IJAAR PUBLISHING®

International Journal of Research in Education and Sustainable Development | ISSN: **2782-7666**
Vol. 3, Issue 4 (April, 2023) | www.ijaar.org/ijresd

Effects of Sequential Teaching Method on Achievement and Interest of Students in Automobile Technology in Colleges of Education (Technical) in North East Nigeria

[1]Prof. J. D. Lkama & [2]Aliyu Musa

[1]Department of Technology Education, Modibbo Adama University Yola. Adamawa State
[2]Department of Automobile Technology. Federal College of Education (Technical), Potiskum. Yobe State
Correspondence email address: musa.aliyu8@gmail.com

Abstract: *-The study was set to determine the Effects of Sequential Teaching Method on Achievement and Interest of Students in Automobile Technology in Colleges of Education (Technical) in North East Nigeria. The study answered two research questions and tested two null hypotheses. The quasi pre-test, post-test non-equivalent group design and a checklist were used for the study. The population for the study comprised of a total of 246 NCE II (Technical) students drawn from Federal Colleges of Education (Technical) Potiskum and Gombe both in North East Nigeria. The instruments used for data collection were Auto-Electrical System Achievement Test (AESAT) and Auto-Electrical System Students Interest Inventory (AESSII) developed by the researcher. The instruments were face and content validated by experts in Automobile Technology Education. The validated instruments were trial tested on 105 students and analyzed using Cronbach Alpha and Kuder Ricardson Formula 21 (KR-21). The reliability for the instruments stood at 0.78 for AESAT and 0.63 for AESSII. The data collected were analyzed using mean and standard deviation to answer the research question. While Analysis of Covariance (ANCOVA) was used to test the null hypothesis one and ANOVA was used to test null hypothesis two at 0.05 level of significance with the help of SPSS statistics. A post-hoc test was conducted to justify the reasons for rejection of the null hypotheses. It was found that students taught Automobile Technology using sequential teaching method had higher mean achievement scores than those taught using lecture and demonstration methods of teaching. The students taught Automobile Technology developed high interest when taught using sequential method of teaching. There was a significant difference in the mean achievement score of students taught Automobile Technology using lecture, demonstration and sequential method of teaching. Significant difference exists in the mean interest level of students taught Automobile Technology than those taught using lecture, demonstration and sequential teaching methods of teaching. Based on the findings of this research, it was recommended among others that teachers in Colleges of education should adopt the use of sequential teaching methods to improve the academic achievement and interest level of students. Government should make it as a matter of policy that teachers should make use of sequential teaching methods to enable students to develop high interest in learning.*

Keywords: Teaching method**,** Sequential, Achievement and Interest

Introduction

Colleges of Education in Nigeria are responsible for the production of teachers for primary and junior secondary levels (NCCE, 2020). The establishment of Colleges of Education in Nigeria emerged from the Ashby Commission in 1960. The National Commission for Colleges of Education (NCCE) was established in 1989 and assigned with the responsibility of supervising all Colleges of Education (COE) in Nigeria. In 1990, the NCCE produced the first minimum standards for all programs of teacher education in Nigeria, which is reviewed after every five years. The Minimum Standard document was based on the new mandate of the teacher training program at the NCE level which is the recognized minimum teaching qualification in Nigeria (FRN, 2014). Technical Education is one of the three-year programs run under NCE of which Automobile Education forms part of the five major disciplines as areas of specialization.

The curriculum of the NCCE (2020) for COE (Technical) specifies that students should offer all relevant technical courses in addition to general education in the first and second years of the program. In the final year, the students are to choose or specialize in the following five areas namely, Automobile Technology Education, Building Technology Education, Electrical/Electronic Technology Education, Metal Work Technology Education, and Wood Work Technology Education.

Primarily, the Automobile Technology area has to do with the study of diagnosing, maintaining, and repair of motor vehicles (Beako, 2018.) The program is designed to prepare teachers who will teach primarily at the junior secondary school. In these Colleges of Education, Automobile Technology is offered to produce competent motor vehicle technology teachers at the NCE level who will impart basic knowledge and training skills for the maintenance and repairs of faulty motor vehicles and their components which are embedded with various systems that enhance its efficient operation. These systems include mainly the ignition system, fuel system braking system, steering system, suspension system, transmission system, and others. Auto-electrical Systemcomprises the ignition system, the battery, starting system, the charging system, the lighting system and the auxiliary system taught using appropriate teaching methods.

