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EFFECTS OF FLIPPED CLASSROOM ON STUDENTS ACADEMIC ACHIEVEMENT IN GEOGRAPHY IN ABIA STATE

Oviosun Benedicta Aina[1] A. O. Ovute[2] I. O. Eluwa[3]
Correspondence email address: *Joyfuldicta4@gmail.com*
Science Education, Michael Okpara University of Agriculture Umudike

Abstract: *The study investigated the effects of Flipped Classroom on Students' Academic Achievement in Geography in Abia State. The study was guided by two research questions and two hypotheses. A quasi-experimental research design was adopted for the study. The population of the study comprised 1,883 Senior Secondary III (SS3) students offering Geography in Abia State, from which a sample of 64 SS3 Geography students was selected using a multistage sampling procedure. Urban Land Use Map Reading Geography Achievement Test (ULMGAT) was instrument for data collection. The reliability of ULMGAT was established using the Kuder-Richardson 20 (KR-20), which yielded a reliability coefficient of 0.88. Data collected were analysed using mean, standard deviation and ANCOVA for research questions and hypotheses. The finding revealed that students taught using the Flipped Classroom Method recorded the highest achievement, than students taught using the Lecture Method, with a statistically significant difference among the groups. No significant difference was found between male and female students' achievement that was taught using the Flipped Classroom Method. The study concluded that Flipped Classroom Method was the most effective instructional approach for teaching map reading than Lecture Method. It was therefore recommended that Geography teachers should incorporate Flipped Classroom approaches more extensively in teaching Map Reading to promote active participation, practical learning and improved learning outcomes among students.*
Keywords: *Map Reading, Flipped Classroom and Geography Achievement*

Introduction

Geography is the study of the Earth's surface, the processes that shape it, and the relationships between people and their environment. Geography literally "earth description" is a field of Science devoted to the study of the lands, the features, the inhabitants, and the phenomena of the Earth. Geography according to Anyanwu (2018) concerned itself as a subject which concerns itself with the understanding of spatial processes shaping the environment. The contributions of Geography to sustainable National development cannot be overemphasized. This is because it instills in the students a critical, inquiring on how the sun, earth and moon work. At the secondary school level, geography stands on a tripod. The three sub-divisions are physical Geography, human and regional geography as well as map work. These sub-divisions are interrelated. Physical geography deals with the natural environment while human and regional geography address issues which directly relate to human activities (Amosun & Oderinde, 2020). Map work on the other hand, deals with the representation on paper and analysis of selected geographical information which may be physical or human and regional. The importance of map reading in the National development cannot be overemphasized as it forms the basis of understanding of the subject geography. Maps aid the achievement of the objectives of Geography as it is a convenient inventory of selected information made available for immediate visual inspection, in the form of exact locations and spatial patterns which are manifestations of a variety of relationships (Ofomata, 2018). Okoro (2020), went further to state that the studying of map reading aid in the understanding of the concepts of differential character and spatial relationships of the features on the earth's surface, understand the concept of man-environment relations, develop in students the ability to appreciate the problems and peculiarities of other people, develop critical thinking ability in the students and develop in the students the skills and techniques for accurate, orderly and objective geographical investigation.

Contemporarily, maps are used in almost every field of human endeavours. For instance, they are used in transportation, tourism, town planning, census, military, economic planning among others. Thus Ehrenberg (2020) posits that the uses of a map depend on the type of map and the information it contains. Simple maps contain few information and little or no map reading skills are required to use it. Complex maps according to Ovenden (2021) demand some basic map reading skills on map interpretation as they may contain the exact location of many land form features, actual distance, elevation, vegetation, political divisions, drainage features, cultural features, land use patterns and so on. It is also noted that

topographic map also known as a general reference map because of the variety of information it represents, is the map type use for the O' level geography examinations. Okonkwo (2021) holds that topographic maps show natural features, artificial features, cultural features and political boundaries of a part of the earth's surface. Topographic maps are differentiated from other maps in that they show both the horizontal and vertical positions of the terrain (Martin & Thompson, 2018).

