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# Effect of three Modes of Teaching on Students' Learning Retention in Electronics Works in Technical Colleges in Rivers State

*Reagan Nnabio Robinson*

*Ignatius Ajuru University of Education*

## ABSTRACT

The understanding and learning retention of electronics works being one of the major subjects offered in technical colleges is a key confirmation on the general performance of electronic subjects in technical colleges. This study was set out to determine the effect of three modes of teaching on students' learning retention in electronics works in technical colleges in Rivers State. The study also examined the influence of location on students' learning retention in electronics works. Two research questions guided the study, while two hypotheses were tested at 0.05 level of significance. The design of the study was pre-test, post-test non-equivalent control group quasi- experimental study. A sample size of 174 students drawn from a population of 267 students in Rivers State technical colleges was used. To obtain the sample, two technical colleges were purposively selected. Three intact classes were randomly selected and assigned to experimental group 1, experiment group 2 and control group.

*Keywords:* modes, teaching, students, learning, retention, electronics, works, technical and colleges.

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# Effect of three Modes of Teaching on Students' Learning Retention in Electronics Works in Technical Colleges in Rivers State

Reagan Nnabio Robinson

## ABSTRACT

*The understanding and learning retention of electronics works being one of the major subjects offered in technical colleges is a key confirmation on the general performance of electronic subjects in technical colleges. This study was set out to determine the effect of three modes of teaching on students' learning retention in electronics works in technical colleges in Rivers State. The study also examined the influence of location on students' learning retention in electronics works. Two research questions guided the study, while two hypotheses were tested at 0.05 level of significance. The design of the study was pre-test, post-test non-equivalent control group quasi-experimental study. A sample size of 174 students drawn from a population of 267 students in Rivers State technical colleges was used. To obtain the sample, two technical colleges were selected using purposive sampling technique. Three intact classes were randomly selected and assigned to experimental group 1, experiment group 2 and control group. The Electronics Works Retention Test (EWRT) of 30 question items was the instrument used for the study. The instrument was validated by three experts in technology and vocational education. A reliability coefficient of 0.67 was obtained using Kuder-Richardson 20 and Pearson's Product Moment Correlation methods. Data collected were analysed using mean with standard deviation to answer the research questions while analysis of covariance (ANCOVA) was used to test the hypothesis at 0.05 level of significance. It was found that students taught with improvised instructional resources mode of teaching retained better in electronics works.*

**Keywords:** modes, teaching, students, learning, retention, electronics, works, technical and colleges.

**Author:** Department of Technical Education Ignatius Ajuru University of Education Rumuolumeni, Rivers State.

## I. INTRODUCTION

The academic and vocational preparation of students for job placement that involves practical and applied skills in the areas of science and technology is one of the key objectives of technical education programme. It emphasizes the understanding and practical application of basic principles of science and mathematics, rather than the attainment of proficiency in manual skills that is properly the concern of vocational education. Technical education programmes are provided for learners to acquire knowledge and practical skills for effective nation building. Technical education according to Nwachukwu (2006) is an education that is specifically designed to provide an individual with the acquisition of practical and applied skills as well as basic scientific knowledge in order to get the individual adequately equipped for self-reliance or employment in the industries. Technical education programmes are offered in technical colleges and other related vocational institutions at post primary level.

Technical colleges according to Okoro (2006) are vocational training institutions in Nigeria that admit junior secondary school leavers to senior secondary schools and provide them with full vocational courses for three years duration. Technical colleges are regarded as the principal vocational institutions in Nigeria that provide

craftsmanship training. They give full vocational training to prepare students for entry into specific engineering trades by offering several subjects that will enable the students' to gain employment after graduation, and one of such subjects is electronics works.

