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Effect of Project-Based Instructional Strategy on Colleges of Education Students' Achievement, and Retention in Electronics Technology in North-East Nigeria

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Abstract

This study examined the Effect of Project-Based Instructional Strategy on Colleges of Education Students' Achievement, and Retention in Electronics Technology in North-East Nigeria. College of Education is one of the tertiary institutions in Nigerian alongside other institutions like polytechnics, monotechnics etc. However, Colleges of Education are the institutions that are exclusively saddled with the responsibility of training teachers who will in turn teach at the Junior Secondary School level of education in Nigeria. They are expected to realise the objectives of NCE (T.) This implies that the graduates should invariably be technologist as well as agents of technological advancement both in the classroom and in the society. In the classroom, the NCE (T) teachers should keep in step with Educational Technology materials and strategies that are applicable to their discipline and level of training. Three research questions and three hypotheses were formulated to guide the study. The study adopted Quasi -experimental dsesign involving pre-test post-test control group. The population of the study was 73 Electronics Technology students in six Colleges of Education North-East Nigeria. The sample was 36 Electronics Technology students in three Colleges of Education. Digital

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Electronics Achievement Test (DEAT), Digital Electronics Retention Test (DERT) and Digital Electronics and DERT were tested for internal consistency using Pearson Product Moment Correlation. The reliability coefficients of the instruments were found to be 0.915 and 0.895 respectively Data were collected and analysed using SPSS the research questions were answered using mean, standard deviation while t-test, ANCOVA and ANOVA statistical tools were used to test the null hypotheses at 0.05 level of significance. The results showed that there was significant difference in achievement test scores between ProBaIS and TIS in favour of ProBaIS. More so, the results show significant differences in students' achievement retention in favour of ProBaIS. Study also revealed that there was no significant difference in achievement test scores of male and female students when taught Digital Electronics Using ProBaIS. It was Recommended that ProBaIS should be encourage in Colleges of Education Electronics Lesson Delivery.

Keywords: Effect, Project-Based Instructional Strategy, Academic Achievement, Retention, Electronics Technology

INTRODUCTION

College of Education is one of the tertiary institutions in Nigerian alongside other institutions like polytechnics, monotechnics etc. However, Colleges of Education are the institutions that are exclusively saddled with the responsibility of training teachers who will in turn teach at the Junior Secondary School level of education in Nigeria FRN (2021). In these institutions offer programmes such as, technical education, Agricultural Science Education, Business Education and many others are offered. At the end of their training, graduates are awarded Nigeria Certificate in Education (NCE). The objectives of the (NCE) as stipulated in the national policy on education is to raise teachers with adequate intellectual and professional background to teach at junior secondary school level of education and to be adaptable to changing situations

However, not all Colleges of Education offer Electronics technology programme, this programme is prominent in Colleges of Education called Colleges of Education (Technical) and some conventional colleges also have it in a department called Technical Education. On completion of this programme, graduates are awarded Nigeria Certificate in Education (Technical) [NCE(T)], with specialization in Electrical/Electronic technology and the objective, is to provide technical teachers with intellectual and

professional background adequate for teaching basic technology at junior secondary school level of education and to make them adaptable to any changing situation in technological development not only in the country but also in the world at large.

The philosophy of this program, Electrical/Electronic Technology NCE (T) is to provide technical teachers with the intellectual and professional background adequate for teaching technical subjects and to make them adaptable to any changing situation in technological development not only in the country but also in the world at large.

The objectives of Electrical/Electronic Technology as stipulated in NCE (T) curriculum are as follows:

1. To produce qualified Technical Teachers and Practitioners of technology capable of teaching Basic Technology in the Junior Secondary Schools.
2. To produce Technical NCE Teachers who will be able to inculcate Scientific and Technological attitudes and values into the Society.
3. To produce qualified Technical. Teachers motivated to start the so much desired revolution of Technological development right from the Nigerian Schools.
4. To prepare Technical Teachers so as to qualify them for a POST – NCE degree program in Technical Education.

The following are some of the courses offered in Electronic programme in Colleges of Education: Entrepreneurship in Vocational and Technical, Electrical Machines and Power, Telecommunications, Electrical Circuits and Electrical Measuring, Instruments, Practical Project, Mechanical Engineering Drawing, Maintenance and Repairs of Electrical Equipment, School Workshop Management, Digital Electronics, Building Drawing. (FRN, 2021). Upon completion of the programme, graduates are expected to be technologist as well as agents of technological advancement both in the classroom and in the society. In the classroom, the NCE (T) teachers should keep in step with Educational Technology materials and strategies that are applicable to their discipline and level of training. In the society, the lecturers as well as the graduates should be able to demonstrate practically the importance of acquiring the knowledge as well as the advantage of using technology in solving life problems.

