

Use of Flipped Classroom Instructional Strategy for Improving Students' Academic Achievement in Colleges of Education

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Abstract

The increasing use of social media by students in tertiary institutions is posing challenges on the effectiveness of traditional lecture method and students' learning outcome. Students nowadays, have become socially diversified and spend more time on social media at the expense of individual learning. Hence, there is the need for incorporation of the internet based means of communication into teaching-learning process. Therefore, this study integrated social-media platform into teaching-learning activities in college of education through the use of flipped classroom with specific aim of determining its effect on students' academic achievement. The study adopted a quasi-experimental research design and a sample of 262 Economics students from two Colleges of Education was used. The experimental group was exposed to flipped classroom instruction while the control group was taught using conventional lecture method. Data were collected with the use of an achievement test while descriptive statistics, t-test and ANCOVA were used to analyze data. Findings from the study revealed a significant difference between the mean achievement scores of students taught Economics using flipped classroom instruction and those taught using conventional lecture method ($p = 0.00 < 0.05$). Also, ability was found to have significant effect on academic achievement ($p = 0.00 < 0.05$) of students in the flipped class. However, the study revealed that the effect of gender on academic achievement of students taught with flipped classroom instructional strategy was not significant ($p = 0.765 > 0.05$). Thus, it was concluded that flipped classroom instruction enhanced students' academic achievement more than conventional lecture method based on these findings. Therefore, the study recommended the use of flipped classroom in colleges of education for improvement of students' academic achievement.

Keywords: Flipped classroom, Quasi experiment, Students' academic achievement, Colleges of education

1. Introduction

Teaching method plays an important role in the teaching process. It links the learners, subject matter and the teachers. Also, teaching method is one of the major determinants of learners' academic performance (Namale Upoalkpajor & Ayambire, 2021; Ononye & Obiakor, 2020). Though, there are different instructional methods used by teachers to achieve desired learning outcome, lecture is one of the oldest and most widely used. Despite the fact that, lecture is mostly described as a one way instructional technique, that is, a teacher-centered instructional method in which students play passive role, the method remains dominant in post-secondary institutions. The method is believed to be more convenient with a larger class and more appropriate in meeting the needs of particular audiences especially those who learn by listening (Goffe & Kauper, 2014). However, students nowadays have become socially diversified with information and communication technology playing a major role in the way they learn. Specifically, the advent of social media

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poses more challenges in the use of tradition teaching methods. Some studies showed that much engrossment in the usage of social media by students has negative impact on class attendance, concentration in the class activities (Tamayo & Dela Cruz, 2014) and overall academic performance (Alwagait, Shahzad & Alim, 2015; Hasnain, Nasreen & Ijaz, 2015). While other studies revealed a positive impact on learning outcome (Alam & Aktar, 2021; Sangwan, 2019). Consequently, education scholars are increasingly advocating for more flexible education deliveries that are student-centered, engaged students actively and integrate social media in teaching (Norman & Wills 2020; Tsai, Liao, Chang & Chan, 2020). This quest has led to development of several instructional strategies that are learner-centered and technology-driven. Flipped classroom (FC) is one of the best innovative teaching approaches in the recent. This is because, in flipped classroom, the onus of learning is being passed to the students while the teacher plays the role of resource provider. The FC is a teaching strategy where learners get exposed to new contents outside the class through video or audio lectures mostly online while the class time is used for active learning activities with the teacher as a guide. Students view short video lectures outside the class before the class time, while the class session is used for discussion, question and answer, exercises and projects. Thus, those parts of a course that are used to be classified as homework are now been done in the class (Bergmann & Sam, 2012). The online video lectures make learning more personalized; provide the learners with more control over their learning and learners become more engaged actively in teaching-learning process. While the face-to-face class time addresses the communication gap between learners and instructor that characterized most online learning (Hew, Huang, Du & Jia, 2021). Also, flipped classroom helps teachers to better meet learners' needs by moving learning from group learning pace to the individual learning pace (Hamdan et al., 2013; Johnson & Renner, 2012; Norman & Wills, 2020). Flipped classroom instructional strategy essentially involves motivating learner to make ready for the lesson ahead of class. Hence, the class turns into a more productive setting in which learners get more detail on what they have already studied before the class time.

