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Blended learning approach on students' academic achievement and retention: A case study of air force secondary school rivers state, Nigeria

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Abstract
This study ex-ray the effect of blended learning approach on students' academic achievement and retention: a case study of Air Force Secondary School Rivers state, Nigeria. Two research questions and two research hypothesis guided the study. The study adopted a quasi-experimental research design. The population of the study was one thousand two hundred (1200) students, while the sample was eighty (80) students purposefully selected from the entire population. Social studies achievement test (SAT) was used as instrument for data collection, mean, standard deviation and analysis of variance (ANOVA) were the statistical tools used for the study. The finding revealed that students taught using station-rotation model performed most followed by students taught using conventional method, also that students taught using the station- rotation model had the highest retention level, than those taught using the conventional method. Conclusion and some recommendations were also made.

Keywords: blended learning, instructional media, academic achievement

Introduction

Globally, education is faced with various forms of innovation which has help in transforming the sector both in human and material resources. This innovation has given rise to various approaches of teaching and learning in which blended learning is one of the approaches which has been understood as a combination of face-to-face and technology mediated instructional forms and practices use in teaching and learning. As new technologies emerge, they are often embraced by the traditional system of teaching and learning. The traditional approach of teaching which is concerned with the teacher being the controller of the learning environment, power and responsibility are held by the teacher and they play the role of instructors and decision makers in regards to curriculum content and the outcome of the learning. They see students as having "knowledge holes that need to be filled with information. Recently information communication technology has energies to bridge the gap between the traditional system of learning and the new learning, thereby creating an avenue of enhancing the traditional instruction. Blended learning is one of the most recent learning model in which content attainment is shifted by instructor facilitated concept application activities in class. Scott (2007) described blended learning as learning that is carried out using a combination of different methods of delivery, teaching and styles of learning, and includes clear communications between the learners and instructors within the lesson period. Participant in a blended learning course are required to be engaging and self-motivated so as to help them construct new knowledge in addition to the existing once. Blended learning is an innovative instructional strategy that is compatible with the 21st century system of learning. It entails the jointly use of different techniques and strategies especially, technology and the conventional face-to-face method in teaching.

Concept of Blended learning

Blended learning is defined as a "formal education program in which students learns: at least in part through online learning, with some element of student control over time, place, path or pace, at least in part in a supervised brick-and-mortar location away from home; and the modalities along each student's learning path within a course or subject are connected to provide an integrated learning experience". Heinze (2010) [10] defined blended as the making of face-to-face teaching and online learning. Thorne (2003) [22] described blended learning as "a way of meeting the challenges of tailoring learning and development to the needs of individuals by integrating the innovative and technological advances offered by online learning with the interaction and participation offered in the best of traditional learning". Muthuchamy and Thiyagu (2011) [14] described blended learning as the integrated combination of traditional learning with web-based online approaches. They described it as combining offline and online forms of learning where the online may be over the internet, intranet, computer and other software packages while offline is the traditional classroom where students and teachers meet face-to-face to engage in learning activities. Norm (2012) [7] defined blended learning is a formal education program in which students learns at least in part through delivery of content and instruction via digital and online media with some element of students control over time, place, path, or pace Blended learning can also be referred to an approach of learning which allow creation of suitable environment for students to achieve their objective more easily in improve educational environments by applying appraise technologies in various classroom environment.

Models of Blended Learning

According to Friesen (2012) [7], Blended Learning can

generally be classified into five models:

Station-Rotation Model

In rotation model, students rotate on a fixed schedule or at the teacher's discretion among classroom-based learning modalities. The rotation includes at least one station for online learning. The station-rotation model differs from the individual-rotation model because students rotate through all of the stations, not only those on their customized schedules. The station-rotation model give students the opportunities to rotate around or between a given stations. The class is divided into different segment from where the teacher supplement his traditional face-to-face teaching with some online posts which may be video, screen cast about the subject under discuss. The station-rotation allows students to visit various station during the allocated time for the online class. They may rotate between one-on-one or in small-group with the discretion of the teacher.

