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IMPACT OF SMART LEARNING ON PERFORMANCE OF JUNIOR SECONDARY SCHOOL STUDENTS IN BASIC TECHNOLOGY IN NIGER STATE, NIGERIA

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ABSTRACT:

This study investigated the impact of smart learning on performance of junior secondary school students in basic technology in Niger State. The study adopted a quasi-experimental pre-test post-test control group design. The participants of the study consist of 55 female and 115 male (170) students selected from the JSSII stream of two schools; government day secondary school Minna and Ahmadu Bahago secondary school Minna in Niger State was the experimental group, located in the urban area of the state while government secondary school, Beji the control group located in the rural area purposive sampling technique was used to select intact classes used for the study. Basic technology performance test (batpet) instrument was pilot tested at government secondary school Gwagwalada, Abuja, a reliability coefficient of .76 was established using SPSS. Data was collected after the control and experimental groups received instructions for seven weeks t-test statistical analysis of mean and standard deviation was used to analyse data obtained, as well as draw inference from the hypotheses, the findings indicate that the use of technology without satisfying the conditions of learning such as factual information, learners cognitive skills and intellectual ability, especially ability to read, write, and understand does not improve learning. It was recommended that for effective teaching and learning of basic technology at all levels must be encouraged and trained to ensure learners acquire the requisite rudiments, this is necessary for effective teaching and learning in all disciplines with or without technology.

Keywords: Smart Learning, Basic Technology, Performance

Introduction

Basic technology is an integrated subject offered at the junior secondary school level. According to Olaniyan and Ojo (2008) basic technology is an elective subject that comprises element of woodwork, metalwork, building technology, auto mechanic, electrical/electronics and technical drawing at their basic levels. Basic Technology is taught in the junior secondary schools as integrated aspect of introductory technology designed to expose the students to the appreciation and stimulation of their interest in various areas of industrial technology. The aim is that at the end of junior secondary school, students would have attained technological and solid foundation for their entrance into a vocation of their choice (Uwaifo & Edigin, 2011; Kennedy,

2011). This is in consonance with the statement in the National Curriculum for Junior Secondary Schools (FRN, 2013), which amongst others states that in order to reduce ignorance about technology.

Basic Technology was introduced into the Nigerian education system, 6-3-3-4 in 1982 as a result of the newly defined National Policy on Education that came into being after the National curriculum conference of September, 1969. The techniques for transmitting technical skills has remained too theoretical and devoid of the use of technology to stimulate interest and sustain the necessary skills required after school that could lead to advancement in technology. Consequently, undermining the essence and the cardinal objectives of the subject matter of Basic Technology, this

assertion is drawn from the perspectives of failures in school examination which may be ascribed to factors guiding teaching and learning which include archaic pedagogical approaches that are not in tune with global best practices (Kennedy, 2011).

As an alternative to e-learning, smart learning is intelligent and personalized learning to meet learners' diverse needs and learning styles (Kwak, 2010). It can also improve communication, thinking and problem-solving skills by integrating a new type of e-learning technologies with smart devices. It is defined as a learner-centered humanistic learning system that provides easy access to learning sources and enhances interaction among learners and between learners and instructor and supports a self-directed learning environment (Kwak, 2010). Thus, smart learning is expected to supplement the existing e-learning system and extend the territory of learning (Kim, 2010). It makes it possible to create and provide a learning environment that is not content and technology-driven but knowledge and learner-driven (Badawy, 2012).

Academic performance is said to be the result of education, it is the extent to which a student, teacher, or institution has achieved their educational goals. It is about how students deals with their studies, cope with academics tasks, and how they fared in the overall school activities. Academic performance is student's level of pass and failure over a period of time at the end of any academic activity across disciplines, It is measured in a number of ways such as; oral and written tests; presentations, assignments, class work, projects and continuous assessment. Other forms of evaluating student's academic performance include; standardized tests and teacher-made tests. There is universal agreement that a major criterion of technological implementation in schools should be whether such applications actually do improve teaching and learning and improve student academic performance. However, there is a consensus about the complexity and challenge of reliably evaluating the impact of technology. (Noeth & Volkov, 2014).

