



## Effect of E-Scenario Based Model on Students' Retention in Electronic Works in Technical Colleges in Gombe State

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### ABSTRACT

This research was carried out with the aim of testing the e-Scenario Based Model on Technical College Students' Retention in Electronics Works Trade in Gombe state. Three (3) research questions and two hypotheses were formulated to guide the study. The study adopted Pre-test-post-test non-equivalent group Quasi-experimental design. The area of the study was Gombe state. The population of the study consisted of 145 students while the sample of the study consisted of 58 students from the two selected technical colleges. The instrument used for the collection of data was Electronics Works Performance Test Instrument (EWPTI), which is a 10-item instrument for assessing how students conducted the practical test. The test instrument was validated by two experts from the Department of Electrical Technology Education MAU, Yola and one expert from the Department of Vocational and Technology Education, Abubakar Tafawa Balewa University, Bauchi. A reliability coefficient of 0.8 was obtained using Chronbach's Alpha method which showed that the instrument was valid. Mean and standard deviation was used to analyze research questions while a t-test was used to test the hypotheses at a 0.05 level of significance. The students were taught for a period of six weeks. The experimental group was taught using e-Scenario Based Model while the control group was taught using the conventional method. Post-test was administered to the students after the treatment, followed by a retention test after a two-week interval. The means retention scores of students in experimental and control groups were 74.26 and 58.07 respectively while the mean performance scores of male and female students in the experimental group were 70.49 and 74.38 respectively. The findings revealed among others that, students taught using e-Scenario Based Model performed better than the students taught using the conventional method. It was therefore recommended that teachers should be trained and encouraged to use both offline and online e-Model SBT in the process of teaching.

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### INTRODUCTION

Technical college is an equivalent of conventional secondary school in Nigerian education system with curriculum which contains skilled subjects known as trades. In addition to that, it also contains non-skilled subjects known as general education subjects. Technical colleges

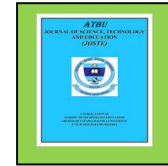
provide technical and vocational training needed to prepare students for work in various technical occupations (Ezugu, 2004). National Policy on Education (NPE) (2014) also defined technical colleges as schools that prepare students to acquire practical and applied skills as well as basic scientific knowledge". Federal Republic of Nigeria

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(FRN, 2014) outlined a range of trades in the technical colleges to include but not limited to: Mechanical, Computer craft, Building, Wood work, Cosmetology, Catering, Textile, Printing, Business and Electrical Engineering trades which consist of electrical installation and maintenance work and Radio, Television and Electronic Works trade.

Radio/Television and Electronic Works (RTVe) is a trade which consists of subjects that cover both cognitive and psychomotor aspects of learning. The trade is designed to equip students with hands-on experience in installing, maintaining and servicing of electronic devices and systems (National Business and Technical Examinations Board, NBTE, 2006). The trade also enables the trainees acquire the operations of common electronics devices as well as understand the basic concepts of satellite transmission, reception and installation. It also enables the trainees appreciate the operations of electronics devices as well as acquiring practical skills in diagnosing faults and repair television (NABTEB, 2006). RTV trade prepares students to become machine operators, artisans, craftsmen and master craftsmen in Radio, Television, and Electronics works (Zambwa, Makinde & Samaila, 2018). Radio Communication trade is clustered into modules of instruction as follows. Electronics devices and Circuits, Radio and Audio frequency amplifiers, Radio system, Television I, Television II, Colored Television and Radio and Electronics system (NBTE, 2006). The modules are designed to give training and impart necessary skills leading to the production of craftsmen and other skilled personnel who will be enterprising and self-reliant, (FRN, 2013). Specifically the Radio, Television and Electronic works modules are designed among other things to provide the student with basic competencies that will enable trainees dismantle, assemble, repair, service, maintain and install Radio and Television sets, Amplifiers, Video recorders and other Electronic appliances, system and circuits (NBTE, 2006). The Federal and State governments of Nigeria have recognized the importance of teaching radio; television and electronics works trade in technical colleges. Hence, the programmes are being introduced in

many Federal and State Technical Colleges (NABTEB, 2006).