Various studies have been carried out on effects of flipped classroom at different education levels such as universities (Duygu & Ali, 2018), secondary schools (Gambari, Shittu, Ogunlade & Osunlade, 2017; Makinde & Yusuf, 2018; Zaher et al., 2016) and KG-12 (Gerald, 2014). Findings from these studies revealed the potential of flipped classroom to enhance learners' academic achievement (Al Naabi, 2020; Bhagat, Chang & Chang, 2016; Crouch, 2014; Gerald, 2014; Martinez-Jimenez & Ruiz-Jimenez, 2020; Palazon-Herrera & Soria-Vilchez, 2021; Van Alten, 2019), motivation, satisfaction and attitude towards learning (Duygu & Ali, 2018; Martinez-Jimenez et al, 2020; Sirakaya & Ozdemir, 2018; Tsai et al., 2020). Also, flipped classroom ease the use of technology based learning, fosters collaboration among learners and encourages individual learning (Bachiller, & Badia, 2020; Bergmann & Sams, 2012; Chang & Chan, 2020; Parra-Gonzalez et al., 2021; Emine, 2018; Gladys & Cheta, 2015; Palazon-Herrera & Soria-Vilchez, 2021; Yutaka, 2019). However, some studies presented no significant effect on learning outcome and showed that learners were less satisfied in flipped classroom (Bachiller & Badia, 2020; Findlay-Thompson & Mombourquette, 2013; Talbert, 2012). Similarly, studies revealed that students' gender has no effect on their academic achievement when taught using flipped classroom (Gambari et al, 2016; Gerald, 2014).

The fore going shows that effects of flipped classroom on students' academic achievement have not been sufficiently established in the reviewed studies. Also, there is need for investigation on the applicability and effectiveness of FC in Colleges of Education (CoEs). Additionally, examining the effect of students' ability in flipped classroom approach is also required. These formed the bases for this study. Thus, the intent of the study was to; establish the effect of flipped classroom on students' academic achievement in Colleges of Education, determine what would be the effect of students' gender and investigate whether students' ability would have effect on the academic achievement when flipped classroom is used.

In Nigeria CoEs are teacher training institutions responsible for training of prospective teachers and awarding of Nigeria Certificate of Education (NCE), the country's minimum qualification for teaching. Over the years, these education institutions have played significant role in training and retraining of non degree teachers for basic education. In the recent, misuse of social media by CoEs' students is having negative impact on their learning outcome. This poses a serious challenge in our educational development because failure at this educational level amount to failure of the whole education system. This unimpressive students' academic achievement implies that there are problems in teaching-learning process at these institutions which are yet to be fixed. Previous studies revealed that the use of teacher-centered method by the teachers and the negative influence of social media on students contributed to the persistent unsatisfactory learning outcomes in the locus of focus for this study (Adesegun et al, 2016; Oladebinu et al., 2018). Hence, there is the need for the introduction of instructional approaches that will be student-centered and as well integrated social media in teaching. Flipped classroom is one of the most recent innovative instructional approaches that is learner-centered approach and as well complied with the technology advancement. Flipped classroom promotes individual learning pace among students, fosters collaboration and has significant effect on academic achievement (Yutaka, 2019; Bergmann & Sams, 2012; Mok, 2014; Goodwin & Milter, 2013; Al Naabi, 2020; Palazon-Herrera et al, 2021; Parra-Gonzale et al, 2021). However, some studies on flipped classroom revealed no significant effect (Bachiller & Badia, 2020; Findlay-Thompson & Mombourquette, 2013; Talbert, 2012; Tsai et al, 2020). In addition, most of the previous studies on this innovative instructional strategy were not conducted in Nigeria and the few ones that were carried out in the country focused on university and secondary education (Makinde & Yusuf, 2018; Gambari, et al, 2017; Gambari et al., 2016). Therefore, there is the need to study this innovative instructional strategy at College of Education level, considering the significance of these institutions in national development, especially in education sector in Nigeria.