Poor performance in examination cut across the strata of secondary education. This position is reinforced by the basic education certificate examination internal examiners

report 2016, which shows remains decline in students performance in basic technology. Retrogression in performance is also reflected in National Examination Councils (NECO) School Certificate Examination results since 2011. BECE results of NECO since 2011 has witnessed continuous decline; for example in 2011 only 10.6% of candidates that sat for the BECE exams obtained five credits and above including basic science and technology, 9.3% in 2011; 8.06% in 2012 and 31.58% in 2013 (Edet, 2014).

This study attempts to remedy some of the foregoing problems by exploring the impact of Smart learning Basic Technology Package (SMBATEP) designed and developed by the researcher could have on the performance of Junior Secondary School Students in Basic Technology in Niger State.

Literature Review

With the development of ICT in education and considering scaling up the innovation of technology enhanced learning, researchers began to conceptualize how learning environments can be made more effective, efficient, and engaging on a large and sustainable scale (Spector 2014). The concepts of next generation learning space, smart learning environment, and smart classroom emerged. Learning space is a new emerging research area, with the aim to promote independent, flexible, and engaged learning by providing learner with appropriate technology and pedagogy (Kwak, 2010). Smart Learning Environments (SLE) are defined as physical environments that are enriched with digital, context-aware and adaptive devices, to promote better and faster learning (Koper, 2014). With technology support, smart classrooms has become places where teachers and students could have rich and immersive teaching and learning experiences that they have never experienced before (Li, Kong & Chen 2015). Hwang (2014) presented the definition and criteria of SLE from the perspective of context-aware ubiquitous learning. Hwang also introduced a framework to address the design and development of SLE to support both online and real-world learning activities.

Zhong and Zhang (2006) presented that smart learning environments were a learner-centered intelligent, open, integrated digital virtual reality learning space. Zhong and Zhang maintained that the core elements of smart

learning were corresponding equipment, tools, technology, media, textbooks, teachers, and students, etc., and all these core elements should be organized according to constructivist learning theory, blended learning theory and modern teaching theory. Chin (2007) argued that smart learning environments were a learner-centered environment based on the application of information and communication technology, with the following characteristics: adapt to different learning styles and learning abilities of learners; provide support to lifelong learning of learners; provide support to the development of learners.

In today's contemporary world the potentials of Smart learning cannot be underestimated. There is a plethora of established findings on the instructional value of computer, especially in advanced countries. However, on a general context when information and communication tools are constructively deployed they provide the leading edge to the actualization of the nations educational goals.

Computer in education is an emerging phenomenon in Nigeria educational system. The International Telecommunication Union (ITU) in her 2013 global ICT chart ranked Nigeria as 122nd in the world behind smaller African countries like Mauritius, Botswana, Kenya, Senegal and South Africa, this position is within the context of ICT integration in schools. In another report, NEPAD scored the level of students' experience with ICTs and their proficiency in using them in Africa very low. Fifty-five percent of students within the continent, including Nigeria, Algeria, Burkina Faso, Cameroon, Republic of Congo, Egypt, Gabon, Lesotho, Mali, Mauritius, Mozambique, Rwanda, Senegal, South Africa, and Uganda (who are participating in the first phase of the NEPAD e-Schools initiative), stated they had no experience at all in using computers. Other findings on the integration of ICT in education suggested that the typical African school environment provides neither opportunity nor training in using ICTS, and that 75% of responding teachers have no or have very limited experience and expertise regarding ICT educational applications (Esharenana & Emperor, 2010).

Statement of the Problem

An investigation into the average performance of JSS students that offered Basic Technology

in Junior Secondary School Certificate Examination (JSCE) in Niger State from 2010 to 2012 academic sessions indicated very poor performance. These records indicate that students performed poorly and raised serious cause for concern considering the huge resources expended by Governments at different levels to improve the standard of education in Nigeria as a whole and Niger State in particular. The spate of poor return on investment in education by Governments across the country in terms of paying the examination fees and other sundry expenditures in secondary education. The critical importance of basic technology to the development of science and technology in Nigeria and Niger state in particular makes it necessary to explore available strategies to improve teaching and learn of basic technology. Since learning can be contextualized, smart learning may be the medium to facilitate students better learning of basic technology.

Objectives of the study

1. determine the effects of smart learning on JSS performance of basic technology
2. determine influence of gender on JSS performance in basic technology when exposed to students exposed to smart learning technique.

Research Questions

1. What is the effect of the smart learning on JSS students performance in basic technology?
2. What is the influence of gender on JSS students performance taught basic technology using smart learning and those taught basic technology using Traditional method?

