

The Effects of Teaching Secondary School Students Agricultural Science with Flipped Classroom and Lecture Method in Public Secondary Schools in Owerri Education Zone 1

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Abstract

The study aimed at finding out the comparative effect of flipped classroom and lecture teaching methods on the students' learning outcomes in agricultural science in public secondary schools in Owerri education zone 1. The population of the study comprised 9,432 SS II students; the sample was made up of two intact classes of 80 SS II students that were selected from the population. Four (4) research questions and two (2) null hypotheses were formulated to guide the study. A pilot study was carried out at Amakohia Comprehensive Secondary School, Owerri North Local Government Area. Two treatment groups were used for this research with two methods of teaching (Flipped classroom method and Lecture method). Eight lesson topics were taught to the students and these lasted for eight weeks. In the first week, before the commencement of the eight lesson topics, a 50-item researcher-made multiple choice questions on Agricultural Science were administered to the two treatment groups as pre-test. The same 50 item researcher-made questions were also administered as post-test at the end of the eight weeks. A ten affective response questionnaire items were also administered. One group was exposed to lecture method of teaching and the other group by flipped classroom method. The data obtained were analyzed using t-test analysis for research question and ANCOVA for the hypotheses. All the hypothesis were tested at 0.05 level of significance. The result made some findings which include: students taught Agricultural Science using flipped classroom method reacted highly positively than those with lecture method. On the basis of the above findings, the researcher recommends among others that the government, its agencies and private organizations should embark on the provision of computer-assisted instructional programmes like text-assisted programmed learning on various subject; the research to be replicated using other flipped classroom methods on other subjects to cover other geo-political zones of the country; the government should encourage both the teacher and the students by providing enough and adequate computer and install programme learning for their use.

Key Words: Effects, Flipped classroom, Lecture method, Students achievement, Agricultural Science .

Introduction

It is worthy of note that the functionality and effectiveness of any educational system is dependent upon its mode of delivery. In line with Newton's third law of motion which states that; to every action, there is an equal and opposite reaction, which implies that the measure one gives is the measure he/she receives. The method adopted in the teaching and learning process determines the outcome. Also Ifegbo (2008, p.55) citing Oguniyi, Okebukola and Fatuwase stated that the teaching of science to pupils which agriculture is one of them is to enable them to:

- ✓ acquire basic science knowledge as part of their general education.
- ✓ discover the order and complexity of the universe.
- ✓ develop the scientific approach to problem solving and acquire the ability to scientific processes for collecting genuine information and analyzing those from the environment
- ✓ develop scientific attitude as science gives valuable mind-training.
- ✓ seek meaningful and scientific explanation to the mysticism and superstitions, which have plagued Africa for many years.
- ✓ apply science to everyday life and obtain vocational skills from the study of science.

From the foregoing, it is expected that agricultural science teachers should be aware of the stated objectives and in addition develop, promote and foster science principles amongst the students in the classroom environment. Purposeful learning cannot take place without a condition. Condition may be tangible material/resources the learner interacts with. Onyejemezi (2002) opines that a systematic integration of a variety of resources in a teaching/learning process or environment produces appropriate learning experiences which in turn result in effective or meaningful learning. Teachers' instructional methodologies and strategies have often affected the general performance of students.

The lecture method of teaching still takes precedence in our classrooms and teachers rely wholly on text materials as instructional materials which appeal to only the sense of sight. Lecture teaching method is a type of teaching that is characterized by one-way communication, from teacher to students. Information is presented at the instructor's rate of delivery. Learning takes place when learners are given the opportunity to take part in the teaching process. In lecture teaching, students are usually passive, listening, and taking notes or completing related worksheets (Kemp, 1975).

In order to bring about positive change in the educational system, information and communication technology has been introduced. The ability of a teacher to effectively utilize the available and relevant ICT materials to a large extent determines the performance of his/her students. The flipped classroom is one of the ICT methodologies geared towards transmogrifying the teaching and learning process. Flipped classroom is a form of blended learning in which students learn new content by watching video lectures, usually at home and what used to be homework (assigned problems) is now done in class with teachers offering more personalized guidance and interaction with students instead of lecturing (Greg 2011). The use of flipped classroom in the teaching of agricultural science is likely to bring about the desired change in the classroom as it will highly motivate the students to learn. This will make learners to be more creative and very analytical in their thinking. Unlike in the lecture method of teaching, flipped classroom is more an individualized method of instruction. Flipped classroom is a method of instruction that utilizes more than one medium of instruction. It adopts a lot of multimedia like the video tape recorder, audio tape recorder, compact disc, VCD, DVD, handset, i-pads, laptops, desktops, television, radio, etc.

