

# Effects of Pascal Problem Solving Strategies on Technical College Students' Achievement in Radio, Television and Electronics in Niger State, Nigeria

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**Abstract:-** The study determined the effects of Pascal problem solving strategies on technical college students' achievement in Radio, Television and Electronics (RTVE) in Niger State, Nigeria. Related literature was reviewed under appropriate headings. Specifically, the pre-test post-test non-equivalent control group experimental research design was used. The target population for the study consisted of 310 Technical College two (TC II) RTVE students in all the Niger state technical colleges. Two sets of lesson plans were prepared by the researcher and used to teach the experimental and control groups respectively. Radio, Television and Electronics Trade Achievement Test (RTVEAT) was used as instrument for data collection. The Radio, Television and Electronic Achievement Test (RTVEAT) was face and content validated by two experts in that field from Industrial and Technology Education Department, Federal University of Technology Minna .and one expert in Government Technical College Eyagi-Bida. The measure of reliability coefficient of the RTVEAT was established to be 0.87 using Kuder Richardson 20 (K-R 20) formula. Data collected were analyzed using mean and Analysis of Covariance (ANCOVA). Mean was used to answer the research questions while ANCOVA was used to test the hypotheses at 0.05 level of significance. The findings of the study revealed that students taught RTVE with Pascal problem solving strategies performed better as they had higher achievement scores than students taught with lecture method; 1) There was a significance difference in the mean achievement scores of students taught with Pascal problem solving strategies and those taught with lecture method; 2) There was no significance difference in the mean achievement scores of male and female students taught with Pascal problem solving strategies and those taught with lecture method. The findings imply that Pascal problem solving model is a suitable teaching method for improving students' achievement in RTVE. It is therefore recommended that technical college teachers be trained and equipped with necessary pedagogical skills needed to effectively use Pascal problem solving model in the teaching RTVE.

**Keywords:** Radio Television and Electronics, Technical colleges, Pascal problem solving, Achievement

## I. INTRODUCTION

Radio Television and Electronics (RTVE) is among the electronic trades taught technical schools. RTVE is planned to churn out qualified electronics craftsmen and master craftsmen in radio television and electronics works. A graduate of RTVE according to National Board for Technical

Education (NBTE 2011), is anticipated to be able to fully and accurately troubleshoot and fix identified defects in electrical /electronic works in Radio, Television and Communication system as required by clients. The RTVE graduates also have the opportunity of enrolling in higher education programmes in technical education in universities, polytechnics as well as colleges of education plus other related higher institutions offering technical education. The programmes in vocational schools at the secondary school level are arranged and lead to the award of National Technical Certificate as well as Advanced National Technical Certificate for craftsmen as well as master craftsmen respectively (Federal Government of Nigeria, FGN, 2011).

The FGN (2013) policy document revealed pointed that the major characteristics of the planned course of instruction for technical schools shall be organized in basics and trade segment, the planned learning experiences for every vocational course shall contain general education, theory and connected subjects, workshop practice, industrial training segment as well as entrepreneurship training. The vocational aspect of the theoretical segment and workshop practice entail the study of RTVE, electronic device, circuit, radio communication, radio and audio frequency amplifier, satellite transmission and reception. Despite the great effort by several authorities on science as well as technology, focused at increasing their course of instruction as well as students outcome, the cognitive academic attainment of students in RTVE examinations is not encouraging (Awolola, 2011).

Technical College student low achievement in some core subjects and indeed RTVE has been largely attributed to inefficient and ineffective way the subject is taught (Musa, 2012). The teaching of RTVE at the technical college level is handled using the traditional method only, as pointed out by Olaitan, (2004). Odili, (2006), expressed that several instructors like the conventional age-long approach of delivering instruction and do not often adopt new approach to teaching and learning as revealed by researchers in educational field.

Educational scholars like Akubilo (2004) as well as Ibe (2007), in separate studies revealed that, even though several knowledge acquisition pattern and propositions exist several

instructors disseminate knowledge via the utilization of conventional orthodox approach irrespective of whether learners assimilate or not. The conventional orthodox approach are non practical-based and teacher centered, rather than being task-focused as well as student-focused. In conventional orthodox approach the instructor or tutor is the major partaker while the students pay attention and observe for the purpose of recalling afterwards. In this approach, Ameh, Daniel and Akus (2007) revealed that, the instructor performs most of what learners are anticipated to carry out after the instructional process by describing to tutees the way carrying out a task sequentially.

