Effect of Flipped Classroom Instruction via Google Classroom on Secondary School Students' Academic Attitude Towards Chemistry in Onitsha Education Zone of Anambra State of Nigeria

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DOI: https://dx.doi.org/10.47772/IJRISS.2023.7605

Received: 15 May 2023; Accepted: 25 May 2023; Published: 25 June 2023

ABSTRACT

The study investigated the effect of flipped classroom instruction via Google classroom on secondary school students' academic attitude wards chemistry in Onitsha educational zone. The study was conducted at Onitsha education zone of Anambra State. The influence of gender on students' achievement was determined. Two research questions were raised to guide the study and three hypotheses were tested at 0.05 alpha levels. A quasi-experimental of research design was adopted; specifically the pre-test and post-test non-randomized control group design was used. The population of the study was 3192 senior secondary year two students offering chemistry in Onitsha education zone out of which a sample size of 109 students was drawn using purposive and random sampling techniques. Also two schools were chosen through simple random sampling techniques as experimental and control group centre. The instruments for data collection was Chemistry Attitude Questionnaire (CAQ).The instruments were validated by two experts in departments of science education and one in educational foundation from Nnamdi Azikwe University, Akwa. The reliability of CAT was established using Cronbach Alpha method with reliability value of 0.82. The data for the study were obtained by administering the instrument to the respondent as pretestposttest, data gathered were analyzed using mean and standard deviation to answer research questions and the null hypotheses were tested using Analysis of covariance (ANCOVA). The findings from the results showed that there is a significant difference in the academic attitude of students taught chemistry using FCIVGC and those taught lectured method in favour of the FCIVGC group. Gender was not significant in the attitude of students taught chemistry using FCIVGC and LM. There was no significant interaction effect of instructional approach and gender on students' attitude in chemistry. Generally, the study has shown that FCIVGC of Brame is effective in enhancing attitude of students in chemistry. It was concluded that FCIVGC is more effective for male students academic attitude which has encourages positive attitude of male chemistry students in learning chemistry. It was recommended that teachers should employ FCIVGC in teaching and learning of chemistry.

INTRODUCTION

The study of science especially chemistry has made tremendous contribution in the modernization of the world. The food we eat, the clothes we Wear,the books we read, medication and transportation all have something or the other to do with chemistry. Likewise it's instructional modes have advanced rapidly following various generations. This generation called Z generation has witnessed digital educational growth and development, such as distance and blended. That is why Hanan, (2021) states that today learner cannot study in the pedagogy of the past because they have to survive in the future. Therefore, to teach chemistry today, an effective teacher applies instructional mode to help learner construct their knowledge at anytime, anywhere, and at their own pace. The instructional mode should be appropriate for their developmental and generation level, so that they will not only improve their academic achievement but also have positive attitude towards chemistry. In addition, looking at advancement on digital education in the world, The

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VII Issue VI June 2023

Nigeria educational system requires learners who could have acquired the necessary attitude and skills of digital instructional modes in learning science, and chemistry in particular.

Chemistry is the branch of science concerned with the substances of which matter is composed, the investigation of their properties and reactions, and the use of such reactions to form new substances (Izuegbunam and Osuafor, 2021). Chemistry has made great impact in the world; it has helped man to understand the complexity of his body, the environment, benefit and hazard of the world around us. The application of chemistry to modern life has greatly been felt in manufacturing, agriculture, production system, transportation, communication system and almost all affairs of human.

With the impact of chemistry to modern life, it is expected that the education system of every nation should put priority on the subject and the attitude of students toward the subject wii be overtly overwhelming as its application revolves around their daily lives. In Nigeria chemistry is on the compulsory science subject that every students enrol in science must have good knowledge in other to meet the criteria for the pursuit of career in science and chemistry related courses.