Project-Base Instructional Strategy (ProBaIS) is one of the learner centred learning strategies that gives students the opportunity to take charge of the learning process while the teacher guides the learner. Harmer and Stoke (2014), see Probes as a student-centred

approach to learning in which students are required to take part in a real project by developing a question or inquiry under the supervision of teachers in order to create a project to share with the selected audience. Projects are intensive experiences that engage students in activities that are interesting to them and important to the course(s) of study. They can involve community members and settings, and they often result in an exhibition of product for a real-world purpose or audience. The typical project lasts for two to eight weeks. The successful use of projects is facilitated by a learner-centred approach in which teachers serve as guides, monitors, coaches, and facilitators. This approach encourages students to develop habits that can help them become lifelong learners. Project-based Instructions strategy can be achieved in the colleges of Education, especially in delivering Electronics technology lessons by employing Construction projects which involves construction of given materials for the practical skills acquisitions and Intellectual projects: This category according to the author involves the presentation of some challenging problems that will involve the ingenuity of the students to solve for student's Achievement.

Traditional Instructional Strategy (TIS) used by the lecturers in Colleges of Education has been found to be deficient. This is because the delivery is at the Lecturer's pace and often characterised with new concepts. This makes it difficult for the students to catch up with the lecturer. This strategy requires deliberate selection of simple words that may be familiar to the learner. Unfortunately, course like Electronics contains registers (style of language used in a particular context) which altering them may distort the meaning and renders the language unprofessional. According to Nnenna, Blessing and Eze (2014), the conventional traditional method some disadvantages which includes: 1) Individual differences are not taken care of in this method 2) There is the risk of destroying learners' initiatives 3) It forces students to accept the teacher's views as final, while students are not made active participants, and 4) Much content is covered so quickly without proper comprehension by the students.

Students' academic achievement is the fundamental determinant of students learning in any teaching and learning situation. It is the functional response of the cognitive domain to the learning stimulus and immediate indicator that learning has taken place, in formal learning system, it is a prerequisite to the psychomotor domain learning or practical skills acquisition. According to Oladebinu, Amos and Oyediran (2018), Academic achievement is one of the major factors considered by lecturers in grading students' activities in institutions. Yet, students" academic achievement in the Colleges of Education

in Nigeria is on the decline going by the low quality of graduates turning out every year Oladebinu, Amos and Oyediran (2018). In Electronics Technology, somany concepts have to be grasp by the students before there programme is completed.

Gender is one of the factors mentioned in literature to have considerable effects on students' academic activities especially in science related subjects. According to Adigun, Onihunwa, Irunokha, Sada and Adesina (2015) Gender is the range of physical, biological, mental and behavioural characteristics pertaining to and differentiating between the feminine and masculine (female and male) population. The background of examining performance in relation to gender is based primarily on the socio-cultural differences between girls and boys. Some vocations and professions have been perceived to be men's (engineering, arts and crafts, agriculture etc.) while others as women's (catering, typing, nursing etc.). Studies about gender in relation to educational phenomenons have ended in discord for example: Elejere and Eze (2018) established a significant difference between female and male students exposed to blended learning. Contrarily, Yakubu (2021), reported that male students perform better than their female counterparts when taught using Blended learning strategy. Therefore, innovations for teaching and learning should take gender into consideration.

Retention is the ability to store or keep in mind what is learnt and be able to recollect it when the need arises (Safo, Ezenwa and Wushishi, 2013). Retention is an important variable in learning especially in technical subjects. This is because achievement lasts only when students are able to retain what they have learnt. An Electronics technology student that learns a concept and easily forgets it will not perform well in the world outside school. Retention is important in sustaining students' achievement. This is because if a student achieved a high score in a post-test but a low score in the retention test, it is an indication that the student did not register the concept in the long term memory.

