.973	.008
Error	4815.316	131	36.758		
Total	578779.000	136			
Corrected Total	6905.757	135			

*Significant at sig of F<.05

The data presented in table 6 shows that the F-cal value for method is 7.973 with a significance difference of F at .008, which is less than 0.05. The null-hypotheses is therefore rejected at 0.05 level of significance. With this result, there was significant difference between the mean performance scores of students taught Technical Drawing Component of Basic Technology using the multimedia approach and those taught using the conventional teaching method.

9. DISCUSSSION OF FINDINGS:

The data presented in Table 1 provided answer to research question one, finding revealed that students taught with multimedia instruction had a higher mean performance score than those taught with the conventional teaching method in Basic Electricity/ Electronics Component of Introductory Technology. In the same vein, the analysis of covariance presented in Table 3 confirmed that the difference between the mean scores of students taught with the multimedia approach and conventional approach was significant. The significant difference is attributed to the treatment given to

the experimental group. The finding indicated that the multimedia instruction approach had a positive effect on student's performance in Basic Electricity/ Electronics Component of Introductory Technology. This result was in accordance to the work of Nwanekezi and Kalu (2012) who found out that students taught with multimedia instruction tended to be superior to their counterparts with regard to retention in Basic Science Concepts studied.

The data presented in Table 2 provided answer to research question two, finding revealed that students taught with multimedia instruction had a higher mean performance score than those taught with the conventional teaching method in Mechanical/ Metal Work Component of Introductory Technology. In the same vein, the analysis of covariance presented in Table 4 confirmed that the difference between the mean scores of students taught with the multimedia approach and conventional approach was significant. The significant difference is attributed to the treatment given to the experimental group. The finding indicated that the multimedia instruction approach had a positive effect on student's performance in Mechanical/ Metal Work Component of Introductory Technology. This finding concord with the assertion of Aloraini (2012) who confirmed that multimedia instruction increases student's retention level

The data presented in Table 3 provided answer to research question three, finding revealed that students taught with the constructivist multimedia instruction approach had a higher mean score than those taught using the conventional teaching method in cognitive performance test. In the same vein, the analysis of covariance presented in Table 6 confirmed that the difference between the mean scores of students taught with the constructivist multimedia approach and conventional approach was significant. The significant difference is attributed to the treatment given to the experimental group. The finding indicated that the constructivist multimedia instruction approach had a positive effect on student's cognitive performance in Technical Drawing Component of Introductory Technology. These findings were supported by Teo and. Chai (2009) who viewed multimedia instruction positively over the traditional lecture-based instruction.

10. CONCLUSIONS:

Given the general concern over the apparent production of low quality Basic technology teachers in Junior Secondary School, the need to find the appropriate instructional technique to assist Introductory technology students to learn practical contents of Introductory technology in order to improve their psychomotor achievement becomes imperative. This study found out that multimedia instruction is more effective in improving students' achievement in introductory technology than conventional (demonstration method). This improvement noticed in students' performance and interest were due to the students' interaction with learning material that is organised systematically from simple practical tasks to complex ones.

This s imply means that constructivist multimedia instruction enables the students to actively participate in the laboratory instruction and consequently enhanced their achievement in practical skill acquisition. Therefore, introductory technology teachers in junior secondary school should be encouraged to adopt this technique. This will help them (teachers) to teach the subjects for better understanding and active participation of the students in the performance of the tasks. If constructivist multimedia instruction is used by introductory technology teachers in junior secondary school, it will enhance the production of high quality junior secondary school students who will be well equipped with the practical competencies for the professional job of being self-employed or furthering to senior secondary schools or in technical colleges.

RECOMMENDATIONS:

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

1. Introductory technology teachers in junior secondary school should adopt the use of the constructivist instructional approach to the learning of introductory technology.
2. National Examination Council (NECO) should consider the review of curriculum for introductory technology programme with a view to incorporating the constructivist multimedia instructional approach into the teaching of introductory technology.
3. Government should provide tools and equipment needed to teach the state of the art of introductory technology in junior secondary schools.
4. Ministry of Education (Federal and State) may organize re-training programmes through workshop, seminar and conferences for introductory technology teachers in order to update their knowledge on how to develop and utilize constructivist multimedia instruction for maximal result.

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