Akude,(2004) citing Sleeman, Coubon and Rockwell posited that sometimes single medium may not carry a message adequately in either content or form. They were of the view that when such happens, it becomes imperative therefore to employ other media to achieve the intended objectives. This implies that certain instructional situations demand the utilization of more than one medium to enable the objectives to be achieved. Multi-mediated approach to instruction exposes the learner to utilization of more than one medium. It employs the learner to engage many natural gateways to learning. The teacher who wants to capture attention and clarify concepts in the classroom presentation may decide to use media-mix of sound, motion, video and or text.

Ngoka cited in Anumihe(2012) posited that instructional media enhances pupils achievements, attitudes, motivation and problem solving abilities on sciences. Instructional materials make learning meaningful and permanent in the minds of the learners through the interactive process. Designing opportunities for students to engage in individualized form of active learning experiences is the core of the flipped classroom. Regardless of which type of flipped model you use in your classes, research continues to provide evidence that whatever the student discovers on his own is permanent and it motivates him/her to engage in more learning activities. Flipped classroom gives the student the opportunity to interact with his learning material which could be any multimedia.

According to Akude(2004), the word interactive is an adjective used in describing the process of conversation that goes on between two parties. That conversation must be seen to be two-way that is the

two parties must be exchanging their views. So when it is aligned to video, it is called interactive video. He further added that the interactive video creates a multimedia learning environment that capitalizes on the features of both television and computer-assisted instruction. It is an instructional delivery system in which recorded video materials are presented under computer control to the viewer who not only sees and hears the pictures and sounds but makes active responses. While using this device, the learner communicates with the instructional programme responding to audio, visual, or verbal stimuli displayed on the computer monitor. The monitor displays the picture and sound from the video source. It can also display the output from the computer software in the form of text, graphics or sound effects.

The researcher believes that if flipped classroom method of instruction is fully adopted in our educational system especially in the teaching and learning of agricultural science, its goals in the national policy on education shall surely be achieved.

It is worthy of note that flipped classroom method of instruction is not gender bound. So it is a method of instruction that is not limited by sex of the student. To Nnachi(2009, p. 4), gender is: “an analytic concept, which emphasizes the sociological roles, cultural expectations and responsibilities of men and women (masculine and feminine) in any given society.” She further explained that the term ‘gender’ equally projects those characteristics that distinguish and group organisms according to their reproductive and cultural expectant roles, inhibitions and limitations

Statement of the Problem

The importance of agricultural science in sustainable food production as well as national development cannot be overemphasized. So many agencies and agricultural programmes had been established in Nigeria by various administrations to boost agriculture as well as to encourage the youth to embrace agriculture. Also in the education sector, workshops, conferences, seminars, training and re-training of agricultural teachers and others who are engaged in agriculture are organized from time to time by both government and non-governmental organizations to see to quality assurance in the teaching and learning of Agricultural science. Despite all these, students show poor attitude to agricultural science. Some school of taught has argued that poor teaching and lack of effective utilization of resources/media are some major factors that affect students’ positive attitude towards agricultural science and science related subjects .Records from the Imo State Secondary Education Management Board showed that the enrolment of students in SSCE and NECO Agricultural Science is not satisfactory

The questions are:

- How can the interest of students in agricultural science be raised and sustained?
- How can the performance of students in agricultural science be enhanced?
- What alternative pedagogical strategy can the educational system adopt in the teaching and learning of agricultural science.?
- The study is designed to provide answers to these questions.