Statement of the Problem

Colleges of Education are the institutions that are saddled with responsibility of realizing the objectives of NCE (T) programmes. Some of this objectives are: (1) To produce qualified Technical Teachers and Practitioners of technology capable of teaching Basic Technology in the Junior Secondary Schools.(2) To produce Technical NCE Teachers who will be able to inculcate Scientific and Technological attitudes and values into the Society.(3)To produce qualified Technical Teachers motivated to start the so much

desired revolution of Technological development right from the Nigerian Schools. Despite these laudable objectives, NCE (T) programmes in Colleges of Education have been battling with poor performance generally and specifically in Electronics Technology programme. The graduates that are turned out have not been able to meet up with their requirement of teaching Basic Technology at the Junior Secondary level. Researchers such as Oladebinu, Amos and Oyediran (2018) have also observed the inability of these graduates to effectively teach Basic Technology at Junior Secondary schools. Evidence gathered by the researcher on preliminary surveys in these colleges points to the following records of declined performance: Adamawa State College of Education, Hong percentage performance over ten years- 2011/2012: 59.17%, 2013/2014: 63.67%, 2015/2016: 61.14%, 2016/2017: 48.44%, 2017/2018: 51.57%, 2018/2019: 43.3%, 2019/2020: 40.8%, 2020/2021: 45.5%, 2021/2022: 43%, 2022/2023: 39.8%., Federal College of Education (Technical.) Potiskum, Yobe percentage performance over ten years- 2011/2012: 63.67%, 2013/2014: 51.14%, 2015/2016: 49.17%, 2016/2017: 48.44%, 2017/2018: 41.57%, 2018/2019: 45.92%, 2019/2020: 43.83%, 2020/2021: 40.23%, 2021/2022: 39.84 Federal College of education (Technical) Gombe percentage performance over ten years- 2011/2012: 61.56%, 2013/2014: 60.23%, 2015/2016: 58.27%, 2016/2017: 59.54%, 2017/2018:, 2018/2019; 55.50%, 2019/2020: 52.55%, 2020/2021: 48.50%, 2021/2022: 40.40%. Appendix I contained the copies of results obtained from the institutions. This decline in students' performance may be due to one or combination of several factors which can be grouped into: government-related, teacher-related, student-related, curricula-related, Parent-related and or environmental-related factors.

However, the researcher wishes to concentrate on the teachers-related factor. This is because, of all educational inputs, the teacher is the syphon that delivers all these to the students. The way and the manner in which this is done determine, to a large extent, the success or failure of the system. The focus is particularly on instructional strategies adopted by the lecturers in colleges of education. It is stipulated in the national policy on education article 96 that, Teacher education shall continue to take cognizance of changes in methodology and in the curriculum. Teachers shall be regularly exposed to innovations in their profession. However, the researcher had observed that the Electronics lecturers in Colleges of Education North-East Nigeria still hold on to Conventional Traditional Strategies which are mostly teacher-centered.

We live in a world of Technology proliferation, where the whole world is turning into a global village. The development & strength of society is rated by its level of technology (Stone age, Iron age...World of Computers & Machines). Nigeria cannot afford the risk of having faulty Technology foundation. We all know that when the foundation is faulty, the whole building collapses. Generally, Poor Technology Education foundation as it is in Nigeria will result in poor Technology practice in a society. No wonder Nigeria is very far backward in Technology and specifically in Electronics than many other countries of the world.

If nothing is done to avert the situation, this will result in failure of the laudable NCE (T) objectives, the future of youths that pick up admissions to study Electronics will be jeopardised and the Nigerian society will be left handicap and backward in terms Electronics technology technicians.

In this 21th century, there is shift in teaching paradigm from traditional to modern instructions strategies like the Project-based and the Blended Instructional Strategies. Project-Based instructional Strategy is a strategy that involves given students task to perform over a given period of time while teacher serves as a guide from the background. This has been found effective and better than the Conventional Traditional Strategy by researcher such as Muntari and Ahmed (2020) and Ibrahim, Yunus, and Yusuf (2015) in other Educational discipline. Similarly, Blended Instructional Strategy is a strategy that involves the combination of ICT and face to face instructions to deliver the lesson. This was also found effective and better than the Conventional Traditional Strategy by researchers such as Gambari, Shittu, Ogunlade and Osunlade (2017) and Udochukwu Alison, Okeke and Ibe (2022) in other educational discipline. This is what informed the researcher's decision to study the 'Effect of Project-Based Instructional Strategy on Colleges of Education Students' Achievement, and Retention in Electronics Technology in North-East Nigeria'.