Electronics works in technical colleges involves the repairs, maintenance and construction of basic electronics systems. It enables students in technical colleges to learn basic electronics theory that are needed to understand circuit designs in order to install, operate, maintain and repair electronic systems (Medugu, 2011). According to Robinson (2012), electronics works as a subject also deals with the study of the properties and behaviour of electrons under different conditions, especially with reference to technical and industrial applications. This is because devices which are used in electronics systems, control the flow of electrons which came from atoms. It has electronics devices and circuits as one of its branch subjects that involves the design and interconnection of electronic components with conductive wires or traces through which electrons can flow.

Electronics works is a skill oriented subject that requires adequate presence and use of instructional resources during teaching and learning processes (Robinson, 2012). Aina (2000) opined that the adequate use of instructional resources in a technical college is the heart of craftsmanship training. This invariably means that instructional resources are very important in technical college training. The lack of adequate use will hinder the acquisition of sufficient practical skills which are the core objectives of the programme. Instructional resources are usually arranged to give occupational direction so that acceptable work habits and procedures are successfully executed.

Moreover, Okujagu (1992) defined instructional resources as those educational apparatus, that are curriculum oriented, audio-visuals, teaching and learning materials and basic tools the teacher uses to assist learners in their learning process. It ensures that the learners see, hear, feel, recognize and appreciate learning, utilizing the five senses

modalities at the same time. At all levels of the nation's educational system and for all known and existing school types, instructional resources are indispensable factors in the attainment of set goals and technical colleges is not an exception. It is known that no technical college programme can be functional without instructional resources being utilised during the classroom experience in order to inculcate technology skills for maximum nation's development. According to Akaniwor (2005), instructional resources can be real or improvised.

Real instructional resources are those resources that are ready made; produced by manufacturers for a specific task. In electronics works, real instructional resources are purchased from sellers or gotten from technicians' dumps. However, due to consistent inadequacies in the provision of real instructional resources in the teaching of electronics works in technical colleges; it becomes imperative for technical teachers to think of how best to make use of their creative skills to improvise in order to achieve their lesson objectives.

Improvisation refers to the technique of using materials obtainable from the local environment to produce a product that will serve the purpose of the real one in its absence (Olagunju, 1998). Thus in electronics works; improvisation refers to the use of materials available in the local environment to produce basic electronics systems in the absence of the real ones. This invariably means that when the real instructional resources are not available, improvisation takes their place by producing similar instructional resources that will serve the same purpose. This is to enhance the teaching and learning processes in technical colleges by ensuring that the persistent problem of inadequacy of instructional resources will not seriously affect students' learning retention.

In the same vein, the real and the improvised are all instructional resources and any can be used in the class for teaching learning process but depending on the subject matter, topic and choice of selection by the teacher (Umunadi, 2009). Umunadi however suggests that using the real instructional resources is more profitable in the

class because it has the advantage of being manufactured properly and correctly to suit a teaching and learning process. Udosen and Ekukinam (2013) are of the opinion that improvised instructional resources can be more profitable in the class since it uses things that are familiar to the students to produce materials that can enhance teaching and learning processes. They emphasized that if the students are involved in the improvisation and/or the improvisation of an instructional resource will be done before the students during teaching periods, better impartation can be obtained with respect to students' learning retention. In electronics works, the appropriate selection of instructional resources lies on the shoulder of the teacher (Umah and Maaji, 2010). It is the teacher's responsibility to choose either real or improvised instructional resources that will best suit a teaching learning process.

In another development, Towe (2000) and Umar (2002) in their separate studies pointed out that, despite the inevitable need for the use of instructional resources for teaching in technical colleges, the teachers whose responsibility are seriously lacking in the use of neither the real nor the improvised instructional resources for teaching in technical colleges could lead to very poor students' learning retention. These according to Umar and Maaji (2010), have become a persistent problem for some years in the technical colleges. Apart from the problem of students' learning retention in relation to real and improvised resources, the issue of location of a school could have a significant effect on students' learning retention.