According to Kumar (2006), Electronics students find it difficult to understand the principles, operations, practices and application of most of the Electronic Devices. These limitations encountered by students of Technical Colleges could be among the possible reasons for the difficulties they encounter in learning electrical electronics related disciplines at the tertiary education level. In order to lay a sound foundation for electronics work trade students, teachers need to diversify their instructional approaches so as to help such students to effectively specialize in any of the chosen electronics career related courses; Tumba and Chinda (2014) observed that Electronics works trade students of technical colleges find it difficult to understand the principles and practices of Electronics which leads to their poor performance in theoretical and practical courses. Their study revealed that the use of conventional method of teaching could be the major factor that affects their performance in learning electronic skills.

Conventional teaching method has been defined by Sawant and Rizvi (2015) as the teacher-centered approach where teacher is active and students are passive in teaching and learning process. It has also been defined by Kivunja (2013) as the method of teaching using chalk and board for teachers; pen and paper for students.

Unfortunately, conventional teaching methods such as lecture method and demonstration method are more widespread in Nigeria (Gombe state inclusive) than modern methods of teaching and there is a need to investigate empirically on student-centered methods of teaching that will help students to improve on their performance in electronics (Errigton, 2010). Recent studies conducted by Ogbu (2018), Chinda (2016) and Petal (2014), have also shown that, conventional method of teaching focuses on inculcating knowledge to learners with little application or practice thus, making the conventional method of teaching ineffective. On the other hand, modern methods of teaching expose learners to active participation in

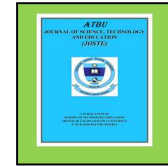
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classroom lessons and its assessment is seen as activity integrated with teaching and learning which occur through observation. Modern methods of teaching involve use of modern ways to improve teaching and learning in classroom. For example, Teleconference method of teaching which involves use of computer with Wi-fi connection in the classroom where teacher demonstrates the subject on his computer and students receive lectures in their various homes. Another modern method of teaching is Scenario-Based teaching, which is the modern method for this study.

Scenario Based Teaching (SBT) is a teaching method or strategy that encourages students to fully participate in classroom lessons using real-life stories, and sometimes incorporated with photos and video clips of local community activities that students are conversant with for the purpose of explaining professional concepts so that students could get real knowledge of the subject matter (Patel, 2014). Scenario-based teaching (SBT) is a re-discovered method of teaching that creates active learning which integrates knowledge, improves motivation, provides critical thinking and helps in acquiring skills of problem-solving (Norton, 2012). It also includes positioning learning in "real life" situations which is a significant element of acquiring knowledge. Presentation of Scenario-Based teaching is considered difficult, because it requires the capability of group discussion around an extensive range of complex problems where skills are required to encourage learners to take responsibilities for guiding their own learning. The ability to express the words and narrate the cultural stories of practice in education is the best and fundamental learning where learners exhibit concrete understanding of what they are being taught through comparison of such stories and subject matter.

Models are specific instructional plans which are designed according to concerned learning theories in order to help instruction to have a positive outcome on students' performance and behavior. Models can be used to shape a curriculum or course to select instructional materials that would guide teacher action. Joyce

and Weil (2014) described model as prescriptive teaching strategies which help to realize specific instructional goals. Teaching models help students to acquire concrete information, idea, skills, value, way of thinking and mean of expressing themselves. Hence models of teaching train students on how to learn. In fact, the most important long term outcome of instruction may be students' increased capabilities to learn more easily and effectively in the future. The main aim of models is to foster and strengthen the cognitive structure and to create powerful learners. In this study, the model is being transformed into an application package for e-learning.

Electronic Learning (e-learning) has been described by Fry (2017) as the delivery of training and education via network interactivity and distribution technologies. Sambrook (2018) sees e-learning as learning and communication exercise across computers and networks. Khan (2016) pointed that, e-learning has been described in various ways as learning using a number of different technologies and methods for instruction delivery such as Computer-based learning (CBL), Computer-based training (CBT), Internet-based training (IBT), Web-Based instruction (WBI), Advanced Distributed Learning (ADL), Distributed Learning (DL), Distance learning (DL), Online learning (OL), Mobile learning (ML) and Learning management system (LMS). In this research work, students learn electronic courses through a system called Computer-based learning (CBL) and being evaluated through Computer-based test (CBT). The learning involves students' interaction with model of teaching which explains electronic work concepts inform of stories, pictures and videos through the use of an online application package known as e-Model Scenario-based teaching (SBL).

