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Blended Learning and Pre-service Teachers' Achievement on "Classroom Testing" Course during COVID-19 Pandemic

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Abstract

The COVID-19 pandemic ravaging most cities of the world has forced many countries to go into partial or total lockdown thus suspending face-to-face learning. The difficulties created by the lockdown that arose to mitigate the spread of the COVID-19 pandemic forced educational institutions to adopt blended learning which became crucial to fostering undisrupted teaching and learning. This study, therefore, investigated the effect of blended learning on a compulsory course, Classroom Testing, in the Nigerian Teacher Education Curriculum. The post-test randomised control group quasi-experimental design was adopted using two groups (experimental, n = 232 and control, n = 214). The experimental group was taught using blended learning while the control group was taught using the lecture method. The classroom Testing Achievement Test was used to collect data while descriptive and inferential statistics were used to analyse the data collected. Findings from this investigation revealed that pre-service teachers who taught classroom testing using blended learning achieved better than their counterparts who taught the same content using the conventional lecture method. This study concludes that blended learning can guarantee undisrupted learning and also increase pre-service teachers' achievement in the course classroom testing.

Keywords: Blended Learning, Classroom Testing, Covid-19, Lecture Method, Undisrupted Learning.

1. Introduction

Growing concern around the world is the effect that the COVID-19 pandemic has on many nations especially in the health sector. The suspension of face-to-face learning thus disrupting teaching and learning at all levels of education (primary, secondary, tertiary) is a confirmation of the effect of the pandemic on education. Coronavirus known as "COVID-19" was declared a pandemic by the World Health Organization (WHO) and its index case was confirmed in Nigeria on 27th February 2020 (Nigeria Education in Emergencies Working Group, 2020). This confirmation led the government of the nation to declare lockdown and embark on school closure as a step in preventing the further spread of the virus. This singular act led to the closing of schools leaving thousands of children and youths out of school (Federal Ministry of Education, 2020). The closing of schools brought about the need to begin to look for other ways to avoid disruption in learning.

An investigation into learning disruption shows that it militates against students and pre-service teachers' achievement in schools. This assertion was confirmed by Nyamupanpedengu (2017) who found out that disruption to teaching and learning in the form of protest against

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unaffordable fees hikes and lack of transformation affected student's performance in South Africa. The study carried out by Huntington-Klein and Gill, (2020) in the United States of America also identified high course load and unavailability of necessary hardware and software requirements for synchronous and asynchronous online instruction as some of the factors impeding the performance of students in their courses. This suggests that students' performance is being inhibited by disruptions to teaching and learning.

In Nigeria, the conventional instructional method also known as the traditional lecture method is more popularly used for instruction (Akinbobola, 2006; Ogunleye, Babajide, 2011; Olaniyan et al., 2015). This method requires that the teacher stands in front of the students to deliver his lecture while the students are required to listen and take down notes. This method is referred to as a teacher-centered method because the teacher is active thus controlling the class while the students remain passive almost throughout the teaching-learning process (Akpan, Aminikpo, 2017). This method has been found not to take into consideration the different characteristics of the students because students differ in terms of intelligent ideas, perception, and learning rate (Umoh, Akpan, 2014). Again, the lecture method becomes a disadvantage especially during educational disruption such as it is being currently experienced with the COVID-19 pandemic. Students and pre-service teachers could not attend schools hence the possibility of it affecting their achievement in the identified course. The findings of Nyamupanpedengu (2017) and Huntington-Klein and Gill (2020) already confirmed that disruptions in learning affected students' performance.

Blended learning is a strategy that has been discovered to have the capacity of alleviating the challenges caused by disruption to learning in schools. It is a strategy that relies on students learning some content online combined with the face-to-face lecture method. Scholars investigated the effects of blended learning on student achievement in secondary schools and found a significant effect of its use on student achievement (Abdulkareem, 2016; Alsalhu et al., 2019; Khader, 2016). Also, other scholars conducted studies on the effect of blended learning on student's achievements in tertiary institution courses and modules and found out that the use of blended learning has a positive effect on student's achievement (Gambari et al., 2017; Kiviniemi, 2014; Onyenma, Abraham; 2020; Onyenma, Olee, 2020).

