Blended Learning and Improved Biology Teaching in the Nigerian Secondary Schools

Francisca Aladejana, PhD.

Abstract— **The study is designed to assess the ICT literacy skills of student teachers and their teacher educators and determine if there is any significant difference in the performance of learners when exposed to the traditional approach and those exposed to blended learning. The research designs are both descriptive survey and experimental study. A questionnaire was administered on 312 student teachers and 75 teacher educators. The pre-test post-test control group design was carried out. The experimental group was exposed to a blend of three approaches while control group had the traditional method. Results showed that all students and teachers can boot, operate and type but specialized skills were found to be very low. The t test analysis of the posttest revealed that there is a significant difference in the performance of learners. The use of blended learning can make a significant difference in the performance of learners compared to the traditional chalk and talk approach.**

Index Terms— Blended learning**,** Constructivism, ICT Preferred styles of learning,

I. INTRODUCTION

Nigeria is still a developing country with low technological development. The youths in the country are growing up in a complicated and fast growing society and are caught in a web of change as they are bombarded with new information and products of technology. It is the responsibility of the educational system to prepare these youths not to be passive recipients and consumers but active and empowered participants.

Science education is fundamental to the technological development of any nation. The future therefore depends largely on the performance of students in science but this has consistently been poor in the West African Examinations, the final examinations for senior secondary school students. According to [1], the average performance at credit level in the West African School Certificate Examinations (WASCE) between 2001 and 2005

in Mathematics, Electronics. Biology and Building Construction was 30% credit pass.

It is imperative that no effort must be spared in ensuring the improved performance of the students. The quality of teaching is very important in effective learning and good academic performance of learners. According to [2], [3] and [4], teachers are the main determinant of quality in education especially in developing countries like Nigeria. Also, according to [5], no education system may rise above the quality of its teachers.

Generally, teaching still retains the old conservative approach of teachers acting as repertoire of knowledge and students the dormant recipient. This traditional teacher-centered learning approach often favours passive reception of knowledge. On the other hand interactive technology encourages active learning; hence teaching should no longer center around transfer of content from teacher to student.

Technology has been identified as playing a critical role in curriculum implementation as it has been found that its proper use can enhance teaching and learning, [6]; [7]; and [8]. According to [9], there have been very little efforts in the integration of ICT into the Nigerian secondary school classroom. There is therefore the need to energize action to bring technology into the classroom for improved learning and performance.

Various barriers to ICT use in Africa schools have been identified to include: poor infrastructure: epileptic power supply: lack of electricity: lack of trained personnel; poverty; inadequate funding and limited or no internet access [9] and [10]. Advocating a total shift to technology-assisted classroom might be unrealistic in most secondary schools.

Blended learning can however be a better alternative. Blended learning has been defined as the combination of multiple approaches to learning [11]; [12] and [13]. This can be achieved by having technology-based materials and face-to-face sessions used together to deliver instruction. Such method of providing many options for learners to acquire knowledge increased what they learned, [14]. The use of a variety of different approaches such as large group didactic, small group discussion, individual study, and computer-assisted learning are blended together in order to accommodate a variety of learning styles.

Various advantages have been identified for the use of blended learning. It can serve to optimize resources in that one can have a big impact with very low investment, combine the strengths of many methods, low cost as a teacher can build his/her own and produce optimal educational benefit, [15]. Teachers can thus be encouraged to experiment with blended learning in their classrooms.

The specific objectives of the study are therefore to:

1. assess the ICT literacy skills of student teachers and their teacher educators
2. determine if there is any significant difference in the performance of learners when exposed to the traditional approach and those exposed to blended learning.

Operationally defined, ICT literacy skills involve the basic competence and ability that an individual possesses to be able to define, access, manage and communicate information using ICT and specifically for this study to use the computer. The study will assess these skills in undergraduates undergoing pre-service training to be teachers (student teachers) and their teachers (teacher educators).

Students have preferred styles of learning: hence learning must be provided in a variety of ways so that no one is disadvantaged by an approach. It has been found that when learners are able to use their own particular style of learning and processing information, results improve, [16] and [17].

The study is also predicated on the theoretical framework of constructivism, a philosophy of learning founded on the premise that by reflecting on our experiences, we construct our own understanding of the world we live in. According to the constructivist view, meaningful learning is a cognitive process in which individuals make sense of the world in relation to the knowledge, which they already have constructed, and this sense-making process involves active negotiation and consensus building, [18].

Methodology

The research designs are both descriptive survey and experimental study. A 15-item questionnaire was designed to assess ICT literacy skills of the teachers and their students. The content validity was determined by two specialists in 'ICT in Education' while a reliability coefficient of r =0.92 was obtained using the retest method in a pilot study. It was administered on 312 randomly selected student teachers and 75 randomly selected teacher educators from the Faculty of Education of three Nigerian universities. Response rate was 98.19%. The data collected was analysed using descriptive statistics.