In another view, Mundi (2006) explained it as a show of learning style often carried out by the tutor while the learners pay attention as well as observe with utmost zeal. It is done by explanations by the teacher while the student watches. This approach, according to Nwachukwu (2011), entails the utilization of educational technology gadgets as well as other instructional aids that creates an environment for seeing what is learnt to enhance effective comprehension and remembering of instructional objectives as well as learned materials. There are also indications that the conventional lecture method of instruction is predominantly used in teaching students in RTVE (Adah & Ameh, 2012). Students are mostly known to memorize and regurgitate facts and concepts without carrying out activities on which these goals and concepts are based. Nwosu (2010) has also indicated that there is no quality teaching in technical subjects including RTVE, and stated that the class sessions are more teacher centred than student-centered.

Several vocational and technical educators are worried with regards to the low results of learners in technology courses particularly at the Technical colleges. A vital technical course in this regards that demand urgent treatment is RTVE. The scholar who is an RTVE instructor is of the opinion that RTVE learners in Technical College in display poor performance over the years in Niger state. Following the observation of NABTEB office report, which re-emphasized that the number of students, that passed RTVE in Niger state with distinction and credit grade levels, which will enable them proceed for further studies at the tertiary education levels were on the decline while those that had ordinary passes and failure were on the increase (Office report, NABTEB, 2014). The students' achievement in RTVE is unsatisfactory and the problem has persisted as a vital challenge to educators, parents and public examination bodies.

The urge to improve RTVE achievement via better efficient tutoring approaches has increased the orientation concerning the relevance of student interest in instructional delivery. Learners therefore must be assisted to learn and understand concepts very well. As a result, there exist a paradigm drift as regards the view of the functions of the learners in the knowledge acquisition implementation activities. Rather than viewing learners as inactive receptors of information supplied by the teachers, they are looked upon as active participants in

the knowledge acquisition process (Nwokorie and Akpata, 2004). The teacher is recognized as the key factor in determining the quality and success of students through proper instructional strategies and approaches. However, Onimisi(2011) observed that if the teachers can influence what the students learn by stimulating learning styles and study habits, then the teacher classroom interactions and students learning needs greater attention and deeper investigation. Thus investigating into the RTVE classroom interaction and how they influence or affect students learning outcome becomes imperative.

For the purpose enhancing learners cognitive performance when teaching RTVE, it becomes important for the tutor to pay adequate as well as rapt interest particularly in selection of approaches relevant to the instructional process effectiveness which would enhance understanding of technical knowledge, skills as well as attitude to facilitate a better understanding of the subject matter (Okoli, 2009). There are many methods a teacher may use in the course of his instruction. None of the available method(s) can be the best which the teacher must use always. A research on instructional behavior and learners cognitive attainment in technology subjects revealed by Akubulo (2004), unveiled that learners tasks are important than tutor tasks in enhancing appropriate instructional process, with modern teaching methods such inquiry and problem solving. Problem solving method is selected based on the fact that it is activities oriented and student-centre oriented. The students under the employment of this method are not ordinarily mere spectators but are fully engaged in the knowledge acquisition activities.

The domineering characteristics of teachers and passive posture of the students are reduced to the barest minimum. RTVE as a subject involves more practice and thus demand workshop-based teaching as well as real life technical tasks or activities via the utilization of problem solving approach (Olaitan, 2004). Abimbade (2007) stated that this method can be employed at all levels of education-primary, secondary and tertiary. Problem solving method has been defined by many educationists in various ways with regard to its philosophical and psychological backgrounds. The Gestalt theorists according to Alio (2007) defined it as an insightful or initiative process involving the perceptual processes of the solver. It was further revealed that this approach to knowledge acquisition represent a kind of discovery knowledge acquisition process whose emergence depends on the structure of the task and independent of the learners' previous knowledge.