Students' attitude towards this branch of science will determine how effective they will be in it and to what extent they can use the knowledge gain to understand the changes around them and contribute to the development of the society in they belong. An attitude refers to a set of emotions, beliefs, and behaviours toward a particular object, person, thing, or event (Elginda and Ikhsan, 2021). Attitude towards chemistry is a psychological construct, a mental and emotional entity that inheres in or characterizes students' reactions towards chemistry. Attitude towards chemistry is essential; it denotes interests or feelings towards studying chemistry. Attitudes towards learning according Amoke (2019) are important factors on the learners' levels of goal setting, problem solving abilities, their beliefs towards learning, their inner and external motivations in the process of learning and all the academic performances they attain. Attitudes towards school and learning are associated with academic achievement (Amatobi and Amatobi, 2020). Students with poor academic performance have a more negative attitude towards learning and believe that school and learning will not help them being successful in the future. Studies (Elginda and Ikhsan, 2021; Munir, Sunarlia and Amra, 2021; Nwanze and Okoli, 2021) showered that students have a negative attitude towards chemistry and this affects their academic achievement in the subject. By implication students' academic attitudes contributes to their overall disposition towards their learning and what they make out of every teaching and learning process. Teaching and learning can only be impactful if the students show positive attitude in the whole process of learning through following teacher digital instructional mode.

Also, Ujumadu (2021) stated that student attitude towards learning has been negatively impacted by disruption of academic activities by COVID-19 lockdown, natural disasters like flooding. The morale to go back to school after the long stay at home have reduced seriously and many students are unwilling to return to school and those who do return with poor attitude and interest in learning. The negative attitude towards chemistry and corresponding poor academic achievement in the subject amidst the problems facing the educational system in Onitsha Education Zone and Anambra state in general have incites the need for innovative instructional approach and one of such approach that could be mitigate the aforementioned problems could be flipped classroom instructional modes via google classroom (FCIVGC).

Flipped classroom is an instructional mode and a type of blended learning that integrates physical classroom with online via digital tool developed by Jonathan and Aaron in (2012). It is a multimedia cognitive instructional mode that focused cognitive processes that the students used to learn, FCIVGC focuses on considering the students mind as a dual channel, limited capacity, and active processing system by presenting instruction as audio, video , narrations , text and graphics'. So that the learner can actively generate meaningful relationship between instructions in both classrooms and online, since students learn contents at home and practice working through it at school. A side benefit is that teachers can record lessons that emphasis on a given curriculum contents to achieve educational goals. It also allowing students to

pause, rewind, review as well as creating already made library for students review make work, (The flipped classroom learning network, 2014). This is unlike the physical classroom only based learning of conventional instructional modes, which ends in physical classroom teaching. Teacher talks, writes, and in fact does everything in the classroom.

There are several versions of flipped classroom learning model as proposed by many researchers like as Jonathan and Aaron (2012), Wesley Baker (2000), Walvoord and Anderson (1998), and Brame (2013). This study focuses on Brame (2013) model which is of Inverted Classroom Assignment Peer Instruction Based Model. This model according to Brame, helps students' learning problem solving, and reasoning skills to improved because they first encounter learning content at home and interacted with each other before physical classroom. Before peer instruction occurs in physical class, learners are first received their first learning exposure before class in new material, completing knowledge based assignments before physical classroom. Here, the instructor coach rather than lectured and learners work on the processing aspect of learning, including the critical thinking processes of analyzing, problem solving, synthesizing, during class. It is an instructional mode with three instructional phase namely; before class, during class and after class. Flipped classroom could be seen as a one useful instructional mode in this digital era that could improve academic achievement.