Graham (2013) describes blended learning as an approach that combines computer-mediated instruction with face-to-face lecture methods. This requires that the teacher brings in some online mediated approach with lecture method to achieve teaching-learning objectives. This assertion was supported by Norm (2012) who opines that blended learning is a formal education program in which students learn at least in part through the teaching of content and instruction using digital and online media with students having control over some elements such as time, path and place.

In the study carried out by Kiviniemi (2014) on the effect of blended learning approach on students' outcomes in a graduate-level public health course, he adopted a quasi-experimental, non-equivalent control group design which involved 66 graduate students (Experimental group, n = 38, Control group, n = 28). The experimental group was taught the content of the public health course using blended learning (online and face to face) while the control group was taught the same content using the traditional method. The data used in this study was obtained using the examination questions while inferential statistics (Analysis of Covariance) was used to analyse the data collected. Kiviniemi (2014) found out that student's taught the content using blended learning performed better than their counterparts taught using the traditional method.

In the research completed in 2016 by Abdulkareem, he investigated the effects of blended learning on senior secondary school student's performance and retention in the English Language in Kaduna State, Nigeria. The researcher adopted the pre-test post-test control group quasi-experimental design which involved 172 students (Experimental group, n = 110, Control group, n = 62). The experimental group was taught English Language using blended learning (blended learning package) while the control group was taught the same concept using the traditional lecture method. English Language Achievement Test (ELAT) was used to obtain data for this study and the data obtained was analysed using descriptive and inferential statistics. Abdulkareem (2016) discovered that there was a significant difference between the mean achievement score of students taught English Language using blended learning package and those taught the same content using traditional teaching method in favour of those taught using blended learning.

Khader (2016) studied the effectiveness of blended learning (online and face to face) in improving third-grade student's achievement in science. His study adopted a quasi-experimental

design that involved 108 students (Experimental group $n = 54$, Control group $n = 54$) randomly selected from two schools in Bani Kenana. The experimental group was taught science using blended learning while the control group was taught the same content using the traditional lecture method. A researcher-prepared achievement test was used to obtain data for this study. The data obtained were analysed using the two-way Analysis of Covariance. Khader's (2016) investigation revealed a statistically significant difference in the achievement of students taught using blended learning and those taught using traditional lecture methods in favour of those students taught using online and face-to-face methods.

The investigations carried out in 2017 by Akpan and Aminikpo on the effect of blended learning on student's performance in social studies in River State, Nigeria revealed that blended learning has a significant effect on student's performance when compared to those students taught using the lecture method. The study adopted the quasi-experimental research design and it involved 80 students (Experimental group $n = 40$, Control group $n = 40$). The researchers taught the experimental group social studies using blended learning (Station Rotation) while the control group was taught using the conventional teaching method. Social Studies Achievement Test (SAT) was used to gather data for this study and the data obtained was analysed using inferential statistics (Analysis of Variance).

Gambari et al. (2017) in their study investigated the effectiveness of blended learning (internet and face to face) and e-learning modes of instruction on the performance of undergraduate students from three universities in Kwara State in the educational technology concept. Their study adopted the pre-test post-test control group quasi-experimental design which involved 85 participants (Experimental group 1, $n = 30$, Experimental group 2, $n = 30$, Control group, $n = 25$). Experimental group 1 was exposed to blended learning, experimental group 2 was exposed to e-learning while the control group was taught using the traditional method. Educational materials and methods performance test was used to obtain data for the study and the data obtained was analysed using inferential statistics (Analysis of Covariance). Gambari et al (2017) study revealed that there was a significant difference in the performance of students taught using blended learning, e-learning and traditional method in favour of those students taught using blended learning followed by those taught using e-learning.

Suleiman et al. (2017) investigated the effects of computer-based blended learning strategy on secondary school chemistry student's retention in individualised and collaborative learning in Minna, Niger State. The study adopted the pre-test post-test and delayed post-test quasi-experimental design which involved 120 students (Experimental group 1, $n = 40$, Experimental group 2, $n = 40$, Control group, $n = 40$). The researchers taught the experimental group 1 the concept of a mole using computer-based blended learning individualize settings, while experimental group 2 was taught the same content using computer-based blended learning collaborative settings. The control group was only limited to the traditional lecture method. Suleiman et al. (2017) used Chemistry Achievement Test to collect data for this study and analysis of covariance was used to test the hypothesis. They found out a significant difference in the retention scores of students taught moles concept using computer-based blended learning individualise settings, computer-based blended learning collaborative settings and the control group in favour of those students taught using computer-based blended learning individualise settings, computer-based blended learning collaborative settings.