A school could be located in the urban or rural area. Odo (1999) stated that the location of a school (urban or rural) affects a child's ability to study and perform at the level expected of him. Jahun and Momor (2001) noted that different aspects of the school environment influence students' learning retention. They stress that the individual students' learning retention behaviour is influenced not only by the motivating forces of his home, scholastic ability and values but also by the social pressure applied by the participant in the school setting. In Nigeria, rural based schools

commonly lack good infrastructures which could serve as an inhibiting factor of a good learning retention. However, Umunadi (2009) stated that school location among other factors is a necessary prediction in electronics works learning retention. Similarly, Odo (1999) found school location to be a significant factor on student's difficulties in mathematics. He emphasises that students in rural areas have less difficulties in mathematics than their urban counterparts due to less distraction. However, Jahun (1999) reported that urban students performed better than their rural counterparts in Ahmadu Bello University Mathematics Test (ABUMT). Therefore the question is, whether students in urban and rural locations have different learning retention?

In education, learning retention can be referred to as having information stored in the memory in such a way that it can readily be retrieved in response to standard prompts (Karpicke and Roediger, 2007). It involves the ability to retain facts and figures in memory after teaching. Students must retain information taught in classes in order to show the benefit of learning. The teachers' job is not over according to Lieb (1991) until he has assisted the learner in retaining the information. For students to retain information taught, they should be able to interpret and apply the taught information to new situations (Abbamondi, 2014). Therefore Abbamondi concluded that students' scores on delayed tests was a good measurement of learning retention.

This problem of poor students' learning retention is seen in their performances in various examinations, particularly the National Business and Technical Education Board (NABTEB) examination. Federal Ministry of Education (FME, 2010) reported that there was a decline in students' performance in electronics works. It stresses that students' performance in electronics works in technical colleges have been dwindling in recent time and the situation calls for immediate attention in the institutions. FME (2010) stated that technical colleges are expected to produce craftsmen who are highly needed in the industries. According to Aworanti (2011), for some past years till date, electronics works had

recorded a high failure rate of over 50 per cent in National Business and Technical Examination Board (NABTEB). The situation calls for urgent attention in order to avoid a total depletion of students' enrolment in electronics craft trade in technical colleges.

According to Akaninwor (2005), the use of inappropriate modes of teaching is one of the reasons for students' poor learning retention in technical colleges. Mode of teaching in this context refers to the manner or form of imparting knowledge or skill to learners which includes; conventional instructional resource mode of teaching, improvised instructional resource mode of teaching and real instructional resource mode of teaching. However, Akinfolarin, Ajayi and Oloruntegbe (2012) observed that technical teachers' give more preference to conventional instructional resource modes of teaching over other modes. Hence, it is the view of the researchers that technical teachers' preference for conventional instructional resource mode of teaching over result oriented ones like real instructional resources mode and improvised instructional resources mode in teaching might be a major reason for students' poor learning retention in electronics works.

Conventional instructional resource mode in this context refers to the use of chalk boards for teaching learning processes. It is without the use of real instructional resources or improvised instructional resources (Akaninwor, 2005). It is a talk and chalkboard method of teaching. On the other hand, real instructional resource mode refers to the use of real instructional resources in a teaching and learning process while improvised instructional resource mode refers to the use of improvised instructional resources in a teaching and learning process.

The conventional instructional resource mode of teaching is employed by many electronics works teachers because it enables the teachers to cover a larger content area at a time and the students are given the same content at a time. Besides, this mode of teaching fails to encourage manipulative skill and creative thinking in the learner, hence leading to poor learning retention of the students.

It is regrettable that many electronics works teachers prefer the use of the conventional instructional resource mode which is devoid of the use of neither real instructional resources nor improvised instructional resources. This invariably means, electronics teachers are no longer recognising the potency of using real instructional resources nor improvised instructional resources in the teaching of electronics works in technical colleges. Hence, the need arises to determine the effect of these three modes of teaching on students' learning retention in electronics works in technical colleges in Rivers State.