2. Method

2.1 Research Design

The study adopted quasi experimental design without randomization. This was to prevent interruption of normal school activities. The study comprised two groups, experimental group (EG) and control group (CG). The EG was exposed to the use of flipped classroom instruction while the CG was taught with the use of conventional lecture method. The design is illustrated as:

E: EO₁ X EO₂ EO₃
 C: CO₁ - CO₂ CO₃

E = Experimental group, C = Control group, O₁ = Pretest, O₂ = Posttest, X = Flipped classroom, - = Conventional lecture method

Also, the research design has gender and ability as independent moderator variables. This enabled the researcher to control the effects of these variables. The design is represented in Table 1.

Table 1 Design of the study with gender and ability as moderator variables

Pretest	Ability Streaming	EG		CG		Dependent Variables
		M	F	M	F	
262 Students	High	20	24	16	17	Students' Achievement in Economics
	Average	25	35	23	26	
	Low	17	25	13	21	

2.2 Participants

A total of 262 students drawn from NCE II Economics students for 2021/2022 academic session participated in the study. This comprised 114 males and 148 females. The experimental group has a total number of 146 students (62 males and 84 females) while the control group comprised 116 students (52 males and 64 females). Two public CoEs in Kwara state, Nigeria were selected randomly by lucky dip and assigned to experimental and control groups. The rationale was to control the possibility of interaction effect. Table 3 shows the distribution of participants by gender.

Table 2 Distribution of participants by gender

S/N	Colleges	Group	Number of Students		Total
			Male	Female	
1	CoE, Ilorin	EG	62	84	146
2	CoE, Oro	CG	52	64	116
Total			114	148	262

2.3 Data Collection Instrument

Macroeconomics Achievement Test (MAT) was developed by the researcher to collect data. The test items were generated from Macroeconomics course content for NCE as approved by National Commission for Colleges of Education (NCCE), (2012). The reliability of the instrument was determined with the use of Kuder Richardson (K-R₂₁) statistical method and internal consistency co-efficient of 0.81 was obtained. The average item difficulty index was 0.47 while the average item discriminating power was 0.51.

2.4 Experimental Procedure

Permission was obtained from departments of Economics in the two selected colleges before the experimental treatment. To control the extraneous variable (experimenter effect) and ensure homogeneity of the instructional and testing procedure, the teaching of the two groups was done by the researcher. The two groups were pretested by the researcher using MAT, in order to establish same entry behaviour. The result of the pretest was analyzed using t-test statistical method to determine similarity in students' ability. The two groups had similar ability before the treatment. Table 3 presents the mean, standard deviation and t-test for the two groups.

Table 3 Mean, Standard Deviation and T-test for students' pretest with MAT

Group	No	Mean	SD	Df	T	Sig
COE, Ilorin	146	10.53	4.405	2	11.527	0.125
COE, Oro	116	11.48	5.28			

Table 3 shows a relatively close mean and standard deviation values for students of the two colleges in the pretest. This implies that the two groups were not far from each other in terms of academic ability prior to the treatment. Similarly, the p value (0.125) is more than 0.05 alpha level which indicates a non significant difference between the mean pretest scores of students in the two colleges. Thereafter, assigning of students into experimental and control groups was done randomly. Also, students were classified into three ability groups (high, average and low) based on the scores obtained from pretest.