Purpose of the Study

The purpose of this study is to determine the effects of project-based instructional strategy on colleges of education students' achievement and retention in Electronics technology in North-East Nigeria. While the specific purposes were to:

1. Determine the pre-test and post-test mean achievement scores of students in Digital Electronics achievement test when taught using ProBaIS and TIS

2. Determine the post-test mean achievement scores of male and female students in Digital Electronics achievement test when taught using ProBaIS.

3. Determine the mean retention scores of students in Digital Electronics achievement test when taught Digital Electronics using ProBaIS and TIS

Research Questions

The following research questions were formulated guided the study:

A. What are the pre-test and post-test mean achievement scores of students in Digital Electronics achievement test when taught using ProBaIS, and TIS?

B. What are the post-test mean achievement scores of male and female students in Digital Electronics achievement test when taught using ProBaIS?

C. What are the mean retention scores of students in Digital Electronics achievement test when taught Digital Electronics using ProBaIS and TIS?

Hypotheses

The following null hypotheses were formulated to guide the study and were tested at 0.05 level of significance

1. There is no significant difference in students' achievement when they are taught Digital Electronics using ProBaIS, BIS and TIS.

2. There is no significant difference between male and female students' achievement test when they are taught Digital Electronics using ProBaIS.

3. There is no significant difference in students' Achievement Retention when they are taught Digital Electronics using ProBaIS and TIS.

METHODS

Research Design

The design is quasi-experimental design. Quasi-experimental Pretest-Posttest non-randomized non-equivalent control-group design was used because it lacks random assigning of subjects.

Population of the Study

The population of the study was all the NCE II students in the Colleges of Education in the North-East Nigeria offering Electronics Technology. This is because NCE II have good background of Electronics Technology course than NCE I students, who are new in the system and not much familiar with Electronics Technology course. While NCE III, although they have good background of Electronics Technology course, they are in final year about to round up their studies and may have a lot of engagements that can make it difficult for them to adjust to changes such as e-learning. The total number of students is 73. This population consisted of 66 (90.40 %) male students and 7 (9.60%) female students.

Sample and Sampling Technique

The sample of the study will be NCE II students of three Colleges of Education in the North-East Nigeria offering Electronics Technology by means of simple random sampling. Their total number was 36. The institutions were randomly assigned to experimental group and control group by balloting Technique.

Instrument for Data Collection

The instruments for data collection (Pre-test, Post-test, Retention test) was forty-item multiple choice Digital Electronics Achievement Tests (DEAT). Each carried forty marks. The instruments were formulated by the researcher from the topics that were taught which included: 1. .Introduction to computer, 2. Number system, 3. Logic gate and 4. Flip-flops in accordance with the NCE (T) curriculum objectives of Electronics. This is because the topics are picked from Digital Electronics.

Experimental Procedure

Two Electronics Technology lecturers from each of the institution was used as research assistants: One of the research assistant for the ProBaIS, and one for the TIS, these two lecturers were properly orientate on that they are required to do. Before the treatment commences, each group was given the pre-test. Experimental group was taught using ProBaIS, and the control group was taught using Lecture method for the achievement. The researcher takes turn to monitor the treatments group by group. The treatment lasted for four weeks. At the end of the four weeks, of the treatment, a post-test DEAT and DESAT was given to all the students that took part in the treatment. The

students were allowed to use their school identity to avoid the consciousness that they are being used for experiment. The administration and collection of the post-test scripts was done by the research assistants and later handed over to the researcher.

Two weeks after the administration of the post-test, a retention test was given to both the experimental and control groups in order to evaluate the retention level of each group. This is in order to give reasonable time interval between the Post-test and the Retention test.

Method of Data Analysis

The data were analysed using statistical package for social sciences (SPSS) version 26 analysis procedures. Mean and standard deviation were used to answer the research questions while T-test, ANCOVA and ANOVA were used to test the hypotheses at 0.05 levels of significance.

RESULTS

Research Question 1

What are the pre-test and post-test mean scores of students' achievement test in experimental group and control group, when taught Digital Electronics using ProBaIS and TIS respectively?

Table 1: Mean and Standard Deviation of Pre-test and Post-test Achievement Test Scores of Students Taught Digital Electronics Using ProBaIS and TIS.