Map reading is the analysis of the representations on a map using the signs and symbols. Therefore, the understanding of the content of a map is dependent on the ability to recognize and interpret the symbols on the map. Map reading is an aspect of the geography curriculum in secondary education. It is taught mostly at the secondary school in Senior Secondary I-2 units. It is imperative to highlight that the map reading section of the O' level geography examinations presents one and the only compulsory question of the examinations.

Despite the significance of interpretation of topographic map features in geography studies show that interpretation of topographic map features is the most difficult section of geography for students (Adetumberu, 2022). It has also been found that many students fear geography because of interpretation of topographic map features and that affects the students' achievement. Oyeieke (2024) in his study of Oranmiyan Local Government Area of Oyo State reported that 62% of senior secondary school students feared Geography because of interpretation of topographic map features. The "WAEC" Chief Examiners' and Moderators' reports (WAEC, 2022) revealed that the candidates would have performed better had it not been for the poor performance in the interpretation of topographic map features section of the subject. The reports stated that in spite of good performance of some candidates, they scored low marks because they were poor in map interpretation. Some studies such as (Okpala, 2017 & Obi, 2019), have identified poor instructional methodology as a major reason why students find interpretation of topographic map features difficult. The poor instructional methodology appears to be associated with the conventional lecture method of learning. In a survey of teachers' methods of teaching Interpretation of topographic map features in Nigeria secondary schools, Arowosegbe (2022) reported that the method of teaching predominately use for teaching interpretation of topographic map features in the lesson they observed was lecture and note or text book dictation. However, flipped classroom may give more opportunity for learners to understand map work in Geography. This is because flipped classroom gives online videos on how map work is carried out. There is thus the need to investigate and confirm the effectiveness of flipped classroom on achievement of students in map-reading. Achino (2019) define academic achievement as the level of individuals' growth in a test when compared with the scores of others of the same level. Saka, *et.al* (2021) define academic achievement as what is measured regarding skills or knowledge develop through specific instruction or training with emphasis on how well instructional objectives have been attained. The poor achievement of students in map reading has been mainly attributed to use of teachers centered approach in teaching. Among the new educational strategies for teaching and learning is flipped classroom instruction. The choice of flipped classroom is because it gives online videos on how map work is carried out for learners to watch and learn out of the class before school hours.

Flipped learning is quite a different approach from the traditional teaching method which requires some changes in teachers and students' roles. Contrary to traditional teaching, flipped learning is a pedagogical approach that aims to have learner gain information outside the classroom which enhance and reinforce their learning in the classroom environment. The flipped classroom is an instructional strategy that provides teachers with a way of reducing the amount of face to face interaction in their teaching exercise while promoting self-paced learning and in-depth engagement with the students and content. According to Milman (2022) flipped learning saves the time of students in order to learn actively and classroom activity will not jeopardize valuable time needed for students to cover the content. It reduces time spent answering basic and repetitive questions due to students' ability to review lectures online; increases adaptation of lecture content to respond to new learning needs (Milman, 2022, & Centre for Digital Education, 2022). Talbert (2022) indicated that flipped classroom gives opportunity to make the students learn more and better.

Since flipped learning has power to meet the necessities of this century and it is clear that flipped learning has great importance for today's learning environments. Hence the researcher wants to find out the effects of flipped classroom and on students' achievement in Geography with particular focus on map reading and gender differences in the achievement.

Gender is a contemporary issue in education. Gender refers to state of being male or female. Findings on effects of gender on students' achievement are inconclusive. For instance, Etim, *et.al* (2016) reported the performance of female students was higher than that of their male counterparts in English Language, Mathematics and Biology. Similarly, Alexander and Maeda (2019) reported the female out-performed their male counterparts in science but no gender difference in Mathematics was observed. Musa, *et.al;* (2025) reported that the performance of male and female were highly improved in Geography achievement, however, Gaubari, *et.al;* (2019) reported that gender did not influence students' performance in individualized and comparative learning but the males performed better than female in competitive instructional strategy. Gender is considered as a factor in this study so as to find out if male and female have difference in achievement when flipped classroom method is used in teaching map reading in Geography.