In support, Idoko and Ibitoye (2008) described problem solving as a manipulation of the problem statement geared towards achieving the desired solution which is cognitive in nature or domain dependent. Problem-solving method involves the identification and selection of problems arising from individual experiences to the students (Nwachukwu, 2011). These problems are placed before the learners and they are guided to the solutions. As a teaching procedure, the

method involves steps of scientific method (techniques for enquiring new knowledge) and also steps of reflective thinking (analyzing and making judgment). The teachers also play an important part in clarifying the problems and providing necessary materials which will help the students solve the problems.

The success in the use of a problem-solving method depends on sufficient interest and creative mind on the part of the students in activity undertaken which should be within the researchable reach of the students. Students must be willing to succeed on the problem given or selected. Problem solving is a pathway of getting to a solution of problem which involves identification of the type of problem to be solved, the necessary pre-requisites, the strategies, the heuristics or hints and the elements used in applying the strategies. Pascal problem solving strategies is highly very useful as it helps students to gain knowledge through active participation and autonomously find out information for them, thus promoting their level of intellectual productivity. It also creates the ability to appraise problematic situations constructively and objectively among students (Olaitan, 2004 and Mundi, 2006). The model would help the students to acquire appropriate problem solving skills and offer students the opportunity to work at different levels of RTVE abstractions. The four steps are; reading and interpreting concept; retrieving relevant information; constructing solution and carrying out a solution and other operation (RRCC).

Students' achievement connotes academic performance in school subject as symbolized by a score or mark on an achievement test. According to Anene (2015), students' academic achievement is quantified by a measure of the students' academic standing in relation to those of other students of his age. Atherson (2012) contended that students' achievement in teaching and learning is determined by several factors among which are teachers' attitude and enthusiasm, instructional methods, learning environment as well as students' attitude and background. Teachers with good teaching techniques challenge students to verbalize their knowledge and thinking (articulation) at higher intellectual level. Furthermore, one important role of the teacher is to order and structure the learning environment (Moore, 1998). Included in this role according to Moore are all the decision and action required of the teacher to maintain order in the classroom, such as laying down rules and procedures for learning to enable students set personal goals to seek skills that would improve their achievement of learning.

Another important concern of this research work is the connection existing between gender and academic performance. In the past, there has been a general view that males students performed better than female students in technology subjects (RTVE inclusive). But Magnuson, (2007) found a high achievement in favor of female students in Home economics. This may then show that sex could still be a variable of study in RTVE problem solving investigation. The use of this approach in RTVE teaching may have gender

(male and female students) based implications which is worth exploring. Hence the researcher intends to investigate the effects of Pascal problem solving strategies on technical college students' cognitive performance as well as retention in RTVE work trade.

#### *Statement of the Problem*

The teaching of RTVE requires appropriate instructional methods, as their proper application is essential for facilitating the achievement of the set objectives. The experience of the teacher and his adoption of appropriate methodology in teaching greatly help in promoting his effectiveness and consequently students' academic achievement (Adah and Ameh, 2002 and Idoko, 2004). It has been observed that students' achievement in electrical/electronic courses in Technical College Certificate Examination' has not been very good, the performance of students was not impressive most especially in RTVE (Odumu, 2010). This could be attributed to RTVE teachers' method of teaching the subject.

This trend of students' performance in RTVE has led to student's lack of interest in the subject which lead to low enrolment in tertiary institutions to read RTVE related courses, as very few had credit in RTVE in NABTEB examinations. (Odumu, 2010) attributed the use of inappropriate teaching methods to be the major cause of student's poor achievement in examinations. Onimisi (2011) suggested that to improve on tutees' cognitive performance and retention in subjects like RTVE, the need for demonstrable, appropriate, skill and practically oriented methods like problem solving approach are advocated. Hence an attempt shall be made in this study to ascertain whether problem solving method using Pascal model will enhance student cognitive performance of learning in RTVE.

#### *Purpose of the Study*

1. The effect of Pascal problem solving strategies on learners' cognitive performance in RTVE.
2. The influence of sex disparity on learners' cognitive performance in RTVE when taught with Pascal problem solving strategies

#### *Research Questions*

1. What is the effect of Pascal problem solving strategies on learners' cognitive performance in RTVE?
2. What is the influence of sex disparity on learners' cognitive performance in RTVE when tutored using Pascal problem solving strategies?

#### *Research Hypotheses*

- H<sub>01</sub> There is no statistically relevant disparity in the average cognitive performance figures of learners tutored RTVE using Pascal problem solving strategies and those tutored without it.

