

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 to the effectiveness of traditional lecture methods and students' learning outcomes. Students nowadays have become socially diversified and spend more time on social media at the expense of individual learning. Hence, there is a need for the incorporation of the internet-based means of communication into the teaching-learning process. Therefore, this study integrated social-media platforms into teaching-learning activities in the college of education through the use of flipped classrooms with the 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 the 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 methods ($p = 0.00 < 0.05$). Also, the ability was found to have a significant effect on the academic achievement ($p = 0.00 < 0.05$) of students in the flipped class. However, the study revealed that the effect of gender on the academic achievement of students taught with a 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 the conventional lecture method based on these findings. Therefore, the study recommended the use of flipped classrooms in colleges of education for the improvement of students' academic achievement.

Keywords: colleges of Education, flipped classroom, quasi-experiment, students' academic achievement

Introduction

The teaching method plays an important role in the teaching process. It links the learners, the subject matter, and the teachers. Though there are different



instructional methods used by teachers to achieve desired learning outcomes, lecture is one of the oldest and most widely used. Even though, the lecture is mostly described as a one-way instructional technique, that is, a teacher-centered instructional method in which students play a 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 for 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 poses more challenges to the use of traditional teaching methods. Some studies showed that much engrossment in the usage of social media by students harms class attendance, concentration in class activities, and overall academic performance. Consequently, education scholars are increasingly advocating for more flexible education deliveries that are student-centered, engage students actively, and integrate social media in teaching (Norman & Wills 2020; Tsai, Liao, Chang, & Chan, 2020). This quest has led to the development of several instructional strategies that are learner-centered and technology-driven.

The flipped classroom (FC) is one of the best innovative teaching approaches in recent. This is because, in a 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 content 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 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). Online video lectures make learning more personalized; provide the learners with more control over their learning and learners become more engaged actively in the teaching-learning process. Face-to-face class time addresses the communication gap between learners and instructors that characterizes most online learning. Also, a flipped classroom helps teachers to better meet learners' needs by moving learning from a group learning pace to an individual learning pace (Hamdan et al., 2013; Johnson & Renner, 2012; Norman & Wills, 2020). The flipped classroom instructional strategy essentially involves motivating learners to get 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 the flipped classrooms at different education levels such as universities (Duygu & Ali, 2018), secondary schools (Atwa et al., 2016; Gambari, Shittu, Ogunlade, & Osunlade, 2017; Makinde & Yusuf, 2018) and KG-12 (Gerald, 2014). Findings from these studies revealed the potential of the 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 classrooms ease the use of

technology-based learning, foster collaboration among learners, and encourage 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, 2016). However, some studies presented no significant effect on learning outcomes and showed that learners were less satisfied in flipped classrooms (Bachiller & Badia, 2020; Findlay-Thompson & Mombourquette, 2013; Talbert, 2012). Similarly, studies revealed that students' gender does not affect their academic achievement when taught using a flipped classroom (Gambari et al., 2016; Gerald, 2014).

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

In Nigeria, CoEs are teacher training institutions responsible for training prospective teachers and awarding of Nigeria Certificate of Education (NCE), the country's minimum qualification for teaching. Over the years, these educational institutions have played a significant role in training and retraining of nondegree teachers for basic education. In the recent, the misuse of social media by CoEs' students has had a negative impact on their learning outcomes. This poses a serious challenge in our educational development because failure at this educational level amounts to failure of the whole education system. This unimpressive student's academic achievement implies that there are problems in the teaching-learning process at these institutions that are yet to be fixed. Previous studies revealed that the use of the 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 a need for the introduction of instructional approaches that will be student-centered and as well integrate social media into teaching. The 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 a significant effect on academic achievement (Al Naabi, 2020; Bergmann & Sams, 2012; Goodwin & Milter, 2013; Mok, 2014; Palazon-Herrera et al., 2021; Parra-Gonzalez et al., 2021; Yutaka, 2016). However, some studies on flipped classrooms 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 (Gambari, et al., 2017; Gambari et al., 2016; Makinde & Yusuf, 2018). Therefore, there is a need to study this innovative instructional strategy at the College of Education level, considering the

significance of these institutions in national development, especially in the education sector in Nigeria.