Students in the experimental group had two class meetings per week (Monday and Thursday) for an hour each. In the first class meeting (week 1: lesson 1), the class was grouped into smaller units and students' phone numbers were collected. The researcher created a WhatsApp group named Macro Economics Flipped Classroom 2022 (MEFC22) and added the students' phone numbers as participants. Lecture videos were posted on the WhatsApp platform (MEFC22) for students to watch before the class. The choice of WhatsApp was informed by the fact that, it is more popular among the subjects of the study, easier to be accessed and the videos can be watched on multiple devices like smart phone, ipad or laptop.

Series of video lectures of 3-5 minutes were recorded by the researcher using smart phone camera and Inshot video editor application was used for necessary editing. The researcher decided to use this low technology because it is easier to use, straightforward and saves time. The first video lecture (3 minutes 35 seconds) was on nature and scope of Macroeconomics. It focused on the meaning of macroeconomics, macroeconomic objectives and policy. The video was posted online via MEFC22 two days before the second class meeting. This was to give the students enough time to watch the video before coming to class. The class time (week 1: lesson 2) was used for active learning. Students gave their summary of the content watched and asked questions based on the topic. These summaries and questions were used to stimulate classroom discussion with the teacher as a guide. The second video lecture (4 minutes 10 seconds) was on national income and focused on meaning of national income, some basic concepts and approaches to national income measurement. The video was also posted through MEFC22 two days before the third class meeting for students to watch. The class time (week 2: lesson 1) was devoted for questions and answers and discussion based on the topic, the teacher played the role of facilitator. The third video lecture (3 minutes 52 seconds) was a continuation of national income and focused on problems of national income measurement and circular flow of income. The video was posted through MEFC22 two days before the fourth class meeting while the class time (week 2: lesson 2) was used for discussion and questions and answers based on the topic. The fourth video lecture (4 minutes 5 seconds) was on theory of consumption and focused on meaning of consumption, relationship between consumption and national income, APC and MPC. The video was posted online through MEFC18 for students to watch before class time. During the class time (week 3: lesson 1), students explained the content watched in the video as they understood it. The teacher briefly gave further explanation on the topic and thereafter guided the students through questions and answers session. The fifth video lecture (5 minutes 3 seconds) was a continuation of theory of consumption and focused on Keynes's psychological law of consumption, absolute income hypothesis and determinants of consumption. The video was posted through MEFC22 for students to watch two days before the sixth class meeting while the class time (week 3: lesson 2) was used for discussion and questions and answers based on the topic with students at the center of the activities. The sixth video lecture (3 minutes 45 seconds) was on investment and focused on meaning of investment, types of investment (fixed, inventory and replacement) and determinants of investment. The video was also posted through MEFC22 two days before the class meeting for students to watch. The class time (week 4: lesson 1) was devoted for questions and answers and discussion based on the topic, the teacher played the role of facilitator. The seventh video lecture (3 minutes 40 seconds) was on inflation. It focused on the meaning of inflation, causes of inflation and effects of inflation on economy. The video was posted online via MEFC22 two days before the eighth class meeting. In class time (week 4: lesson 2) students gave their summary of the content watched and asked questions based on the topic. Students' summaries and questions were used as basis for classroom discussion with the teacher as a guide.

However, students in the control group had one class meeting per week (every Wednesday) for two hours each. They were taught the same macroeconomics topics (nature and scope of macroeconomics, national income, theory of consumption, investment and inflation) by the researcher using conventional lecture method. The treatment lasted for four weeks. Immediately after the treatment, MAT items were

rearranged and administered on students both in experimental and control groups as posttest. Rearrangement of items was to reduce the memory effect. The posttest was conducted to determine students' academic achievement in Economics after treatment.

2.5 Data Analysis

Data were analyzed with the use of descriptive statistics (means and standard deviations) and ANCOVA with pretest as covariate at 0.05 alpha with SPSS 21 package.

3. Results

Students' pretest and posttest scores from the two groups were used to compute arithmetic means and standard deviations to find their academic achievement. The result is presented in table 4.