H<sub>02</sub> There is no statistically relevant disparity in the average cognitive performance figures of masculine and feminine learners tutored RTVE utilizing Pascal problem solving strategies and those tutored without it.

## II. METHODOLOGY

The study specifically utilized pre-test, post-test non-equivalent control group design chose from quasi experimental research procedure. The study work was conducted in four technical schools that offered RTVE in Niger State. These Technical Colleges are GTC-Eyagi Bida, GTC-Minna, GTC NEW Bussa, and FSTC-Shiroro Kuta. These Technical colleges were among the six Technical colleges located in the seven educational zones. The population of the study consisted of 310 Technical College two (TC II) trainees in 4 technical colleges offering RTVE in Niger State. The study adopted purposive sampling approach to choose two technical colleges that were designated as experimental as well as control group for the field work. The experimental subject utilized was made up of 160 (130 males and 30 females) Technical Two (TC II) students drawn from Four technical colleges offering RTVE in Niger state; these include Government Science Technical College Shiroro Kuta and Government Technical College New Bussa. Purposive sampling technique was adopted because the schools chosen have female students offering RTVE

The data collection device utilized for gathering research information was a 40 item Radio, Television and Electronics Achievement Test (RTVEAT). The RTVEAT test items was drawn from five vital topics in RTVE such components include; Transistors, Diode, Resistors, Capacitors and Semiconductor following the curriculum for Technical College two (TC II). The RTVEAT was a 40-item multiple choice questions followed by 5 alternative choices lettered A-E out of which the testees are mandated to select the best alternative or answer. The RTVEAT was divided into 5 segment, A to E with respect to the 5 areas covered in RTVE. The Radio, Television and Electronic Achievement Test (RTVEAT) was validated by two experts in the field of research from Department of Industrial and Technology

Education, of the Federal University of Technology Minna and one expert in GTC Eyagi-Bida. The measure of reliability coefficient of the RTVEAT was established using the trial testing procedure. Balloting selection was utilized to select twenty 20 RTVE students in Government Science Technical College Garki. The school was used for trial-testing of the instrument because the school was not covered in the scope of the study. In determining the estimate of reliability coefficient of this instrument which was administered only once on the testees, Kuder Richardson 20 (K-R20) formula was used. This is because K-R20 is mostly applicable to test that has multiple choice of answers, that is either pass or fail, right or wrong of multiple choice instrument. The procedure helped to establish the consistency index of the RTVEAT items. The consistency index was found to be 0.87 using Kuder Richardson 20 (K-R20) formula after the trial test.

At the beginning of the experiment, prior-test of the RTVEAT to the treatment and non treatment groups was administered. At the completion of the experiment the RTVEAT was given to the two categories as post-treatment. For each of the groups, data for the pre-test and post-test was recorded separately. The researcher ensured that the sampled schools took the test the same day to avoid leakage. The scoring of both the prior-test and post-treatment was recorded by the researcher and his assistants using the marking scheme provided by the researcher. In this research work, the answers to the research questions was provide via average statistics while answers to the hypotheses provided via Analysis of Covariance (ANCOVA) at 0.05 alpha level. The approach to hypothesis analysis was to control the errors of the initial non-equivalence arising from the use of intact classes as subjects of the study. With the use of ANCOVA, the pre-test result would serve as covariate of the post-test results. The statistical computation was carried out utilizing Statistical Package for Social Sciences.

## III. RESULTS

### *Research Question One*

What is the influence of Pascal problem solving strategies on students' cognitive performance in RTVE?

Table 1: Average Statistics of Prior treatment and Post treatment Figures of Treatment and Control Groups in the Radio Television and Electronics Achievement Test

Category	N	Pre-test Mean	Post-test Mean	Average Gain
Experimental	72	48.82	67.07	18.25
Control	88	45.63	56.34	10.71

The research information provided in the above table showed that the treatment category group had an average statistical figure of 48.82 in the prior-treatment and average statistical figure of 67.07 in the post-treatment resulting to average statistical gain in treatment category to be 18.25. The non treatment or control category had average statistical figure of

45.63 in the prior-treatment and average statistical figure of 56.34 in the post-treatment leading to average statistical gain of 10.71. Based on this research findings displayed numerically, the learners in the treatment category performed higher in the cognitive attainment exercise than the learners in the control category. Therefore, Pascal problem solving

strategies is much efficient than the lecture method for enhancing learners cognitive attainment in RTVE.

