Effects of Two Educational Technologies on Economics Students` Achievement in Two States Colleges of Education

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Abstract: The purpose of the study was to experimentally determine the effect of two educational technologies (Google classroom and YouTube videos) on Economics students` achievement in two states (Lagos and Ogun State) colleges of education. The study adopted quasi experimental research design. Four research questions and four hypotheses guided the study. The population of the study was 468 National Certification of Education One (NCE I) Economics students in all government owned colleges of education in Lagos and Ogun state (2019/2020 session). The sample size for the study was 65 NCE I Economics students. The sampling technique adopted was purposive sampling techniques. The instrument for the study was a 50 items multiple choice objective questions of Mathematics for Economics Achievement Test. Using Kudar Richardson 20 (K – R 20), the reliability coefficient of 0.79 was obtained on the Test instrument. The research questions were answered using mean and standard deviation while the hypotheses were tested at 0.05 level of significance using Analysis of Covariance (ANCOVA). The study found out that students taught Economics using Google classroom performed better that those students taught using YouTube videos. Also, both Google classroom and YouTube videos were effective in improving both male and female students` achievement in Economics.
Key words: Educational technology, Google classroom, YouTube videos, Economics, Achievement and Gender.

I. Introduction

Despite technology is significant at all levels of education yet social science educators have not been able to ascertain the best technological tools to be used in the teaching and learning of social science education courses in the classroom so as to enhance students` achievement in a difficult course such as accounting, statistics and mathematics for economics. Fardanesh [1] refers to technology as arguable or logical application of knowledge to real life situations. Since all aspect of today's student life has been influence by digital technology, therefore, technology should be used to facilitate students' involvement in lesson which could be derived through a well-planned learning objective. The use of proper technology in the classroom will make learning to be interesting and engaging as no students will be left out in the teaching and learning process.

Integrating technology into the classroom will make teaching not to be teacher-centric but to be learner-centric. There are lots of emphases on integrating technology into the classroom through innovative teaching strategies that focuses on enabling students to achieve the desired learning objectives [2]. Innovative teaching technology such as Google classroom and YouTube videos could make colleges of education students to achieve their learning objectives in Economics courses, since educational technology could help to increase students` participation in a lesson Northey, Buscic, hylinski and Govind [3] which is essential in obtaining the required learning objectives [4].

Educational technology is the application of teaching and learning technologies into the classroom to facilitate learning and quick understanding of the students. Educational technology involves production, design, evaluation, analysis, implementation, and running of educational systems and other learning environment which leads to learning and development of mind, body and spirit [5]. Graham [6] believes that educational technologies are often incorporated in a classroom setting to allow learning to be personalized and independent for the learners. There are various forms of educational technologies such as Edmodo, Socrative, Kahoot, Google classroom application, Classroom response system, YouTube instructional package, Ted-Ed, CK-12, Classdojo, Educlipper,Think link, Projeqt, Story Bird and Animoto, but for the purpose of this study, only Google classroom and YouTube videos as a form of educational technologies will be considered.

One of the popular web 2.0 which offers interesting application and facilities is Google. Google is a potential for teaching and learning in the sense that it was built on special function that give rooms for social,

pedagogy and technological affordance [7]. In 2014, Google introduced a new apps called Google Classroom application to it Google Apps for Education. Unlike the traditional classroom, this new classroom encourages teachers to create and upload notes and assignments within short period of time and get response from students efficiently. Present traditional method of teaching students is teacher-centered learning where lecturers make use of visual aids such as slide, visualizer and whiteboard. Learning activities in the school computer laboratory entails 4 major types of practical works: experience, demonstration, exercises and investigations [8]. Where Google classroom is applicable in computer laboratory and projected classroom, present traditional method of teaching is not practical oriented in computer laboratory. Kmre and Kaur[9] regard Google classroom as a blended internet learning platform meant for educational providers and educational institutions that focuses on creating, streamlining, sharing and grading continuous assessment and other class materials in a paper freeway. Kgalemelo [10] see Google Classroom as zero free web based learning application or internet tool that is used for collaboration among teachers and students. The present study regards Google classroom as the application of online educational technology in teaching and learning. The role of teachers in using new learning technology such as Google classroom and YouTube videos to enhance students` achievement should not be neglected if transformation of educational practices is to be attained in Lagos and Ogun States Colleges of Education, Nigeria.

