COMPARATIVE EFFECT OF LECTURE METHOD AND MULTIPLE INSTRUCTIONAL APPROACH ON STUDENTS' COGNITIVE ACHIEVEMENT IN BASIC TECHNOLOGY IN OSUN STATE

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Abstract
The study compared the effect of lecture method and multiple instructional approach on students' cognitive achievement in basic technology. Two research questions were answered and two null hypotheses were tested at 0.05 level of significance. Quasi-experimental design was adopted for the study, specifically, the non-equivalent control group design. The study was carried out in Ilesa Education Zone of Osun State. The population of the study was 1,876 JSS two students, while the sample comprised 80 JSS two students drawn from two intact classes in two junior secondary schools in Ilesa. Experimental group was taught using multiple instructional approach, while the Control group was taught using lecture method. The treatment lasted for four weeks after pretest has been administered using Basic Technology Achievement Test (BTAT) as instrument for data collection. The instrument was subjected to face and content validity. Test-retest method was adopted to establish reliability of the instrument which yielded a coefficient of 0.75. Data collected were analyzed with mean and analysis of covariance (ANCOVA). The result revealed that students taught with multiple instructional approach performed better than students taught with lecture method in basic technology. There was no significant difference in the mean scores of male and female students in basic technology after the treatment. Based on the findings of the study, it was recommended that relevant agencies should instruct basic technology teachers to adopt multiple instructional approach when teaching to enhance students' cognitive achievement.
Keywords. Basic technology, cognitive achievement, lecture method, multiple instructional approach.

Introduction

Basic Technology is an integrated subject that introduces students to basic rudiments of technology and vocational education as it provides basic knowledge of woodwork, metalwork, technical drawing among others at the introductory level. Basic technology is a pre-vocational subject offered at junior secondary schools as post primary education. According to Uwameiye and Ojikutu (2008), basic technology exposes students at the junior secondary school (JSS) level to technology through exploratory activities. Its objectives among others include; enabling students to explore their environment with their hands. It is designed to be taught in junior secondary school which is also known as upper basic school.

At junior secondary school level, basic technology was designed to be taught so as to achieve the specific lay down objectives. In other to facilitate the process of knowledge transmission, teachers need to apply appropriate instructional approach. Abubakar, (2015) reiterated that the major role of instructional approaches is to provide a wide range of alternative avenues through which the same unit of instruction can be presented to learners. Most teachers

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today apply lecture method which is teacher centered approach to promote interest, analytical research, critical thinking and enjoyment among students but eventually fail to achieve lesson's objectives and results to poor cognitive achievements (Hesson & Shad, 2007). Transferring knowledge requires teachers to use the appropriate approaches and pedagogy that best suits the learner and suit the objectives and desired outcomes.

Adunola (2011) maintains that teachers need to be conversant with numerous instructional approaches that take recognition of the magnitude of complexity of the concepts to be covered. Ndirangu (2007) opined that, the choice of a particular method or approach of teaching by the teacher is determined by the number of factors which includes the content to be taught, the objectives which the teacher plans to achieve, availability of teaching and learning resources and instructional approach adopted by teacher just to mentioned a few.

Reports from different states in Nigeria indicated poor cognitive achievement of students in their Junior Secondary School Examination in Basic Technology (Nwoji, 2000; Lenga, 2001). Akpan, Usoro, Akpan, and Ekpo (2010) opined that many students cannot interpret simple machine drawings. Few or no student on completion of the subject can even construct simple electric circle correctly in terms of using switch, battery, copper wire and electric bulb. This poor cognitive achievement of students in basic technology could be further ascribed to insufficient tools, equipment, materials and above all lack of suitable instructional approach adopted by teachers among others to teach the subject. The main purpose of teaching at any level is to bring out a significant change in the learner (Tebabal & Kahssay, 2011).

Poor cognitive achievement by majority of the students in various subject areas is basically linked to the application of ineffective instructional approach used by teachers to impact knowledge. Common instructional approach use today by teacher is lecture method which does not cater for learners' preference to learn and it results to poor cognitive achievement in basic technology. This therefore calls for new innovation in teaching basic technology. Such new innovation according to researcher's view is called multiple instructional approach.