Laboratory-Rotation Model

The online lab model is the model where an online course is delivered in a physical classroom or in a computer lab without direct instruction from a face-to-face teacher. The learning takes place at school and teachers either delivers it asynchronously or synchronously but it is purely an online course. The online teacher delivers the content via an online learning management system. The online labs or classrooms are monitored by teachers who are not necessarily certified in the area of instruction that the online teacher is certified in. Monitors are not trained necessarily in the subject area but are present to deal with any technology or discipline related issues.

Flex Model

The flex blended learning model is a model in which the curriculum is delivered through an online content provider with classroom teachers providing onsite support. The flex model is used in many dropout-recovery and credit recovery programs that are designed to either bring students back from declining attendance or enable them to graduate on time (Staker, 2011) [21]. The flex model is not fixed but fluid, allowing for real-time changes in schedules to meet ever-changing student learning needs. This model relies on personalized online systems, teachers-of-record, and other adults to continuously use data, such as student performance analytics from the online system, to know how to best support each student in accomplishing predetermined goals. Instruction is delivered by an online teacher and there is always a classroom teachers to supervise the learner (Gairla, 2016) [10].

A Self-blend Model

The self-blend model is also known as the "a la carte" model which allows students to design their educational experience by selecting specific online courses to supplement their traditional in-school coursework. For the online coursework component, the teacher-of-record is virtual and learning occurs either in the school or off-site. This approach may be employed when schools do not have certain courses available on-site. The self-blend model is a model in which students decide what courses they want to take online to supplement what their school offers. It is used any time students choose to take one or more courses online to supplement their traditional school's catalog. The teacher is an online teacher and the online learning is completed off the school campus. Students decide on the combination of traditional classes and online classes. Just like the online lab model, the self-blend model can be used as a way to offer curriculum content that is not available because of the lack of certified teachers (Staker, 2011) [21].

The Flipped Classroom Model

Flipped classroom is a Rotation Model in which the students rotate on a fixed schedule between online delivery of content and instruction, generally outside of the classroom, and face-to-face teacher-guided practice (or projects), generally in a classroom setting (Christensen *et al*., 2013) [3]. This approach flips the way students use homework and class time, wherein homework time (after traditional school time) is spent receiving content information online at the students' own pace, and class time supports practice and problem-solving. This is a typical blended learning model where normal classroom activities are done in a reverse order. Instructional content are posted online outside the class and use class time for home work, assignment a d dwelling on grey areas in the online content. The audio or video content of the lecture are viewed by students at home and class times are used for project and discussion. The underlying assumption of the flipped classroom is to engage students and direct their attention on conceptual knowledge. The advantages of flipped classroom like other blended learning models students have unrestricted access to lesson content.

Concept of Instructional Media

Dictionary.com (2017) defined instructional media as instructional aids that can be used by instructors to facilitate learning especially in the present 21st century classrooms. These includes printed materials (pamphlets, handout, manuals, study guides etc.), visuals (charts, photographs, transparencies, real objects), audio-visuals (films, television, multimedia, slides, tapes), electronics (radio computers, electronic mail, multimedia, CD-ROM), static/display (chalkboard, display easels, flip chart, cloth board, magnetic board, team board, interactive white board). Instructional media can be used as mode of communication in which teaching takes place such as face-to-face instruction, radio lesson instruction, and interactive learning instruction via internet. Romiszowski (1998) [18] highlighted some of the importance of advantages of instructional media to learners in classroom to be

- Instructional media facilitate the understanding of abstract concepts for learners.
- It allows easy and repeated reproduction of events during the learning process.
- It promote illustration and reality of concepts in the class.
- It provides conceptual framework for learners
- It focus attention on high key points by saving time.