Teaching methods according to Theresa (2016) are the strategies by which a teacher delivers the subject matter to the learner based on some predetermined instructional objectives to promote learning. Teaching methods also refers to approaches to teaching and learning in which concepts, pattern, and abstractions are taught to emphasize concept learning, inquiry learning, and problem-solving learning (Burdens & Byrd, 2010). In Automobile Technology Education, lectures, demonstrations, and field trips are the most common teaching methods used by teachers to impart concepts and skills to the students. These teaching methods may not provide the students with all the learning experiences that will be required to produce competent Automobile Technology Education teachers. To facilitate the process of knowledge transmission, teachers should apply appropriate teaching methods in particular or in combination that best suit specific objectives and level exit outcomes (Ganyaupfu, 2013). Therefore, Automobile Technology teachers need to employ a combination of teaching methods arranged in a sequence to improve students' performance.

In Automobile Technology Education, most teachers present instruction using the lecture and practical demonstration teaching methods. In (2014), Melisa observed that the lecture method is a teaching method whereby the teacher is the central focus of information transfer.

This lecture method according to Melisa (2014) and Saidu (2008) does not allow active student participation in the lesson and does not promote meaningful learning of a subject or course since it appeals mainly to the sense of hearing which can easily lead to forgetting (Saidu,2008). The demonstration method on the other hand involves the display or exhibition usually done by the teacher while the students watch and acquire skills in real-life situations (Ochoba, Ogide&Ogide, 2019). Demonstration, therefore, bridges the gap between theory and practice and allows learners to become good observers and develop an interest in the subject matter. However, the demonstration method does allow students to develop manipulation skills required for carrying out activities on their own to a certain level. The demonstration method also covers less scope in seeing details of objects being demonstrated (Ameh & Dantani, 2012). The demonstration method may not be very effective when too many participants are involved which could result in a potential shortage of time, space, and resources. For better performance of Automobile Technology students, the use of sequential teaching methods that combine lecture and demonstration arranged in a sequence needs to be embraced. In this research work, starting with a lecture, followed by demonstration and lecture teaching methods in different combinations provides sequential teaching methods.

The sequential Teaching Method (STM) is a method of imparting knowledge, skills, and attitude to the students using more than one teaching method arranged in a different order (Linde, 2018). Sequencing has to do with putting events, ideas, and objects in a logical order (Mbachu, Osuafor & Akachukwu 2020). In the sequential teaching method, the students learn from two or more methods of teaching arranged in a given order or sequence. In an attempt to achieve the objectives of the NCCE to provide competent Automobile Technology teachers, the NCCE (2020) Minimum Standards stipulated that the mode of teaching will be by lecture and workshop/practical demonstration and tutorial. A combination of lecture and demonstration teaching methods arranged in three different order constitutes sequential teaching methods. According to Zabanal (2020), one of the goals of teachers is to sequence instruction effectively in a manner that will improve the academic achievement of the students.

Academic achievement is the extent to which students, teachers, or institutions have achieved educational goals (Pooja, 2017). Academic achievement is commonly measured through continuous assessment or examination or in a combination of both usually symbolized by a score. Student achievement measures the amount of academic content a student has learned within a determined time. Teaching and learning methods are among the several factors that influence the academic achievement of students (Rhadika, 2018). Zewude (2015) maintained that teaching methodology affects students' academic achievement and students' achievement may be determined by the teaching method applied by the teacher. In Colleges of Education (Technical), students' achievement scores are measured through assignments, tests, and projects as specified in the NCCE (2020) Minimum Standards. The extent to which students have achieved their short or long-term educational goals can be attained if students retain what they have learned.

Interest in learning on the other hand refers to personal preferences concerning learning which entails an individual choice of one thing over another (Lai, 2010). It elicits pleasure and satisfaction; a feeling of likening associated with a reaction and could result in curiosity toward the subject of interest. Interest is classified into inventoried, tested, manifest, and expressed interests to collect data. Anyagh & Okwu (2010) identified curriculum, environment, the

perception that a subject is difficult, large class syndrome, and poor teaching methods among others as factors responsible for students' low interest and poor performance. Interest is important in students learning and therefore, the students need to be guided to develop a positive interest to improve their academic achievement and retention level in Automobile Technology Education. Based on the background of the study, this research work determined the effects of the Sequential Teaching Method on Academic Achievement and Interest of Students in Automobile Technology in Colleges of Education (Technical) in North East.