For this study, e-Scenario based Model (E-SB Model) was developed by the researcher in such a way that learners were actively involved in an online programmed instruction and work at their own pace, it can be on individual basis or in small groups as the instruction provides immediate feedback. Students do not move to the higher level until he masters the concept. On the other

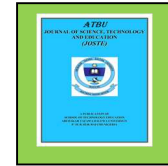
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hand, the teacher becomes mediator or collaborator instead of being the key source of information and transmitter of knowledge and skills. This is in line with the study conducted by Samai'ila, Makinde and Zambuwa (2016) where they stated that, a teacher is a mediator that helps his students to have concrete knowledge and skills in teaching electrical course with Computer Assisted Instruction (CAI). Hence, it can be observed that, there is a compelling challenge to also expose electronic students in technical colleges because the world community of knowledge now depends on digital systems. This calls for Co-opting e-learning into the classroom by electronic teachers in order to meet the world standard.

Retention is the ability of the memory to store information which can be recalled after interval of weeks when exposed to a series of instructions and training (Lakpini, 2006). Retention gives students ability to elicit performance and hold it after duration of time. Retention is a very vital component of educational process as it tells the worth of a student in a subject area in terms of knowledge acquired and power to reserve it overtime. It also refers to the knowledge or competence a learner acquired and retained from a learning situation after forgetting has taken place (Ezeoano, 2018). Retention serves as capacity to remember skills, knowledge, habit, attitude or other responses initially acquired. Retention plays very important role for the skill or knowledge learned to be effectively applied and reserved. Teachers teaching electronic works usually faced with task on how to help learners to improve on their abilities through an innovative instructional style to retain what they have learnt; this is due to the abstract concepts of Electronics.

Dantin (2005) asserts that, failure to provide enough application of knowledge to real life activities due to poor teaching techniques are strong limiting factors to students' retention. In a similar vein, Nneji and Azuka (2009) stated that retention depends mainly on teaching strategies adopted by a teacher and students' memory. Retention has to do with ability to remember and apply previously learnt behaviour. Retention in the view of Graham in Miller (2014) is the learning that

last beyond the initial unit of lesson and it is assessed with test administration two or more weeks after the information have been taught and tested. This means that a learner who is able to repeat an acquired piece of knowledge and skill with less error over time is said to have retained the knowledge and skill taught to him or her. Retention in context of this study means the ability of electronic works students to repeat an acquired knowledge, skill and attitude in electronic works over time with less error either through their responses to test administered on them or practical application of the acquired competency. Learning could be made clearer, easier and meaningful for better achievement of the concept learnt. Scenario-based learning could also reduce the perceived stereotyped status of both male and female students in learning Electronics in order to change the retention attitude of those genders in technical colleges.

Colman (2003) defined gender as a behavior pattern and attitudes perceived as masculine or feminine. Gender schema tends to relate most of the technical trades to the masculine gender, and show remarkable similarities as well as considerable differences in teaching learning evaluation. Differential performance of the sexes in technology education has now become an issue of interest. Traditionally, technology traits are believed to include remoteness, impersonality, detachment and objectivity (Birke, 2006). More often than not these traits are held to be feminine attributes. With this association, science and technology are given a masculine image. This image and other social and psychological barriers alienate girls with potentials; they often make choices, which exclude them from science and technology

Gender is also one of the factors that influence students' performance in Electronics works trade at Technical Colleges. Anekwe (2006) found some items which account for gender disparity. These include among others, unequal access for female/male students to participate in classroom discussion, higher performance level set for boys than girls and female students being assisted often in practical, projects and other assignments even by some of their teachers.

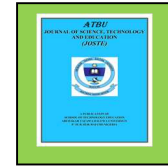
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These could also affect students' performance. However, the use of e-Scenario based model may help both male and female students of Electronics and other technical education courses.

### Statement of the Problem

In spite of the efforts by successive Nigerian governments aimed at improving the quality of education in technical colleges through federal and state ministries of education, the academic performance of the students in Electronics works trade is not encouraging. Several factors have been lamented in the literature that could have caused such poor performance of students, these include: school management factor, students' factor and teacher factor. The study will put emphasis on teacher factor as Federal Ministry of Education (FME, 2004) identified lack of good methodology as the major reason for low performance and drop-outs in the technical colleges in Nigeria. Ogbu (2018) observed that students' poor performance in Electronics works trade at national examinations has persisted from 2007 to 2017, and consequently has resulted in unemployment, poverty among craftsmen plus scarcity of skilled men and women needed for the growth of the nation's economy. Abdullatif and Rufa'i (2019) stated that the quality of technical college graduates has been a major concern for most employers of labour in Nigeria.