Hypotheses

The following hypotheses were formulated to guide the study:

Ho₁: There is no significant difference on the impact of smart learning on performance of students taught basic technology using smart learning and those taught using traditional method.

Ho₂: There is no significant difference in performances of male and female students taught Basic Technology with smart learning and traditional method.

Methodology

The study adopted a quasi-experimental research design which is a non-equivalent pre-test and post-test control group design. This is

considered appropriate because, according to Hassan, Kareem, Bala and Abba (2016), there will be no randomization of the subjects into treatment and control groups. Intact classes were used to avoid disturbing the normal classes in terms of classroom schedule.

The study was carried out in Niger State in Niger State, the target population for this study consists of all the 1,552 JSSII Students in the Junior Secondary schools in Niger State, the sample for this study was made up of 170 Students. The study adopted multi-stage sampling technique to select the sample for the study. Multi- stage sampling technique was used- first, by sampling of the educational zone: purposive sampling was used to select two out of seven educational zones in the state (Bida and Kutigi zones). Secondly, purposive sampling technique was also used to select two co-educational JSS schools from Bida and Kutigi Niger State. The instruments used for this study are: The treatment instrument, a researcher developed smart learning basic technology package (SLBTEP), a Performance Test, named Basic Technology Performance Test (BATPET). Basic Technology Performance Test (BATPET) was validated by experts in Industrial and Technology Education Department, Federal University of Technology, Minna. The study instrument, Basic Technology Performance Test (BATPET) was administered to 30 randomly selected JSS II Students of Government Secondary School, Gwagwalada, FCT, Abuja. The students were made-up of 15 male and 15 female they were selected using Simple Random Sampling procedure by the researcher with the assistance of the subject teacher in the school. The reliability of BATPET was established through the analysis of the data obtained from the

administration of the 30-item multiple-choice questions on the randomly selected students of Government Secondary School, Gwagwalada, FCT, Abuja. A reliability coefficient (r)of .76 was recorded using SPSS package. This alpha level confirms descriptive statistics (mean and standard deviation) and t-test of independent samples were the statistical tool used to analyse the data obtained from the respondents while, to test at a significant level of 0.05 using SPSS version 16 The level of significance was the basis for which the hypotheses were accepted or rejected.

Results

Research question one

What is the effect of smart learning on JSSII students performance in technology?

To determine the impact of smart learning on performance of students in basic technology, the basic technology performance test was administered as pre-test and post-test, descriptive statistics that is; mean and standard deviation obtained were used to answer the research questions as follows:

Table 1 Shows that at pre-test; the control group had a mean score of 7.13 and standard deviation of 2.88, while at post-test a mean of 9.93 and standard deviation of 3.00 was recorded this indicate a marginal increase of 2.80. The experimental group had a mean score of 7.15 and standard deviation of 3.70 at pretest, and a mean score of 9.50 and standard deviation of 3.44 at post-test, the experimental group has a 2.45 mean difference. However, the difference between the mean scores of the control and experimental group is 0.35 in favour of the control group. Impliedly smart learning has not had effect on the performance of the

Table 1: Mean scores and Standard deviation of respondents in experimental and control group

	Control Group				Experimental Group			
	N	\bar{X}	Sd	Md	N	\bar{X}	Sd	Md
Pre-test	61	7.13	2.88	2.80	109	7.15	3.70	2.35
Post-test	61	9.93	3.00		109	9.50	3.44	
<i>High mean gain in favour of post-test</i>				<i>High mean gain in favour of post-test</i>				

N: Number of respondents, X: Mean. Sd: Standard deviation., Md: Mean difference.

experimental group in Basic Technology. This may be either because they are familiar with computer and therefore computer could not stimulate much of their interest and improve their performance or the intervention of computer was overwhelming to them, or probably more time was needed to meet up with the intellectual skills and cognitive ability of the respondents.

Research question two

What is the influence of gender on JSSII students performance taught basic technology using smart learning and those taught basic technology using traditional method? To find out the difference between the performance of male and female respondents,

the mean score and standard deviation obtained by the control group and experimental group is presented in Table 2 below:

Table 2: Shows that the male students obtained a mean score of 9.40 and standard deviation 3.11 while the female students has a mean score of 10.20 with standard deviation of 3.57 the difference of mean is 0.80 and standard deviation of 0.46 in favour of the female students suggesting the female are better than male students, the level of significance of the difference was determined by the testing the corresponding hypothesis.

