Effect of Flipped Classroom Learning Strategy on Students' Academic Achievement in Basic Technology in Junior Secondary Schools in Rivers State

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Abstract: The aim of the study is to investigate the effect of flipped classroom learning strategy on students' academic achievement in Basic Technology in junior secondary school in Rivers State. Two research questions were posed to guide the study. Two null hypotheses was formulated and tested at .05 level of significance. The study adopted a quasi-experiment design. The population for the study consisted of only government Junior Secondary School two (JSS 2) Basic Technology students in the 14 (fourteen) public secondary schools in Obio/Akpor local government area of Rivers State. A total of six thousand, one hundred and twenty-seven (6,127) JSS 2 students comprising; three thousand, seven hundred and Ninety-nine (3,799) male and two thousand three hundred and twenty-eight (2,328) female. One hundred and fifty (150) junior secondary school two (JSS 2) Basic Technology students in three intact classes constituted the sample size for the study. The instrument for data collection was Basic Technology Achievement Test (BTAT) which consists of 30 multiple choice questions developed by the researcher to assess students' achievement in the experimental and control groups respectively. The research instrument were subjected to face and content validity by three (3) experts. Thereafter the reliability of the instruments was determined using test-re-test method. The initial and re-test scores of the sample were correlated and computed using Pearson's Product Moment Correlation Co-efficient to obtain the reliability index of 0.80. The data obtained from the study was analyzed using mean statistics and standard deviation which answered the research questions while Analysis of covariance (ANCOVA) at .05 level of significance was used to test the null hypotheses. The findings of the study revealed that Students taught with flipped classroom performed better than those taught with traditional learning method. In addition, flipped classroom enhanced the achievement of both male and female for both male and female students than the traditional learning method. The researcher recommended that Basic Technology teachers should be encouraged to adopt blended learning approach especially flipped classroom strategy because it will help to improve students' academic performance. Students should be encouraged to study together irrespective of their gender to eliminate gender biases.

Keywords: Basic Technology, Flipped Classroom, Instructional Strategy, Academic Achievement.

Introduction

Education is a process of training and imparting knowledge to improve and develop skills in learners. The essence of education is to advance in knowledge and empower an individual to excel in a chosen field of endeavour and to make positive impact on the environment (Calinten, 2015). On the contrary, the results of the process of education have failed to maintain the

standard for academic distinction and excellence amongst learners and recipients of education in institutions of learning. One of the factors responsible for this negative outcomes could be educational policies, curriculum content as well as learning approaches which are vehicles through which these desired outcomes are driven into performances. Nevertheless, appropriate approaches to teaching must be implemented to remedy the situations of poor academic performances in schools and colleges. However, some facts have revealed that in some science subjects like engineering, the attitudes of students and performances towards the subject at all levels have been declining. The poor performances of student in basic technology could thus be attributed to the teacher education knowledge and awareness as well as the teaching styles or approaches adopted in basic technology in junior secondary schools.

Junior secondary education as the name implies is the education offered to pupils after the primary school. It is the form of education which children receive after primary education and 'before the tertiary stage. Specifically, junior secondary education is the education meant for children between the ages of 11 and 17 years (FRN, 2013). The junior secondary education is meant to prepare the beneficiaries towards useful living within the society and higher education for those willing and able to withstand it. Consequently, the junior secondary level of education is not only a bridge between the primary and the senior secondary level of education rather it is also a means of living and fitting well into society for those who may not aspire further. The junior secondary school leaving certificate is based on continuous assessment while the senior secondary school certificate is based on a national final examination (The West African Examinations Council and the National Examinations Council Examination). In the Nigerian situation, junior secondary education is the basic or raw material provider for the desired future manpower resources. Taiwo (2014) observed that junior secondary education is of great importance to the nation because it is a source of mid-level manpower production that is necessary to sustain and improve the economy. Among the numerous subjects undertaken in junior secondary schools is basic technology.

Basic technology identifies issues and challenges that are mere pointer to the fact that basic technology programme is currently delivered theoretically, and as such not capable of equipping recipients with the requisite attributes which is knowledge, skills, and attitudes for gainful employment and further secondary school (Ezeocha, 2012). Commenting on this unpleasant situation, Ogbagi (2017) argued that the practical courses that are supposed to expose individual students to real practical training in order to strike a balance with or match the theory learnt in the classroom have become a mirage as a result this have affected students' academic performance. However, with new learning strategies students' achievement and performance in basic technology can be improved.