Scope of the Study

The study was restricted to the comparative effect of flipped classroom and lecture teaching methods on the students' learning outcomes in agricultural science in public secondary schools in Owerri education zone I. The unit topics that were covered are pest of crops and weeds; this was made up of six lessons:

- i. Meaning and classification of crop pests
- ii. Mode of feeding of the crop pests
- iii. Nature of damage done by the pests
- iv. Ways of controlling the pests
- v. Economic importance of pests and weeds
- vi. Revision

Purpose of the Study

The main purpose of the study was to ascertain the effects of teaching secondary school students agricultural science with flipped classroom and lecture method in public secondary schools in Owerri education zone 1. Specifically the study focused on

- i. Ascertaining the students' affective response to the use of flipped classroom and lecture method learning strategy in the teaching of agricultural science.
- ii. Determining the mean pretest and post test scores of students taught through the lecture method.
- iii. Computing the mean scores in the pretest and post test of students taught with the use flipped classroom method of instruction.
- iv. Determining the differences in the mean post test scores of students taught using both methods of instruction

Research Question

The following questions served as guide to the study

1. What are the students' affective response to the use of flipped classroom and lecture learning strategy in the teaching of agricultural science?

1. What are the mean pretest and post test scores of students taught through the use of lecture method?
2. What are the mean scores in the pretest and post test of students taught through the flipped classroom method of instruction?
4. What are the differences in the mean post test scores of students taught using both methods of instruction?

Hypotheses

The following hypotheses were tested at 0.05 level of significance

1. There is no significant difference between the mean affective response scores of students taught through flipped classroom method and those taught through the lecture methods.
2. There is no significant difference between the adjusted mean post test scores of students taught using flipped classroom method and those taught with lecture method.

Research Design

This study employed quasi-experimental design. According to Nwanna cited in Ogunna(2008,p.117),quasi-experimental design is one “which lacks control of some variables”. Ogomaka (1992, p.67) viewed that “if a researcher in an attempt to carry out an experimental study fails to control one (or more) extraneous/intervening variables, then the researcher ends up with a quasi-experimental study”. He further explained that “the inability to control any of the extraneous variables like environment, time, resources, ages, temperament confounds the results of the study.

However, the experimental research design is pre-test treatment/post-test groups.

gpO₁ X₁ O₂

gpO₁ X₂ O₂

With ANCOVA as a post-hoc control

Where;

X₁ indicates the lecture teaching method group

X₂ indicates the flipped classroom treatment group.

O₁ indicates pre-test (researcher-made test)

O₂ indicates post-test (researcher-made test).

Methodology

The study was carried out in Owerri Education Zone I of Imo State of Nigeria. This zone comprised of five (5) local government areas, they are; Ikeduru, Mbaitoli, Owerri-Municipal, Owerri North and Owerri West. Specifically the study was conducted in Comprehensive Development Secondary School, Owerri of Imo State. It is precisely located along Douglas Road in Owerri Municipal Council Area. The research school, Comprehensive Development Secondary School, was purposively chosen for the study because it relatively has large number of students that offer agricultural science both at the junior and senior levels and they register this subject in Senior Secondary Certificate Examinations (SSCE), the school is also a co-educational institution.

The population of the study consist of all the SS II students in Owerri Education Zone I in the 2014/2015 academic session. According to SEMB Owerri(2015) there were (9,432) Nine thousand, four hundred and thirty-two SS II students in the zone. The statistic division of SEMB Owerri also showed that, there are 68 public secondary schools in the zone. The choice of SS2 students for the study stems from the fact that at this stage, the students should have chosen their subjects which they will offer in the Senior Secondary Certificate Examination and National Examination Council. More importantly, the subject is made compulsory for the SS2 in the first and the second terms in the school. And most importantly, the students would have made up their minds on career choices in which a good pass in agricultural science will help them to gain university admission.

The sample for this study was made up of 80 students who were members of the two intact classes that were purposively chosen from the three streams of the science class. Out of the six streams of SSII classes, three streams are science class and the other three streams are arts class,. The two intact classes were labeled group A and group B. There are 40 students in each of the classes chosen given a total sample of 80 students. The researcher purposively selected a co-educational public secondary school, named Comprehensive Development Secondary School Douglas Road Owerri.

Two instruments were used for data collection. The first instrument was a ten item questionnaire on affective responses for students exposed to lecture teaching method and those students exposed to flipped classroom teaching method respectively.