According to chief examiner's report (2014-2018), out of 9,225 students that sat for electronic works examination only 38.6% passed at credit level. This statistic showed that, 61.4% failed the examination of electronic works trade. Studies such as that of Tumba and Chinda (2014) have shown that, this poor performance is attributed to poor delivery of instruction in the classroom. Another study to mention is the study conducted by Lancaster and Lau (2020) where they stated that, adoption of teacher-centered methods of teaching while inculcating knowledge and skills to learners results into ineffective use of varieties of instructional methods and instructional techniques and inability of teachers to effectively implement the curriculum to naturally increase students' interest, participation and commitment to

learning. Ogbuanya and Owodunni (2015) stated that, the shortcomings of teacher-centered method of teaching could be responsible for poor academic performance of Electronics works trade students in public examination.

The conventional methods used for teaching students in technical colleges especially in Electronics works trade are not sufficient enough to inculcate the desired knowledge and skills to students in such a way that the teaching and learning process becomes lively and interesting to both students and their teachers (Medugu, 2011). In order to address the issue of teaching and learning techniques and methodologies in Electronics works trade, this study uses a model in form of software application with the view to assist electronic teachers to teach effectively the abstract and difficult concepts of the trade in an explicit way for students to acquire knowledge and skills that will equip them to have good retention capacity in order to perform well during and after any stipulated examination.

### Research Questions

The following research questions were posed to guide the study:

- 1) What is the difference in the mean Retention scores of students who were taught electronic concepts using e-Scenario Based Model and those taught using lecture Method?
- 2) What is the difference in the mean retention scores of male and female students who were taught using e-Scenario Based Model?
- 3) What is the difference in the mean retention scores of male and female students who were taught using Conventional Method?

### Research Hypotheses

Two hypotheses were formulated and tested in this study as follows:

H<sub>03</sub>. There is no significant difference between the mean retention scores of students taught electronic concepts using e-ScenarioBased Model and those taught using lecture method after a-two-week

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interval of administering performance test.

Ho7. There is no significant difference between the mean retention score of male and female students taught electronic concepts using e-Scenario Based Model.

### METHODOLOGY

This study adopted Pre-test – post-test non-equivalent group Quasi-experimental design: - This is a research design in which experimental techniques are applied to an intact class without random allocation of students into groups (Nworgu, 2003). This research design was suitable for this study because the researcher avoided disruption of the normal class set up organized by the school authorities.

Pre-test was conducted for both experimental and control groups in order to determine entry behaviour and equivalence of the two groups before giving any treatment to the groups. After that, control group students were taught electronics-work concepts using conventional method while the students in experimental group were taught the same electronics-work concepts using e-Scenario Based Model. After two weeks, retention test was conducted in order to find out the difference in students' skills and knowledge retention of both the experimental and control groups. Finally, the mean performance and retention of each group were recorded and analyzed.

$G_E$	$O_1$	$X_1$	$O_2$	$O_3$
$G_C$	$O_1$		$O_2$	$O_3$

Where:  $G_E$  refers to the experimental group and

$G_C$  refers to the control group  
 $O_1$  and  $O_2$  indicate pretest and posttest respectively

$O_3$  refers to retention test  
 $X_1$  is the treatment that will be given to the experimental group