The use of YouTube videos to teach Mathematics for Economics classes as a supplementary teaching aid will provide students with good knowledge and understanding of the lecture. YouTube video is likely to make the learning process more interesting and meaningful. In addition, it makes learners to memorize lessons quickly and easily. YouTube gives students the opportunity to be interested in a lesson and stored what is been taught easily. This website also give students the opportunity to access videos on the topic they missed the class. Almurashi [11] see YouTube videos as an online materials use to aid teaching and learning. In the view of Duffy [12], YouTube is a video sharing website in which users can view, share videos and upload videos. Though, using YouTube videos can make students gain numerous advantages that will make learning process active and not being passive like when using traditional method. In addition to this, YouTube videos may offer teachers the opportunities to overcome a number of negative concerns and ensure learners participate in a new method of teaching. There are various functions of YouTube videos ranging from searching and watching videos, creating personal YouTube channel, uploading videos to one's channel, like and share comment, subscribe and follow other videos, and create playlist to organize videos. Since YouTube videos can be used to increase students` involvement in a lesson through the use of discussion on the videos and showing practical examples of theoretical concepts in Economics [13]. The present study deems it necessary to compare the effect of these technologies (Google classroom and YouTube videos) on Lagos and Ogun States Colleges of Education students in Nigeria.

The College of Education is an aspect of tertiary institution in Nigeria empowered with the responsibility of training teachers to obtain non-degree but sound professional certificate in education (National Certificate of Education) after successful completion of a minimum of three years course. The history of Colleges of Education in Nigeria can be trace back to 1950s when the Ashby Commission of 1959 see the need to provide middle level manpower to meet Nigerian needs in the area of teaching. The commission observed that majority of the teachers then were not certificated and trained in teaching line. This strong observation by the commission was followed by a suggestion for greater expansion of intermediate education for intermediate teachers at secondary and teachers training college level of education in the country, which was aimed at upgrading the existing teaching force [14]. However, the National Commission for Colleges of Education recognizes lecturers in all the colleges of education in Lagos State and Ogun State has a prominent player in developing ICT skills in students at this level of education. Hence, being computer literate has been made compulsory for all lecturers in the four government owned colleges of education in Lagos and Ogun States since 2004/2005 in which those lecturing in the department of Economics Education are not left out.

Economics is a basic course of study that explained a set of rules and relationships, concept which provided the foundation of many other course of study such as marketing, finance, business management, sociology, business management, agricultural economics or economic policy that cannot be studied without the knowledge to be achieved studying the science of economics. Ayers and Collinge [15] regards economics as how to make choices well and the allocation of limited resources in response to unlimited wants. The present study regards Economics as the study of the economic activities of the entire economy in relation to small and large. Mathematics for Economics is a course which is been offer in the department of Economics in National Certificate of Education 1 (NCE 1) by all the 4 colleges of education in Lagos and Ogun States. The study believes that good knowledge in mathematics for Economics will help students in their everyday life in making reasonable purchasing decision. The mathematics needed for the study of economics and business continues to grow with each passing year, placing ever more demands on students and faculty alike [16]. No wonder Puu [17] regard mathematical economics as the application of mathematical methods in economic theory. To regard a subject or course as mathematical economics, it most applied some mathematical methods in economic theory

such as growth theory, rational choice theory, new trade theory, game theory, prospect theory, new growth theory, Bagehot theory of central bank lending, fisher theory of interest rate, principal-agent theory, theory of optimal taxation, chaos theory, social choice theory, and theory of storage.