A google classroom is digital classroom space that allows educators to post learning contents, assignments, educational material, and grades (Azhar and Iqbal, 2018). It provides an online platform that is organized, interactive, and paperless. Google Classroom is a suite of online tools that allows teachers to set assignments, have work submitted by students, to mark, and to return graded papers. Google Classroom is a free blended learning platform developed by Google for educational institutions that aims to simplify creating, distributing, and grading assignments. The primary purpose of Google Classroom according to Ismail, Mustakim and Samad (2021) is to streamline the process of sharing files between teachers and students. Teachers can easily progress monitor students, as well as provide instant feedback on all assignments, streamline assignments, boost collaboration, and foster communication. The classroom is available on the web or by mobile app. Teachers can use the Classroom with many tools that they already use, such as Gmail, Google Docs, and Google Calendar (Cabi, 2018). The present study intends to use the goolge classroom as an application installed on mobile phones, tablet or laptops.

Since the goal of innovation in instructional pedagogy is to improve achievement and stimulate a positive attitude, the question remains whether flipped classroom instruction can effectively improve attitude given its manifold challenges. Literature of Gupta and Pathania, (2021) suggest that one of the most promising flipped classroom instruction that has the capacity to incite a more positive attitude towards chemistry is flipping via google classroom.

Studies on the effectiveness of google classroom on chemistry attitude as means of flipped classroom instruction are not common in Anambra State. Despite its promising effect, the approach finds little application at the secondary school level as most studies in the area of google classroom were conducted using higher education students. Again, most studies relating to flipped classroom instruction via google classroom did not establish whether gender difference exist in chemistry attitude towards the subject. There is need therefore to explore whether Google classroom will be effective for both male and female students' attitude enhancement.

PROBLEMS STATEMENT

There is no aspect of our lives that is not touched by chemistry. Irrespective of the great importance of chemistry to a developing country like Nigeria, it is disheartening to note that the students' academic achievement in the subject in senior secondary school certificate examination has remained poor. This is supported by West Africa Examination Council (WACE) chief examiners' report 2020. According to the

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VII Issue VI June 2023

report students' weaknesses among other are poor knowledge of the concept of Acid and base reactions and preparation, emergence online learning in covid, era. These poor achievements have generated concern for the researcher to carry out this study. As it understood for centuries teaching and learning in secondary schools in Nigeria generally tend to be done conventionally through face to face, physical classroom based only instructional mode. But the need for the application of digital instructional mode was made relevant with the dawn of the novel coronavirus and its effect, and natural disasters which have serious disrupted academic programmes and have led to poor academic achievement and poor attitude of secondary school students in Onitsha Education zone and Anambra state at large.

Again, there is observed lack of attitude, positive commitment towards chemistry by students who are exposed to teaching and learning of chemistry in Onitsha Education zone and Anambra. This lack of commitment may be as a result of poor attitude of the students which may be as a result the method through which the teacher pass instruction to the students. Generally teaching and learning in Nigeria has overtime observed to be more of passive learning where the teacher give instruction and direct the teaching and learning process. Students are more passive rather than active. However researchers, and advocates of good education tends to emphasize on the need for active participation of learners in the classroom and with the wide spread of technology into every field of life, which has the ability to capture the interest of young minds, it becomes imperative to this study on how to combine technology and face to face activity based learning to improve the attitude of the students which will be done using flipped classroom instruction via Google classroom.

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Purpose of the Study

The purpose of the study is to investigate the effect of flipped classroom instruction via google classroom on students' academic attitude towards chemistry in Onitsha Education zone of Anambra state.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VII Issue VI June 2023

Specifically, the study seeks to determine the:

1. Differences that exist between the mean attitude scores of students taught chemistry with FCIVGC and LM.
2. Differences that exist between the mean attitude scores of male and female students taught chemistry with FCIVGC and LM.

Research Questions

The following research questions will guide the study.

1. What are the differences in the pretestposttest mean attitude scores of students taught chemistry using FCIVGC and LM?
2. What are the differences in the pretest and posttest mean attitude scores of male and female students taught chemistry with FCIVGC and LM?