Teaching Strategy	Source	**N**	$\bar{X}$	σ	Mean Gain
ProBaIS	Pre-test	12	17.00	2.70	39.17
	Post-test	12	56.17	14.08	
TIS	Pre-test	11	17.46	2.88	
	Post-test	11	43.73	13.42	26.27

N=Sample size, $\bar{X}$=Mean, σ =Standard Deviation

Table 1 shows pre-test mean scores of 10.50 and 10.73 for ProBaIS and Lecture strategy respectively. This is an indication that that the two groups had little entry behaviour of Digital Electronics before the treatment commenced. Also standard deviation of the pre-test mean score was 2.07 for ProBaIS and 2.28 for the Lecture strategy. These showed that the differences of scores in the experimental group and control group from

the pre-test DESAT were very small. Thus the groups fulfilled the condition of both homogeneity of variances and normal distribution. There were post-test mean scores of 57.50 and 55.27 for ProBaIS and TIS strategy respectively and standard deviations of 11.77 and 7.80 for ProBaIS and TIS strategy respectively. These indicated that the treatments resulted in high and uniform students' achievement. The mean gain of 47 and 44.54 for ProBaIS and CTS strategy respectively implies that ProBaIS was the more effective strategy and Lecture strategy was found to be the least effective strategy in delivering Digital Electronics lesson.

Research Question 2

What are the post-test mean scores of male and female students' achievement test in experimental group when taught Digital Electronics using ProBaIS?

Table 2: Mean and Standard Deviation of Post-test achievement Test Scores of male and female Students Taught Digital Electronics Using ProBaIS.

Instructional strategy	Source	Gender	N	$\bar{X}$	σ	Difference
ProBaIS	Post-test	Male	10	59.00	14.18	
		Female	2	52.67	12.01	6.33

N=Sample size, $\bar{X}$=Mean, σ =Standard Deviation

Table 2 display the analysis of male and female students' Post-test mean scores when taught Digital Electronics using ProBaIS. The result indicated that male and female students taught Digital Electronics using ProBaIS had post-test mean scores of 59.00 and 52.67 with standard deviation scores of 14.18 and 12.01 respectively. Therefore, it is clear that both male and female students achieve well when they are taught using ProBaIS. This indicated that ProBaIS had been effective in the teaching of Digital Electronics irrespective of gender. However, male students' achievement means score was higher than female students' achievement mean score when they were taught using ProBaIS.

Hypothesis 1

There is no significant difference in students' achievement when they are taught Digital Electronics using ProBaIS and TIS.

Table 3: Result of ANCOVA of the Difference in Students' Achievement When they are Taught Digital Electronics Using ProBaIS and TIS.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1686.099[a]	2	843.049	5.299	.014
Intercept	74.525	1	74.525	.468	.502
Pretest	798.034	1	798.034	5.016	.037
Istructionalstrategies	1030.099	1	1030.099	6.475	.019
Error	3181.814	20	159.091		
Total	62869.000	23			
Corrected Total	4867.913	22			

The results of the analysis in Table 3 revealed that, F = 6.48 and P = 0.019 < 0.05. Since the computed p-value (0.019) is less than 0.05 level of significant, this means that, there is significant difference in students' achievement when they are taught Digital Electronics using ProBaIS and TIS. Therefore, the null hypothesis of no significant difference was rejected. Hence it is concluded that, there is significant difference in students' achievement when they are taught Digital Electronics using ProBaIS and TIS. The difference was in fovour of ProBaIS.

Hypothesis 2

There is no significant difference between male and female students' achievement test when they are taught Digital Electronics using ProBaIS.

Table 4: T-test Analysis of The Difference between male and female Students' Achievement When they are Taught Digital Electronics Using ProBaIS.

	n	$\bar{X}$	σ	D	t-value	P-value	Remark
Male	10	59.00	14.18				
				6.33	-.299	.092	Uphold Ho1
Female	2	52.67	12.01				

The results of the analysis in Table 4 revealed that, P = 0.092 > 0.05. Since the computed p-value (0.092) is greater than 0.05 level of significant. This means that there is no significant difference between male and female students' achievement test when they are taught Digital Electronics using ProBaIS. Therefore, fail to reject the null hypothesis of no significant difference. Hence it is concluded that, there is significant difference between

male and female students' Achievement when they are taught Digital Electronics using ProBaIS.

Hypothesis 3

There is no significant difference in students' achievement retention when they are taught Digital Electronics using ProBaIS and TIS.