1.2 Statement of the Problem

Results obtained from the examination offices in the two colleges that were studied revealed that the average score of students in Auto-Electrical Systems for the year 2016/2017 (42%), 2017/2018 (40%), 2018/2019 (38%), 2019/2020 (48%) and 2020/2021 (47%) were below the average score. This perhaps explains the poor performance of students which attracts public cries. If this situation is left unattended, the aim of Automobile Technology Education will be defeated. Therefore, the study investigated the possible effects of the sequential teaching method on academic achievement and interest of Automobile Technology students in Colleges of Education (Technical) in North East Nigeria.

Purpose of the Study

Specifically, the study conducted an experiment to:

1. Determine the academic achievement of students taught Automobile Technology using lecture, demonstration, and sequential teaching methods in Colleges of Education (Technical) in North East Nigeria.
2. Determine the interest level of students taught Automobile Technology using lecture, demonstration and sequential teaching methods in Colleges of Education (Technical) in North East Nigeria

Research Questions

The following research questions guided the study.

1. What is the mean academic achievement scores of students taught Automobile Technology using lecture and sequential teaching methods in Colleges of Education (Technical) in North East Nigeria?
2. What is the mean interest level of students taught Automobile Technology using lecture, demonstration and sequential teaching methods in Colleges of Education (Technical) in North East Nigeria?

Hypotheses

The following null hypotheses were formulated and tested at a 0.05 level of significance:

1. There is no significant difference between the mean academic achievement score of students taught Automobile Technology using lecture, demonstration and those taught using sequential teaching methods in Colleges of Education (Technical) in North East Nigeria.
2. There is no significant difference between the mean interest level of students taught Automobile Technology using lecture, demonstration and those taught using sequential teaching methods in Colleges of Education (Technical) in North East Nigeria

Methodology

The quasi pre-test, post-test, and non-equivalent control group design was used for the study. The study was conducted in Gombe and Yobe states in North East geopolitical region of Nigeria. The population of the study comprised a total of 246 NCE 11(Technical) students for the 2020/2021 academic session in Federal Colleges of Education (Technical) Potiskum and Gombe. Two instruments: Auto-Electrical System Achievement Test (AESAT), Auto-Electrical System Students' Interest Inventory (AESSII) were developed by the researcher and used for the study The AESAT and consist of a total of 45 multiple-choice questions with four options, A, B, C, and D. The developed instruments were validated by experts from the Department of Technology Education Modibbo Adama University, Yola and Abubakar Tafawa Balewa University, Bauchi. The experts were requested to validate the instrument in terms of content, appropriateness and adequacy of the items in measuring what they are supposed to measure. The AESAT, AESRT and AESIIS were subjected to enable the researcher to determine the clarity of the test items, their readability, appropriateness and adequacy. The trial testing was carried out at the Federal College of Education (Technical), Bichi which is outside the study area since they operate the same (NCCE, 2020) Minimum Standards. The reliability of the instruments was determined using K-R.21 for the achievement and interest with the help of SPSS version 32 statistics. The values stood at 0.76 and 0.63 respectively. The topics covered were ignition system, battery and charging systems.

The sequence of the experiment is as follows:

Group 1	Lecture--- Lecture --- Lecture
Group 11	Lecture --- Demonstration --- Lecture
Group 111	Demonstration --- Lecture --- Demonstration

Data generated from the study were analyzed using mean and standard deviation to answer the research questions. Inferential statistics (Analysis of Covariance, ANCOVA were used to test the null hypotheses at 0.05 level of significance. The research questions were answered based on the NCCE (2020) minimum standard for grading. For analysis of data relating to the null hypotheses, if P-value is less than 0.05 level of significance ($P<0.05$), the null hypothesis was rejected. On the other hand, the null hypothesis was accepted, when the P-value was greater than 0.05 level of significance

Results

Research Question 0ne: What is the mean academic achievement scores of students taught Automobile Technology using lecture and sequential teaching methods in Colleges of Education (Technical) in North East Nigeria?