Achievement is to attain a particular standard in a course of study. Ugwuanyi [18] refer to achievement as a cognitive attainment of students in a school work which is ascertained in terms of pass mark in school teacher-made test/standardized test in a subject such as mathematics. This meaning of achievement is in relation to the meaning given by Ajua [19] which states that student's academic achievement as to do with successful academic progress derived through student effort and skill in a particular subject area. Academic achievement is educational outcome, that is, the level to which a student/learner, teacher/instructor or institution has achieved the goals of education [20]. The present study regards academic achievement as the determination of the degree of attainment of male and female colleges of education students in class tasks, assignment, courses, research project, or programmes to which the students were sufficiently exposed.

Gender is an attribute that is use to differentiate a male from female. There are many reticence posed by gender on students' academic achievement which as to do with sex role differentiation in which certain task are recognized for male and others for female. Gender is refers to as the social meaning of being a boy or a girl, including the construction of identities, expectations, behaviours and power relationships that is gotten from social interactions [21]. Keightley [22] regard gender as what is concerned with male and female as classify to each sex in the society. Bronfenbrenner [23] see gender as a social differences and relations between male and female. The academic achievement of both male and female in Mathematics for Economics is priority of this study.

Economics students in South-West colleges of education achievement in Mathematics for Economics have been discouraging for the past 14 years in contrast to other courses in Economics such as public finance, introduction to business finance, principles of economics and others. According to the preliminary study conducted by the researcher using 294 National Certificate of Education (NCE) 2 and 3 students who have offered Mathematics for Economics in NCE1, 228 (77.6%) students response shows that Mathematics for Economics and Mathematics related courses such as statistics and accounting are the major courses they have challenges in when they were in NCE 1 and this made the researchers to be curious to carry out an investigation on how Educational technologies such as Google classroom and YouTube videos can be used to promote Economics students` achievement in Mathematics for Economics and to compare both educational technologies to ascertain which one is more effective in promoting learning. classroom and Y

The study aims was to ascertain the effects of two educational technologies on Economics students` achievement in two states Colleges of Education. In particular, the study sought to:

• Find the differences in the mean achievement scores of students taught Economics using Google classroom and those taught with YouTube videos.

• Find the differences in the mean achievement scores of gender (male and female) students taught Economics using Google classroom.

• Find the differences in the mean achievement scores of gender (male and female) students taught Economics using YouTube videos.

• Find the interaction effects of educational technology (method) and gender on the differences in the mean achievement scores of students taught Economics.

The following research questions guided the study.

• What are the differences in the mean achievement scores of students taught Economics using Google classroom and those taught with YouTube videos?

• What are the differences in the mean achievement scores of gender (male and female) students taught Economics using Google classroom?

• What are the differences in the mean achievement scores of gender (male and female) students taught Economics using YouTube videos?

• What is the interaction effect of educational technology (method) and gender on the differences in the mean achievement scores of students taught Economics?

The following null hypotheses tested at 0.05 level of significant guided the study.

Ho$_1$: There is no significant difference in the mean achievement scores of students taught Economics using Google classroom and those taught with YouTube videos.

Ho$_2$: There is no significant difference in the mean achievement scores of gender (male and female) students taught Economics using Google classroom.

Ho$_3$: There is no significant difference in the mean achievement scores of gender (male and female) students taught Economics using YouTube videos.

Ho$_4$: There is no significant difference in the interaction effect of educational technology (method)and gender on the differences in the mean achievement scores of students taught Economics.