Hypotheses

The following hypotheses will be tested at 0.05 level of significance:

1. There is no significant difference in the mean attitude scores of students taught chemistry using FCIVGC and LM.
2. There is no significant difference in the mean attitude scores of male and female students taught chemistry using FCIVGC and LM.
3. There is no significant interaction effect of instructional approaches (FCIVGC and LM.) and gender on students' attitude towards chemistry

METHOD

The study adopted a quasi-experimental design, specifically, the pretest-posttest non-randomized control group. The study was carried out using Onitsha Education zone of Anambra state. The population consists of 3,192 senior secondary year two (SS2) students offering chemistry in Onitsha education zone of Anambra state. The sample consisted of one hundred and two (102) SS2 students offering chemistry in Onitsha Education Zone Anambra state which was drawn from the population using purposive sampling technique. The validity of the CAT was ascertained by using experts' opinion. One expert in Educational Psychology and two lecturers from Science Education Department all from Nnmdi Azikiwe University, Awka. The reliability of the instrument was established Kuder-Richardson Formula 20 (KR-20) a coefficient of internal consistency of 0.71 for CAT.

The experiment was conducted in two phases. Phase one was be training of research assistants who will be the regular SS2 chemistry teachers in the selected schools. Phase two involved the treatment using the different lesson plans prepared for the experimental and control groups and their respective instructional approaches. Before the treatment, the students will be given the instrument Chemistry Attitude Questionnaire (CAQ)for the study as a pre-test. In other to use the Google classroom effectively for treatment a 'Google Workspace for Education' account was created by the research to enable her use Google Classroom. From there a Google classroom was created, the researcher will further create google email accounts for all students in the intact class selected for the study. The e-mail address name and passwords was given to the students as their login Id. And invitation hyperlink was created by the research and given to the students to enable them participate in the google classroom. The classroom created by the researcher to be used by the regular chemistry teacher who will be given the classroom account details.

The chemistry teacher taught the concepts in a noiseless laboratory in the school using the lesson plan and the videos of the lessons was shot. The lesson videos was shot within the space of 3 days, 2 and half hour per day. After the videos are shot using ring light and 48 megapixel Camon S16 techno android phone, the videos was edited using viva video application to remove the noises, edit and delete time gaps during the lectures to reduces the video overall duration. The videos was divided into short clips of 15 minutes so that students can watch the content and attend to the assignments or class work relating to the lesson content of each video. The videos was posted one per day for each concept until one week with corresponding class works and assignment which was monitored, graded and uploaded by the researcher for the students to receive their feedbacks while at home. Each day in the classroom, the teacher will only give further exercise to the students in the classroom and intimate them with the objectives for the next class while further orienting them on the effective ways to navigate and use the google classroom on the parents or guardians phone or laptops. The students received Chemistry Attitude Questionnaire (CAQ) as posttest in the classroom after the treatment period.

PRESENTATION OF RESULTS

Research question 1: What are the differences in the pretestposttest mean attitude scores of students taught chemistry using FCIVGC and LM?

Table 1: Difference on Mean, Standard Deviation and Mean gain of attitude score of students taught Chemistry using FCIVGC and LM

Subjects		Pre-attitude		Post-attitude		Mean gain	Mean diff.
	№	X	SD	X	SD		
FCIVGC	59	30.37	9.23	49.07	8.01	18.70	
LM	50	27.42	9.11	37.94	10.17	10.52	8.18

Table 1 is various means and standard deviations of students in line with their attitude towards chemistry when exposed to treatment using FCIVGC and LM. The result showed that students who were taught using FCIVGC had mean scores of 30.37 for the pre-attitude test and 49.07 for the post-attitude test while those taught with LM had 27.42 and 37.95 as their pre-attitude and post-attitude means scores respectively. A mean gain of 18.70 was obtained for FCIVGC group while a mean gain of 10.52 was obtain for LM group. A mean difference of 8.18 which favoured the FCIVGC group.

Research question 2: What are the differences in the pretest and posttest mean attitude scores of male and female students taught chemistry with FCIVGC and LM?