Also in 2018, Utami investigated the effect of the blended learning model on senior high school student's achievement on an information and communication technology course. The study adopted the pre-test post-test randomized control group experimental design involving 62 (Experimental group, $n = 31$, Control group, $n = 31$) students offering an information and communication technology course. The experimental group was taught using blended learning (online and face to face) while the control group was taught using the traditional teaching model. An objective test was used to collect data for the study and a t-test was used to analyse the data obtained. Finding from his study revealed that the experimental group taught using blended learning had higher levels of learning achievement than their counterparts taught using the traditional method.

Alsalmi et al. (2019) conducted a study on the effect of blended learning on the achievement of ninth-grade students in science and their attitudes towards its use. The study adopted the quasi-experimental approach involving 112 students (Experimental group $n = 61$, Control group $n = 51$).

The experimental group was taught science using blended learning while the control group was taught using the traditional method. An achievement test was used to collect data for this study and a t-test was used to test the hypothesis. Finding from this study revealed that blended learning has a positive impact on student's performance in science when used.

In a more recent study by Onyenma and Abraham (2020), the effect of blended learning (flipped classroom) on the academic performance of students in Physics was investigated. The study adopted the non-equivalent control group quasi-experimental design and it involved 81 students selected from two federal colleges in southeast Nigeria. The experimental group was taught electromagnetic theory using blended learning while the control group was taught the same content using the face-to-face lecture method. Researcher-made Electromagnetic Theory Achievement Test (RMETAT) was used to obtain data and analysis of covariance was used to analyse the data obtained. Finding from Onyenma and Abraham's (2020) study showed that blended learning has a significant effect on the performance of students in physics.

Again, Onyenma and Olele (2020) investigated the effect of blended learning (Flipped Classroom) on student's retention of Physics. The study adopted the non-equivalent control group quasi-experimental design which involved 81 Federal College of Education students in Southeast Nigeria. The experimental group was taught electromagnetic theory using blended learning while the control group was taught the same content using face to face method. Researcher-made Electromagnetic Theory Achievement Test (RMETAT) was used to obtain data for this study. The data obtained were analysed using descriptive and inferential statistics. Finding from this study showed that blended learning has a significant effect on student's retention of physics.

A review of the extensive literature on blended learning revealed that there are different blends of blended learning. Friesen (2014) identified five different models of blended learning to include the station rotation model, laboratory rotation model, flex model, self-blend model, and the flipped classroom model. Most of the previous investigations of the effect of blended learning on students achievement were limited to the use of station rotation, laboratory rotation, flex, and self blend model with only a few of these studies using the flipped classroom model (Akpan, Aminikpo, 2017; Abdulkareem, 2016; Gambari et al, 2017; Kiviniemi, 2014; Onyenma, Abraham, 2020; Onyenma, Olele, 2020). This assertion was again stressed by Tandoh et al. (2014) who discovered that the combination of web-based techniques and instructional tools with face-to-face instruction is the most common approach to blended education. Since Jonathan (2014) already argued that blended learning has various event-based activities mixed, there might be the need to try other blends of the concept.

In this present study, the flipped classroom model of blended learning with self-paced learning was adopted. Onyenma and Olele (2020) opined that self-pace learning refers to the e-learning activities learners engage in and which can be completed at learner's leisure thus encouraging students to learn at their own pace. A good example of this is the WhatsApp and Telegram platforms which allow students to learn remotely at their pace, thus, giving the learner power over their learning.

The justification for using WhatsApp and Telegram is because there is little or no evidence in the literature that its blend has being used in blended education. Not only is there relatively scare literature of its usage, WhatsApp and Telegram was the most available and accessible platform readily available to avoid disruption in learning at the instance of the abrupt emergence of the COVID-19 pandemic. This is because, despite the hardship experience and the relatively low scientific development in the country of this study, students can still afford and also have access to its use. The use of WhatsApp and telegram might seem ancient to the world over, but to the area of this study, the proliferation of its use is just in vogue. Students, especially pre-service teachers taking the course classroom testing during the 2019/2020 harmattan semester in the selected college of education, have access to its use on their mobile phones hence its adoption in other to avoid disruption to learning.