#### Research Question Two

What is the influence of sex disparity on learners' cognitive performance in RTVE when tutored utilizing Pascal problem solving strategies?

Table 2: Average Statistics of Pretreatment and Post treatment Figures of Masculine as well as Feminine Learners Tutored RTVE in the Cognitive Attainment Test

Gender	Pascal problem solving strategies				Lecture method			
	N	Pretest Mean	Posttest Mean	Mean gain	N	Pretest Mean	Posttest Mean	Mean gain
Male	57	48.40	65.60	17.20	73	35.50	37.70	2.20
Female	15	46.16	56.98	10.82	15	28.10	29.60	1.50

From the findings above presented in tabular form, the masculine learners in the experimental category had an average statistical figure of 48.40 in the pretreatment and 65.60 in the post treatment resulting to an average statistical gain of 17.20. Feminine learners of the similar category had a statistical average figure of 46.16 in the pretreatment and 56.98 in the post treatment, resulting average gain to be 10.82. Additionally, masculine learners of control category had a statistical an average figure of 35.50 in the pretreatment and 37.70 in the post treatment, leading an average statistical benefits of gain to be 2.20, while feminine learners of similar category had an average statistical figure of 28.10 in the

pretreatment and 29.60 in the post treatment, resulting an average gain to be 1.50. From the findings, it can be implied that Pascal problem solving strategies is much efficient for increasing male and female learners' cognitive performance in RTVE.

#### Testing of Hypotheses

##### Hypothesis one

There is no statistically relevant disparity in the mean achievement scores of learners tutored RTVE utilizing Pascal problem solving strategies and students tutored without it.

Table 3: Brief Overview of ANCOVA for test of statistical relevance of teaching method on Students' Achievements in RTVE using Lecture method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4587.503 <sup>a</sup>	4	1146.876	106.006	.000
Intercept	4862.768	1	4862.768	449.467	.000
Pretest	8.122	1	8.122	.751	.388
Posttest	2382.706	1	2382.706	220.234	.000
Error	1676.940	155	10.819		
Total	604923.000	160			
Corrected Total	6264.444	159			

The table above displayed the ANCOVA of achievement results of learners tutored utilizing Pascal problem solving strategies and students tutored without it. The computed statistical relevant (Significant) at intercept (449.467) and F ratio 106.006 and was 0.000 while the significant level for the hypothesis is 0.05. As evidenced, the calculated ANCOVA probability Significance. figure of 0.000 is below 0.05 alpha level. From this outcome, the negatively worded intelligent guess is not upheld. This revealed that there exist a relevant

statistical disparity in the average cognitive performance figures of learners tutored utilizing Pascal problem solving strategies and learners tutored without it.

##### Hypothesis Two

There is no relevant statistical disparity in the average cognitive attainment figures of masculine as well as feminine learners' tutored RTVE utilizing Pascal problem solving strategies.

Table 4: Brief Overview of ANCOVA of Masculine and Feminine Students Achievement Figures taught RTVE using Pascal problem solving strategies.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4886.364 <sup>a</sup>	4	1221.591	187.173	.000
Intercept	.021	1	.021	.003	.954
Posttest	1412.715	1	1412.715	216.458	.070
Gender	1.177	1	1.177	.180	.672
Group * Gender	1.782	1	1.782	.273	.602
Error	1011.611	68	6.527		
Total	505644.000	72			
Corrected Total	5897.975	71			

The table above revealed the statistical results of cognitive performance figures of masculine as well as feminine learners tutored utilizing Pascal problem solving strategies and students tutored without it. The computed statistical figure at F ratio 187.173 for gender was 0.672 while the significant level for the hypothesis is 0.05. As evidenced, the calculated ANCOVA probability Sig. figure of 0.672 is higher than 0.05 alpha level. With this outcome, the negatively worded intelligent guess is not rejected. Indicating that there exist no relevant statistical disparity in the average cognitive attainment figures of masculine as well as feminine learners tutored utilizing Pascal problem solving strategies and learners tutored without it. Hence, Pascal problem solving strategies is not gender bias, rather it is gender friendly in enhancing masculine as well as feminine learners cognitive performance in RTVE.