The second instrument was a 50 item multiple choice test (MCT). These multiple choice questions were based on the unit topic taught to the students. The unit topic was sub-divided into three (3) sub-topics,

The instrument together with the objectives of the study, research questions and hypothesis were given out for validation to one agricultural science teacher in the public secondary school; Comprehensive Development Secondary School, Owerri. This was so because it is believed that they must have been

teaching the particular unit topic ‘crop pest’ in agricultural science lessons over the years and would therefore be more conversant with the depth of coverage and the difficulty index of the question items. The instrument was also given out for validation to two lecturers of Educational Technology in the Faculty of Education Imo State University, Owerri who looked at the terminologies to ensure it was in order. Finally, the instrument was given to two experts in Measurement and Evaluation for a critical appraisal and suitability of the test questions. These are currently lecturers in the Imo State University, Owerri. After the detailed corrections by the experts, a copy of the 50-item multiple choice questions was produced for administration.

In the second instrument, a copy of 10 question items of the affective response questionnaire was constructed and submitted together with purpose of the study, research questions and hypotheses to the experts in measurement and evaluation unit of the Faculty of Education, Imo State University, Owerri, two experts from educational technology and the subject teacher from Comprehensive Development Secondary School Douglass Road Owerri. The affective response questions were critically examined and subsequently produced for administration.

The reliability coefficient of the two instruments (i.e. the researcher-made multiple choice tests in agricultural science and affective response questions) are 0.6700 and 0.7881 respectively. The analysis which gave the values above were done using Kuder- Richardson 20 (for the researcher-made multiple choice tests in agricultural science) and Cronbach Alpha (for affective response scale). This was through, a pilot study that was carried out in Comprehensive Secondary School Amakohia in Owerri North Local Government Area which was use for the pilot study. It is also a co-educational school and more so it is outside the LGA where the actual study was carried out. The pilot school has only four streams of classes, two science classes and two arts classes. The two science classes were used and they were made up of a total of 50 students i.e. 25 in SS2A and 25 in SS2B. In order to categorize these 2 groups into Group A and Group B for treatment group, the toss of the coin was used. This was intended to remove bias in the categorizing. The toss of the coin actually showed that Group A was for flipped classroom while group B was for lecture treatment groups respectively.

Methods of Data Analysis

Mean and standard deviation were used to answer the research questions whereas t-test and ANCOVA F-test at an alpha level of 0.05 were used to test the hypotheses. The ANCOVA F-test was used because it involved using a regression model to factor out initial differences between the two treatment groups while taking the covariate as a basis. The calculated mean was examined in relation to the tabulated means to determine whether the means differed significantly or not. Therefore, a decision of this nature was used to make a final decision on each of the hypotheses, thus: If the significance probability is less than 5% ($P < 0.05$) then the treatment effect or gender effect or the difference in the mean scores is statistically significant i.e. there is significant difference. But if the significant probability is greater than 5% ($P > 0.05$) then the treatment effect or gender effect or the difference in the mean scores is not statistically significant i.e. there is no significant difference. **OR** if the calculated value was greater than the critical value, at a probability level of ($p < 0.05$) significance, then reject the null hypothesis. On the other hand if the calculated value is less than the critical value, accept H_0 . This will mean that the treatment effect or the differences in the mean scores will not be statistically significant

Results

Research Question 1

What are the student’s affective response to the use of flipped classroom and lecture learning strategy in the teaching of agricultural science?

Table 1: Mean affective response of students to the use of flipped classroom and lecture learning strategy in the teaching of agricultural science

Learning Strategy	No of students	Mean	Standard Deviation	Standard Error
Flipped	40	39.38	3.61	0.57030
Conventional	40	28.08	4.05	0.64090

Table 1 shows that the mean (39.38) response of the students that were exposed to flipped classroom was greater than the mean (28.08) response of those that were exposed to the lecture method .Also their standard deviation are different as that of those exposed to flipped classroom is less than those exposed to the lecture method of instruction. So this shows that the students preferred the flipped classroom to the lecture learning strategy.

Research question 2

What are the mean scores in the pretest and post test of students taught using the lecture method?

Table 2: The mean scores in the pretest and post test of students taught using the lecture method.

Test Type	No of Students	Mean	Standard Deviation	Standard Error
PRETEST	40	28.08	3.35	0.52914
POST TEST	40	33.15	3.40	0.53774

The table above revealed that the mean post test score of the students (33.15) is greater than the mean pretest score (28.08) of students who were taught using the lecture method. This implies that the students performed better in the post test score than in the pretest score. And from the standard deviation values, it could be deduced that the deviation from the mean is not too large i.e. 3.40 for the post test and 3.35 for the pretest.