Table 4 Descriptive statistics for students' academic achievement for both experimental and control group

Groups	Treatment	No	Pre-test		Post-test		Achievement Gain
			\bar{X}	SD	\bar{X}	SD	
EG	Flipped classroom	146	10.56	4.41	46.85	12.96	36.29
CG	Control Group	116	11.48	5.28	31.62	13.86	20.14

Table 4 shows that students in experimental group (EG) had higher mean post-test score of 46.85 and lower standard deviation of 12.96, while students in control group (CG) had lower mean post-test score of 31.62 and higher standard deviation of 13.86. The experimental group's achievement gain is 36.29, while CG has achievement gain of 20.14 as revealed in the result. This implies that the academic achievement of students in the flipped classroom is higher than those in conventional lecture class. ANCOVA was used to determine whether the difference observed is significant. Table 5 presents the result.

Table 5 Differences between the two groups in terms of achievement mean scores

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	58004.810 ^a	2	29002.405	2193.688	0.000	0.944
Intercept	3978.396	1	3978.396	300.919	0.000	0.537
Pretest	43013.797	1	43013.797	3253.484	0.000	0.926
Group	20046.503	1	20046.503	1516.280	0.000	0.854
Error	3424.198	259	13.221			

a. R Squared = 0.944 (Adjusted R Squared = 0.944)

Table 5 shows that $p = 0.000$ is less than 0.05 alpha level, this indicates a statistically significant difference between achievement mean scores of students taught using flipped classroom instruction and those taught using lecture method in favour of flipped classroom. Also, the effect size value (0.854) implies that 85.4% of the difference in the mean achievement scores of students is attributed to the treatment.

Additionally, to determine the achievement of students in the flipped class based on gender, descriptive statistics for male and female students' scores were computed using the pretest and posttest scores. The result obtained is presented in table 6.

Table 6 Descriptive Statistics for Students' Achievement Mean Score Based on Gender (EG)

Groups	Gender	No	Pretest		Posttest		Achievement Gain
			\bar{X}	SD	\bar{X}	SD	
EG	Male	62	10.90	4.49	47.81	12.90	36.91
	Female	84	10.31	4.35	46.14	13.03	35.83

Table 6 shows that male students had mean posttest score of 47.81 and SD of 12.90 while their female counterparts had 46.14 mean posttest score and 13.03 SD. Also, the male students had 36.91 achievement gain while the female students had 35.83 achievement gain. Thus, the male students had a slightly higher achievement gain than the female students.

To determine whether the difference is significant, ANCOVA was used to compare the mean achievement scores for male and female students. The result obtained is presented in Table 7.

Table 7 Test of ANCOVA for Students' Achievement Mean Scores Based on Gender

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	37966.451 ^a	2	18983.225	209.553	0.000	0.618
Intercept	6677.130	1	6677.130	73.708	0.000	0.222
Pretest	37852.090	1	37852.090	417.844	0.000	0.617
Gender	8.144	1	8.144	0.090	0.765	0.000
Error	23462.557	259	90.589			

a. R Squared = 0.618 (Adjusted R Squared = 0.615)

Table 7 shows that $p = 0.765$ is more than 0.05alpha level. This indicates that the difference between male and female students' mean achievement scores in the flipped class is not statistically significant.

Also, descriptive statistics was used to estimate academic achievement based on students' ability. The result obtained is presented in Table 8.

Table 8 Descriptive Statistics for Students' Achievement Mean Scores Based on Ability (Experimental Group)

Group	Ability	No	Pretest		Posttest		Achievement Gain
			\bar{X}	SD	\bar{X}	SD	
EG	H	44	16.09	1.97	62.95	4.83	46.86
	A	60	9.90	1.89	45.87	5.01	35.97

L	42	5.71	1.37	31.38	2.88	25.67
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Table 8 shows that high ability students had 46.86 achievement gain while that of average ability students is 35.97 and the low ability students had 25.67. This implies that the high ability students gained more than average ability and low ability students. To determine whether the difference is statistically significant, achievement scores were compared using ANCOVA. The result obtained is presented in Table 9.