Test of Hypotheses

Hypothesis one H_{o1} . There is no significant difference the impact of smart learning on

Table 2. Mean scores and Standard deviation of respondents based on Gender.

	Gender	N	%	X	SD
Pre-test	Male	115	68	6.71	2.84
	Female	55	32	8.04	4.28
Post-test	Male	115	68	9.40	3.11
	Female	55	32	10.20	3.57

Gender, N: Number of respondents, X: Mean., SD: Standard deviation. Md: Mean difference.

performance of students between those taught Basic Technology using smart learning and students taught using traditional method. This hypothesis was tested using independent t-test statistics as follows:

Table 3. Indicate that The experimental group, which is also a day school and located in the urban centre, had a significantly lower score (mean=9.51, SD=3.44) at the end of treatment compared to the control group (mean= 9.93; SD= 2.97) $t(168) = 0.854$. Therefore, there is statistically

no significant difference between the academic performance of students taught with smart learning and those taught using traditional method of teaching after treatment, consequently the hypothesis which says that: There is no significant difference on the Effect of smart learning on performance of students between those taught Basic Technology using smart learning and students taught using traditional method, is retained.

Hypothesis two H_{o2} . There is no significant difference in performance of male and female students taught Basic Technology with smart

Table 3: Difference between students taught Basic technology with smart learning and students taught Basic technology with traditional method.

	Groups	N	X	SD	df	t	P<0.05	Significant
Pre-Test	Experimental	109	7.15	3.69	168	0.031	0.97	(Not Significant)
	Control	61	7.13	2.87				
Post-test	Experimental	109	9.51	3.44	168	-0.854		
	Control	61	9.93	2.97				

learning and Traditional method. This hypothesis was tested using independent t-test statistics as follows:

Table 4. Shows that the female group had a statistically significantly higher score (mean= 10.20, SD = 3.57) at the end of treatment compared to male students taught basic technology using smart learning (mean= 8.80; SD= 3.20) $t(107) = -2.17, p=0.05$ Therefore the

Hypotheses which says that there is no significant difference between the performance of female students taught basic technology using smart learning with their male counterpart is rejected.

Discussion of Findings

Research question one sought to find out the impact of smart learning on performance of

Table 4. Difference in performance based on Gender

	Groups	N	X	SD	df	t	P<0.05	Significant
Pre-Test	Male	54	6.24	2.8	107	-2.60	0.97	(Not Significant)
	Female	55	8.04	4.3				
Post-test	Male	54	8.80	3.20	168	-2.17		
	Female	55	10.20	3.57				

secondary students in basic technology examination, Evidence from the study shows that smart learning had no effect on students' performance in basic technology, the table shows that the control group has a higher improvement in their mean score than the experimental group after the tests. This outcome lends itself with the position that smart learning is considered as effective as conventional teaching method (Jenks & Springer, 2012) and is varying with other findings Gambari, (2009), Yaki, (2011), and Bello, (2012). The implication of this finding is that teaching and learning will be devoid of technology with the consequence of being uninteresting, boring and less motivating.

Research question two sought to find out differences in performance between male and female students taught basic technology with smart learning, the study revealed that the female students have a higher gain in their mean score and standard deviation. This finding is consistent with similar studies Tunde, (2013), Achuonye, (2011), Yusuf and Afolabi, (2010). They found out in their studies that there was no significant difference on academic performance based on gender. However, the implication of the finding suggest the need for sustained campaign for Girl-child education in Niger state in particular and Nigeria as a whole, it shows that female can perform as well as the male if given the opportunity and provided with the necessary materials and tools for learning. Especially in enrolment into science and technology based subjects.

Studies by; Yusuf and Afolabi, (2010); Onasanya, Fakomogbon, Shehu, and Soetan, (2010); Adeyemi, (2011); Pilli, (2008); Parr, (2013); Schacter and Fagnano, (2009) and Fletcher-Flinn & Gravatt (2015). Revealed that learning with smart learning compared with traditional teaching methods produces higher level of academic performance. The negative outcome of the study may be ascribed to students familiarity with computer hence, its introduction in the classroom could not

stimulate their interest, it could also be that the use of computer to teach the subject matter of basic technology overwhelmed the students and hence could not positively influence their performance in Basic technology examination. It could perhaps be the time invested (Seven weeks, precisely) to teach the students was not enough to foster knowledge and understanding of the Basic Technology contents. However, the performance of the students may be placed on absence of certain conditions of learning, that is required for effective teaching and learning; these conditions which are both internal and external (Gredler, 2013) include; learners cognitive strategies, intellectual skills and factual or verbal information.