Research question 3

What are the mean scores in the pretest and post test of students taught using the flipped classroom method?

Table 3: The mean scores in the pretest and post test of students taught using the flipped classroom method.

Test Type	No of Students	Mean	Standard Deviation	Standard Error
PRETEST	40	28.65	3.56	0.56336
POST TEST	40	39.98	3.64	0.57567

From the table above, the mean post test score (39.98) of the students is greater than the mean pretest score (28.65) of the same students who were taught using the flipped method. This implies that the students performed better in the post test than in the pretest. The deviation from the mean is not too large as the value for the post test is (3.64) a bit higher than the value for the pretest (3.56).

Research question 4

What are the mean post test scores of students taught using the lecture and flipped methods of instruction?

Table 4: The mean post test scores of students taught using the lecture and flipped methods of instruction

Learning Strategy	No of Students	Mean	Standard Deviation	Standard Error
Lecture	40	33.15	3.40	0.53774
Flipped	40	39.98	3.64	0.57567

It could be deduced from the table above that the mean scores (39.98) of students who were taught using flipped method is higher than the mean scores (33.15) of students who were taught using the lecture method. This implies that the students exposed to the flipped method of instruction performed better than

the students who were exposed to the lecture method. And the deviation from the mean of both the flipped group and the lecture group are not too large but the value of the flipped group(3.64) is slightly higher than that of the lecture group(3.40)

Hypothesis 1

Ho₁: There is no significant difference between the mean affective response scores of students taught through flipped classroom method and those taught through the lecture method(p<0.05)

Table :5 Table of calculated t value for the test of the difference between the mean affective response scores of students taught through flipped classroom method and those taught through the lecture method(p<0.05)

Variable	N	X	SD	df	LS	Prob	t _{Computed}	t _{Critical}	Decision
Conventional	40	53.84	4.0537	78	0.05	0.00	14.663	1.96	Reject
Flipped	40	40.97	3.64226						

From table above the value of t-calculated (14.663) is greater than the table value of t (t-cal > t-tab), we reject the null hypothesis and conclude that there is significant difference between the mean affective response scores of students taught through flipped classroom method and those taught through the lecture method(p<0.05)

Hypothesis 2

HO₂: There is no significant difference between the adjusted mean post-test scores of students taught using lecture method and the adjusted mean post-test scores of students taught using the flipped classroom(p<0.05).

Table 6: Table showing the result of the calculated value of F-ratio for the test of the significant difference between the adjusted mean post-test scores of the lecture and the adjusted mean post-test score of the flipped classroom group.

Source	Sum of Squares	df	Mean Square	Comp-F	Crit-F	LS	Probability.
Corrected Model	1492.866a	2	746.433				
Intercept	241.782	1	241.782				
Covariate	561.254	1	561.254				
Group	808.038	1	808.038	152.939	4.08	0.05	.000
Error	406.821	77	5.283				
Total	108845.00	80					
Corrected Total	1899.688	79					

From the analysis of covariance (see appendix) the value of the F-cal 152.939 is greater than the value of the F-tab(4.08) i.e. $F_{cal} > f_{tab}$ so we reject the null hypothesis and conclude that there is a significant difference between the mean post-test scores of students taught using lecture method and the mean post-test scores of students taught using flipped classroom. Also since the probability level gotten in the analysis above is less than the alpha level of 0.05, it implies that there is significant difference between the mean post scores of students taught using lecture method and the mean post-test scores of students taught using flipped classroom

Discussion of the findings

The findings of the study were discussed in accordance with the research question and hypotheses under the following headings:

Mean affective response of students to the use of flipped classroom and lecture method in the teaching of agricultural science.

This research revealed that the mean affective response of the students who were exposed to flipped teaching was greater than the mean affective response of students who were exposed to the lecture method. Also from the hypothesis that was tested, this difference in mean was significant. This implies that the students preferred the flipped teaching method to the lecture method. This is in line with Stiffens (2012) who reported the findings from an interview of some students who had the flipped classroom learning experience. He revealed that the students liked the flipped classroom approach. Their reasons were that they can watch the video without all the class distractions; their notes now answer more of the questions

they have about the lessons they watch at home; they are learning more on their own and participating more actively in class discussions. From the responses of the students, flipped method of instructions as an innovation will go a long way in improving their performance as well as encourage them to develop more interest in agricultural science since it allows them to study at their own pace and with better performance still. This finding agrees with the advocates of flipped classroom who suggests that it facilitates self paced learning, flexible scheduling and online learning among other things (Sams, & Bennett, 2011).