Achievement is the product of mastery of concepts. Achievement therefore may be said to be an accomplishment or the ability to perform the desired task. Academic achievement is defined as the attained ability or degree of competence in school tasks, usually measured by standardized test and expressed in grades or units based on norms derived from a wide sampling of pupils' achievement (Osuafor & Orji 2017). It can also be seen as the expected outcome of learning from students over a period which could be good or poor. Achievement in academics can be in cognitive or psychomotor domain. The cognitive domain involves knowledge and the development of intellectual skills. These include the recall or recognition of specific facts, procedural patterns and concepts that serve in the development of intellectual abilities and skills. Thus, learning in this domain could be in form of identification of metals or recall the safety rules to be observed in the workshop to more intellectual skills such as determining and selecting the best or the combination of appropriate techniques in metalwork project. On the other hand, achievement at the psychomotor domain is concerned with the development of muscular skills coordination. Objectives from this domain emphasize motor skills, manipulation of materials or subjects or an act which requires neuromuscular coordination. This could be a performance task such as using a screwdriver to fasten a screw or as using series of tools and instruments in overhauling a machine (Obed & Tom 2020). To enhance learners' academic performance in

basic technology, teachers should apply the desirable methodology in teaching of basic technology especially the use of instructional materials one of which is flipped classroom learning strategy.

Flipped classroom strategy is a learning strategy where normal classroom activities are done in a reverse order. Instructional content are given to students to study at home and then come to classroom for interaction and discussion. It is an instructional strategy and a type of blended learning that reverses the traditional learning environment by delivering instructional content, often online, outside of the classroom. It moves activities, including those that may have traditionally been considered homework, into the classroom. Flipped learning has become an increasingly popular instructional strategy and has gained increasing attention among educators and practitioners worldwide as a consequence of the widely accepted trend to shift the focus from teacher to learner in instruction (Vikash, 2015). Flipped Learning according to Flipped Learning Network (2014) announced a formal definition of the term: "Flipped Learning is a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter. Learners must take at least some of the initiative to give shape and direction to the learning process and must share in monitoring progress and evaluating the extent to which learning targets are achieved. Danker (2015) stated that it is a learning in which students learn new content online by watching videos of lectures, usually at home, and what used to be homework is now done in class with teachers offering more personalized guidance and interaction with students, instead of lecturing. This is also known as backwards classroom. A flipped classroom is a specific type of blended learning to move lectures outside the classroom. Flipped classroom strategy has become one of the latest learning methods in recent years and it requires technology use. Although the flipped classroom (FC) strategy is not a new educational method, it has gained popularity with technology use in education (Jensen, Kummer, & Godoy, 2015). The FC method gives students the opportunity to learn course concepts outside the classroom environment with online educational materials such as video, film and voice so that classroom time is used for active learning such as problem solving and practical applications (Bergmann & Sams, 2012). This method, whereby students learn the theoretical part of the course at home before class, allocates classroom time for active learning practices such as question-answer, discussion, problem solving and practical sessions in schools. In the FC strategy, students take responsibility for their own learning and progress at their own speed (Davies, Dean, & Ball, 2013). It is in view of the above, that the study seeks to investigate the effect of flipped classroom strategy on junior secondary school students' academic performance in basic technology.

Statement of the Problem

There are many conditions that are considered adequate for effective teaching and learning processes which have eluded the present classroom situations in Nigeria schools today. Several studies in Nigeria reveal that the achievement of students in science is generally poor. Many reasons have been linked with this, one of which is the teaching methods. Borich (2004) carried out a research on effectiveness of teaching methods, which revealed that most teachers do not have the idea of the philosophy or objectives of the science subject they teach, hence their lesson are not usually well prepared and appropriate instructional methods are not used.

Thus the teaching and learning of Basic Technology is still dominated with the lecture method. This approach may have contributed to the consistent poor performance of students in Junior School Certificate Examination (JSCE) over the years. Dele (2015) also observed abysmal performance of students in Junior School Certificate Examination (JSCE). This has raised concern among stakeholders about the efficacy of teaching methods and approaches adopted over the years. Therefore, the problem that this study seems to address, posed in a question form is, will the use of flipped classroom learning strategy improve students' achievement?

Aim/Objectives of the Study

The aim of the study is to investigate the effect of flipped classroom learning strategy on students' academic achievement in Basic Technology in junior secondary school in Rivers State. Specifically, the study sought to;

1. Determine the mean achievement scores of students taught Basic Technology using flipped classroom strategy.

2. Determine the mean achievement scores of male and female students taught Basic Technology using flipped classroom strategy.