Research Questions

The following research questions guided the study:

1. What are the mean achievement scores of students taught Map-reading in Geography using flipped classroom method and lecture method in Abia State?
2. What are the mean achievement scores of male and female students taught Map-reading in Geography using flipped method in Abia State?

Hypotheses

The hypotheses were tested at 0.05 level of significance:

HO_1: There is no significant difference between the mean achievement scores of students taught Map-reading in Geography using flipped classroom method and lecture method in Abia State

HO_2: There is no significant difference between the mean achievement scores of male and female taught Map-reading in Geography using flipped method in Abia State

Methodology

The study adopted quasi- experimental research design. Specifically, pretest, treatment and post test non – randomized control group design using intact classes. The study was carried out in Abia State. The population of the study consists of one thousand eight hundred and eight three (1883) Senior Secondary three (SS3) school students offering geography in Abia State. Senor secondary three students were used because having completed two years geography (SS1-SS2) in physical and Human geography aspects, they were considered to have mastered some concepts which are fundamental to the study of Map Reading in Senior Secondary three. The sample for this study was 64 SS3 Geography students. Multistage sampling procedure was used to select the sample for the study. Firstly, one out of the three Education zones of Abia State (i.e Aba, Umuahia and Ohafia) was randomly selected. Hence, Umuahia education zone was sampled. Secondly, two schools were randomly selected from Umuahia education zone. One school was used for experimental while the other one was used for the control group. SS3 classes were purposively selected because map work is in SS 3 scheme of work. Instrument used for data collection was Urban land use map reading Geography Achievement test (ULMGAT) The Achievement Test is a multiple-choice test items adapted from past WAEC and NECO question paper 2023-2025 which covers the concepts of land use aspect of map reading unit of Geography. The achievement test (ULMGAT) is a 50-item multiple choice with four multiple options. Face and content validity were established for urban land use map reading Geography Achievement test (ULMGAT). The instrument was trial tested and being administered to 20 SS3 students in Aba Education zone which is not part of the study schools. The scores obtained from the trial testing were subjected to reliability test using Kuder Richardson 20 (KR_{20}) test statistics with reliability index of 0.88. The researcher used three research assistants for data collection. The research assistants with the researcher administered the pre-test and posttest test to the students. At first the pretest was administered to the students before treatment. At the end of the treatment, the instrument was reshuffled and re- administered to the students as posttest. One

hour was allowed for the test. The test was marked by the researcher using marking guide, scores were collated.

The experiment begins with seeking approval from the school administration to implement the teaching strategies. At first using flipped classroom method for teaching map reading, the researcher prepares instructional materials in advance, including recorded video lessons, PowerPoint presentations, short reading notes, and practice worksheets covering key map reading concepts such as map elements, types of scale, grid references, bearings, contour lines, and conventional symbols. These materials were uploaded to an accessible platform like WhatsApp. Clear instructions are given to students to study the materials at home before the scheduled class session.

Students are directed to watch the recorded lessons, take notes, and attempt short pre-class quizzes designed to assess their initial understanding of map reading concepts. Students are encouraged to write down areas of difficulty or questions that arise while studying the materials independently. Parents are informed about the new instructional approach to ensure support for students' home-based learning.
On the scheduled classroom day, instead of delivering a traditional lecture, the teacher begins with a short review session to clarify misconceptions identified from the online quizzes and students' questions. The majority of class time is then devoted to interactive, practical activities. Students were divided into small groups and given topographic maps to practice identifying map elements, interpreting symbols, calculating distances using scale, determining bearings with protractors, and locating features using four-figure and six-figure grid references. The teacher moves around the classroom facilitating discussion, guiding problem-solving and providing immediate feedback rather than lecturing.