Table 1: Mean Achievement Score of Students Taught Automobile Technology Using Lecture, Demonstration and Sequential Teaching Method

Teaching Approach	N	$\overline{X}$	SD	Mean Difference
Lecture	82	35.01	10.96	
				20.12
Demonstration	82	55.13	5.60	
				10.61
Sequential	82	65.74	9.91	

The data presented on table one clearly shows that students taught using the lecture method had a mean achievement score of 35.01, while those taught using demonstration method had 55.13. Those taught through the sequential teaching method scored a mean of 65.74 on the achievement test. This indicates that there is a much higher mean difference of 20.12 and 10.61 in favour of those taught with the sequential teaching method. Going by the NCE grading system as stated in the NCCE Minimum Standards for the Colleges of Education in Nigeria, the students under the lecture method group have failed while those under demonstration and the sequential group have their mean score within the Merit and Credit Grade scores. Looking at the standard deviation for the two groups, there is a wider variability at 10.96 for lecture, 5.60 for demonstration and 9.91 for the sequential group. These differences in the mean performance of the students clearly show that the sequential teaching group outperformed the lecture method group by 30.73 points and the demonstration method by 10.61 mean points. Therefore, sequential teaching method is better than lecture and demonstration methods of teaching.

*Research Question Two***:** *What is the mean interest level of students taught Automobile Technology using Lecture, demonstration and Sequential Teaching methods in Colleges of Education (Technical) in North East Nigeria?*

Table 2: Mean Interest Level of Students Taught Automobile Technology Using Lecture, Demonstration and Sequential Teaching Methods

Teaching Method	**N**	$\overline{X}$	SD	Remark
Lecture	82	1.85	0.61	Low level
Demonstration	82	3.68	1.12	High level
Sequential	82	4.01	0.71	High level
Total	246	3.18	1.27	Moderate level

The result in Table two presents the mean interest level and standard deviation for all the students taught Automobile Technology using lecture, demonstration and sequential teaching

methods. The results for the three groups were combined to obtain an overall result on their interest level. The mean interest level and standard deviation for all the three groups stood at 3.18 and 1.27 respectively. The lecture method group had a low mean interest level of 1.85 which falls within the real limits of 1.50- 2.29 indicating a low interest level. The demonstration group on the other hand had high interest level with a mean interest score of 3.68 and a standard deviation of 1.12, which corresponds with 3.50-4.49 real limits. This indicates that the demonstration group had a high interest level in learning Automobile Technology than the lecture method group. The sequential teaching method group demonstrated a high mean interest level of 4.01which falls within 3.50-4.49 real limits, indicating that the students taught using the sequential teaching method developed high interest level in learning Automobile Technology. The standard deviations for the three groups stood at 1.27. The combine interest level for all the three groups was at moderate level. Therefore, students taught Automobile Technology using sequential teaching method developed higher interest than their counterparts taught using lecture and demonstration methods of teaching.

Hypotheses

HO_1. *There is no significant difference between the mean achievement scores of students taught Automobile Technology using Lecture, Demonstration and those taught using Sequential teaching methods in Colleges of Education (Technical) in North East Nigeria.*

Table 3: ANCOVA of Mean Achievement Score of Students Taught Automobile Technology Using Lecture, Demonstration and Sequential Teaching Methods

Source	Type III Sum of Squares	Df	Mean Squares	F	p-value	Remark
Corrected Model	40032.946[a]	3	13344.315	160.092	.000	Reject
Intercept	83369.471	1	83369.471	1000.183	.000	
Pre-test	74.408	1	74.408	0.893	.348	
Method	40026.338	2	20013.191	240.098	.000	
Error	20171.725	242	83.354			
Total	724453.000	246				
Corrected Total	60204.671	245				

A=R Squared = 0.665 (Adjusted R Squared = 0.661)

The result in Table 3 presents the data collected from the experiment to test hypothesis one with the help of ANCOVA. The analysis of data shows that the probability value associated with the calculated value of F (240.098) for the effect of the sequential teaching method on students' academic achievement in Automobile Technology is 0.000. Since the value is less than the 0.05 level of significance, the null hypothesis is not retained. This shows that a significant

difference exists between the mean achievement scores of students taught Automobile Technology using lecture, demonstration and sequential teaching methods.