#### IV. DISCUSSION OF FINDINGS

With respect to research question one and hypothesis one, the average scores of the Pascal treatment category was 67.07 and that of the control category was 56.34. The outcome revealed that, student in the Pascal category or class exhibited higher performance than those in the non Pascal class. The calculated significance at interface (440.467) and F ratio (106.006) is significant at the 0.05 level ( $P < 0.05$ ). This indicated that there exist a relevant statistical disparity in the mean achievement scores of learners in the Pascal class than learners taught with lecture method. As such the null hypothesis 1 table 3 was rejected. And the alternative hypothesis was held. The implication of this finding was that Pascal problem solving strategies was effective in increasing students' achievements in RTVE than the lecture method.

The findings above was similar to the findings of Alio (2007) who carried out a research on the influence of similar instructional approach and found out that Pascal problem solving strategy was much efficient in enhancing learners' cognitive performance as well as zeal in Mathematics. The deductions from this research work is that, Pascal's problem solving strategies affects student's achievement in the subject positively. This can also be buttressed by Pekene (2012) who conducted a research on the influence of problem-solving

technique on learners' cognitive performance in physics. The result of the study revealed that learners tutored with problem solving model exhibited higher performance outcome than in Physics cognitive performance test than students tutored utilizing traditional approach.

With respect to research question two and hypothesis two, the results revealed that male students in the Pascal problem solving strategies group had a pretest-posttest mean gain to be 17.20 from pretest-posttest mean score while the Female students of the same group had mean gain to be 10.82 from pretest-posttest mean score. However, male students of lecture method group had a average gain to be 2.20 while feminine learners of the similar class had a pretest-posttest average gain to be 1.50. From the outcome, it can be inferred that Pascal problem solving strategies is much efficient for increasing male and female learners' cognitive attainment in RTVE. From table 7, the calculated significant value at F ratio 187.173 for gender was 0.672 while the significant level for the hypothesis is 0.05. As evidenced, the calculated ANCOVA probability Sig. figure of 0.672 is higher than 0.05 alpha level. From the outcome, the negatively worded intelligent guess is upheld.

The findings that Pascal problem solving strategies has more effect in improving learners cognitive performance is closely related to the discovery of Ibitoye (2010) who conducted similar research and found out that problem solving model was more effective in improving students achievement in Basic science and Technology. The finding was also similar to that of Ajibodi (2010) who carried out a comparative study on the three methods of teaching Keyboard on learners' cognitive performance in Business Education in selected schools. The study found out that among the three teaching methods, problem solving was more effective in improving masculine as well as feminine learners achievement in Business Education.

#### V. CONCLUSION

From the foregoing findings, and discussion it could be concluded that most of the students taught with Pascal problem solving strategies performed excellently well in the achievement test items, when compared with those taught

with conventional method. Again Pascal problem solving strategies was effective for improving both male and female student's achievements and retention in RTVE irrespective of sex disparity. Also, there was a relevant statistical disparity in the average achievement, and retention figures of learners tutored with Pascal problem solving strategies and learners tutored utilizing traditional approach. However, there was no relevant statistical disparity in the average cognitive performance and retention test figures of masculine as well as feminine learners tutored utilizing Pascal approach and learners tutored without it

## VI. RECOMMENDATIONS

1. Pascal problem solving strategies of learning should be encouraged in RTVE classrooms.
2. There is need for RTVE teachers in technical colleges to acquire the pedagogical Training necessary for effective utilization of Pascal problem solving strategies in teaching RTVE in technical colleges in Niger state.
3. Including Pascal problem solving procedures and tasks in the vocational teacher preparation programme at the higher institutions of learning where teachers are trained.
4. Providing adequate training facilities for effective implementation of Pascal problem solving instructional strategies in technical colleges.
5. Encouraging gender equality and fairness to encourage the females in RTVE when Pascal problem solving procedures as well as tasks need to be implemented.