Table 9 Test of ANCOVA for Students' Achievement Mean Scores Based on Ability

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	42344.783 ^a	3	14114.928	190.820	0.000	0.689
Intercept	9135.138	1	9135.138	123.498	0.000	0.324
Pretest	924.146	1	924.146	12.494	0.000	0.046
Ability	4386.477	2	2193.238	29.650	0.000	0.187
Error	19084.224	258	73.970			

Table 9 shows that $p = 0.000$ is less than 0.05 alpha level. This means that, in flipped class, the differences in students' mean achievement scores based on ability is statistically significant.

4. Discussion

The study adopted a quasi-experimental research design specifically a non-randomized pretest, posttest, control group design to investigate the effect of flipped classroom instructional strategy on students' academic achievement in colleges of education. The study showed that academic achievement of students exposed to flipped classroom instructional strategy was significantly higher than those of their counterparts in lecture method class. Thus, there was statistically significant difference between the mean achievement scores of students taught Economics using flipped classroom and those taught using conventional lecture method. This is in consonance with previous findings (Al Naabi, 2020; Bhagat et al., 2016; Crouch, 2014; Duygu and Ali, 2018; Gambari, et al, 2016; Gambari, et al, 2017; Gerald, 2014; Makinde & Yusuf, 2018; Martinez-Jimenez & Ruiz-Jimenez, 2020; Palazon-Herrera & Soria-Vilchez, 2021; Sirakaya & Ozdemir, 2018; Van Alten, 2019; Zaher, et al, 2016). However, this result contradicts the findings of Johnson and Renner (2012) and Emine (2018) who reported that there was no significant difference between the mean achievement scores of students in flipped class and those in lecture method class.

Furthermore, the study found a significant difference between the mean achievement scores of Economics students in flipped class when segregated by ability. This means that ability has significant impact on students' learning outcome in flipped classroom instructional strategy. This improvement in students' academic achievement could be as a result of the fact that flipped classroom method enhanced students' active participation in learning process. However, it was discovered that in flipped classroom, mean achievement scores were not affected by students' gender. This indicated that the difference between male and female students' mean scores is not significant. This finding is consistent with the reports of Gerald (2014) and Gambari, et al, (2016). This could be ascribed to the fact that there was no bias for gender as the instructional condition was relatively similar.

5. Conclusion

Based on the results, the following conclusions were drawn: Flipped classroom method is more effective in enhancing students' achievement in Economics than conventional lecture method. This agrees with previous studies (Al Naabi, 2020; Bhagat et al., 2016; Gambari, et al., 2017; Makinde & Yusuf, 2018; Martinez-Jimenez & Ruiz-Jimenez, 2020; Palazon-Herrera & Soria-Vilchez, 2021; Van Alten et al., 2019). Similarly, flipped classroom enhances students' active participation in Economics class. This as well concurs with the findings of Duygu and Ali, 2018, Sirakaya and Ozdemir 2018 and Zaher, et al., 2016. Also, ability was found to have significant effect on students' achievement when exposed to flipped classroom. However, students' learning outcome was not affected by their gender when used flipped classroom instructional strategy. This finding is consistent with reports of previous studies (Gerald 2014; A. Gambari, et al., 2016). Based on the findings of this study, the researcher recommended that the use of flipped classroom instructional strategies should be encouraged in all teacher training institutions.

Funding

The author expressed his appreciation to the Tertiary Education Trust Fund (TETFUND), Abuja, Nigeria for funding this study through Institution Based Research (IBR) grant.

Declaration of Conflict

The authors declare that they have not known competing financial or personal relationship that could have appeared to influence the work reported in this paper.

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