Academic Achievement

Ukwuji and Kpolovie (2003) [24] defined academic

achievement as a psychological test which measures learners' cognitive and intellectual traits. The result of these test are very crucial in the academic decision making by the teacher concerning learners because it help the teacher and guardian to ascertain the progress of their learners. Bonk (2006) [2] described academic performance as college point average and the success of both teachers and students. It points to excellence in all academic discipline as well as the attainment of educational goals measured by standardized test scores. Academic achievement measure the extent to which students fails or succeed in a given cognitive academic task. Anyichie and Onyedike (2012) in a study stated that academic achievement is the ability of the learner to attain its set educational goal within the specific duration of the program. They tested the effect of self-instructional learning strategy on secondary schools students' academic performance in solving world problems in Nigeria. The study indicated a significant main effect of treatment on the student's world problem of performance. The findings revealed that students' academic achievement depends on the instructional approach use by the instructors in content delivery.

This study is anchored on two theories which are; theory of connectivism by George Siemens and Stephen Downes (2005) [6] and theory of constructivism by Jean Piaget (1975). Connectivism as a learning theory was developed by Siemens and Downes in (2005) [6]. The theory is also referred to as digital age learning theory as it explained how learning occurs in digital world that is constantly changing using the network connection and nodes concepts. Siemens (2005) [20] explain connectivism as the incorporation of principles discovered by self-organization and complexity, network, and chaos theories. From the connectivism view point knowledge does not reside in any individual but is distributed through connections networks and for a learner to learn, he must be able to connect and navigate through those network making learning to occur through connectiveness and connections within networks. Siemens (2005) [20] stated that learning takes place with shifting core element's environments that is unformulated by individual control, Siemens stressed that learning resides within database or an organization, not within individuals and it is based on connections of specials information sets and connections which permit individuals to know more. However, from the connectivism perspective, it is understood that learners learn when they use internet technologies (Like, social network, online discussion forums, email, web browsers etc). And the World Wide Web to access, download and share information with others. Relating this theory to this study implies that in the blended classroom approach, both teachers and students must be connected to the internet to make the model work. The instructor must be connected to the internet to be able to post developed lecture videos and other resources to students. The instructor can search for learning resources online and pre-recorded video lectures in internet database, the students, in the other hand need internet connectivity to be able to search on line resources, and also have the ability to access and download the learning materials posted to them by their teachers. Constructivism also known as learning theory by Jean Piaget (1975) is built on the work of Jean Piaget and Jerome Bruner. Constructivism is a learning theory found in psychology which explains how people might acquire knowledge and learn. It suggests that human beings construct knowledge and meaning from their experiences. Constructivism is a psychological theory of knowledge which argues that humans generate knowledge and meaning from their experience (Alamina, 2008). It suggested that through processes of assimilation and accommodation, individuals construct new knowledge from their experience. Research shows that we learn by doing (Petty, 2002 [17]; Alamina, 2008). That is by applying what we have learned, in order to answer questions for example. Learning is therefore a constructivist process. Constructivism has many features which include active learning, discovery learning, and knowledge building. Social constructivist scholars view learning as an active process where learners would discovery principles, concepts and facts for themselves (Kukla, 2000 [12] and Ackerman, 2004). Mayer (2004) [13] argues that not all teaching techniques based on constructivism are efficient or effective for all learners. Mayer proposes that learners should be "cognitively active'' during learning and that instructors use "guided practice". The underlying challenge of constructivism is the issue of changing the system of control over learning from instructor to the learner. The theory encourage working together as a team in order to achieve a common goal. Relating this theory to this work implies that humans generate knowledge and meaning from interactions between their experiences and ideas, therefore learners must be actively involved in the process of learning in order to constructs their own knowledge and share with others within and outside their learning environment.

Purpose of the study

The aim of this study is to determine the impact of blended learning on students' academic achievement and retention in Air force secondary school in Rivers State. Specifically, the study intends to

1. Determine the difference between the achievement mean score of students taught using station-rotation model and conventional method.
2. Find out the level of retention of students taught using station-rotation and conventional method.
3. To determine the relative differences that exist between the achievements mean scores of students taught social studies using station-rotation model of blended learning and those taught based on gender.

Research Questions

1. What difference exists between the achievement mean scores of students taught using station-rotation and those taught using conventional method?
2. What relative difference exists between the level of students' retention used in the study when taught using station-rotation and conventional method?
3. What difference exist between the achievement mean scores of students taught social studies using station-rotation model of blended learning and those taught based on gender?