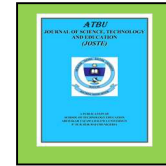
The population of the study consisted of 145 students of Electronics works trade from four (4) technical colleges while the sample of the study was 58 students from two intact classes of the two technical colleges; 15 students from GSTC Gombe and 43 students from GSTC Barunde. Simple random sampling technique was used to assign one technical college as experimental group while the other technical college was assigned as a control group. The experimental group was taught using e-Scenario Based Model while control group was taught using conventional method. The instrument used for the collection of data was Electronics Works Performance Test Instrument (EWPTI). Electronics Works Performance Test Instrument (EWPTI) is a 10-item instrument for assessing how students conducted the practical. It uses the standard Graphical rating-scale which commonly uses tabular scale for evaluating formative and summative performance/practical test. It has series of cells for a rater or examiner to tick the appropriate quality or performance of practical work of a person being rated (Enemali, 2010). It was used for the assessment of each step of a particular task using: "Highly Skilled" which carried 5 marks, "Skilled" which carried 4 marks, "Moderately Skilled" which carried 3 marks, "Limitedly Skilled" which carried 2 marks and "Not Skilled" carried 1 mark. This gave a total of 50 marks ( $50 \times 2 = 100$ marks) for a student that scored 5 marks in all the 10 items in the Electronic Work Performance Rating Scale. The test instrument was validated by two experts from the Department of Electrical Technology Education MAU, Yola and one expert from Department of Vocational and Technology Education, AbubakarTafawa Balewa University, Bauchi. A reliability coefficient of 0.8 was obtained which showed that the instrument was valid. Mean and standard deviation were used to analyze research questions while t-test was used to test the hypotheses at 0.05-level of significance.

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## RESULTS

**Table 1:** Mean Retention Scores of Students in Experimental and Control Groups

Retention Test	N	Experimental	N	Control	Mean Difference	Remark
Performance Test	43	74.26	15	58.07	16.19	VHD

**Source:** Field Work (2022)

Table 1 revealed mean retention scores of students in experimental and control groups; where the mean performance scores of students in experimental group was 74.26, while the mean performance score of students in control group was 58.07. The mean difference was 16.19, which

showed that there was a Very High Difference (VHD) between the mean retention scores of students in experimental and control group. In other word, experimental group performed better than control group in retention test.

**Table 2:** Mean Retention Scores of Male and Female Students in Experimental Group

Group	Gender	N	Mean (x)	Mean Difference	Remark
Experimental	Male	27	70.49	3.89	SD
	Female	16	74.38		

**Source:** Field Work (2022)

The result from Table 2, revealed the retention test of male and female students in experimental group; where the mean retention scores of males in the experimental group was 70.49, while the mean retention scores of female students in the same group was 74.38. The mean

difference was 3.89, this showed that there was a Slight Difference (SD) between male and female students in retention test of experimental group. In other word, female students in experimental group performed better than male students.

**Table 3:** Mean Retention Scores of Male and Female Students in Control Group

Group	Gender	N	Mean (x)	Mean Difference	Remark
Control	Male	12	57.33	4.17	SD
	Female	3	61.50		

**Source:** Field Survey (2022)

The result from Table 3, revealed the retention test of male and female students in control group, the mean retention scores of males in control group was 57.33, while the mean retention scores of females in the same group was 61.50. The mean difference was 4.17, this showed

that there was a Slight Difference (SD) between male and female students in retention test of control group. In other word, female students performed better than male students in control group.

**Table 4:** t-test of Difference between the Mean Retention Scores of Electronic Students in Performance Test of Experimental and Control Groups.

Variable	Group	N	Mean	S.D	df	t	Sig.	Decision
Performance Test	Exp.	43	74.26	6.83	56	7.89	0.000	Reject H <sub>03</sub>
	Cont.	15	58.07	5.95				

**Source:** Field Survey (2022)

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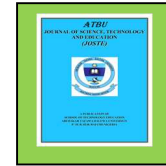


Table 4 showed the mean retention scores of students in performance test of experimental and control groups, where the p value of 0.000 is less than the 0.05 significance level used for investigation. The null hypothesis which stated that there is no significant difference between the mean retention scores of students who were taught electronic concepts using e-SB Model and those taught using lecture method of

teaching was rejected. Inference drawn therefore is that, there was a significant difference between the mean retention scores of students who were taught electronic concepts using e-SB Model and those taught using lecture method of teaching. This implies that, students taught using e-SB Model had higher mean retention score than those taught using lecture method in performance test.

**Table 5:** t-test of Difference between the Mean Difference of Retention Scores of Male and Female Students in Experimental Group

Test	Gender	N	Mean	S. D	df	t	Sig.	Dec.
Retention	Male	27	72.13	6.15	41	0.943	0.351	uphold H <sub>07</sub>
	Female	16	70.38	5.44				

Source: Field Survey (2022)

Table 5 shows the mean retention scores of male and female students in experimental group, where male students obtained a mean retention score of 72.13 with a standard deviation of 6.15, while female students in the same group obtained a mean retention score of 70.38 with a standard deviation of 5.44. The mean difference was 1.75.

