Flipped Classroom and Academic Performance of Educational Technology Semi-Final Year Students in the South-South Universities, Nigeria

BY

Idongesit N. UDOSEN, *Ph.D*
Department of Educational Technology and Library Science,
University of Uyo, Uyo, Akwa Ibom State.

ABSTRACT

The main objective of this study was to examine the effect of flipped classroom on the academic performance of Educational Technology Semi-Final year students in the South-South Universities, Nigeria. Quasi- experimental research design was used and the study population comprised 861 Educational Technology fourth year students in two federal universities in the South-South of Nigeria. A sample size of 89 Educational Technology fourth year students from two intact classes selected through purposive sampling technique was used to select from the two universities. Instrument for data collection was Students' Performance Test (SPT). The instrument was validated by three experts and Kuder Richardson Formula 20 was used to determine the internal consistency of the instrument which yielded a reliability co-efficient index of 0.71. The researcher trained the lecturer who presented this strategy for the experimental group and students were pretested; treatment was carried out within 3 weeks and thereafter posttest was administered. Mean ($\bar{X}$) and standard deviation (SD) were used in answering the research questions while analysis of covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. There was a significant difference in the mean performance scores of educational technology fourth year students taught using flipped classroom compared with those taught using traditional method of teaching. There was no significant difference in the mean performance between male and female students taught using flipped classroom. Based on the findings of the study, it was recommended among others that Teachers should adopt the flipped classroom approach because it is a student-centered learning strategy that involves the students rather than the spoon-feeding approach which is an undeniable index of the traditional teaching method.

KEYWORDS: Flipped classroom, Traditional method of teaching, ICT

INTRODUCTION

The speed of growth of any nation is influenced by her stage of educational advancement. No country can claim to be educationally advanced without embracing technology in her educational activities. Nigeria, a developing country and a member of the global community cannot afford to be backwards in educational advancement. In the Nigerian National Policy on Education (FRN, 2014), it is stipulated that education should sustain individual citizens and society at large in consonance with the realities of the immediate environment and the modern world. The use of multimedia in an organisation has been broad and equally efficient in improving performance and rate of retention. Research has confirmed that 20% of what people see, 40% of what they see and hear, and about 75% of what they see, hear and do are

simultaneously remembered (Oshinaike and Adekunmisi, 2012). The Flipped Classroom (FC) can be defined as a classroom where homework could be done at school and school work could be executed at home. The school work is the recorded lessons in videos adopted or adapted by the teachers on all the topics in any subject or course. The students will need to watch the video at home online or offline in the absence of the teacher, then, do the homework (assignments) in the class in the presence of the teacher who will supervise and offer assistance in the area of difficulties, and monitor the learning progress. A study by Herreid and Schiller (2013), asserted that FC involves and concentrates on joining vigorous, student-centered teaching/learning activities with content mastery that could be used in the actual sense. The Flipped Classroom (FC) is a conjoined learning model that brings basic content out of the planned class-time for learners to study freely, allowing educators to involve students in group discussions and interactive learning activities during the lesson period in the class to promote higher-level thinking (Bergmann and Sams, 2012).