## REFERENCES

- [1]. Abimbade, A. (2007). *Principles and practice of educational technology*. Ibadan: university press.
- [2]. Adah, O. C. & Ameh O. S. (2002). Determination of basic electricity teaching methods on students' achievement in technical colleges. *Teacher Education Journal*, 12 (2) 41-47.
- [3]. Adah, O. C. & Ameh, B. A. (2012). Project approach to teaching of basic electricity in Nigeria. *Teacher Education Journal*, 2 (3) 22-25.
- [4]. Ajibodi, A. N. (2010). Comparative study of the three method of teaching key board on students' achievement in business education at college of education, Ankpa. *Teacher Education Journal*, 2 (1), 46-49.
- [5]. Akubuilu, D.U. (2004). & Ibe, A. (2007). Effect of problem solving international strategies on students' achievement in biology. *Science Teacher Association Journal*, 24 (1 & 2), 94 – 100.
- [6]. Alio, B. C. (2007). Polya's problem solving strategy in technical college students' achievement and interest in Mathematics. Unpublished doctoral. thesis. faculty of education, University of Nigeria, Nsukka, Nigeria.
- [7]. Ameh, I. E., Daniel B. P. & Akus, Y. (2007). *Research and methods in the Social Sciences*. Ankpa: Rowis publishers.
- [8]. Anene, G.U. (2015). Home economics and the academic performance of a child. *Journals of home economics research*, 6 (1), 99-103.
- [9]. Atherson, J.S. (2012). Learning and teaching intelligence. Retrieved on 30<sup>th</sup> January, 2016 from www.dmu.ac.uk
- [10]. Awolola, S. A. (2011). Effect of brain-based learning strategy on students' achievement in Technical college students education in Oyo State. *Journal of Teachers of Technology Education*, 6 (2), 91- 106.
- [11]. Federal Republic of Nigeria (2013). *National Policy on Education* (4<sup>th</sup> ed.). Lagos: Nigerian Educational Research and Development Council press.
- [12]. Ibitoye, S. J. (2010). Effects of problem solving model on junior secondary school student's achievement in basic Technology in Kogi state college of Education Ankpa. *Teacher Education Journal*, 2 (1), 51-56.
- [13]. Idoko, D. & Ibitoye, S. J. (2008). Place of problem solving approach in Agricultural science teaching. *National Association of Science, Humanities and Educational Research Journal*, 8 (2) 153-159.
- [14]. Magnuson, K. (2007). Maternal education and children's academic achievement during middle childhood. *Journal of Developmental Psychology*, 43(1), 1497.
- [15]. Mundi, N. E. (2006). The place of expository/lecture method on students performance in electronics in technical colleges in Niger State. *Teacher Education Journal*, 5 (2) 17-23.
- [16]. National Business and Technical Examinations Board (2014). Students' results analysis. Benin: Author.
- [17]. National Board for Technical Education (2011). *National technical certificate examination syllabus for engineering trades based on the NBTE modular curricular*. Kaduna: Author.
- [18]. Nwachukwu, C. E. (2011). *Designing appropriate methodology in Vocational and Technical Education for Nigeria*. Nsukka: Fulladu printing company.
- [19]. Nwokorie, L. S. & Akpata, S. I. (2014). *Principles and methods of teaching in primary and technical colleges*. Ankpa: Ebonyi printing house.
- [20]. Nwosu, A. A. (2010). The effect of using problem solving method on students' achievements in mathematics. Unpublished doctoral thesis, University of Nigeria, Nsukka, Nigeria.
- [21]. Odili A. O. (2006). *Radio Television in Nigeria Technical schools: teaching perspective*. Port-harcourt: Anachuna educational books.
- [22]. Odumu, S. O. (2010). Needs for improvement in the teaching of Radio Television in technical colleges: *Journal of Confluence Educators*, 2 (1) 20-25.
- [23]. Okoli, J. N. (2009). Effect of two interaction learning styles on students achievement and interest in Biology. Unpublished doctoral thesis, University of Nigeria, Nsukka, Nigeria.
- [24]. Olaitan, S. O. (2004). *Electronic education in the tropics methodology for teaching Radio Television*. London: Macmillan Publishers.
- [25]. Onimisi, J. A. (2011). Impact of type of teacher training on students' achievement and attitude towards electrical/electronic options. Unpublished doctoral thesis, University of Nigeria, Nsukka, Nigeria.
- [26]. Pekene, D. J. (2012). Effects of using problem-solving models on Students' Achievement in Physics. *Journal of Science Teachers Association of Nigeria*, 37 (1 & 2), 39-43.