II. Methodology

The study was a quasi-experimental research design. In particular, non-equivalent pre-test post-test alternative treatments control group design. This may be used to more rigorously test whether or not treatment X_1 produces outcomes different from those emerging from treatment X_2 [24]. The intact classes of the two colleges of education were used. The use of intact classes was to avoid the threat of selection bias among the college students and to avoid re-arranging and re-grouping which could affect the normal lesson. According to Rogers and Revesz [25], quasi-experimental research design examines whether there is a causal relationship between independent and dependent variables. Quasi-experimental does not use random assignment of subjects, rather intact class is usually used. However, a practical difficulty experienced by researchers in this respect is the refusal of the course lecturer to allow the researchers to disorganize their classes as would be required by randomization. With this situation, the researchers have no choice than to use the classes as they are (intact or non- randomized classes); thereby setting for a quasi-experiment.

The group was a 2x2 paradigm. This paradigm represents two groups: the Google Classroom (experimental group one) and YouTube videos (Experimental group 2) with two levels of gender (male and female). The research design is illustrated below:

Educational Technology	Pretest	Treatment	Posttest
Google classroom	R_b	$X_1 R_a$	
YouTube videos	R_b	X_1	R_a

The study was carried out in Colleges of Education in Lagos and Ogun State, Nigeria. Lagos and Ogun State have five (5) colleges of education in which only 4 have Economics department. The only one that is not having the department of Economics is Federal College of Education (Technical) Akoka, Lagos State. The two states have 2 federal colleges of education with 3 state colleges of education. The two states have a surface area of $20107km^2$ with Ogun State having $16762km^2$ surface areas and Lagos State with $3345km^2$ surface areas [26]. The two states are located in South-West, Nigeria which was predominantly Yoruba speaking tribe. Both states shared landed border with the Republic of Benin. The population for this study was 468 of NCE 1 Economics students in all the 4 out of 5 government-owned Colleges of Education in Lagos and Ogun State, Nigeria. Out of the 4 Colleges of Education offering Economics in both states, 2 were in Lagos State with 74 male students and 181 female students making a total of 255 students in NCE 1 Economics while 2 were in Ogun State with 71 male students and 142 female students making a total of 213 students in NCE 1 Economics. The choice of NCE1 students was because Mathematics for Economics is been offered at this level. The sample size of the study was 65 (27 for group 1 and 38 for group 2) NCE 1 students studying Economics. The intact classes of the NCE 1 students of Economics from two government-owned colleges of education were used as the sample size. The nature of the study, however, required that the sample should be purposively selected and this serves as justification for the use of Tai Solarin College of Education, Omu-Ijebu, Ogun State as the sampled college for the study (Google Classroom) and Michael Otedola College of Primary Education, Lagos State (YouTube videos) as both colleges have constant electricity power supply and good network for internet in the area.

One instrument was used for data collection and was Mathematics for Economics Achievement (MEAT). The MEAT was a 50 item of 4 multiple-choice objective questions and was adopted and modified by the researchers from mathematical economics and General (Schaum`s Series and Comprehensive Mathematics) covering arithmetic progression, geometric progression, simultaneous equations, crammer`s rule, matrix inversion, techniques of differentiation, techniques of integration, set theory and logarithmic based on the curriculum of the subject matter. Five experts face and content validated the instrument. Two of the experts were in Economics Education, two in Measurements and Evaluation and one in Mathematics, all in the faculty of Education, University of Nigeria, Nsukka. The validators validated the instrument based on the appropriateness of the instrument, clarity of the instrument, appropriate mathematical symbols used in the instrument and suitability of the instruments for this level of students.

To ascertain the reliability of the research instruments, a pilot study was carried out in Kwara State College of Education, Ilorin, Kwara State and Kwara State College of Education, Oro, Kwara State. The reason for the choice of Kwara State College of Education, Ilorin, Kwara State and Kwara State College of Education, Oro, Kwara State was that the two colleges of education were believed to be more or less equivalent in standard to the two colleges of education used for this study and were not in any way involved in the main study because both colleges of education were under North-Central, Nigeria. One type of reliability testing was conducted to determine the internal consistency using Kuder Richardson 20 (K – R 20). The Mathematics for Economics Achievement Test (MEAT) was administered to fifteen (15) NCE I Economics students of Kwara State College