Hypotheses

The following null hypotheses guided the study

1. There is no significant difference between the mean

achievement scores of students taught using station-rotation and conventional method.
2. There is no significant difference between the level of students' retention used in the study when taught with station-rotation and conventional method.
3. There is no significant difference between male and female students taught using station-rotation model of blended learning.

Methodology

The population of this study comprises all the Universal Basic Education (UBE) air force secondary school students in Rivers State. The total population of the students is one thousand two hundred (1200) (Office of the principal, 2017). While the sample for the study was one eighty students (80). The study adopted a quasi-experimental research design. Social studies achievement test (SAT) was used as instrument for data collection. Validity of the instrument was done by experts in the field of educational technology, and the reliability was established using cronbach's Alpha Analysis and the reliability coefficient of 0.76 was obtained. The data obtained were analyzed using mean, standard deviation and Analysis of variance (ANOVA) while the formulated hypotheses were tested at. 05 level of significance.

Findings

Research Question one

What difference exists between the achievement mean scores of students taught using station-rotation and those taught using conventional method?

Table 1: Analysis of achievement mean scores using blended strategy and conventional teaching method.

Teaching Strategy	No of Sample	Pretest	Posttest	Mean Gain	Mean Gain %
Station-Rotation	40	37.125	63.250	26.125	70.370
Conventional Method	40	35.125	52.125	17.00	48.399

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Analysis of achievement mean scores using blended learning strategies and conventional teaching method was shown in Table 4.2 above. It was shown that all the students performed better after the administration of treatment as indicated by the mean scores for the pretest and posttest. However, the mean gain and percentage mean for Station-rotation model [mean = 26.126, % mean = 70.370], Lab-rotation model [mean = 17.000, % mean = 48.399] and conventional methods [mean = 5.625, % mean = 23.560]. The findings of the study shows that students taught using Station-rotation model performed most followed by students taught using Lab-rotation model before those taught using conventional method.

Research Question 2

What relative difference exists between the level of students' retention used in the study when taught using station-rotation, laboratory-rotation and conventional method?

Table 2: Analysis of students' retention level when taught with Station-Rotation and Conventional Method.

Teaching Strategy	Sex	N	Posttest	Post Delayed Test	Mean Gain	Mean Gain %
Station-Rotation	Male	25	63.600	62.600	26.000	71.038
	Female	15	64.333	64.333	26.333	69.279
Conventional Method	Male	18	24.250	28.750	4.518	18.556
	Female	22	24.000	28.500	4.500	19.750

Table 4.4 shows the analysis of the level of retention of students taught Social Studies using Station-rotation model, Lab-rotation model and Conventional method. The findings of the study revealed that students taught using the Lab-rotation model had the highest retention level [3.250] followed by those taught with Station-rotation model [2.625] and those taught using the convention method having a mean gain of 2.000 after the post delayed test were administered.

Research Question 3

What difference exist between the achievement mean scores of students taught social studies using station-rotation model of blended learning and those taught based on gender?

Table 3: Analysis of students' achievement scores when taught with Station-Rotation, and Conventional Method considering gender

Teaching Strategy	No of Sample	Pretest	Posttest	Mean Gain	Mean Gain %
Station-Rotation	40	63.250	65.875	2.625	4.150
Conventional Method	40	29.500	31.500	2.000	6.780

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Hypothesis one

There is no significant difference between the mean achievement scores of students taught using station-rotation and conventional method.

Table 4: ANCOVA analysis showing the main effect (Blended learning and conventional strategy) and the pretest as covariate

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	25093.804[a]	3	8364.601	61.896	S
Intercept	14978.829	1	14978.829	110.840	S
Pretest	95.054	1	95.054	.703	ns
Treatment	15844.317	2	7922.158	58.622	S
Error	15676.196	116	135.140		
Total	317250.000	120			
Corrected Total	40770.000	119			

The hypotheses showing the main effect (Blended learning instructional strategy and conventional strategy using the pretest as covariates was tested at $p > 0.05$ level of significant. The calculated $F_{2,116}$ is 58.622 at a degree of freedom 2,116 and probability level of 0.05 against the $F_{2,116}$ critical value of 3.040. Since the calculated F value is greater than the table

value, the null hypotheses is rejected. There is significant difference between the achievements mean scores of student taught Social Studies using Station-rotation and Conventional method.