HO_2.*There is no significant difference between the mean level of interest of students taught Automobile Technology using Lecture, Demonstration and those taught using the Sequential teaching method in Colleges of Education (Technical) in North East Nigeria.*

Table 15: ANOVA of Mean interest Level of Students Taught Automobile Technology Using Lecture, Demonstration and Sequential Teaching Methods

Source of Variation	Sum of Squares	Df	Mean Square	F	P-value	Remark
Between Groups	221.913	2	110.957	155.096	0.000	Reject
Within Groups	173.843	243	0.715			
Total	395.756	245				

Table four presents the ANOVA result of the mean level of interest of students taught Automobile Technology using lecture, demonstration and sequential teaching methods. The means and standard deviations have earlier been discussed under research question two. The sum of squares between groups is 221.913 while the sum of squares within groups stood at 173.843. The P-value of the mean interest level of the students was 0.000 at 2 and 243 degrees of freedom less the 0.05 level of significance, indicating that there is a significant difference in the mean interest level of students taught Automobile Technology using lecture, demonstration and those taught using sequential teaching method. Therefore, the null hypothesis was rejected due to the significant difference that occurred.

The findings of the study revealed that:

1. The mean achievement score of students taught Automobile Technology using Lecture, demonstration and sequential teaching method showed that sequential teaching method is better than lecture and demonstration methods of teaching.

2. The mean level of interest of students taught Automobile Technology using lecture, demonstration and sequential teaching methods showed that students taught using sequential teaching method developed more high interest than the students taught using lecture and demonstration methods of teaching.

3. There is a significant difference in the mean achievement score of students taught Automobile Technology using lecture, demonstration and sequential teaching methods.

4. There was a significant difference in the mean interest level of students taught Automobile Technology using lecture, demonstration and sequential teaching methods.

Discussion of Findings

The findings of the study revealed that the mean achievement score of the students taught Automobile Technology showed merit. The result also agrees with the findings of Namasaka, Helen & Chbukovian (2017) which showed that the use of STM has enhance student's achievement and retention of knowledge. The findings of the study agree with the work of Snezana (2013) which lamented that the use of STM has led to an improved achievement and interest level of students. The study also agrees with the work of Ugwu (2014) which lamented that students taught basic science using guided inquiry had higher mean interest score than their counterparts taught using conventional lecture method. There was a significant difference in the mean achievement score of students taught Automobile Technology using lecture, demonstration and sequential teaching methods. The result agreed with the works of Mbaegbu, Osuafor & Akachukwu (2020) which revealed that there was a significant effect of treatment with sequential teaching on students' achievement. There was a significant difference in the mean level of interest of students taught Automobile Technology using lecture, demonstration and sequential teaching methods. There was a significant difference between the mean level of interest of students taught Automobile Technology using lecture, demonstration and sequential teaching methods. This finding is related to the works of Ogunkunle & Onwunedo (2014) which revealed that there is a significant difference in the mean level of interest of students taught using differential instruction strategies and those taught using the conventional method. The study is also in agreement with the work of Namasaka (2015) which revealed that retention and transfer of knowledge in Biology are more effective with laboratory experiments than with lecture methods of teaching.

Recommendations

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

1. Teachers of Automobile Technology in Colleges of Education should adopt sequential teaching methods to improve the students' achievement.
2. Teachers of Automobile Technology in Colleges of Education should adopt sequential teaching methods to encourage students to develop high interest.
3. Colleges of education need to provide enabling environment that will improve the academic achievement of students in Automobile Technology.
4. Teachers in colleges of education need to combine two or more teaching methods to teach Automobile Technology so as to determine which method will enable the students to develop high interest in learning.