Multiple instructional approach (MIA) is referred to the approach which permits more than two approaches to be combined together as an entity during learning process. It comprises more than two approaches used simultaneously just to motivate students to learn and sustain this throughout the teaching of specific topics. Ayeni (2011), referred to MIA as the approach that allows teacher to inject varieties in teaching thereby stimulating learning and maintaining learners' interest throughout the teaching period. Multiple instructional approach used in this study is embedded in Jean Piaget theory in 1972 with the assumptions that all learning is the child's own activity as the child interacts with the physical and social environment. From the observations of Odundo (2013) after investigated the effect of instructional approaches which comprised lecture, dictation and chalkboard notes used together simultaneously on learners' achievement in Business studies in secondary schools, discovered that multiple instructional approach prove to improve students' achievement in sciences and technology related subjects like basic technology more than the traditional single instructional lecture method. His findings is also in line with that of similar studies by Ogbuanya, (2010) who carried out a study on the effect of multiple intelligence-based instructional approach on students' cognitive achievement in Electrical Electronics. Three instructional strategies which were simultaneously used comprised active learning, collaborative learning and authentic learning techniques. It was also revealed that group taught through multiple instructional strategies performed excellently better than those taught through conventional lecture method.

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Multiple instructional approach used in this study comprised the combination of discussion, cooperative learning and simulation approaches Simulation is an approach which involves students playing roles in simulated situations in order to learn specific skills and concepts transferable to real lifeCooperative learning allows students to work together in small groups on a common learning task and at the same time depend on one another for the outcome Discussion is an approach in which the teacher leads or guard students in expressing their opinions and ideas with a view to identify and solve problems collectively. Discussion is an approach which engages teachers together with students in thinking and developing social, talking and listening skills as it gives students an opportunity to be listened to and guided in a non-threatening atmosphere (Akinleye, 2010). In this study each topic selected to be taught in basic technology was divided into three sections and each section was taught with the each approach described in the study simultaneously.

Gender differentiation is an old and long controversial issue both in the society and in education. Different opinions and view abound on the issue of gender i.e male and female and its effect on student achievements especially in sciences and technology related subjects. There are two strong opposing schools of thoughts as regards to the effect of gender and cognitive achievement. As some educators back up some sex other educators are against it. This is one of the issues of contention in Nigeria today.

In recent times educators have expressed diverse views about gender and achievement. While some of these educators are of the view that male students do better than female students especially in science and technology, others disagree with this view arguing that achievement is a factor that is dependent on several factors such as socio-economic background, instructional approaches among others. Obiekwe (2008) who found that girls achieved more than boys in science and technology related subjects, and that female learners show some superiority over male learners.

Notwithstanding Okoro (2011) found out that male students achieve higher than their female counterparts in science and technology related subjects. Although Okeke (2007) and Nzewi (2010), are of the view that females achieve as high as their male counterparts when given equal opportunities. Notwithstanding, this study also join the queue to actually determine if gender is independent of either lecture method or multiple instructional approach.

Despite Osun State government efforts to improve the standard of education by providing the required human resources such as teachers, supervisors and material resources like textbooks, well equipped workshops comprised some basic machines in metal work, woodwork, automobile just to mentioned a few that are needed for the implementation of education at all levels, students' performance in basic technology in both internal and external examination is still very poor in recent years. This situation makes one to wonder what could be the causes of this persistent poor performance of students in basic technology examination. Some scholars attributed this high failure rate in science and basic technology to various factors which could be institutional and non- institutional. In support, Okolie, Elom and Inyiagu (2014) observed that poor performance of students in basic technology has been so high in many Nigerian public schools in the recent years.

It is against these backdrops that this study intends to find out the most effective approach of teaching basic technology by comparing the effect of lecture method and multiple instructional approach on students' cognitive achievement in basic technology in Osun state junior secondary schools. This study also looked into gender as one of its variables.

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Purpose of the Study

The purpose of this study was to compare the effect of lecture method approach and multiple instructional approach on students' cognitive achievement in junior secondary school Basic Technology in Osun State. Specifically, the study determined the

1. difference between cognitive achievement mean scores of JSS students taught Basic Technology using lecture method and multiple instructional approach,
2. gender difference between cognitive achievement mean scores of JSS students taught Basic Technology using lecture method and multiple instructional approach.