The pre-test, post-test control group design was carried out using all the 105 year two students in a senior secondary school. The students were randomly assigned into two groups. A pre-test was conducted to assess their knowledge of Evolution. Data collected was subjected to t-test of significant difference to determine the homogeneity of the groups. Both groups were taught the topic Evolution for three periods each.

Group A. the experimental group had the first lesson as a large discussion group on the topic and their previous knowledge, the second lesson was the traditional approach lesson presentation by the teacher on what evolution involves while the third lesson was a combination of presentation of the process Evolution using the 'Mathematica' to show changes that can occur in the cellular automata structure with a single cell change to describe single base change by mutation in living organisms. The third lesson involved students assisted by the teacher trying various cell/base changes to observe the effects as well as have small group discussions on the process of evolution.

Group B, the control group had their three lessons taught by the typical traditional method, with each lesson following the format of: review of previous knowledge, teacher presentation, summary (using question) and note writing. At the end of the lessons, both groups were subjected to the post-test. Data collected was subjected to t-test of significant difference.

Results and Discussion

The results showed that all the teachers can boot operate and type on the computer, with 93.3% with high skills in booting. 53.3% average skills in operating the computer. However, only 26.7% have high typing skills with most teachers having low speed at typing (46.6%). Most of the teachers can averagely browse and get information from the internet (66.6%) and do word processing (46.7%), only very few of them cannot browse (2.6%0 or do word processing (4.0%). All the teachers can send e-mail messages with 94.7% of them having high skills at doing this.

Specialized skills on the use of computer and other ICT such as use/development of database, creating web pages, use/write program, present information were found to be very low with those that cannot do these at all ranging from 33.4-78.7%. The percentages of teachers highly competent in doing these are quite negligible (2.7-13.3%) while those with average skills range between 2.7-26.7%. Thus, although teachers have some low level skills to use the computer, specialized skills that will enable them to use ICT in the teaching and learning process and make meaningful impact on the students are not adequate, see Table 1.

The findings revealed that most of the students perform well in booting, operating and typing on the computer, as only 19.6% cannot boot. 17.6% cannot operate the computer and 2.6% cannot type. A good percentage of the students can browse and get information from the Internet (37.2%-highly and 36.5%-averagely) and do word processing (80.2%), only few of them cannot browse (23.76%) or do word processing (15.9%). All the students can send e-mail messages with 80.1%) of them having high skills at doing this.

As with their teachers, possession of specialized skills on the use of computer and other ICT such as use/development of database, creating web pages, use/write program, present information were found to be very low with those that cannot do these at all ranging from 21.1-78.5%. The percentages of students highly competent in doing these are quite negligible (1.6-25.6%) while those with average skills range between 4.0-26.7%). It is interesting to note that a good percentage of the students can chat on the web (high-32.1%) and average 26.6%), See Table 1. These findings indicate that there is a reasonable level of ICT literacy skills among the students, which can enable them to use ICT for learning.

Table I: Percentage Response of Assessment of Teachers' and Students' ICT Literacy Skills

N	Items	High *St **Tr	Average St Tr	Low St Tr	None St Tr
1.	Boot a computer	36.5 93.3	26.6 6.7	17.3 0.0	19.6 0.0
2.	Operate a computer	18.6 33.3	45.2 53.3	18.6 13.4	17.6 0.0
3.	Typing skills	20.2 26.7	17.3 26.7	59.9 46.6	2.6 0.0
4.	Getting information on the internet	37.2 13.4	36.5 66.6	2.6 7.4	23.7 2.6
5.	Word processing create a document and save it	32.1 36.0	48.1 46.7	3.9 13.3	15.9 4.0
6.	Send e-mail messages	80.1 94.7	8.0 5.3	8.0 0.0	3.9 0.0
7.	Operate electronic devices like: overhead projector, video, CD-ROMS	45.2 26.6	36.5 33.3	16.0 37.3	2.3 2.8
8.	Interact with others via the internet	32.1 9.3	26.6 26.7	20.2 17.3	21.1 46.7
9.	Use a database	14.1 13.3	16.0 20.0	27.2 32.0	42.4 34.7
10.	Draw a picture or diagram	25.6 9.3	28.8 18.7	17.1 36.0	28.5 36.0
11.	Present information (using power point or equivalent	3.9 5.3	14.1 17.3	22.4 44.0	59.6 33.4
12.	Create web pages	3.2 2.7	9.6 5.3	20.2 13.3	67.0 78.7
13.	Develop a data base	1.6 4.0	8.0 2.7	15.4 17.4	75.0 75.9
14.	Use a program	7.7 9.3	20.2 18.7	22.4 33.3	49.7 38.7
15.	Write a program	2.2 4.0	15.4 4.0	3.9 2.8	78.5 89.2

*St = Students percentage responses
**Tr = Teachers' percentage responses

To determine any significant difference in the performance of learners when exposed to the traditional approach and those exposed to blended learning

The t test analysis of the pre-test showed that there is no significant difference in the entry levels of the two groups. Both groups are homogenous and so any difference in performance observed after the experiment can be attributed to the treatment (Table 2). The t test analysis of the posttest revealed that there is now a significant difference in the performance of learners. It can thus be concluded that the use of blended learning can make a significant difference in the performance of learners compared towhen the traditional chalk and talk approach to teaching is used.