Table 5: Schffe's Post-Hoc analysis on treatment

Dependent Variable: Posttest						
(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
SRM	LRM	10.884*	2.615	.000	5.704	16.064
	CON	33.231*	3.086	.000	27.119	39.342
CON	SRM	-33.231*	3.086	.000	-39.342	-27.119
	LRM	-22.347*	2.941	.000	-28.171	-16.523

Based on estimated marginal means

*. The mean difference is significant at the. 05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

From the analysis of Schffe's post-Hoc test, using the magnitude of mean difference, the Station-rotation model is significantly the highest, which was followed by the Conventional instructional group which has a mean that is significantly the low.

Hypothesis two

There is no significant difference between the level of students' retention used in the study when taught with station-rotation, laboratory-rotation and conventional method.

Table 6: ANCOVA analysis of treatments on retention level.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	26150.243[a]	3	8716.748	46.077	.000
Intercept	16136.175	1	16136.175	85.297	.000
Posttest	38.577	1	38.577	.204	.652
Treatment	9152.313	2	4576.156	24.190	.000
Error	21944.548	116	189.177		
Total	376225.000	120			
Corrected Total	48094.792	119			

Table 2.2 shows the ANCOVA analysis of the treatments and retention level of students. It was revealed that at $p > 0.05$ level of significance, the $F_{2,120}$ calculated value is 24.190 as compared with the table value of 3.040. Therefore, the null hypothesis is rejected while the alternative hypothesis is retained. Based on that, there is significant difference between the level of students' retention of concepts when taught using Station-rotation model and conventional method. Further analysis using the Schffe's Post-Hoc test as shown below;

Table 7: Schffe's Post-Hoc analysis on treatment based on retention level Pairwise Comparisons

Dependent Variable: Posty						
(I) Treament	(J) Treament	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
SRM	LRM	10.200*	3.308	.003	3.648	16.752
	CON	33.538*	4.883	.000	23.867	43.208
CON	SRM	-33.538*	4.883	.000	-43.208	-23.867
	LRM	-23.338*	4.010	.000	-31.281	-15.395

Based on estimated marginal means

*. The mean difference is significant at the. 05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

From the analysis of Schffe's post-Hoc test, using the magnitude of mean difference, the Station-rotation group that is significantly the highest, which was followed by the Conventional instructional group which has a mean that is significantly the low.

Hypothesis three

There is no significant difference between the mean achievement scores of students taught using station-rotation and conventional method considering gender.

Table 8: ANCOVA analysis showing the main effect (Blended learning and conventional strategy) and the pretest as covariate considering gender

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	26083.602[a]	3	6384.601	81.896	S
Intercept	12978.629	1	14978.829	120.840	S
Pretest	95.054	1	95.054	.703	ns
Treatment	15844.317	2	6922.158	52.822	S
Error	15676.196	116	135.140		
Total	417250.000	120			
Corrected Total	40870.000	128			

The hypotheses showing the main effect (Blended learning instructional strategy and conventional strategy using the pretest as covariates was tested at $p > 0.05$ level of significant. The calculated $F_{2,116}$ is 52.822 at a degree of freedom 2,116 and probability level of 0.05 against the $F_{2,116}$ critical value of 2.020. Since the calculated F value is greater than the table value, the null hypotheses is rejected. There is significant difference between the achievements mean scores of male and female student taught Social Studies using Station-rotation and Conventional method.

Discussion of Findings

Research Question 1

What difference exist between the achievement mean scores of students taught using Station-rotation and those taught using conventional method?

The result suggests that significant difference exist between the achievements mean scores of students taught Social Studies using Station-rotation and Conventional method. The F-calculated is equal to 58.622 while the significant value is equal to 3.040. Hence, the significant value is ($p = 3.040 > 0.05$), since the calculated F-value is greater than the table value, the null hypothesis is rejected. Based on that, there is significant difference between the achievements mean scores of students taught using Station-rotation and Conventional method. The findings of the study shows that students taught using Station-rotation model performed most followed by those taught using conventional method.