Research Questions

The following research questions guided the study:

1. What are the mean achievement scores of students taught Basic Technology using flipped classroom learning strategy?

2. What are the mean achievement scores of male and female students taught Basic Technology using flipped classroom learning strategy?

Hypotheses

H_{O1} There is no significant difference between the mean achievement scores of students taught Basic Technology using flipped classroom learning strategy and those taught with the traditional learning method

H_{o2} There is no significant difference between the mean achievement scores of male and female students taught Basic Technology using flipped classroom strategy and those taught with the traditional learning method.

Methodology

The study adopted a quasi-experiment design. A quasi-experiment is an empirical study used to estimate the causal impact of an intervention on its target population without random assignment (Ogundu 2018). The study adopted quasi experiment design because the independent variable is manipulated before the dependent variable is measured and participants are not randomly assigned to treatment. The population for the study consisted of only government Junior Secondary School two (JSS 2) Basic Technology students in the 14 (fourteen) public secondary schools in Obio/Akpor local government area of Rivers State. A total of six thousand, one hundred and twenty-seven (6,127) JSS 2 students comprising; three thousand, seven hundred and Ninety-nine (3,799) male and two thousand three hundred and twenty-eight (2,328) female (Universal Basic Education Board, Rivers State, 2017). One hundred and fifty (150) junior secondary school two (JSS 2) Basic Technology students in three intact classes constituted the sample size for the study. The schools selected are Community Secondary School Apara, Community Secondary School Rumuepirikon and Community Secondary School Okporo, Rumuodara. Purposive sampling technique was used to select three secondary schools based on the following criteria. Public schools for uniformity of curriculum, Co-educational schools to allow collaboration between male and female students, Schools that have functional computer Laboratories and Schools with qualified and experienced Basic Technology teachers.

The instrument for data collection was Basic Technology Achievement Test (BTAT) which consists of 30 multiple choice questions developed by the researcher to assess students' achievement in the experimental and control groups respectively. The multiple choice items were based on the content of junior WACE and NECO syllabus for Basic Technology in junior secondary schools in Rivers State.

The research instrument were subjected to face and content validity by three (3) experts; one from measurement and evaluation and two basic technology teachers in Models Girls Secondary

School Rumueme Port Harcourt . The corrections made by the experts were used to update the research instruments as recommended.

The reliability of the instruments was determined using test-re-test metho. The instrument was administered to the items of the instrument with honesty. The instrument was pilot-tested on 40 J.S.S II students of Community Secondary School Emouha in Emouha local government area of Rivers State. After an interval of two weeks, the instrument was re-administered to the same sample. The initial and re-test scores of the sample were correlated and computed using Pearson's Product Moment Correlation Co-efficient to obtain the reliability index of 0.80.

Prior to the research, Basic Technology teachers in the sample schools were introduced to the instructional strategy to ensure proper administration of the instrument, lesson delivery and scoring. The teachers for the experimental group were guided on the introduction of the lesson, the teaching format and how to score. For the control group, students were taught in the traditional classroom setting. The experimental group was taught using the flipped classroom strategy. At the commencement of the experiment the students in each of the selected sampled secondary schools were randomly assigned to the experimental group and control group. On the first day of the experiment, The Basic Technology Achievement Test (BTAT) was administered as pre-test to the two groups. After which the actual experiment was conducted by regular trained Basic Technology teachers in the sample schools, the experimental group was given Video CDs on the various topics downloaded and recorded to watch at home within an interval of 48 hours before returning to class for discussion. Those who do not have computers at home watched the videos via their smart phone. This exercise lasted for three weeks. Immediately after the treatment a post-test was conducted two weeks later.

The data obtained from the study was analyzed using mean statistics and standard deviation which answered the research questions while Analysis of covariance (ANCOVA) at .05 level of significance was used to test the null hypotheses. ANCOVA was adequate because it serves as a procedure for controlling initial differences across the groups.

Data Presentation

Research Question One: What are the mean achievement scores of students taught Basic Technology using flipped classroom learning strategy?