Classroom testing is a compulsory course taking by all 400 level pre-service teachers in the Nigerian teacher education curriculum. The course is a 2 unit course for all science-related disciplines in the college of education. The content of classroom testing includes the learning of concepts and the application of these concepts through mathematical calculations. The adoption of the course in this investigation was also considered novel because literature has little or no evidence of the effectiveness of blended learning on pre-service teacher's achievement. In light of

this, the objective of this study is to investigate the effect of blended learning on pre-service teacher's achievement in classroom testing. The only null hypothesis "there is no significant difference in the achievement of pre-service teachers taught classroom testing using blended learning and those taught using lecture method" will be tested for acceptance or otherwise at a significant level of 0.05 while the corresponding research question- "Is there any significant effect of blended learning on pre-service teachers' achievement in classroom testing" will be answered. The investigation is arranged as follows; methods, results, and discussion.

2. Methods

Research Design

This investigation adopted the quasi-experimental post-test control group design. This involves one level of experimental (Blended Learning) and control groups. The independent variable in this study is the teaching method (Blended Learning and Lecture Method). The dependent variable is the post-test achievement of students in the two groups.

Participants

The population for this study comprised all the undergraduates in the College of Education in Ondo State, Nigeria. The target population was all the 400 level students studying science-related programmes and offering the course classroom testing (EDU 403). The total population of students offering the course classroom testing during the 2019/2020 Harmattan semester was 854 covering six departments (Agricultural Science, Biology, Chemistry, Home Economics, Mathematics, Physics). Out of this number, four intact classes were randomly selected for this study. Two of these classes were used as the experimental group while the other two classes were used as the control group. A total number of 446 students took part in this study. [Table 1](#) shows the distribution of participants used in this study.

Table 1. Sample Distribution of Participants

Gender	Experimental Group		Control Group	
	Frequency	Percent (%)	Frequency	Percent (%)
Male	105	45	102	48
Female	127	55	112	52
Total	232	100	214	100

Research Instrument

The researchers employed two instruments to collect data for this study

1. Course Content/ Material: The researchers adopted the course material for the course as documented in the Nigerian Teacher Education Curriculum. The course material used for the experimental group was given to the students using blended learning while that of the control group was given to the students using face to face lecture method only. The instrument covered all the course content on classroom testing (SEC 403). A breakdown of the course content and the modes of instruction is shown in [Table 2](#).

Table 2. Break Down of the Course Content and Modes of Instruction for Experimental and Control Group

S/N	Course Content	Mode of Instruction	
1	(a) The need for evaluation in education	W/T and LM	LM
	(b) Basis attitudes to a good test	W/T and LM	LM
2	Types of Test	W/T	LM
3	Planning for the assessment of learning	W/T	LM
4	Test Construction	W/T and LM	LM
5	Test Administration	W/T	LM
6	Test Scoring and Reporting	W/T and LM	LM
7	Test Scores Interpretation	W/T and LM	LM

8	Continuous Assessment	W/T	LM
9	Examiners' Report	W/T	LM

Notes: W/T = WhatsApp and Telegram Platform; LM = Lecture Method.

2. Test Instrument: The researcher designed an instrument titled Classroom Testing Achievement Test (CTAT) was used to collect data for this study. CTAT in its initial form comprised of 50 multiple choices and was developed from the course content of classroom testing. Each item on the instrument has five options (A-E) with one correct answer and four distractors. CTAT has two sections. Section A contains information on the bio-data of participants (Department, Level) while section B consists of 50 multiple choices objective tests on the content classroom testing. The instrument was given to 3 experts in Science Education and 2 experts from tests and Measurement, to check for its validity. Based on the expert's recommendation, the researchers added, removed, and modified some items on the instrument. The final draft of CTAT consisted of 45 multiple choice objective items on classroom testing. The reliability of the test was determined using Kuder Richardson 21 and a coefficient value of 0.86 was obtained which is considered reliable enough to be used for this study.