The mean scores in the pretest and post test of students taught using the lecture method.

The results gathered above revealed that the mean post-test scores of students who were exposed to the lecture method were slightly greater than the mean pretest scores of the same students. It means that there were not much difference between the performance of students in the pretest and their performance in the posttest scores. This is in line with the findings of Becker (2010) who analyzed the pretest and posttest scores with gain scores and repeated measures in College of Letters, Arts and Sciences University of Colorado USA, the result indicated that there was no significant difference in the control group. The outcome is a prove that no much change occurred in the students since they are used to the same old method of the teacher dominating the class. The small difference in mean could be as a result of more time the students dedicated to be exposed to the subject matter

The mean scores in the pretest and post test of students taught using the flipped classroom method

The result obtained from the analysis showed that the mean post-test scores is greater than the mean pretest scores of the students exposed to the flipped classroom method. This implies that the students who were exposed to the flipped method of instruction performed better in their post-test than in their pretest. This is in agreement with the research conducted by Green(2012) in which a school flipped its ninth grade classroom. The result was that they saw a reduction in their failure rates, improved grades, a decrease in their discipline rates and increases in their standardized testing scores. This is also in line with the findings of Becker (2010) who analyzed the pretest and posttest scores with gain scores and repeated measures in College of Letters, Arts and Sciences University of Colorado, the result which indicated that there was significant difference in the treatment group. Also the result corroborated with the views of Ertmer and Newby (1993) who added that constructivism believed that knowledge is a function of how the individual creates meanings from his or her experiences. In the same vein, Pavlovs' experimental findings proved that repetition and drill are important to the teaching-learning situation. Also in a study carried out by Lynne (2012) at The Arizona Center for Research and Outreach (AZ REACH) ,the pre test mean was 2.37 while the posttest mean was 4.56. Similarly, the pretest standard deviation was 1.02 while at posttest it was 1.10.

This information tells you that there was a general increase in instruction quality between pre test and post test. The similar values of the standard deviations indicate that the distribution of scores around the means are similar for the pretest and posttest .

The mean post test scores of students taught using both the lecture and flipped methods of instruction.

The analysis from the data collected revealed that the students that were exposed to the flipped method of instruction had a higher mean and standard deviation when compared to the mean and standard deviation scored by those exposed to the lecture method in their post-test scores. When these means were subjected to hypothetical testing, the result revealed that there is a significant difference between the mean scores of students exposed to the flipped method of instruction and the mean scores of student exposed to the lecture method in the post-test.

This goes a long way to prove that the students who were exposed to the flipped method of instruction performed far better than the students who were exposed to the lecture method. The outcome of this research concores with that carried out at 2011 Michigan's Clintondale High School in 2011 which flipped every class. Principal Greg Green had been posting YouTube videos on baseball techniques for his son's team. He then worked with social studies teacher, Andy Scheel, to run two classes with identical material and assignments, one flipped and one conventional. The flipped class had many students who had already failed the class — some multiple times. After 20 weeks flipped students were outperforming traditional students. No flipped student class scored lower than a C+. The previous semester 13 percent had failed. The traditional classroom showed no change.

Recommendations

Based on the findings of the study, the following recommendations were made.

1. Less emphasis should be paid to the use of the chalk board in the classroom where the students are made to copy big notes which most of the time they do not read because such do not catch their interest and attention like the flipped classroom.
2. This innovation flipped classroom method of instruction should be introduced at all levels of our educational system since it has proved that it can yield the needed result in the educational system by attracting the attention and catching the interest of the students who prefer their phones to their text books and notebooks these days.

3. The flipped classroom method of instruction which is an innovation should be adopted in all sectors of our education system. This is so because the process is in line with the current global trend in information and communication technology which emphasizes on the use of various technological device to improve the standard and quality of education.
4. Government and stakeholders should train and retrain teachers in line with the current trends of flipped classroom which has transformed and improved the educational system in other countries.
5. Curriculum planners should review the school curriculum to accommodate the flipped classroom method of instruction.
6. Subject specialist should be engaged in the development and production of flipped materials because they know the needful materials for each subject matter to be taught in their various fields

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