## II. PURPOSE OF THE STUDY

The purpose of the study was to determine the effect of teaching electronics works with real instructional resources, improvised instructional resources and conventional instructional resources on students' learning retention in technical colleges in Rivers State. Specifically the study sought to;

1. Determine the effect of using real instructional resources, improvised instructional resources and conventional instructional resources modes of teaching on students' learning retention when taught devices and circuits in electronics works in technical colleges in Rivers State.
2. Determine the effect of using real instructional resources, improvised instructional resources and conventional instructional resources modes of teaching on urban and rural students' learning retention when taught devices and circuits in electronics works in technical colleges in Rivers State.

## III. RESEARCH QUESTIONS

The following research questions guided the study:

1. What are the mean learning retention scores of electronics works students when taught devices and circuits using real instructional resources, improvised instructional resources as compared with those taught on the same

- topic using conventional instructional resources in technical colleges in Rivers State?
2. What are the mean learning retention scores of urban and rural electronics works students when taught devices and circuits using real instructional resources, improvised instructional resources as compared with those taught on the same topic using conventional instructional resources in technical colleges in Rivers State?

#### IV. HYPOTHESES

The following null hypotheses (Ho) were tested at, 0.05 level of significance;

1. There is no significant difference in the mean learning retention scores of electronics works students when taught devices and circuits using real instructional resources, improvised instructional resources as compared with those taught on the same topic using conventional instructional resources in technical colleges in Rivers State.
2. There is no significant difference in the mean learning retention scores of urban and rural electronics works students when taught devices and circuits using real instructional resources, improvised instructional resources as compared with those taught on the same topic using conventional instructional resources in technical colleges in Rivers State.

#### V. METHODOLOGY

This study adopted a quasi-experimental research design. Specifically, the design is a pretest posttest non-equivalent control group quasi experimental group design. The population for the study consisted of 267 students. There are three technical colleges offering Electronics Works in Rivers State which are; Government Technical College Port Harcourt, Federal Science Technical College Ahoada and Government Technical College Tombia. The population for each college was as follows: Government Technical College Port Harcourt, 99 students; Federal Science Technical College Ahoada, 93 students and Government Technical College Tombia, 75 students. The sample for the study consisted of 174 students of Electronics Works, which represents 65% of the population. The sample was

obtained using purposive sampling technique to select two technical colleges for the study considering location as a factor. There are three intact classes; the researcher randomly assigned these intact classes to experimental group 1 (E1), experimental group 2 (E2) and control group (C) using balloting method. The experimental group 1 had a sample size of 62 students, experimental group 2 had 52 students and the control group had 60 students.

The instrument used for data collection was the Electronics Works Retention Test (EWRT) which was constructed and developed by the researcher. It is a well-structured test from the content of Electronics Works in the NABTEB syllabus with five items for each selected subject topic. The instrument contained a total of 30 items with four-point multiple choice responses. The development of the instrument was based on a Table of Specification.

The instrument was subjected to face and content validation by three experts from technology and vocational education. Their observations were used to improve the instrument in content, grammar, spellings and language. The reliability indices of the instrument was determined by subjecting EWRT to internal consistency and stability using Kuder-Richardson 20 formula and Pearson's Product Moment correlation methods respectively. The average reliability coefficient for both was 0.67, which was considered adequate to be used for the study. The experiment took duration of six weeks

A pretest was given to the students in each group a day before the teaching began using the Electronics Works Retention Test (EWRT). A posttest was also administered in the sixth week during the revision of all taught topics using the same Electronics Works Retention Test (EWRT). The Research questions were answered using mean with standard deviation, while the Hypotheses were tested at 0.05 level of significance using one-way and two-way Analysis of Covariance (ANCOVA).

## VI. PRESENTATION OF RESULTS

The analysis of data in relation to each of the research questions and hypotheses are presented as follows;

### Research Question 1

What are the mean learning retention scores of electronics works students when taught devices

and circuits using real instructional resources, improvised instructional resources as compared with those taught on the same topic using conventional instructional resources in technical colleges in Rivers State?