Although studies have shown that the use of smart learning promotes learning, this study revealed otherwise; that the use of computer alone cannot deliver, without satisfying other conditions for learning such as the learners' intellectual skills which include ability to read, comprehend and respond to questions relevant to the contents.

Gredler, (2012) refers to this skill as „correct application of knowledge learned and cognitive strategy that is preparing the learner into new learning situation to be able to make new learning worthwhile. The result from the test of hypothesis two which says „there is significant difference between students taught basic technology with smart learning and those taught traditionally“, is upheld. This outcome is inconsistent with findings from similar studies for instance Yusuf and Afolabi (2010) reported no significant difference in the students' performance on gender variable both with Smart Learning and conventional method. Similarly, Achuonye (2011) investigated gender as a factor in academic achievement of students in Port-Harcourt, River state; Smart Learning was used to teach photosynthesis in Biology. She found that gender had no significant effect on student's achievement. Although gender has been linked to academic performance, they conclude that new studies

are needed to clarify the effects of Smart Learning in contemporary student/computer environment. They also observed that how Smart Learning is delivered can impact its effectiveness. Also, Christmann and Badgett (2010) corroborated the outcome of this study, they made very strong case for further research, arguing that despite the accolades heralding smart learning as the effective teaching methodology, there is still no documented evidence verifying its perceived superiority. Jenks and Springer advanced the fact that smart learning can be an effective mode of instruction in the education environment but is not offered to prove the superiority of Smart Learning. Rather Smart Learning should be seen as supplementing the activities in teaching and learning.

Conclusion

Current trends in education advocate the use of technology in education because of its ability to facilitate teaching and learning. The negative outcome of the study may be ascribed to certain confounding variables that are central to the success of such study, these variables are the learners' intellectual skills that is ability to read, write, recall past experience and relate to new information, learners' cognitive style and the longevity of the treatment thus, seven weeks was used for this study. However, the researchers substantively believe and position remain as there is no better intervention for poor performance in schools than technology, it offers greater opportunities to achieve learning objectives whether in short term or long term. As a major finding of this study, technology alone does not optimize and actualize teaching and learning unless learning conditions such as good learning environment, willingness and readiness to learn, time/duration of teaching and learning process, learners' intellectual skills, and learners' cognitive styles are adequately secured.

Recommendations

- Computer if used adequately and wisely, supplement teaching; make learning more interesting, real, and motivating. Therefore, Nigeria Educational Development and Research Council (NEDRC) should research how to develop and create subject based instructional software for all subjects to encourage the use of smart learning.
- Governments at all tiers must ensure

continuous capacity building of teachers and educators across disciplines most specially in appreciation of current trends and issues in smart learning in education.

- Government at all levels must continue to encourage and intensify campaigns on girl child education, and provide necessary teaching /learning resources in secondary schools to enhance learning opportunities for the girl-child particularly and everyone as a whole. Several studies including this one has shown that female students can academically perform as well as their male counterparts both in computer mediated educational environment and traditional teaching/learning setting.

References

- Achuonye, K. A. (2011) Using Computer in Science Class: The interactive effects of gender. *Journal of African Studies and Development*. 3(7), 131-134 (online) Retrieved September 26, 2012 from <http://www.academicjournals.org/JASD.1926>.
- Adeyemi, T. O. (2011). A Comparative study of students' academic Performance in Public Examinations in Secondary Schools in Ondo and Ekiti States, Nigeria. *Current Research Journal of Economic Theory*, 3(2), 36-42.
- Afolabi, A. K., Abidoye, J. A. and Afolabi, A. F. (2012). Effect of Instructional Media on the Academic Achievement of student in Social Studies in Junior Secondary Schools: *PNSLA Quarterly*, 77(1), 1-7,
- Badawy, T., Adewole, A. and Olalekan, O. (2012). Uses of Computer and its relevance to teaching and learning in Nigerian educational system. *Educational Research and Review*, 4(10), 443-447 ISSN 1990-3839.
- Bello, R. M. (2012). *Effect of smart learningal Package on secondary School student's Academic performance in Biology concepts in Minna, Niger state*. Unpublished M.ed. Thesis. Usmanu Danfodiyo University Niger, Nigeria.
- Chin, K.W. (2007). Smart learning environment model for secondary schools in Malaysia: An overview [EB/OL]. 10 October, 2011. <http://www.apdip.net/projects/seminar>