The theoretical foundations which justify the FC to develop from a body of literature on student-centered learning, from the theory of Piaget, Elkind and Tenzer (1967) and Vygotsky (1978). Jonathan Bergmann and Aaron Sams used flipped classroom for students absent from the classroom. Lectures recorded by them on video cartridge or DVD with annotations, slide presentations and demonstrations sent online to students to study (Hamdan, McKnight, McKnight, and Arfstorm, 2013a). In addition, Bergmann and Sams (2012), asserted that FC reduced the time the teacher used in teaching while students take notes and reduced class time used for activities and problem-solving, not long time lecture as usual (Acton and Knorr, 2013). Now, students have assorted sophisticated phones and tablets with which they log on to the Internet to watch videos and chat on social websites (2go, WhatsApp, Twitter, yahoo, chat ON, Facebook, Messenger, Instagram and Google and so on), and they even discuss classwork while playing with one another. In the Educational Technology classroom where provision is available for deeper illustrations with examples in each topic/concept, students should not find it difficult to understand and increase the ability to practise on their own and interact with other students proficiently. Charles-Ogan and Williams (2015), also noted that the FC promotes peer instruction among students, provides the opportunity for first exposure to teaching materials prior to class time which prepares students better for class work and assesses their comprehension. It also added that FC encourages activities that focus on higher- level cognitive activities. Thus, the merits of FC method of teaching exceed that of the traditional classroom. Puarungroj (2015), employed Google Classroom as a tool for managing course materials for a flipped programming class and observed improvement in student-instructor interaction, student engagement, and self-paced learning. Similarly, Yoshida (2016), reported that when an educational technology class was flipped for Japanese university students, it was affirmed to result in high perceived usefulness in terms of enhancement of classroom instruction, learning effectiveness, and productivity. LanCastle, Barlow and Davison (2016), in the same vein observed that the flipped classroom particularly benefits engineering education students who struggle with traditional lectures, and who may otherwise fall behind. The studies reviewed here have generally attested to the robustness of the flipped classroom across several fields. The particular reviews in educational technology from Nigeria pointed out the relative efficacy of the flipped model of educational technology. This present study however, is geared towards ascertaining the effect of the flipped classroom on academic performance of educational technology fourth year students in South-South Universities, Nigeria.

In a study, Eze (2008), asserted that gender had significant effects on students' achievement in chemistry, and showed that male students achieved higher than their female counterparts did. Owoyemi (2007), asserted that student's achievement in chemistry course has 'nothing to do with whether the student is male or female'. Agbir (2004), found that gender was not a significant factor in the overall mean achievement rating of students in practical skills on acid-base titration. Ifeakor (2005), showed a significant gender-related difference in students' cognitive achievement in favour of male students over their female counterparts. Ssempala (2005), investigated gender differences in the performance of practical skills on quantitative analysis, an aspect of chemistry, among senior secondary school girls and boys in selected co-educational schools. Ssempala showed that there were no statistical significant differences between girls and boys in their ability to manipulate the apparatus/equipment, take observation, report/record results correctly, and compute/interpret/analyse results during chemistry practical; girls performed slightly better than boys overall; boys performed slightly better than the girls in the following skills: recording/reporting results correctly, and computing/interpreting/analysing results.

It would appear, from the above studies, that gender as an influencing factor in learning and academic performance in aspects of educational technology remains important but controversial. None of the reviewed studies was on educational technology; this leaves a gap in knowledge, thus creating a need for this current study.

Statement of the Problem

The concern of educationists has always been to achieve effective teaching/learning outcomes. However, the teaching and learning processes still depend exclusively on traditional methods. Lecturers use different applications and software for personal purposes, but using social network applications for educational purposes is very minimal. Given previous experience, it can be indicated that there is a big gap between modern teaching methods that should be adopted by lecturers, and learning methods that their students need based on their abilities and interests. Alzedanin (2009), pointed out that new strategies and methods should be based on cooperation, direct and positive interaction between learner and educational technologies through the teacher's guidance and supervision. This situation encouraged the researcher to conduct this study to investigate the effect of flipped classroom on the academic performance of educational technology semi-final year students in South-South Universities, Nigeria.

Objectives of the Study

The main objective of this study was to examine the effect of flipped classroom on the academic performance of educational technology semi-final year students in South-South Universities, Nigeria. Specifically, this research intends:

1. To determine the difference in mean performance scores of educational technology fourth year students taught using flipped classroom and those taught using traditional method of teaching in South-South Universities, Nigeria.

2. To ascertain the difference in the mean performance scores of male and female students taught using flipped classroom.

Research Questions: The following research questions were stated to guide the study:

1. What is the difference in mean performance scores of educational technology fourth year students taught using flipped classroom and those taught using traditional method of teaching in South-South Universities, Nigeria?

2. What is the difference in the mean performance scores of male and female students taught using flipped classroom?

Null Hypotheses

The following hypotheses were formulated to guide this study and tested at 0.05 level of significance.

1. There is no significant difference in mean performance scores of educational technology fourth year students taught using flipped classroom and those taught using traditional method of teaching in South-South Universities, Nigeria.

2. There is no significant difference in the mean performance scores of male and female students taught using flipped classroom.