Method

Research design

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

Participants

A total of 262 students drawn from NCE II Economics students for the 2021/2022 academic session participated in the study. This comprised 114 males and 148 females. The experimental group had 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 the 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

Data collection instrument

The 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 the National Commission for Colleges of Education (NCCE), (2012). The reliability of the instrument was determined with the use of the Kuder Richardson (K-R₂₁) statistical method and an internal consistency coefficient of 0.81 was obtained. The average item difficulty index was 0.47 while the average item discriminating power was 0.51.

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, to establish the same entry behaviour. The result of the pretest was analyzed using the t-test statistical method to determine similarity in students' abilities. The two groups had similar abilities 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 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 before the treatment. Similarly, the p-value (0.125) is more than 0.05 alpha level which indicates a nonsignificant difference between the mean pretest scores of students in the two colleges. Thereafter, the 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 the 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 access and the videos can be watched on multiple devices like a smartphone, iPad, or laptop.

A series of video lectures of 3-5 minutes were recorded by the researcher using the smartphone camera and the 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 the 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 the meaning of national income and 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 to 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 and 5 seconds) was on the theory of consumption and focused on the meaning of consumption, the relationship between consumption and national income, APC, and MPC. The video was posted online through MEFC18 for students to watch before class time. During 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 the questions and answers session. The fifth video lecture (5 minutes 3 seconds) was a continuation of the 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 the 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 to 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, the causes of inflation, and the effects of inflation on the 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 the 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 the conventional lecture method. The treatment lasted for four weeks. Immediately after the treatment, MAT items were rearranged and administered to students both in experimental and control groups as posttest. The rearrangement of items was to

reduce the memory effect. The posttest was conducted to determine students' academic achievement in Economics after treatment.

Data analysis

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

Findings and Discussion

Findings

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 the experimental group (EG) had a higher mean post-test score of 46.85 and a lower standard deviation of 12.96, while students in the control group (CG) had a lower mean post-test score of 31.62 and a higher standard deviation of 13.86. The experimental group's achievement gain is 36.29, while CG has an 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 classes. 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 the lecture

method in favor 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 $\bar{X}$	SD	Posttest $\bar{X}$	SD	Achievement Gain
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 a mean post-test score of 47.81 and an SD of 12.90 while their female counterparts had a 46.14 mean post-test score and 13.03 SD. Also, the male students had a 36.91 achievement gain while the female students had a 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 were used to estimate academic achievement based on students' abilities. 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 $\bar{X}$	SD	Posttest $\bar{X}$	SD	Achievement Gain
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

Table 8 shows that high-ability students had a 46.86 achievement gain while that of average-ability students was 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			

a. R Squared = 0.689 (Adjusted R Squared = 0.686)

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

Discussion

The study adopted a quasi-experimental research design specifically a non-randomized pretest, posttest, and control group design to investigate the effect of flipped classroom instructional strategy on students' academic achievement in colleges of education. The study showed that the academic achievement of students exposed to flipped classroom instructional strategy was significantly higher than that of their counterparts in lecture method classes. Thus, there was a statistically significant difference between the mean achievement scores of students taught Economics using a flipped classroom and those taught using the conventional lecture method. This aligns with previous findings (Al Naabi, 2020; Atwa et al., 2016; 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). 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 classes and those in lecture method classes.

Furthermore, the study found a significant difference between the mean achievement scores of Economics students in flipped classes when segregated by ability. This means that ability has a significant impact on students' learning outcomes in flipped classroom instructional strategy. This improvement in students' academic achievement could be a result of the fact that the flipped classroom method enhanced students' active participation in the learning process. However, it was discovered that in flipped classrooms, 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.

Conclusion

Based on the results, the following conclusions were drawn: The flipped classroom method is more effective in enhancing students' achievement in Economics than the 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, a 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 Atwa et al., 2016. Also, the ability was found to have a significant effect on students' achievement when exposed to flipped classrooms. However, students' learning outcome was not affected by their gender when using the 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.

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