Table 2: Difference on Mean, Standard Deviation and Mean gain of attitude score of students taught using FCIVGC and LM

Subjects		Pretest		Posttest		Mean gain	Mean diff.
	№	X	SD	X	SD		
FCIVGC							
Male	27	31.48	9.93	50.70	7.63	19.22	
Female	32	29.44	8.65	47.69	47.69	18.25	0.97
LM							
Male	28	26.48	8.90	36.61	9.90	10.13	
Female	22	28.68	9.43	39.64	10.47	10.96	0.83

Table 4.1.4 is the mean standard deviation, mean gain and mean difference of male and female students on their attitude score when taught chemistry with FCIVGC and the table showed that male students taught with FCIVGC had mean pre-attitude score of 31.48 while their post attitude score was 50.70. The female students in FCIVGC group score mean attitude scores of 29.44 and 47.69 for pre-attitude and post-attitude rating respectively. A mean gain 19.22 was obtained for male students and 18.25 for female students. A Mean difference of 0.97 was obtained in the table which slightly favoured the male students. However for students who were taught using LM, a mean of 26.48 and 36.61 was obtained for pre-attitude and post-attitude of male students respectively while their female counterparts had mean pre-attitude scores of 28.68 and 39.64 for their post attitude scores. Mean gain of 10.13 was obtained for male students and 10.96 for female students. A mean gain of 0.83 was obtained in favour of female students in chemistry.

Table 3: Analysis of Covariance on the Effect of Methods, Gender and interaction effect students taught Chemistry with FCIVGC and LM

Source	Type III sum of square	df	Mean of square	F	Sig
Corrected model	3621.89[a]	4	905.46	16.73	.000
Intercept	17.45	1	17.45	.332	.571
Attitude-posttest	3262.18	1	3262.18	60.26	.000
Gender	.271	1	.271	.005	.944
method	300.41	1	300.41	5.55	.020
Gender*method	2.04	1	2.04	.038	.0847
Error	5630.06	104	54.14		
Total	101037	109			
Corrected total	9251.96	108			

Hypothesis 1: There is no significant difference in the mean attitude scores of students taught chemistry using FCIVGC and LM.

In table 3 shows the significant mean attitude scores of students taught chemistry using FCIVGC and those taught using LM. An F (1, 104) = 5.55, P=0.020 < 0.05 was obtained, which shows that there is a significant difference in the attitude rating of students taught using FCIVGC and those taught using LM. Therefore the null hypothesis that there is no significant difference between the mean attitude scores of students taught with FCIVGC and those taught with LM does not hold rather the alternative hypothesis.

Hypothesis 2: There is no significant difference in the mean attitude scores of male and female students taught chemistry using FCIVGC and LM.

Table 3 is the main effect of method on the attitude of male and female student taught using FCIVGC and LM. From the table F(1,104)=0.005, P = 0.944 > α=0.05, shows that there is no significant difference in the mean attitude of male and female students taught chemistry using FCIVGC and those taught using LM.

Therefore the null hypothesis is not rejected.

Hypothesis 3: There is no significant interaction effect of instructional approaches (FCIVGC and LM.) and gender on students' attitude towards chemistry

Also from table 3, shows the interaction between gender (male and female) and treatment method (FCIVGC and LM.) on the attitude of the student towards chemistry. With F(3,104)=0.038, p=0.085> α=0.05 indicates that there is no significant statistical interaction between gender and method on attitude of the students taught chemistry. Therefore null hypothesis is not rejected.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VII Issue VI June 2023

DISCUSSION OF FINDINGS

The study examined the attitude of students towards chemistry when exposed to treatment using Flipped Classroom Instruction via Google Classroom (FCIVGC) and Lecture method (LM). Students who were taught using FCIVGC has attitude mean score of 49.07 in their posttest while those taught with LM had attitude mean score of 37.42 in their posttest. A mean difference of 8.18 was obtained in the favour of FCIVGC group. There was a significant difference in the mean attitude scores of students taught chemistry using FCIVGC and those taught using LM. This showed that students who were taught with FCIVGC showed more positive attitude towards chemistry. This may be because of the innovative technology which was applied in teaching of chemistry that make the students to have a change of perspective towards chemistry and instead of run away from it as usual, come to embrace it. students are inclined towards innovative changes most especially those that are attached to technology as it give them the opportunity to explore their world beyond their immediate learning environment and figure out ways to solve their learning needs and difficulties thereby bringing a change in behavior.