Research Method

This study adopted quasi-experimental research design. Specifically, it is a pretest – post-test non-equivalent control group design. Quasi – experimental design is a design in which random assignment of subject to treatment and control groups is not possible (Ali, 2006). This design was adopted because there was no random assignment of subjects into experimental and control groups rather intact classes were used as experimental and control groups. The study was carried out in the South-South of Nigeria with a population comprising 861 educational technology semi-final year students in two universities that offer Educational Technology out of the six federal universities. The universities are University of Port Harcourt, University of Uyo, University of Calabar, University of Benin, Federal University of Petroleum Resources, Federal University, Otuoke, Specifically, University of Port Harcourt and University of Calabar were used for the study since they have consistently produced Educational Technology Students for over seven years. The study was carried out in South- South of Nigeria, specifically, South South States includes Rivers, Akwa Ibom, Cross River, Bayelsa, Delta and Edo State. The choice of students in the semi-final year was guided by the fact of their need to be self-reliant in the flipped classroom learning mode. Having been properly assisted to that level, some independence is required and necessary for these would be flipped classroom instructors. A sample size of 89 Educational Technology semi-final year students was from two intact classes selected through purposive sampling technique namely; 38 female and 51 male students (47 experimental, 42 control). To achieve the principle of equalization in the two groups, the study participants were randomly distributed into two groups. The experimental group was taught according to flipped classroom and the control group was taught according to traditional teaching method. The instrument for data collection was Students' Performance Test (SPT). It consisted of two sections A and B. Section A elicited information on demographic data while section B consisted of 60 multiple choice items and open-ended questions with a total score of 60 marks. The instrument was developed by the researcher in the areas of cognitive, emotional, and behavioural

approaches, to help monitor students' attitude to flipped classroom on the peer teaching methods or effective learning. The instruments were validated by three experts experienced and specialized in Measurement and Evaluation, Educational Technology curriculum and instruction, University of Uyo, Nigeria. Their corrections and comments were used to modify the instrument. To determine the internal consistency of the instrument, trial testing was carried out using 20 educational technology-fourth year students from the study area. Kuder Richardson Formula 20 was used to determine the internal consistency of the instrument which yielded reliability co-efficient index of 0.71, which is an indication that the instrument was reliable.

After that, the researcher developed the content of the unit by designing flipped classroom model that consisted of a variety of activities, handouts, brochures, PowerPoint presentations, and selected educational videos. The developed content of the unit was reviewed by an educational technology lecturer. The content was checked to make sure that the designed flipped classroom strategy was developmentally appropriate to the semi-final year students. The adequate amendments were made based on the experts' feedback. The researcher trained the lecturer who would present this FC strategy for the experimental group before the beginning of the semester. The developed unit was implemented during the first semester of the academic year 2018/2019. The pre-test was implemented at the beginning of the second semester of the academic year of 2018/2019 to both the experimental group and the control group. After that, the developed unit based on flipped classroom strategy was presented by the trained lecturer to the experimental group. The lecturer met with the students 3 times a week. Each lesson lasted for 45 minutes. Some designed materials were distributed to the students ahead of time based on the coming lesson. The students were informed to review the materials and activities at home. When they met with the lecturer, the lesson began with the reflection from the students of the materials observed. Then, the lecturer presented related activities to deepen the students' knowledge of the topic. The control group was taught by the traditional teaching method. Teaching through the traditional method focused on presenting the lessons of the unit by utilizing the textbook and notes of lessons as the main and only resources.

The lecturer presented each lesson in the classroom and asked the students to complete the assignments of the lesson at home. After three weeks of the implementation of the unit, both of the groups responded to the post-test. Mean ($\bar{X}$) and standard deviation (SD) were used in answering the research questions while analysis of covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. The pretest scores were used as covariates to the posttest scores. The ANCOVA was employed to bring out the initial differences between the experimental and control groups.

Results

Research Question One

What is the difference in mean performance scores of educational technology semi-final year students taught using flipped classroom and those taught using traditional method of teaching in South-South Universities, Nigeria?