Students engage in collaborative tasks such as solving map-based problems, analyzing contour patterns to identify landforms, and completing timed exercises that require calculating real-world distances from map measurements. After the class activities, students complete a reflective assignment describing what they learned, the challenges they encountered, and how the in-class activities helped deepen their understanding. A post-test is administered after treatment and data gathered was analyzed in line with each research questions and hypotheses. Mean and standard deviation was used to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. For decision rule purposes, the null hypothesis is rejected if p-value (Sig.) is less than 0.05 ($p < 0.05$) otherwise, the null hypothesis is not rejected.

Results and Analysis

Research Question 1: What are the mean achievement scores of students taught Map-reading in Geography using flipped classroom method and lecture method in Abia State?

Table1. Mean and standard deviation achievement scores of students taught Map-reading in Geography using flipped classroom method and lecture method

		Pretest		Posttest		Mean gain
Method	**N**	$\bar{X}$	**SD**	$\bar{X}$	**SD**	**scores**
FLM	31	29.65	4.12	67.82	5.88	38.17
LM	33	30.32	3.36	57.70	4.54	27.38

Where, $\bar{X}$ = mean, SD= Standard deviation, FLM= Flipped method, LM= lecture method.

Table1, Present the mean and standard deviation of the pretest and posttest academic achievement scores of students in Map-reading taught using flipped method (FLM) and lecture method (LM) in Abia State. The results show that students taught using FLM recorded a posttest mean of 67.82 with standard deviation of 5.88, compared with a pretest mean of 29.65 and standard deviation of 4.12, resulting in a mean gain score of 38.17. In contrast, students taught using the Lecture Method (LM) had a posttest mean achievement score of 57.70 with standard deviation of 4.54, increasing from a pretest mean of 30.32 and standard deviation of 3.36 with the lowest mean gain score of 27.38. The two instructional strategies improved students' academic achievement in Map reading. However, Flipped classroom

method recorded high post-test achievement mean than the students taught using Lecture Method (LM). A corresponding hypothesis formulated to further address the research question is:

Hypothesis 1:
There is no significant difference among the mean achievement scores of students taught Map-reading in Geography using flipped classroom method and lecture method in Abia State

Table 2: Analysis of covariance (ANCOVA) of mean achievement scores of students Map-reading in Geography using flipped classroom method and lecture method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected	5360.504 [a]	2	1786.835	65.005	.000
Intercept	9697.152	1	8482.276	352.781	.000
Pretest	3.183	1	3.813	.139	.710
***Strategies**	4648.873	1	2324.436	**84.563**	**.000**
Error	2776.258	61	27.488		
Total	466177.000	64			
Corrected Total	8136.762	63			

a .R Squared=.659 (Adjusted R Squared=.649)

Table 2 revealed that there was a statistically significant difference in the mean achievement scores of Geography students taught Map reading using the two instructional methods, as indicated by the calculated F-value of 84.563 with a corresponding probability value (Sig. = .000), which is less than the alpha level of 0.05. Since the significance value (.000) is less than the 0.05 level of significance, the null hypothesis which stated that there is no significant difference in the mean achievement scores of students taught Map reading using flipped method and lecture method was rejected. Inference drawn is that there was significant difference in the mean achievement scores of students taught Map reading using flipped method and lecture method in Senior Secondary Schools.

Research Question 2: What are the mean achievement scores of male and female students in Map-reading taught Map-reading in Geography using flipped method in Abia State?