Table 4.1: Mean and standard deviation scores of students taught with flipped classroom and traditional learning method

Teaching Strategy	N	Pre-test		Post-test		Mean Gain	Mean Difference
		Mean	SD	Mean	SD		
Experimental	75	27.85	9.76	66.35	9.00	38.5	
							3.95
Control	75	27.45	4.82	62.00	8.65	34.55	

Source: Researcher (2022)

Table 1 shows the pre-test and post-test mean score of basic technology students in junior secondary school II in Obio/Akpor local government area of Rivers State. Result shows that the students in the experimental group had a pre-test mean score of 27.85 with a standard deviation (S.D) of 9.76 and a post-test mean score of 66.35 with a standard deviation (S.D) of 9.00. The difference between the pre-test and post-test mean for the experimental group was 38.5. Whereas, the control group had a pre-test mean score 27.45 with a standard deviation (S.D) of 4.82 and a post-test mean score of 62.00 and standard deviation (S.D) of 8.65. The difference between the pre-test and post-test mean for the experimental group was 34.55. Also, the mean gain between the mean difference of experimental and control group was 3.95. Thus, this shows students taught basic technology with flipped classroom in junior secondary school II in

Obio/Akpor local government area of Rivers State performed better than those taught using traditional method.

Research Question 2: What are the mean achievement scores of male and female students taught Basic Technology using flipped classroom learning strategy?

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Table 4.2: Mean and standard deviation of male and female students taught Basic Technology using flipped classroom learning strategy

Gender	N	Pre-test		Post-test		Mean Gain	Mean Difference
		Mean	SD	Mean	SD		
Male	36	55.50	8.24	72.83	10.56	17.33	
							0.13
Female	39	54.40	8.21	71.60	8.75	17.2	

Source: Researcher (2022)

Table 2 shows the pre-test and post-test mean score of male and female students taught Basic Technology in junior secondary school II in Obio/Akpor local government area o Rivers State. Result shows that the students in the male had a pre-test mean score of 55.50 with a standard deviation (S.D) of 8.24 and a post-test mean score of 72.83 with a standard deviation (S.D) of 10.56. The difference between the pre-test and post-test mean for the male group was 17.33. Whereas, the control group had a pre-test mean score 27.45 with a standard deviation (S.D) of 54.40 and a post-test mean score of 71 and standard deviation (S.D) of 8.75. The difference between the pre-test and post-test mean for the female group was 17.2. Also, the mean gain between the mean difference of male and female group was 0.13. Thus, this shows that the male students taught basic technology in junior secondary school II in Obio/Akpor local government area of Rivers State using flip classroom performed better than those taught using traditional method.

1.2 Research Hypotheses

HO1: There is no significant difference between the mean achievement scores of students taught Basic Technology using flipped classroom strategy and traditional method.

Table 3: Result of Analysis of Covariance of Students' taught with flipped classroom and traditional method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	838.42a	2	419.214	4.616	.016
Intercept	14315.447	1	14315.447	57.624	.000
Pre-test	1.203	1	1.203	57.624	.909
Methods	684.854	1	584.854	7.541	.009
Error	3360.347	147	90.820		
Total	190931.000	150			
Corrected Total	4198.775	149			

Source: Field Survey 2022

Table 3 shows that there was a significant difference between the mean achievement scores of student taught Basic Technology using flipped classroom and those taught with traditional method ($F_{1, 147} = 7.541$, $P < 0.5$). Hence the null hypothesis was rejected.

HO2: There is no significant difference between the mean achievement scores of male and female students taught Basic Technology using flipped classroom strategy

Table 6: Summary of ANCOVA on the difference in the mean scores of male and female students' taught Basic Technology using flipped Classroom strategy

Source	Type III Sum of Squares	Df	Mean Square	F	Sig
Corrected Model	2102.811a	2	1051.405	18.297	.000
Intercept	1068.583	1	1068.583	18.596	.000
Pre-test	2082.063	1	2082.068	36.233	.000
Methods	2.116	1	2.116	.037	.849
Error	2988.098	72	57.463		
Total	292375.000	75			
Corrected Total	5090.909	74			

Source: Field Survey 2022

Table 6 shows that there was no significant difference between male and female mean achievement scores of student taught Basic Technology with flipped classroom (F_1, 72, 0.7, P>.05). Hence the null hypothesis was upheld.

Discussion of Findings

Table 1 above showed that at pre-test the mean achievement scores of the students taught with flipped classroom and traditional method were 27.45 with standard deviations of 9.76 and 4,82 respectively. This result indicated that the students taught with flipped classroom achieved higher than the students taught with discussion method. In view of the above, the flipped classroom teaching strategy proved superior to the traditional method in enhancing students' achievement scores of students taught Basic Technology. The result showed that there is significant difference between the mean achievement scores of students taught Basic Technology using flipped classroom strategy and traditional method. The null hypothesis was rejected at .05 level of significance. The finding of the study is in agreement with Akabo (2016) who observed that students taught using flipped classroom strategy of blended learning performed higher than those taught using blended learning laboratory rotation model.