This study is expected because the station-rotation model give students the opportunities to rotate around or between a given stations. The station-rotation allow students to visit various station during the allocated time for the online class. This result is expected because the station-rotation model helps the students to navigate, integrate knowledge and also foster collaborative learning of the subject matter which can as well enhance a better learning outcomes. The station-rotation models can also be used as a way to offer curriculum content that is not available. The finding agrees with that of Katie and Shank (2010) [11] who asserted that lab-rotation model enhanced students' academic performance significantly better than conventional approach. The finding of Ghani *et al.* (2012) [8] revealed that blended learning students scored significantly than students of the conventional class. The finding agrees with that of Diepreye (2013) [4] who asserted that students are better motivated to learn with blended learning than with conventional method. The finding of Aladejana (2008) [1] also revealed that blended learning makes a significant difference in the performance of learners as compared to the traditional chalk and talk approach.

Research Question 2

What relative difference exist between the levels of students' retention of Social Studies concepts when taught using Station-rotation, Lab-rotation and conventional method?

The result shows that there is significant difference between the level of students' retention when taught using Station-rotation model, Lab-rotation model and conventional method in public secondary schools in Obio-Akpor Local Government Area. The F-value of 24.190 was significant at 3.040 probability level because it is greater than 0.05 ($p>0.05$), this implies that there is significant difference between the level of students' retention of Social Studies concepts when taught using Station-rotation model, Lab-rotation model and conventional method. Therefore, the null hypothesis is rejected while the alternative hypothesis is retained at 0.05 alpha level. Based on that, there is significant difference between the level of students' retention when taught using Station-rotation model and conventional method. The findings of the study revealed that students taught using the station-rotation model had the highest retention level followed by those taught using the conventional method.

This result is expected because blended learning enhances the level of students' retention. The finding of Nwafor (2014) [15] revealed that blended approaches was effective in enhancing meaningful learning as well as improving their performance as the conventional approach. The study of Tucker (2015) [23] also revealed that the experimental group performed better than the control group which indicates that the experimental group was more motivated to learn than the control group. The finding agrees with that of Ogundele (2014) [16] study which revealed that there is no difference in the performance of Social Studies who were taught using conventional method which is in support of this study. The result also revealed that the retention level was higher for Station-rotation group than the conventional group. Also, result shows that experimental subjects significantly improved on their post-test scores after treatment. The result of Dike (2004) [5] revealed that it build background of the lesson on the mind of the student which can enhance students' interest and students level of retention in Social Studies.

Research Question 3

What difference exist between the achievement mean scores of students taught social studies using station-rotation model of blended learning and those taught based on gender?

The result shows that there is significant difference between the level of students' academic achievement when taught using Station-rotation model and conventional method in public secondary schools in Obio-Akpor Local Government

Area. The F-value of 22.180 was significant at 2.030 probability level because it is greater than 0.05 (p>0.05), this implies that there is significant difference between the level of students' academic achievement of Social Studies concepts when taught using Station-rotation model and conventional method considering gender. Therefore, the null hypothesis is rejected while the alternative hypothesis is retained at 0.05 alpha level. Based on that, there is significant difference between the level of students' academic achievement when taught using Station-rotation model and conventional method. The findings of Abidoye (2015) was also in agreement whose result revealed that there was a significant difference between the academic achievement of male and female students in a social media class.

Conclusion

Blended learning have greatly enhance teaching and learning secondary school students. The researchers observed that secondary school students have learning differences on the various models of blended learning as used by their teachers in teaching, also the retention levels also varies among secondary school students.

Recommendations

Based on the results of this study, the following recommendations are put forward.

1. That blended learning have the ability to be the preferable approach for secondary schools' interaction and communication.
2. That station-rotational models of blended learning should be used interchangeably as a supplement to the conventional teaching method.
3. Gender equality should be encourage among learners in both station-rotational and the conventional classroom.

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