Research Questions

The following research questions guided the study:

1. What is the difference between cognitive achievement mean scores of JSS students taught Basic Technology using lecture method and multiple instructional approach?
2. What is the gender difference between cognitive achievement mean scores of JSS students taught Basic Technology using lecture method and multiple instructional approach?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance.

1. There is no significant difference in cognitive achievement mean scores of JSS students taught basic technology using lecture method and multiple instructional approach.
2. There is no significant difference in cognitive achievement mean scores of male and female JSS students taught basic technology using lecture method and multiple instructional approach.

Methods

This study adopted quasi-experimental design. Specifically, pretest posttest design with experimental and non-equivalent control group was used. The area of the study was Ilesa in Osun State.The population for the study comprised 1,876 from total number of 18 public junior secondary schools in Ilesa educational zone from academic record of State Universal Basic Education Board Osogbo, 2018/2019. Two intact classes of 80 students selected from two schools from the population of the study formed the sample size of the study. They were assigned experimental and control groups and taught four selected topics (energy conversion; basic electricity; woodwork practice; and basic knowledge of computer) used for the study.

Basic Technology Achievement Test (BTAT) was the instrument used for data collection. It comprised 40 objectives questions designed by the researcher. Face validity of the instrument was established by three experts from the Department of Technology and Vocational Education, Nnamdi Azikiwe University Awka while content validity was established using table of specifications designed for the study. To establish reliability, test-retest method was adopted and Pearson Product Moment Correlation was used to establish Correlation Co-efficient of 0.75.

Basic Technology Achievement Test was administered as pre-test to get the baseline data after the training of the research assistants in the first week. Thereafter, the experiment commenced between second weeks to fifth week. The experimental group was taught using Multiple Instructional Approach, while the control group was taught with Lecture Method Approach. Four topics taught for four weeks were energy conversion, basic electricity,

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woodwork practice, and basic knowledge of computer. Each topic was divided into three sub-topics and taught simultaneously with three approaches starting from discussion, cooperative learning and ended with simulation approaches.The last week was used for posttest activity of the two groups using BTAT after reshuffled. The data was collected using BTAT, analyzed with mean and tested with analysis of covariance (ANCOVA) at 0.05 level of significance. When f cal was lower than the level of significant null hypothesis was rejected but when f cal was higher than the level of significant, null hypothesis was accepted. Scores obtained were compared to determine the better approach between the two approaches used.

Results

***Research Question 1*:** What is the difference between the cognitive achievements mean scores of JSS students taught Technology using lecture method and multiple instructional approach?

Table 1

Mean Scores of JSS students' Cognitive achievement taught Basic Technology using lecture method and multiple instructional approach

Group	N	Pre-test	Post-test	Mean gain	Mean Difference
Lecture method	33	41.79	57.89	16.10	
					10.16
Multiple instructional approach	47	38.96	65.72	26.76	

The data on students' cognitive achievement mean scores in Table I revealed that students taught Basic technology using lecture had mean score of 57.89 while cognitive achievement mean score of students taught with multiple instructional approach was 65.72. Also the multiple instructional approach group had a mean gain score of 26.76 over the lecture group who had a gain score 16.10. The mean difference between the two groups was 10.16. It was revealed that students taught basic technology using multiple instructional approach therefore performed better than students taught using lecture method.

***Research Questions 2*:** What is the gender difference between cognitive achievement mean scores of JSS students taught Basic Technology using lecture method and multiple instructional approach?

Table 2

Mean of gender difference between cognitive achievement scores of JSS students taught Basic Technology using lecture method and multiple instructional approach.

Gender	N	Pre-test	Post-test	Mean gain	Mean Difference
Male	42	41.08	65.11	24.03	
					3.18
Female	38	39.26	60.11	20.85	

Data in Table 2 revealed mean achievement score of 65.11 for male students, while the female students had mean achievement score of 60.11. Male students had mean gain score of 24.03 in basic technology while their female counterparts had mean gain score of 20.85. The mean difference between the two groups was 10.16. Male students therefore, performed better

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than their female counterparts in taught basic technology using lecture method and multiple instructional approach.