*Table 1:* Mean learning retention scores with standard deviations due to modes of teaching

Modes	Pretest		Posttest		N
	Mean	SD	Mean	SD	
Real	2.53	0.98	19.95	2.98	62
Improvised	1.92	0.69	23.63	3.06	52
Conventional	2.40	0.81	13.94	2.76	60

Table 1 shows the mean learning retention scores of the modes of teaching. From table 1, the mean retention score of real instructional resources (experimental group 1) was 19.95 with a standard deviation of 2.98. The mean retention score of improvised instructional resources (experimental group 2) was 23.63 with a standard deviation of 3.06. While the mean retention score of conventional instructional resources (control group) was 13.94 with a standard deviation of 2.76. The mean learning retention score of improvised instructional resources was higher, followed by real instructional resources and then

conventional instructional resources followed. Students taught with real instructional resources. Students taught with conventional instructional resources retained least.

### Research Question 2

What are the mean learning retention scores of urban and rural electronics works students when taught devices and circuits using real instructional resources, improvised instructional resources as compared with those taught on the same topic using conventional instructional resources in technical colleges in Rivers State?

*Table 2:* Mean learning retention scores with standard deviations due to modes of teaching on location

Modes	Urban		Rural	
	Mean	SD	Mean	SD
Real	19.68	4.11	19.86	3.89
Improvised	23.59	3.86	23.32	4.21
Conventional	14.12	5.06	13.89	4.95

Table 2 shows the mean learning retention scores of the modes of teaching on location. From table 2, the mean retention score of real instructional resources (experimental group 1) for urban was 19.68 with a standard deviation of 4.11 while the rural mean retention score of real instructional resources (experimental group 1) was 19.86 with a standard deviation of 3.89. The mean retention score of improvised instructional resources (experimental group 2) for urban was 23.59 with

a standard deviation of 3.86 while the rural mean retention score of improvised instructional resources (experimental group 2) was 23.32 with a standard deviation of 4.21. The mean retention score of conventional instructional resources (control group) for urban was 14.12 with a standard deviation of 5.06 while the rural mean retention score of conventional instructional resources (control group) was 13.89 with a standard deviation of 4.95.

The mean learning retention score of urban students was highest when taught with improvised instructional resources, followed by real instructional resources and then conventional instructional resources. Similarly, the mean retention score of rural students was highest when taught with improvised instructional resources, followed by real instructional resources and then conventional instructional resources. This implies that the urban students retained best when taught with improvised instructional resources followed by those taught with real instructional resources. The rural students retained best when taught with

improvised instructional resources followed by those taught with real instructional resources. The urban and rural students retained least in conventional instructional resources.

*Hypothesis I*

There is no significant difference in the mean learning retention scores of electronics works students when taught devices and circuits using real instructional resources, improvised instructional resources as compared with those taught on the same topic using conventional instructional resources in technical colleges in Rivers State.

*Table 3:* One-way ANCOVA on students' learning retention due to modes of teaching

Source	Type III sum of squares	df	Mean Square	F	Sig.	Dec.
Corrected Model	22.488	6	3.748	6.578	0.000	
Intercept	2852.386	1	2852.386	5006.000	0.000	
Modes	4.800	2	2.400	4.211	0.041	S
Location	0.164	1	0.164	0.288	0.661	NS
Modes and Location	0.564	2	0.282	0.495	0.591	NS
Error	96.330	172	0.570			
Total	4222.000	173				
Corrected Total	220.952					

Table 3 shows students learning retention with respect to modes of teaching. For modes of teaching, the SPSS computed F – value of 4.211 was found significant at 0.041 level of significance, which is less than the 0.05 level of significance set for the research. Therefore, mode of teaching is significant. The null hypothesis 1 is rejected. This means that there is a significant difference in the mean learning retention scores

of electronics works students when taught devices and circuits using real instructional resources, improvised instructional resources and those taught on the same topic using conventional instructional resources in technical colleges in Rivers State?