Table 1: Pretest- Posttest and mean performance scores of educational technology semi-final year students taught using flipped classroom and those taught using traditional method of teaching

Group		Pre-test		Post-test		Mean
	n	$\bar{x}$	SD	$\bar{x}$	SD	Difference
Flipped classroom (Experimental group)	47	20.63	4.28	43.12	12.27	22.49
Traditional method (Control group)	42	20.97	5.13	22.73	4.36	1.76

Table 1 shows the mean performance scores of educational technology fourth year students taught using flipped classroom and those taught using traditional method of teaching. The result shows that the pretest mean of students using flipped classroom (experimental group) was 20.63 with a standard deviation of 4.28 and a posttest mean of 43.12 with a standard deviation of 22.49. The difference between the pretest and posttest mean for student taught using flipped classroom was 22.49. On the other hand, the pretest mean performance scores of educational technology semi-final year students taught using traditional method of teaching (control group) was 20.97 with a standard deviation of 5.13 and a posttest mean of 22.73 with a standard deviation of 4.36. The difference between the pretest and posttest mean for students in control group) was 1.76. From this result, it can be deduced that students taught using flipped classroom (experimental group) performed better than students taught with traditional method (control group).

Research Question Two

What is the difference in the mean performance scores of male and female students taught using flipped classroom?

Table 2: Pretest- Posttest and mean difference in the mean performance scores of male and female students taught using flipped classroom

Gender		Pre-test		Post-test		Mean
	n	$\bar{x}$	SD	$\bar{x}$	SD	Difference
Male	26	20.19	3.93	42.19	11.94	22.00
Female	21	21.19	4.70	44.28	12.87	23.09

Result in Table 2 shows the mean difference in the mean performance scores of male and female students taught using flipped classroom. The result showed that male students had a pretest mean of 20.19 with a standard deviation of 3.93 and a posttest mean of 42.19 with a standard deviation of 11.94. The difference between the pretest and posttest means for male students was 22.00. Whereas, female students had a pretest mean of 21.19 with a standard deviation of 4.70 and a posttest mean of 44.28 with a standard deviation of 12.87. The difference between the pretest and posttest means for female students was 23.09. For both male and female taught using flipped

classroom, the posttest means were greater than the pretest means with female having a slight higher mean difference than the male students.

Testing of Hypotheses

Hypothesis One

There is no significant difference in mean performance scores of educational technology fourth year students taught using flipped classroom and those taught using traditional method of teaching in South-South Universities, Nigeria.

Table 3: Analysis of Covariance (ANCOVA) of the difference in mean performance scores of educational technology semi-final year students taught using flipped classroom and those taught using traditional method of teaching

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	11116.984[a]	2	5558.492	82.118	.000
Intercept	637.732	1	637.732	9.421	.003
Pretest	1896.090	1	1896.090	28.012	.000
Method	9514.270	1	9514.270	140.558	.000
Error	5821.263	86	67.689		
Total	116852.000	89			
Corrected Total	16938.247	88			

a. R Squared = .656 (Adjusted R Squared = .648)

The result in Table 3 shows that an F-ratio of 140.558 with an associated probability value of 0.000 was obtained with regards to difference in mean performance scores of educational technology semi-final year students taught using flipped classroom and those taught using traditional method of teaching in South-South Universities, Nigeria. Since the associated probability of 0.000 was less than 0.05, the null hypothesis which states that there is no significant difference in mean performance scores of educational technology fourth year students taught using flipped classroom and those taught using traditional method of teaching was rejected. This implies that there is a significant difference in mean performance scores of educational technology fourth year students taught using flipped classroom and those taught using traditional method of teaching in south-south universities, Nigeria.

Hypothesis Two

There is no significant difference in the mean performance scores of male and female students taught using flipped classroom.

Table 4: Analysis of Covariance (ANCOVA) of the difference in the mean performance scores of male and female students taught using flipped classroom

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2899.781[a]	2	1449.890	15.809	.000
Intercept	45.376	1	45.376	.495	.486
Pretest	2848.871	1	2848.871	31.062	.000
Gender	.691	1	.691	.008	.931
Error	4035.453	44	91.715		
Total	94355.000	47			
Corrected Total	6935.234	46			

a. R Squared = .418 (Adjusted R Squared = .392)

The result in Table 4 shows that an F- ratio of 0.008 with an associated probability value of 0.931 was obtained with regards to the difference in the mean performance scores of male and female students taught using flipped classroom. Since the associated probability of 0.931 was greater than 0.05, the null hypothesis which states that there is no significant difference in the mean performance scores of male and female students taught using flipped classroom was accepted. This implies that there is no significant difference in the mean performance scores of male and female students taught using flipped classroom.