Procedure

This study began shortly after the first COVID-19 pandemic lockdown was lifted in Nigeria. It was the beginning of the 2019/2020 Harmattan semester. Classroom Testing (SEC 403) is one of the compulsory courses talking by 400 level science-related disciplines. The researchers taught the experimental group classroom testing using blended learning while the control group was taught the same content using the lecture method at different times. Concrete efforts were made by the researchers to avoid interaction between the two groups especially as it involves the teaching of the course.

Blended learning in the context of this study involved students studying part of the content online and the remaining part of the content using the lecture method. Lecture notes and teachings were uploaded on WhatsApp and Telegram platforms with all the participants as members of the group. Wednesdays of every week during the investigation period were agreed by the lecturers and the students to be online for the questions and answer section. Only students who made 80 % attendance on the platform (WhatsApp and Telegram) and 80 % attendance during lecture method were used in this study. The control group was taught the same content using the lecture method only. Online teaching for the experimental group took place twice a week for an hour with its face-to-face lecture method component holding once in two weeks. The control group was taught twice a week with a 2 hours duration for the period of the investigation. CTAT was administered to the two groups after completing the teaching of the course. This study lasted for 9 weeks and it was carried out under 3 stages.

Stage 1: (1 week). The researchers prepared the lesson notes and content for classroom testing. The researchers also used this period to create the group for the course on WhatsApp and Telegram platforms. Students also registered on the online platform in preparation for teaching.

Stage 2: (7 weeks). The teaching of the two groups took place. The experimental group was taught classroom testing using blended learning while the control group was taught the same content using the lecture method by the researchers at different times.

Stage 3: (1 week) Post-test administration of CTAT was carried out on the two groups. The test was duly graded and recorded.

Data Analysis

The data collected from the test was analysed using descriptive (mean, standard deviation) and inferential (t-test) statistics. The only research question was answered using mean and standard deviation while the null hypothesis was tested for acceptance or otherwise using t-test analysis.

3. Results

Research Question: What is the effect of blended learning on students' achievement in classroom testing?

Table 3. Effect of Blended Learning on Pre-service Teachers' Achievement in Classroom Testing

Group	N	Mean	Standard Deviation	Mean Difference
Experimental	232	33.22	4.91	4.75
Control	214	28.47	4.70	

Table 3 shows the achievement of pre-service teachers' that participated in the classroom testing achievement test (CTAT) when taught using blended learning and lecture method. The mean score of pre-service teachers' taught classroom testing using blended learning was 33.22 while that of those pre-service teachers' taught using lecture method was 28.47. Table 3 reveals that the mean score of pre-service teachers' taught classroom testing using blended learning is 4.75 greater than those pre-service teachers' taught classroom testing using the lecture method.

Research Hypothesis: There is no significant difference in the achievement of pre-service teachers' taught classroom testing using blended learning and those pre-service teachers' taught using lecture method.

Table 4. t-test Analysis of the Effect of Blended Learning on Pre-service Teachers' Achievement

Group	N	Mean	Standard Deviation	df	t	ρ
Experimental	232	33.22	4.91	444	10.42	0.00
Control	214	28.47	4.70			

Table 4 reveals the independent sample t-test of the achievement scores of pre-service teachers' taught classroom testing using blended learning and lecture method. Furthermore, Table 4 shows that the t-test value of 10.42 was obtained at a significant level of 0.00. Since the calculated value of 0.00 is less than the significant level of 0.05, the null hypothesis is hereby not accepted. This implies that there is a significant difference in the achievement of pre-service teachers' taught classroom testing using blended learning and those pre-service teachers' taught classroom testing using lecture method in favour of those taught using blended learning.