*Table 4:* Two-way ANCOVA on students' learning retention due to modes of teaching on location

Source	Type III sum of squares	df	Mean Square	F	Sig.	Dec.
Corrected Model	22.488	6	3.748	6.578	0.000	
Intercept	2852.386	1	2852.386	5006.000	0.000	
Modes	4.800	2	2.400	4.211	0.041	S
Location	0.164	1	0.164	0.288	0.661	NS
Modes and Location	0.564	2	0.282	0.495	0.591	NS
Error	96.330	172	0.570			
Total	4222.000	173				
Corrected Total	220.952					

Table 4 shows students learning retention with respect to location. For location, the SPSS computed F – value of 0.288 was found significant at 0.661 level of significance, which is higher than the 0.05 level of significance set for the research. Hence, location is not significant. The null hypothesis 2 is not rejected. This means that there is no significant difference in the mean retention scores of urban and rural electronics works students. On interaction for hypothesis two (modes and location) , the SPSS computed F – value of 0.495 was found significant at 0.591 level of significance which is higher than 0.05 level of significance set for this research. Hence, the null hypothesis 2 is not rejected. This means, there is no significant difference in the mean retention scores of urban and rural electronics works students when taught devices and circuits using real instructional resources, improvised instructional resources and those taught on the same topic using conventional instructional resources in technical colleges in Rivers State. It implies that location was not found significant with respect to retention.

## VII. DISCUSSION OF FINDINGS

The study revealed in Research Question 1 that students taught with improvised instructional resources (experimental group 2) had a higher mean retention score in electronics works compared to those taught with real instructional resources (experimental group 1) and conventional instructional resources (control group). Hypothesis 1 further confirmed a high retention rate by indicating that mode of teaching was a significant factor in the retention of students in the electronics works content. This means that the students who were taught using improvised instructional resources have the better ability to retain after a long while. The reason for the better retention with improvised instructional resources may have been as a result of students' ability to link new concepts to improvised instructional resources that are related to their everyday life. Thus, the result of the study revealed that the adoption of improvised instructional resources that are related to students' everyday life enhances learning

retention in electronics works. This study is supported by Karpicke and Roediger (2007) view that students develop greater ability of learning retention of technical education subjects when they are involved with the teacher in the preparation and use of improvised instructional resources. This is at variance with Abbamondi (2014) view, who believed that in the teaching of technology education, improvised instructional resources cannot be of much help at the initial stage, rather enough use of drawings will bring about better retention.

The study also revealed in Research Question 2 that urban and rural students taught with improvised instructional resources (experimental group 2) had a higher mean retention score than their counterparts taught with other modes of teaching. Moreover, Hypothesis 2 reveals that location has no significant effect on students' learning retention in electronics works. This agrees with Jahun and Momor (2001) findings that there is no significant difference in the mean retention score of urban and rural in the technology. The results in this study however disagree with Umunadi (2009) that urban students show significantly greater retention in mathematics than the rural students. On the average, it implies that retention does not depend on location rather it depends on the mode of teaching in electronics works.

## VIII. CONCLUSION

The results of the study provided the empirical evidence that improvised instructional resources mode of teaching enhanced students' learning retention better than real instructional resources mode of teaching and control resources mode of teaching. This implies that, for effective teaching that will bring about a better learning retention of students in electronics works, improvised instructional resources mode of teaching should be used. This finding is irrespective of the location of the technical college; rather it is depended on the mode of teaching.

## IX. RECOMMENDATIONS

The following recommendations were made based on the findings of the study:

1. Since the use of improvised instructional resources mode of teaching has been found to be effective in better learning retention of students in electronics works content; teachers in electronics works should accept the intricacies and develop a better attitude of using it often.
2. Workshops/seminars should be regular for electronics works teachers in order to enable them to use improvised instructional resources mode of teaching excellently in the technical college.
3. Since improvisation enhances learning retention in electronics works, State and Federal governments should legally enforce its mode of teaching in technical colleges.

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