Table 2: t test Analysis of the Pre-test of Experimental and Control Group

Group Score	n	$\bar{X}$	Std Dev.	df	t_{cal}	t_{cal}
H_1 Experimental	156	10.6	3.75	310	*1.04	2.021
H_2 Control Group	156	11.4	2.69			

Table 3: t Analysis of the Post-test of Experimental and Control Group

Group Score	n	$\bar{X}$	Std Dev.	df	t_{cal}	t_{cal}
H_1 Experimental	156	18.6	2.70	310	**6.48	2.021
H_2 Control Group	156	14.4	2.59			

Based on these findings, teachers in Nigerian university can be encouraged to use blended learning to help to improve the performance of learners in the senior secondary school biology. The teacher educators need to acquire more skills to train the student teachers who will go out to teach in the secondary schools. The level of ICT literacy skills possessed by student teachers is fairly adequate as a starting point for technology – oriented learning. Teacher educators should be exposed to workshops that will equip them to effectively incorporate ICT into their teaching.

References

[1] Owokade, O. O. (2006). Facilitating effective performance of students in mathematics, science and technology in secondary schools, *Paper presented at the FGN-UNESCO workshop for inspectors, University of Lagos, Lagos* Nigeria.

[2] Ambasht, N.K. (2003). Teacher education in the new millennium: challenges and strategies. In NTI, Kaduna *Teacher education in Nigeria: past, present and future,* Kaduna, National Teachers' Institute, p. 34.

[3] Jegede, O. (2003). A celebration of teacher education and open and distance learning in Nigeria: Attainments, challenges and strategies. In NTI, Kaduna, *Teacher Education in Nigeria: Past, Present and Future,* Kaduna, Teachers' Institute p11 – 36.

[4] Lassa, P (2000). Teacher production: A focus on Nigeria, in The state of education in Nigeria, Abuja, UNESCO.

[5] Federal Republic of Nigeria (2004). *National Policy on Education,* Lagos, Nigeria. NERDC Press p. 39.

[6] Mhlolo, M. (2007). ICT – The role it plays in communicating data to do with effective teaching and quality education. In *Conference proceedings, 2nd international conference on ICT for development, education and training,* Kenya, Berlin, Germany, ICWE, GmbH, p. 25 – 26.

[7] Yusuf, M.O. (2005). Information and communication technology and education: Analyzing the Nigerian National Policy for Information Technology. International Education Journal, 6(3), p. 316-321.

[8] Kulik, C.C. and Kulik, J.A. (1991). Effectiveness of computer based instruction: An updated analysis. *Computers in human behaviours*, Vol. 7, p. 23.

[9] Aladejana, F. (2007). The implications of ICT and NKS for science teaching: whither Nigeria, *Complex Systems,* Vol. 17 Nos 1 and 2 p. 113 – 123.

[10] Jegede P.O. (2005). A study of teacher educators' behaviour towards ICT in South western Nigeria. *Unpublished PhD Dissertation*, Obafemi Awolowo University, Ile-Ife.

[11] Liebman, K. (2005). Blended learning: definition, controversy and commitment.
http://gocertify.com/article/blendedlearning.shtml

[12] Griffin, J. (2006). Effective elements of designing developing and delivering blended learning. In conference proceedings, 1st international conference on ICT for development, education and training, Kenya. Berlin, Germany, ICWE, GmbH, p. 236-237.

[13] Wikipedia (2007). Blended learning.
http://en.wikipedia.org/wiki/Blended.learning

[14] Rossett, A., Douglas, F. and R.V. Frazer (2003). Strategies for building blended learning
http://www.learningcircuits.org/2003/jul2003/rossett.htm

[15] Manganas, A. (2006). Blended learning approach to health emergency training of first responders and citizens. In *Conference Proceedings, 12th International Conference on Technology Supported Learning and Training,* Berlin, Germany, ICWE, GmbH, p. 475-477.

[16] Carbo, M. (11986). *Teaching students to read through their individual learning styles,* Englewood Cliffs, N: Prentice Hall.

[17] Campbell, B. and Campgell, L. (1999). *Multiple intelligences and student achievement.* Alexandria, V.A Association for supervision and curriculum development.

[18] Wilson, B.G. (1996). Introduction: What is a constructivist learning environment? In B.G. Wilson (Ed.) *Constructivist learning environments,* Englewood Cliffs, N.J: Educational technology publications, p. 3-8.