Table 5: Result of ANCOVA Analysis of The Difference in Students' Retention When they are Taught Digital Electronics Using ProBaIS and TIS.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1180.319[a]	1	1180.319	8.503	.008
Intercept	42603.797	1	42603.797	306.906	.000
GROUPS	1180.319	1	1180.319	8.503	.008
Error	2915.159	21	138.817		
Total	47400.000	23			
Corrected Total	4095.478	22			

The results of the analysis in Table 13a revealed that, F = 8.503 and P = 0.008 < 0.05. Since the computed p-value (0.008) is less than 0.05 level of significant. This means that there is no significant difference in students' Retention when they are taught Digital Electronics using ProBaIS and TIS. Therefore, reject the null hypothesis of no significant difference. Hence it is concluded that, there is significant difference in students' Retention when they are taught Digital Electronics using ProBaIS and TIS.

DISCUSSION

The findings of this research were discussed based on the results, related literature and previous studies in order of the research questions and hypotheses respectively.

The pre-test mean scores was much less than the post-test mean scores of students' achievement test in experimental group I when taught Digital Electronics using ProBaIS. This is in line with Kokotsaki, Menzies & Wiggins, (2016) posed it that, ProBaIS is another teaching strategy which is systematic and engages students in learning knowledge and skills through an extended inquiry process structured around complex, authentic questions and

carefully designed products and tasks. This finding fits into the assertion of English and Kitsantas (2013) that ProBaIS supports self-directed and regulated learning and brings about increased academic achievement.

Students' achievement was found to be significantly different when taught Digital Electronics using TIS than when they were taught Digital Electronics using ProBaIS. The difference was in favour of ProBaIS and BIS. This study agreed with Kokotsaki, Menzies and Wiggins, (2016) who said that Project-based instructional strategy (ProBaIS) is another teaching strategy which is systematic and engages students in learning knowledge and skills through an extended inquiry process structured around complex, authentic questions and carefully designed products and tasks the This finding was in line with (Eze, Onwusuru & Ginigeme 2020; Muntari & Ahmed 2020; Mohsen, Maria, & Shaffe 2013; Harmer & Stokes, 2014), who in their separate studies. Findings revealed that those taught using ProBaIS had higher post-test and delayed post-test scores than those taught using the Lecture strategy. Based on the findings of this study, it was concluded that ProBaIS has the potential to improve students' academic achievement and retention in Basic electricity.

No significant difference was found between male and female students' achievement test when they were taught Digital Electronics using ProBaIS. The finding agreed with Titus, Jacinta & Johnbull (2020) who opined that, In general, students, irrespective of gender, could do well in all subjects if the appropriate instructional method is used in teaching the students.

Students' achievement retention was found to be significantly different when taught Digital Electronics using TIS than when they were taught using using ProBaIS. This finding agrees with Muhammad (2016) who posed it that, the students who participate actively in the project-based process self-evaluate and self-direct themselves. In other words, they concern themselves with meta-cognitive skills which pave the way for long-lasting learning. This finding was also in line with Eze, Onwusuru & Ginigeme 2020), who in their study that sought to determine the comparative effect of ProBaIS and conventional instructional strategy on academic achievement and retention of technical college students in Basic Electricity. Find out that those taught using ProBaIS had higher post-test and delayed posttest scores than those taught using the conventional teaching method.

CONCLUSION

This study which investigated: the effect of project-based instructional strategy on colleges of education students' achievement, and retention in electronics technology in North-East Nigeria. This has brought to lime light the fact that ProBaIS and BIS are effective strategies for teaching Digital Electronic in Colleges of Education. It also clears the question of gender influence on students' achievement and retention in Digital Electronics whenever that ProBaIS and BIS are used.

Therefore, it is imperative to embrace innovation with proven integrity to improve students learning outcome in situation like this. Where, the quality of graduates from Colleges of Education is said to be declining over the recent past years. It is true that innovations like this do not come without challenges. The call here is all stakeholders should swing into action with the view to create a conducive environment for this innovation to be anchored.it is a good alternative increase students' performance

Recommendations

In view of the finding of this study the following are recommended:

1. Lecturers of Digital Electronics in Colleges of Education North-East let go traditional instructional strategies and embrace ProBaIS for lesson delivery.
2. Seminars and workshops should be organized for lecturers to be given appropriate orientation on the use of ProBaIS as instructional strategies.
3. NCE Curriculum developers should point ProBaIS to the lecturers as appropriate instructional strategies for delivering Digital Electronics Lessons'
4. Students should be encouraged to take maximum advantages of the opportunities offered by ProBaIS. Since ProBaIS afford students the opportunity to diversify their sources of knowledge.

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