The table also revealed the p value of 0.351 is greater than the 0.05 significance level used for investigation. The null hypothesis which stated that there is no significant difference between the mean retention scores of male and female students who were taught electronic concepts using e-SB Model was accepted. Inference drawn therefore is that, there is no significant difference between the mean retention scores of male and female students who were taught electronic concepts using e-SB Model. This implies that the mean retention of male and female students in experimental group was almost the same.

### FINDINGS OF THE STUDY

The results of the study revealed the following findings:

1. Mean retention scores of students who were taught Electronics concepts using e-SB Model was higher than the mean retention scores of students taught using conventional

method of teaching. This implies that students who were taught Electronics concepts using e-SB Model performed better than those taught using conventional method of teaching in retention test.

2. Female students had a higher mean retention score than male students in experimental group.
3. Female students had a higher mean retention score than male students in control groups.
4. There was a significant difference between the mean retention scores of students who were taught electronic concepts using e-SB Model and those taught using lecture method after a two-week interval of administering performance test. This implies that, the mean retention scores of Electronics students in experimental group for performance test was higher than the retention scores in Control Group.
5. There is no significant difference between the mean retention scores of male and female students who were taught electronic concepts using e-SB Model.

### DISCUSSION OF FINDINGS

The findings on retention score revealed that, the mean retention scores of students who were taught Electronics concepts using e-SB

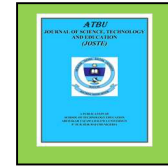
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Model was higher than the mean retention scores of students taught using conventional method of teaching. Students in experimental group had higher mean retention score in performance test. The findings is in agreement with the findings of Pilli and Aksu (2013) who found out that, Student in experimental group had higher mean retention score. The findings on gender revealed that, female students had a higher mean retention score than male students in both experimental and control groups. Female students in experimental and control groups had a higher mean retention score. While male students had a lower mean retention score. This shows that female students performed better than their male counterpart. This result is also in line with the findings of Voyer and Voyer (2014) who found a statistically significant difference in favour of female achievement in Biology.

Findings on mean retention score revealed that, there was a significant difference between the mean retention scores of students who were taught electronic concepts using e-SB Model and those taught using conventional method of teaching. This implies that, the mean retention scores of Electronics students in performance test of experimental group was higher than the retention scores in control group. Since the calculated Probability value was less than the 0.05 alpha level of significance and the calculated t value was greater than t critical, the null hypothesis was rejected and the alternate hypothesis is accepted. The findings is also supported by findings of Adem and Senturk (2010) who found out that, there was a significant difference between the mean performance scores of students in experimental and control groups. This implies that, students in experimental group performed better than those in control group.

Findings on mean retention score of gender revealed that, there is no significant difference between the mean retention scores of male and female students who were taught electronic concepts using e-SB Model. Since the calculated t value was less than the critical value, the null hypothesis was accepted. The findings were in contrast with the findings of Tran (2014) who found out that, there was a significance

difference between the mean retention scores of male and female, where the males performed better than females in experimental and control groups.

## CONCLUSION

The findings of the study serve as the basis for drawing the following conclusions. The performance and achievement of Electronics works students in experimental group was attributed to the use of e-SB Model, which helped students to understand Electronics concepts using the community activities they are familiar with. Based on the findings of the study, it can be concluded that, e-SB Model helped to improve students' performance, academic and retention in Electronics works trade.

## RECOMMENDATIONS

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

1. Ministry of education should recommend the use of e-SB Model in teaching Electronics Works in Nigerian Technical colleges.
2. Management of Technical colleges should encourage Electronic Works teachers to implement e-SB Model in teaching both theory and practical lessons in order to ensure its usability. Conversely, the management of the technical colleges should discourage Electronics works teachers from exclusive use of conventional method of teaching.
3. Electronic works teachers in technical colleges should learn how to develop lesson using e-Scenario Based Model in order to improve both the students' performance and their achievement.
4. Electronic teachers in technical colleges should explore the use of e-SB Model on other topics in Electronics works trade in order to general its application in all fields of Electronics Work.

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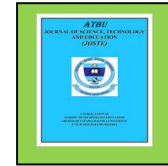
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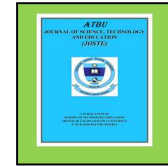
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