Discussion of Findings

Hypothesis one aimed at finding out if there is a significant difference in mean performance scores of educational technology semi-final year students taught using flipped classroom and those taught using traditional method of teaching. It was found that there is no significant difference in mean performance scores of educational technology fourth year students taught using flipped classroom and those taught using traditional method of teaching. This finding is in agreement with the work of Puarungroj (2015), employed Google Classroom as a tool for managing course materials for a flipped programming class and observed improvement in student-instructor interaction, student engagement, and self- paced learning. Similarly, Yoshida (2016) reported that when an educational technology class was flipped for Japanese university students, it was affirmed to result in high perceived usefulness in terms of enhancement of classroom instruction, learning effectiveness, and productivity. LanCastle, Barlow and Davison (2016), in the same vein observed that the flipped classroom particularly benefits engineering education students who struggle with traditional lectures, and who may otherwise fall behind. In contrary to the finding of this study Eze (2008), asserted that gender had significant effects on students' achievement in chemistry, and showed that male students achieved higher than their female counterparts did. Owoyemi (2007), asserted that student's achievement in chemistry course has 'nothing to do with whether the student is male or female'. Ifeakor (2005), showed a significant gender-related difference in students' cognitive achievement in favour of male students over their female counterparts.

Conclusion

Effectual teaching and learning cannot be accomplished without proper management of the learning process. The need to change classroom orientation from teacher- centred to student – centred for more active involvement as a way of improving students' learning is well recognised. As stated in literature review and findings in this research, flipped classroom improves communication skill, makes teaching and learning enjoyable, effective, and satisfying. The following conclusions can be drawn in this study. This research has established the instructional values of the flipped classroom method of teaching.

Recommendations

From the findings and conclusions of this research, the following recommendations were made;

i. Teachers should adopt the flipped classroom approach because it is a student-centered learning strategy that involves active students' participation rather than spoon- feeding.

ii. Teachers should seek for more knowledge on the utilisation of flipped classroom for instruction because it is technology-driven. Hence, attending workshops, seminars and conferences within and outside their education districts and state should be a must if they must use this approach with expertise.

iii. All stakeholders in the education industry should appreciate, support and sustain the use of flipped classroom.

iv. The government should, as a matter of necessity, supply adequate technological facilities that will sustain flipped classroom integration in all universities in Nigeria, to enable Nigerian children to be able to have technology skills.

REFERENCES

Acton, D. and Knorr, E. M. (2013). *Different audiences but similar engagement goals*: In progress work on two course transformations. Paper presented at WCPCCE 2013, North Vancouver, Canada.

Adesoji, F. A. and Babatunde, A. G. (2008). Investigating gender difficulties and misconceptions in inorganic chemistry at the senior secondary level. *International Journal of African & African American Studies.* 7 (1): 1-7.

Agbir, J. D. (2004). *Development and validation of an instrument for evaluating chemistry practical skills for senior secondary schools*. Unpublished M.Ed thesis, University of Nigeria, Nsukka,123p.

Ali, A. (2006). *Conducting research in education and social science*. Enugu: Tashiwa Nation publishers.

Alzedanin, R. (2009). *The role of incubators in human resource development from the standpoint of directors of the incubator and its affiliates in the Jordanian universities*. Unpublished Ph.D Dissertation of Yarmouk University, Jordan.

Bergmann, J. and Sams, A. (2012). Flip your students' learning. *Educational Leadership*, 70(6):16-20.

Bishop, J. and Verleger, M. (2013). *The flipped classroom:* a survey of the research. 120th ASEE Annual Conference & Exposition. American Society for Engineering Education. Atlanta.

Charles-Ogan, G. and Williams, C. (2015). Flipped classroom versus a conventional classroom in the learning of mathematics, University of Port Harcourt, Nigeria. *British Journal of Education,* 3 (6), 71-77.