4. Discussion

The effectiveness of blended learning has been investigated in previous studies especially as it concerns the achievement of students in a tertiary education course (Gambari et al., 2017; Kiviniemi, 2014; Onyenma, Abraham, 2020; Onyenma, Olele, 2020). This present study built on previous research as it investigated the effect of blended learning on a tertiary education course, classroom testing. The study investigated the effect of blended learning on pre-service teachers' achievement in classroom testing. The finding from the study revealed that pre-service teachers' taught classroom testing using blended learning had a greater mean score than the pre-service teachers' taught classroom testing using the face-to-face lecture method. In other to ascertain if the effect of blended learning was significant in terms of the difference recorded in the achievement of pre-service teachers from the two groups, the researchers hypothesized that there is no significant difference in the achievement of pre-service teachers' taught classroom testing using blended learning and those pre-service teachers' taught using lecture method. This hypothesis was not accepted because the intervention (blended learning) significantly improved pre-service teachers' achievement in classroom testing. This finding support recent findings that found a significant effect of blended learning on student's achievement and performance (Alsalthi et al., 2019; Onyenma, Abraham, 2020; Onyenma, Olele, 2020). This finding also opposes the investigations of Adas and Abu (2011); and Akpan and Aminikpo (2017) who did not find a significant effect of blended learning on student achievement and performance.

5. Limitations

This study has limitations and it should be acknowledged when considering the findings and their implications. The study design, quasi-experimental, was not truly experimental because intact

classes of pre-service teachers were used for the investigation hence, we cannot be confirmed if the two groups were equivalent but participants in the two groups already passed the prerequisite course for classroom testing. It is of great essence to acknowledge that other factors like the students' characteristics might account for a small portion of the differences recorded.

6. Conclusion

This investigation evaluated the effect of blended learning on the achievements of pre-service teachers on the course, classroom testing. The study combined the use of WhatsApp and Telegram with face-to-face teaching as the type of blend for blended learning. This study is considered novel because it provided empirical bases of this type of blended learning on the achievement of pre-service teachers in the course, classroom testing. The results of this study can be adopted by classroom testing lecturers in teacher training institutions to improve the achievement of students in the course. The data used in this study was limited to only four science-related disciplines out of six disciplines taking the course classroom testing. The use of blended learning appears to make pre-service teachers achieve better in classroom testing hence it is recommended for use. Further investigation of the effectiveness of blended learning can be carried out on larger participants. Again, the effectiveness of blended learning can also be tested on other courses taking by pre-service teachers in their different teacher training institutions.

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8. Conflict of Interest Statement

No conflict of interest was declared by the researchers.

References

- Abdulkareem, 2016 – Abdulkareem, S.T. (2016). Effect of blended learning on performance and retention of senior secondary school student's in English Language in Kaduna State, Nigeria. [Unpublished doctoral dissertation]. Ahmadu Bello University Zaria Nigeria.
- Adas, Abu, 2011 – Adas, D., Abu, S.W. (2011). Students' perceptions towards blended learning environment using the OCC. *An-Najah University Journal for Research Humanities*. 25(6): 1681-1710.
- Akinbobola, 2006 – Akinbobola, A.O. (2006). Effects of teaching methods and study habits on students' achievement in senior secondary schools' physics, using a pictorial organizer. [Unpublished doctoral thesis]. The University of Uyo, Uyo, Nigeria.
- Akpan, Aminikpo, 2017 – Akpan, K.P., Aminikpo, N.R. (2017). Blended learning approach on students' academic achievement and retention: A case study of air force secondary school river state, Nigeria. *International Journal of Multidisciplinary Research and Development*. 4(12): 15-21.
- Alsahhi et al., 2019 – Alsahhi, N.R., Eltahir, M.D., Al-Qatawneh, S.S. (2019). The effect of blended learning on the achievement of ninth grade students in science and their attitudes towards its use. *Heligon*. 5: 1-11.
- Federal Ministry of Education, 2020 – Federal Ministry of Education. (2020). Management of coronavirus pandemic, FME/PSE/HE/1041/C.I/Vol.1/137.
- Friesen, 2014 – Friesen, N. (2014). Defining blended learning. [Electronic resource]. URL: http://www.learningspace.org/papers/Defining_Blended_Learning_NF.pdf (date of access: 23.01.2020).
- Gambari et al., 2017 – Gambari, A.I., Shittu, A.T., Ogunlade, O.O., Osunlade, O.R. (2017). Effectiveness of blended learning and e-learning modes of instruction on the performance of undergraduates in Kwara State, Nigeria. *Malaysian Online Journal of Educational Sciences*. 5(1): 25-36.
- Graham, 2013 – Graham, C.R. (2013). Blended learning systems: Definition, current trends and Future directions. In C. J. Bonk & C.R. Graham (Eds.). *The Handbook of Blended Learning Global Perspectives, Local Designs*, (pp 2543-2556), Pfeiffer, San Francisco.
- Huntington-Klein, Gill, 2020 – Huntington-Klein, N., Gill, A. (2020). Semester course load and student performance. *Research in Higher Education*. 62: 623-650.