***Hypothesis 1*:** There is no significant difference in cognitive achievement mean scores of JSS students taught basic technology using lecture method approach and multiple instruction approach.

Table 3
Analysis of Covariance of Students' Cognitive Achievement taught Basic Technology using lecture method approach and multiple instruction approach

Sources of Variation	Sum of Squares	df	Mean Square	F	Sig
Corrected model	11613.487	4	2903.372	37.258	.000
Intercept	2623.714	1	2623.714	33.669	.000
Pretest	9974.333	1	9974.333	127.996	.000
Instructional Approaches	2128.256	1	2128.256	27.311	.000
Gender	146.749	1	146.749	1.883	.174
Error	5844.501	75	77.927		
Total	329833.000	80			
Corrected total	17457.987	79			

Base on hypothesis 1, data in table 3 showed that there was a significant difference for mode of instruction on cognitive achievement mean score of JSS students taught basic technology as F (1,,75)=27.311, p<0.001 . The null hypothesis therefore was rejected, indicating that there was significance difference in cognitive achievement mean score of JSS students taught basic technology using multiple instructional approach and those taught using lecture method.

***Hypothesis 2*:** There is no significant difference in cognitive achievement mean scores of JSS male and female students taught basic technology using lecture method approach andmultiple instruction approach

In Table 3, it was revealed no significant mean for gender difference between cognitive achievement mean score of students in basic technology as F (1,75)=1.883, P>0.5. The null hypothesis was accepted indicating that there was no significant difference in cognitive achievement mean scores of JSS male and female students taught basic technology using lecture method and multiple instructional approach.

Discussion of Findings

Multiple instructional approach was superior to lecture method approach in facilitating students' cognitive achievement in basic technology. The differences in performance might have been because of the fact that the students were required to find out facts through discussion between them and their teachers, cooperative learning among themselves among others thereby imbibing the scientific processes involved in learning basic technology, which enabled them to perform better than their counterparts taught basic technology using lecture method approach. When the students generate their own question, analyze and discuss their findings and finally construct their understanding they seemed to understand their own information better than the

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ones the teachers introduced to them. The multiple instructional approach might have been more effective because the instructions were characterized by active student's involvement, thereby capturing the interest of the students and maximizing comprehension of the subject matter. From the observations of Odundo (2013), it was indicated that multiple instructional approach prove to improve students' achievement in sciences and technology related subjects like basic technology more than the traditional instructional methods like lecture and demonstration. The findings of this study are also in line with that of similar studies by Ogbuanya, (2010) who carried out a study on the effect of multiple intelligence-based instructional approach on students' cognitive achievement in Electrical Electronics which happened to be one of vocational subjects in government technical colleges. Her finding revealed that the student taught through multiple instructional approach performed significantly better than those taught through conventional lecture methods.

The results of the study showed that male students performed better than their female counterparts in basic technology. This could be as a result of the different socialization processes of male and female students in which the male persons are expected to explore their environment while the female ones are to conform or maintain their existing environment notwithstanding, male students performed significantly better than female students in basic technology. The finding did not support that of Obiekwe (2008) who found that girls achieved more than boys in science and technology related subjects, and that female learners show some superiority over male learners.

Notwithstanding Okoro (2011) found out that male students achieve higher than their female counterparts in science and technology related subjects. Although Okeke (2007) and Nzewi (2010), are of the view that females achieve as high as their male counterparts when given equal opportunities. Based on this study, males performed better than their female counterparts when taught with multiple instructional approach probably because males tend to explore their environment more than the females who tend to conform to the environment they found themselves.

Conclusion

The study clearly revealed that multiple instructional approach has significant effect on students' academic achievement. It makes learning interactive, increased social interaction, cooperative among others. It is therefore concluded that the use of multiple instructional approach improves students' academic achievement in Basic Technology. Based on the findings of this study, Ministries of Education, zonal inspectors of education, school principals among others should instruct teachers to teach basic technology and other vocational subjects with multiple instructional approach.

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