- s / i t - p o l i c y / c n /
resources/kangwaichin/smartlearning-
mimos.ppt
- Christmann, E. P., & Badgett, J. L. (2000). The comparative effectiveness of CAI on Collegiate Academic Performance. *Journal of Computing in Higher Education*, 11(2), 91-103.
- Edet, B. (2014). NECO: Stay or go. Weekly Trust, P.61.
- Federal Republic of Nigeria (2013). *National Policy on Education (4th edition)* Lagos: NERDC Press
- Fletcher-Flinn, C. M., and Gravatt, B. (2015). The efficacy of computer assisted instruction (CAI): A meta-analysis. *Journal of Educational Computing Research*, 12(3), 219-242.
- Gambari, A.I. (2009). Effectiveness of CAI learning all Package in Cooperative settings on Secondary School Students Performance in physics in Minna, Nigeria. Unpublished PhD Thesis. University of Ilorin, Nigeria.
- Gredler, M.E. (2012). *Learning and Instruction: Theory into Practice*, Upper Saddle River, New Jersey: Prentice-hall, Inc.
- Hassan, A.M, Kareem, W.B, Bala, M.M & Abba, U. (2016). Effects of information and communication technology (ICT) on achievement and interest of junior secondary school students in basic science and technology. 363-368, 57th Annual conference of science teachers association of Nigeria.
- Hwang, G.-J. (2014). Definition, framework and research issues of smart learning environments— a context—aware ubiquitous learning perspective. *Smart Learning Environments*, 1(1), 4. doi:10.1186/s40561-014-0004-5.
- Jenks, M.S. and Springer, J. M. (2012). *A view of the research on the efficacy of CAI. Electronic Journal for the Integration of Technology in Education*. Retrieved September 27, 2012 from <http://www.google.com>.
- Kennedy, O. O. (2011). Strategies in improving the policy and access to Technology education in secondary schools in Nigeria: *International Journal of Academic Research in Business and Social Sciences*. 1 Special issue. ISSN: 2222- 6990.
- Koper, R. (2014). Conditions for effective smart learning environments. *Smart Learning Environments*, 1(1). doi:10.1186/s40561-014-0005-4
- Li, B., Kong, S. C., & Chen, G. (2015). Development and validation of the smart classroom inventory. *Smart Learning Environments*, 2(1). doi:10.1186/s40561-015-0012-0.
- Noeth, R. J. and Volkov, B. B. (2014). Evaluating the effectiveness of technology in our Schools, *ACT Policy Report*
- Olaniyan, D. A., and Ojo, L. B. (2008). Challenges against Implementation of Introductory Technology Curriculum in Nigeria Junior Secondary School. *European Journal of Scientific Research*.
- Onasanya, S. A., Daramola, F. O. and Asuquo, E. N. (2010). Effects of Computer Assisted Instructional Package on Secondary Schools Students performance in Introductory Technology in Ilorin, Nigeria. *The Nigeria Journal of Educational Media and Technology*. 12 (1)98-107.
- Parr, J. M. (2003). *A review of the literature on Computer Assisted learning, particularly integrated learning systems, and outcomes with respect to literacy*.
- Pilli, O. (2008). *The Effects of Smart learning on the Achievement, Attitudes and Retention of Fourth Grade Mathematics Course*.
- Schacter, J., and Fagnano, C. (2009). Does computer technology improve student learning and achievement? How, when, and under what conditions? *Journal of Educational Computing Research*, 20(4), 329-343.
- Tunde, T. R. (2013). A comparative study of the impact of instructional media in teaching and learning process in selected primary schools in Kogi state, *Journal of Educational Media and Technology*, vol.17 no.1. Pp145-148
- Uwaifo, V.O. and Edigin, J. E. O. (2011). *Evaluating Basic Technology Instruction in Nigerian Secondary Schools Benin City*.

- Yaki, A. A. (2011). *Effects of Computer Animation and Guided inquiry on Secondary School Students' Learning Outcomes in Ecological Concepts*. Unpublished M.Ed thesis Submitted to the department of Science and Environmental education, University of Abuja, Nigeria.
- Zhong, G., & Zhang, X. (2006). A Building of the current intelligent learning environment model. *Computer Science*, 1, 170–171.