Jonathan, 2014 – *Jonathan, O.C.* (2014). Challenges facing effective utilization of blended learning model in teacher education programmes in Nigeria. A paper presented at 10th Annual National Conference of Qualitative Education in Nigeria (ASSEQEN) with the Theme Reorienting and Alternative Education to Build a Better Future for All at the Benue State University Markurdi. [Electronic resource]. URL: http://www.unn.edu.ng/publications/files/12302_Challenges_facing_Effective_Utilization_of_Blended_Learning_Model_in_Teacher_Education_Programmes_in_Nigeria.pdf (date of access: 23.01.2020).

Khader, 2016 – *Khader, N.S.* (2016). The effectiveness of blended learning in improving students' achievement in third grade science in Bani Kenana. *Journal of Education and Practice*. 7(35): 109-116.

Kiviniemi, 2014 – *Kiviniemi, M.T.* (2014). Effects of a blended learning approach on student outcomes in a graduate level public health course. *BMC Medical Education*. 14(47): 1-7.

Nigeria Education in Emergencies Working Group, 2020 – Nigeria Education in Emergencies Working Group. (2020). Nigeria Education Sector COVID-19 Response Strategy in North East, pp. 1-18. [Electronic resource]. URL: <https://planipolis.iiep.unesco.org/en/2020/nigeria-education-sector-covid19-response-strategy-northeast-6998>

Norm, 2012 – *Norm, F.N.* (2012). Defining blended learning. [Electronic resource]. URL: <http://www.learningspace.org/papers/defining-blended> (date of access: 23.01.2020).

Nyamupangedengu, 2017 – *Nyamupangedengu, E.* (2017). Investigating factors that impact the success of students in a higher education classroom: A case study. *Journal of Education (University of KwaZulu-Natal)*. 68: 113-130.

Ogunleye, Babajide, 2011 – *Ogunleye, B.O., Babajide, V.F.T.* (2011). Generative instructional strategy enhances senior secondary school students' achievement in physics. *European Journal of Educational Studies*. 3(3): 443-463.

Olaniyan et al., 2015 – *Olaniyan, A.O., Omosewo, E.O., Nwankwo, L.J.* (2015). Effect of polya problem solving model on senior secondary school student performance in current electricity. *European Journal of Science and Mathematics Education*. 3(1): 97-104.

Onyenma, Abraham, 2020 – *Onyenma, C., Abraham, L.K.* (2020). Effect of blended learning on students' academic performance in physics in federal colleges of education in South East, Nigeria. *British Journal of Education*. 8(1): 66-77.

Onyenma, Olele, 2020 – *Onyenma, C., Olele, C.N.* (2020). Effect of blended learning on students' retention of physics in federal colleges of education in South East, Nigeria. *International Journal of Education, Learning and Development*. 8(1): 66-76.

Suleiman et al., 2017 – *Suleiman, M.S., Salaudeen, B.M., Falode, O.C.* (2017). Effects of computer-based blended learning strategy on secondary school chemistry students' retention in individualised and collaborative learning settings in Minna, Niger State, Nigeria. *Bulgarian Journal of Science and Education Policy*. 11(2): 267-278.

Tandoh et al., 2014 – *Tandoh, K., Flis, N., Blankson, J.* (2014). Blended learning: History, implementation, benefits, and challenges in higher education. [Electronic resource]. URL: www.igi-global.com/chapter/blended-learning/92962 (23.01.2020).

Umoh, Akpan, 2014 – *Umoh, J.B., Akpan, E.T.* (2014). Challenges of blended e-learning tools in mathematics: Students' perspectives. *University of Uyo Journal of Education and Learning*. 3(4): 60-70.

Utami, 2017 – *Utami, I.S.* (2017). The effect of blended learning model on senior high school students' achievement. SHS Web of Conferences. 42: e00027. DOI: <https://doi.org/10.1051/shsconf/20184200027>