REFERENCES

Ameh, P.O & Dantani, Y.S. (2012). Effects of lecture and demonstration methods of teaching on academic achievement of students' in chemistry in nasarawa local government area of kano state. *international Journal of Modern Social Sciences 1(1), 29-37. Retrieved from https//wwwsemanticscholar.org/ paper/effects….*

Anyagh, P. I. & Okwu, E. I. (2010). E Vffect of formula teaching approach on student's achievement in algebra. *Journal of research in curriculum and teaching. 5 (1), 374-379.*

Auwal, A. (2013). Effects of teaching method on retention of agricultural science knowledge in senior secondary schools of Bauchi local government area, Nigeria. *International Journalof Science and Technology Educational Research 4(4), 63-69.*doi:10.5897/ijster2013,0206.retrievedon21/07.2019from http://www.academicjournals.org/ijster

Beako, T.Y. (2018). Emerging technical skills expected of students of motor vehicle mechanic works for sustainable manpower development in rivers state. Unpublished Masters Thesis, Rivers State University, Port Harcourt, Nigeria

Burden, P.R. & Bryrd, D.M. (2010). Methods for effective teaching, meeting the needs for all students. London Pearson education.

Federal Republic of Nigeria (2014). *National Policy on Education (5th edition).* Abuja: NERDC

Ganyaupfu, E. M. (2013). Teaching methods and students' academic performance. *International Journal of Human Social Science Invention,* 2 (9): 29-35.

Lai, Q. (2010). A survey of national taoyan senior high school students' interest in learning music and demand for self-decision. m.ataiwan department of music. normal university.

Mbachu, C.S., Osuafor, M.A. &Akachukwu, E.E. (2020). Effect of sequential usage of three teaching methods on academic achievement of secondary school students in biology in Onitsha education zone. *Journal of Research and Methods in Education10(2)49-56.* Retrieved on 16/02/2021 from www.iosrjournals.org

Melisa, K. (2014). Lecture as a teaching method. Retrieved On 6/12/2019 from www.712.Education.Com.

Miller, W.R. (2006). *Instructors and their jobs*. illinois. american technical publisher Inc.

. *European Journal of Educational Studies. 3 (5), 716-735.* doi:1.5283/zenodo.57466. Retrieved on 2/12/2019 from http//www. oapub.org/edu.sequential….

Namasaka, F.W. (2015). Effects of sequential teaching method on achievement, retention and transfer of knowledge in biology by secondary school students in kenya. retrieved on 14/12/2019. From https//pdfs.semanticscholar.org

Namasaka, F. W. Helen., O. W. & Chilikovian, B. W. (2017). Effects of sequential teaching method on retention of knowledge in biology secondary school students in Kenya. *European journal of educational studies 3(5), 716-735.*Retrieved on 14/12/2019. From https//www/oapub.org/edu.sequential

National Commission for Colleges of Education (2020). A summary of minimum standards for nce teachers. Abuja. NCCE.

Ochogba, C.O., Ogide, C.J. & Ogide, O.G. (2019). Effect of demonstration method on students' academic performance in basic technology in secondary schools in Ogba/Egbema/Ndoni local government area, rivers state, nigeria. *International Journal of Innovative Scientific & Engineering Technologies Research 7(2):28-32.* retrieved on 08/12/2019 from http://www.seahipaj.org

Pooja. G.(2017). Study on the effect of teaching method on the academic achievement of school going children of semi-urban area schools of Lucknow City. *International Journal of Home Science 3(2), 447-453*

Radika, K. (2018). Factors influencing the students' academic performance in secondary schools in India. retrieved on 15.10.2019 from http//www. researchgate.net/publication/3299199 119.

Snezena, S.V. (2013). The effects of usage of sequential teaching method on the academic achievement and retention level of students in area of biological sciences or biochemistry. Paper presented at the international valorisation conference on key methodology to successful competence based learning held on january, 2013.

Theresa, E.D. (2016). Different teaching methods: a panacea for effective curriculum development implementation in the classroom. *Instructional Journal of Secondary Education 3(6) 1, 77-84. doi: 10.11648/j.ijsedus.2018 30601.13.*

Ugwu, T.U. (2014). Effect of guided inquiry methods on students' achievement and interest in basic science. Unpublished Masters Thesis University of Nigeria, Nsukka.

Umar, A. A. (2011). Effects of biology practical activities on student's process skill acquisition in Minna. Niger state. JOSTMED 7(2), 118-126.

Zewude, B.T.(2015). Determinants of academic performance of students: case of Sodo university. *International Journal of Statistics Studies 3(4) 35-45.* From www.eajournals.org.