The findings of the study was in line with the work Duygu and Ali (2018) who found out that FCIVGC lead to an improvement in the attitude of students when compared to traditional instruction method. Also the work of Nja, et el (2022) showed students having a positive attitude towards chemistry, when taught using flipped classroom which was in line with the findings of this study.

However, there was no significant difference in the mean attitude of male and female students taught chemistry using FCIVGC and those taught using LM. Also there was no significant interaction effect of method and gender on the attitude of students. This implies that gender is not a significant in the design of the intervention.

CONCLUSION

From the finding of the study and discussion made, it can be concluded that FCIVGC has effect on the attitude of students more than LM in chemistry. However with the use of FCIVGC and LM gender was not significant which implies that the method can improve the attitude of male and female students exposed to it.

RECOMMENDATION

Based on the findings of this study, the following recommendations are made.

1. Teachers of Chemistry should adopt FCIVGC in teaching Chemistry most especially now that technology is having its way in almost all human activities teaching and learning inclusive as it will help improve the attitude of students in chemistry.
2. Teachers of Chemistry should train, encourage to with FCIVGC as it will help transform their attitude and perception towards chemistry which will in turn help significantly in the commitment towards chemistry and science in general.
3. Government and other stakeholders should make resource available to teachers and students that will enable them to fully maximize the benefit of technology especially FCIVGC in teaching and learning process to achieve meaningful learning and societal growth.

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ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VII Issue VI June 2023

APPENDIX 1

CHEMISTRY ATTITUDE QUESTIONNAIRE

Instruction: The following items describe your attitude towards chemistry as a subject. Tick (?) any of the response options that best describe you personally.

Key: SA –Strongly Agree, A – Agree, D – Disagree, SD – Strongly Disagree

S/N	Item	SA	A	D	SD
1	I see chemistry as a subject I need to study more to become a better scientist				
2	Chemical images are needed to help one understand the subject				
3	I might want to have chemistry exercises all the more frequently				
4	The advancement of chemistry have not been a solution to some environmental problems				
5	Chemistry information is valuable to understand numerous parts of our regular day to day existence				
6	Chemistry topics is identified with different other subjects				
7	I address chemistry practices without any problem				
8	Chemistry topics are tasking and requires my reasoning abilities				
9	During chemistry exercises, I am not exhausted				
10	Chemistry learning could help me in practicing any skill after graduation				
11	Chemistry as a subject is interwoven with other subject				
12	The advancement of chemistry are necessary to improve the nature of our lives				
13	Chemistry is as a subject is tackling numerous societal problems				
14	My future profession is not autonomous of chemistry information				
15	The advancement of chemistry is related to advancement in other subjects				
16	Chemistry is an exceptionally sophisticated subject for our necessary education				
17	I put forth numerous attempts to get chemistry				
18	I discover the utilization of chemical equations simple like stroll over				
19	The profession of a chemistry scientist is not one of the less alluring				
20	I do not disdain chemistry as a subject				
21	Chemistry information is important for my future profession				
22	I might want to have more chemistry exercises				
23	I comprehend the chemistry concepts without any problem				
24	I find chemistry topics fascinating				
25	At the point when I attempt to address chemistry questions, I see their value in real life				
26	The chemistry applications of chemistry are not limited but are seen in almost all aspect ofour lives				
27	The advancement of chemistry is an improvement on the states of living				
28	I am equipped for deciphering my general surroundings utilizing chemistry in formation				
29	I might want to turn into a chemist when I finish school.				
30	Each students should have chemistry education due to its importance				