Clark, K. R. (2013). *Examining the effects of the flipped model of instruction on student engagement and performance in the secondary mathematics classroom:* An action research study. Doctoral Dissertation. Retrieve from http://search.proquest.com/ docview/ 1437012328/fulltextPDF/142FE33FC477A66BC70/1?accountid=14645

Eze, C. C. (2008). *Comparative effects of two questioning techniques on students' achievement, retention and interest in chemistry*. M.Ed. project report. Department of Science Education, University of Nigeria, Nsukka, 186p.

Federal Republic of Nigeria (FRN, 2014). *National policy on education*. Yaba: Revised Edition NERDC Press.

Hamdan, N., McKnight, P. E., McKnight, K. and Artfstrom, K. M. (2013). *The Flipped Learning Model*: A White Paper Based on the Literature Review. Flipped Learning Network. Available at: http://flippedlearning.org/cms/lib07/VA01923112/Centricity/ Domain/41/White Paper_FlippedLearning.pdf

Ifeakor, A.C (2005). *Effects of commercially produced computer assisted instruction package on students' achievement and interest in secondary school chemistry*. Unpublished Ph.D Thesis. University of Nigeria, Nsukka.

Işman, A. (2003). *Öğretim teknolojileri ve materyal geliştirme, İstanbul*: Değişim Yayınları.

Kadry, S. and El Hami, A. (2014). Flipped classroom model in Calculus II. *Education*, 4(4), 103-107.

LanCastle, S., Barlow, C. and Davison, L. (2016). A flipped classroom in engineering education –student perception and effect on learning. School of Media Arts and Technology Maritime. *Technology and Environment Research and Innovation Hub*, 3(2):23-33.

Leicht, R. M., Zappe, S. E., Messner, J. I. and Litzinger, T. (2012). Employing the classroom flip to move "lecture" out of the classroom. *Journal of Applications and Practices in Engineering Education*, 3(1), 19-31.

Lim, D. H. and Morris, M. L. (2009). Learner and instructional factors influencing learning outcomes within a blended learning. *Educational Technology & Society*, 12(4), 282–293.

Odabaşı, F., Çoklar, A. N., Kıyıcı, M. and Akdoğan, E. P. (2005). Ilköğretim birinci kademede Web üzerinden ders işlenebilirliği. *The Turkish Online Journal of Educational Technology*, 4(4), 182-190.

Oshinaike, A. B. and Adekunmisi, S. R. (2012). Use of Multimedia for Teaching in Nigerian University System: A Case Study of University of Ibadan. *Journal of Library Philosophy and Practice*, 1(1); 23-39

Peşman, H. and Özdemir, Ö. F. (2012). Approach–Method interaction: The role of teaching method on the effect of context-based approach in physics instruction. *International Journal of Science Education (IJSE)*, 14 (34), 2127- 2145.

Piaget, J., Elkind, D. and Tenzer, A. (1967). *Six psychological studies*. Random House New York.

Puarungroj, W. (2015). *Inverting a computer programming class with the flipped classroom*. Proceedings of the International Conference on eLearning for Knowledge-Based Society held 11-12 December, 2015, in Thailand. 40.1-40.7

Santa, C. M. (2006). A vision for adolescent literacy: Ours or Theirs, *Journal of Adolescent and Adult Literacy*, 49(1), 466- 476.

Ssempala, F. (2005). *Gender differences in performance of chemistry practical skills among senior six students in Kampala District*. Available at: http://www.universalpublishers.com/book. php?method=ISBN&book=1599427 001.

Şimşek, A., Özdamar, N., Uysal, Ö., Kabak, K., Berk, C., Kılıçer, T. and Çiğdem, H. (2009). İkibinli yıllarda Türkiye'deki eğitim teknolojisi araştırmalarında gözlenen eğilimleri. *Kuramda Uygulamalı Eğitim Bilimleri Dergisi*, 9(2), 941-966.

Vygotsky, L. S. (1978). *Mind and society*: The development of higher mental processes. Cambridge, MA: Harvard University Press.

Yoshida, H. (2016). Perceived usefulness of flipped learning on instructional design for elementary and secondary education: With focus on pre-service teachers. *International Journal of Information and Education Technology*, 6(6), 430- 434.

**The contribution of the Research Assistant (Dr. Stella O. Udom) ESUT, Nigeria, is highly acknowledged.*