Table 2 showed mean and standard deviation on the difference in the mean scores of male and female students taught Basic Technology using flipped classroom strategy. It showed that the male had a pretest mean score of 55.50 and SD= 8.24, posttest mean score of 72.83 and SD = 10.56 while the female had a pretest mean score of 54.40, SD=8.21 with post-test mean score of 71.60 and SD= 8.75. This means that male students had higher achievement than the female students in terms of academic achievement. Table 4 showed the Summary of ANCOVA on the difference in the mean achievement scores of Male and female students taught Basic Technology using flipped classroom strategy. The result showed that there is no significant difference in the mean achievement scores of male and female students taught Basic Technology using flipped classroom strategies (F1, 72,= .037, P=.849) (P>0.05). The null hypothesis was upheld at .05 alpha level. The study of Shank (2014) on impact of blended learning on physics students' performance revealed that the experimental group performed better than the conventional group in terms of academic performance also that there is no significant difference between the mean performance scores of male and female students in physics.

Conclusion

Based on the data analyzed the following recommendations were made

➢ Students taught with flipped classroom performed better than those taught with traditional learning method.

➢ The results showed that flipped classroom enhanced the achievement of both male and female for both male and female students than the traditional learning method.

Recommendations

- Basic Technology teachers should be encouraged to adopt blended learning approach especially flipped classroom strategy because it will help to improve students' academic performance.
- Students should be encouraged to study together irrespective of their gender to eliminate gender biases.

Reference

1. Afolabi, L. A. & Adeleke, K. E. (2010). Instructional materials based lectures in business Education: An Empirical Investigation of Student-Perceived-Novelty and Effectiveness. Communication Quarterly, 71.

2. Akabo. J. A. (2016). The effect of blended learning instructional approach on secondary school students' academic achievement in geography in Akure, Ondo State, Nigeria.

3. Bergmann, J., & Sams, A. (2012). Flip your classroom: Reach every student every day. International Society for Technology in Education.

4. Borich, C. D. (2004). *Effectiveness teaching methods*, fifth edition. Pearson Maxwell Prentice Hall.

5. Calinten, A. F (2015). *Getting started with blended learning.* Griffith Institute of higher education press.

6. Davies, R. S., Dean, D. L., & Ball, N. (2013). Flipping the classroom and instructional technology integration in a college-level information systems spreadsheet course. *Journal of Educational Technology Research Development*, *61*, 563-580.

7. Danker, B. (2015). Using Flipped classroom approach to explore deep learning in large classrooms. *The IAFOR Journal of Education, 3*(1), 171-186.

8. Dele, O.A. (2015). Students and Teachers' perception of the causes of poor academic performance in Ogun State secondary schools. *European Journal of Sciences*, 2(13), 22-42.

9. Ezeocha, D. K. (Vanguard Newspaper 9, 2012). *Implementation of universal basic education.*

10. Federal Republic of Nigeria (2013). National policy on education (Revised) NERDC Press.

11. Flipped Learning Network (2014). *What is a Flipped Learning?* http://fln.schoolwires.net/cms/ ty/Domain/46/FLIP_handout_FNL_Web.pdf

12. THE FLIPPED CLASSROOM TEACHING MODEL AND ITS USE FOR INFORMATION LITERACY INSTRUCTION

13. Jensen J. L., Kummer, T. A., & Godoy P. D. d. M. (2015). Improvements from a flipped classroom may simply be the fruits of active learning. *CBE-Life Sciences Education, 14,* 1–12.

14. Ogbagi, D.I (2017).Teachers Perception and Utilization of Instructional Materials types, Principles and Selection.*Global Journal of Educational Research 16(1):* 95-100

15. Obed, O. O. & Tom, C. C. (2020). Effect of problem-based teaching technique on students' performance in refrigeration craft in technical Colleges in Rivers *International Journal of Innovative Psychology & Social Development, 8(1), 28-36.*

16. Osuafor, A. M. & Orji, C. J. (2017). Effect of problem-solving technique on secondary school students' academic achievement in selected topics in algebra. *Elixir Education Technology, 107*(7) 47250-47253.

17. Sethy, M. P. (2008). *Availability of resources for the teaching of science subject in public secondary schools. A case study of some selected secondary schools in Isu Local Government.* [Unpublished masters' thesis]. University of Nigeria, Nsukka

18. Shank, A.L. (2014). *A Compendium of basic principles and practices of general and special education.* Deobe International Publishers

19. Taiwo, C. O. (2014). The Nigerian education system: Past, present and future. Academy Press Ltd