Table 3: Mean and standard deviation achievement scores of male and female students in Map-reading taught using flipped method

FLM		Pretest		Posttest		
Gender	**n**	$\bar{X}$	**SD**	$\bar{X}$	**SD**	**Mean gain scores**
Male	17	34.07	7.38	73.71	4.69	39.64
Female	14	36.75	6.06	76.31	5.53	39.56
Effect						**0.08**

Where n= Number of respondents, $\bar{X}$= mean, SD= Standard deviation, FLM= Flipped method

Table 3 results show that male students had a pretest mean achievement score of 34.07 with standard deviation 7.38 and a posttest mean of 73.71 and standard deviation of 4.69, resulting in a mean gain score of 39.64. Female students recorded a pretest mean of 36.75 with standard deviation of 6.06 and a posttest mean of 76.31 and standard deviation of 5.53, with a mean gain score of 39.56. The effect size (mean gain difference) between the two groups was 0.08, indicating a negligible difference in favour of the male students. This suggests that both male and female students benefited almost equally from Flipped method, with no meaningful difference in their academic achievement gains. A corresponding hypothesis formulated to further address the research question is:

Hypothesis 2:
There is no significant difference between the mean achievement scores of male and female students taught Map-reading using flipped method in Abia State

Table 4: Analysis of covariance (ANCOVA) of mean achievement scores of male and female students taught Map-reading using flipped method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected	66.530 [a]	2	33.265	1.230	.308
Intercept	4901.321	1	4901.321	181.240	.000
Pretest	16.125	1	16.125	.596	.447
*Gender	37.729	1	37.729	1.395	.248
Error	730.170	27	27.043		
Total	169997.000	31			
Corrected Total	796.700	30			

Squared=.084 (Adjusted R Squared=.016)

Table 4 The results showed that gender had no significant effect on the academic achievement scores of students taught Map reading using flipped method with F-value of = 1.395, and probability value (P-Value) of = .248. Since the p-value (.248) is greater than the 0.05 level of significance, the null hypothesis is not rejected. Therefore, there is no significant difference in the mean academic achievement scores of male and female students taught Map-reading using flipped method. Any difference observed was as a result of chance.

Discussion of the Findings

The result of the study was discussed according to the research questions and the corresponding hypotheses a follow.

The finding revealed that students taught Map Reading using the Flipped Classroom Method achieved the highest score than those taught using the Lecture Method. The difference among the three groups was statistically significant, with the advantage favouring Flipped Classroom. This finding demonstrates that the instructional method employed in teaching Map Reading can substantially influence students' academic achievement. The finding is consistent with The Samaila et al. (2025) who found positive effects of flipped classroom teaching on Geography achievement. The present finding therefore strengthens the argument that flipped learning can outperform conventional lecture teaching spatially oriented topic such as Map Reading.

The finding also showed that both male and female students taught Map Reading using the Flipped Classroom Method demonstrated substantial improvement in academic achievement, with only a negligible difference in their mean achievement gain scores. The hypothesis further indicated that there was no significant difference between the achievement scores of male and female students taught using the flipped classroom approach. This finding suggests that flipped learning was equally beneficial to male and female students and did not systematically favour one gender in academic achievement. The result is strongly supported by the study of Adebayo and Alagbe (2026), who reported no significant difference between male and female students' achievement under flipped classroom instruction in Financial Accounting in Oyo State. Similarly, Musa, *et.al;* (2025). found that male and female students improved after receiving video-based flipped instruction and that there was no significant difference between their achievement scores. The finding is also compatible with evidence that student-centred flipped learning can reduce conventional achievement disparities between genders.

Recommendations

Based on the findings and educational implications of the study, the following recommendations are made:

1. **Geography teachers should complement classroom teaching with Flipped Classroom Method.** Teachers should provide students with relevant instructional materials such as short videos, digital presentations, demonstrations, diagrams and reading materials before classroom lessons. Classroom periods should subsequently be used for practical exercises, discussions, map interpretation, problem-solving and clarification of difficult concepts.

2. **The exclusive use of Lecture Method should be reduced in teaching Map Reading.** Teachers should avoid relying on it as the dominant method for teaching practical aspects of Geography. It should be combined with practical and learner-centred methods to provide students with opportunities to actively participate in the learning process.
3. **Geography teachers should ensure equal participation of male and female students in instructional activities.** Since the study found no significant gender differences in academic achievement under Flipped Classroom methods, teachers should provide both male and female students with equal opportunities to participate in use of geographical instruments, digital learning activities, group discussions and presentations.

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