of Education, Oro, Kwara State (Google Classroom) and twelve (12) NCE I Economics students of Kwara State College of Education, Ilorin, Kwara State (YouTube videos). The K – R 20 gave a reliability value of 0.79 which shows that the Mathematics for Economics Achievement Test instruments was highly reliable. Pretest and posttest were used for data collection. The pretest and posttest instrument were administered to both the Google classroom and YouTube videos groups. Pre-test at the initial stage was administered simultaneously to both experimental group 1 (Google Classroom) and experimental group 2 (YouTube videos) NCE 1 Economics students. The treatment for Google Classroom and YouTube videos groups lasted for 9 weeks. After the test of homogeneity, the experimental group 1 were exposed to Google Classroom which was accessed through a Gmail Google account or using Google directly by all the students that have Gmail account while those that did not have were assisted in creating one. The students in the experimental group 2 were exposed to the YouTube videos which were installed by the instructor on the students system or the school system. After the treatment, the two groups were exposed to the Mathematics for Economics Achievement Test (MEAT) as post-test. Considering the role extraneous variables played in research, extraneous variables such as experimental bias, subject interaction, treatment bias and intergroup variables were controlled. Mean and standard deviation were used to answered the four research questions while the four hypotheses were tested using Analysis of Covariance (ANCOVA). Hence, the hypotheses that were greater than 0.05 were accepted and those hypotheses that were less than 0.05 were rejected.

III. Result

Research Question 1
What are the differences in the mean achievement scores of students taught Economics using Google classroom and those taught with YouTube videos?

Table 1
Pre-test and Post–test Mean Scores of Google Classroom and YouTube Videos Groups in the Achievement Test

Group	N	$\bar{x}$	SD	$\bar{x}$	SD	Mean Gain
		Pretest		Posttest		
Google Classroom	27	28.89	6.91	66.81	7.91	37.92
YouTube Videos	38	28.58	8.08	61.53	11.70	32.95

*N = Number of students, $\bar{x}$= Mean   and SD = Standard Deviation

The data presented in Table 1 showed that the experimental group 1 which was taught using Google Classroom (GC) had a pre-test mean achievement score of 28.89 with a standard deviation score of 6.91 and a post-test mean achievement sore of 66.81 with standard deviation score of 7.91. The difference between the pre-test and post-test mean for the group taught using Google classroom was 37.92. The Experimental group 2 which were taught using YouTube videos had a pre-test mean score of 28.58 with a standard deviation score of 8.08 and a posttest mean achievement score of 61.53 with a standard deviation score of 11.70. The difference between (mean gain) the pretest and posttest mean for the group taught using YouTube videos was 32.95. This result reveals that, the students in the experimental group 1 taught using GC performed better in the achievement test than the students in the experimental group 2 taught with YouTube videos. Hence Google classroom is more effective in enhancing students` achievement in Economics.

Hypothesis 1
Ho$_1$: There is no significant difference in the mean achievement scores of students taught Economics using Google classroom and those taught with YouTube videos.

Table 2: Analysis of covariance (ANCOVA) of the significant difference in the mean achievement scores of students taught Economics using Google classroom and those taught with YouTube videos.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	5052.366[a]	2	2526.183	75.204	.000
Intercept	4215.514	1	4215.514	125.495	.000
Pretest	4610.899	1	4610.899	137.265	.000
Group	385.123	1	385.123	11.465	.001
Error	2082.649	62	33.591		
Total	271076.000	65			
Corrected Total	7135.015	64			

The result in Table 2 shows that an F-cal of 11.465 with associated probability of 0.001 were obtained with respect to the difference in the mean achievement scores of students taught Economics using Google classroom and those taught with YouTube videos. Since the associated probability (0.001) was less than 0.05

level of significant set as the bench mark for taking decision, the null hypothesis (Ho_1) was rejected. The inference drawn was that there was a significant difference in the mean achievement scores of students taught Economics using Google classroom and those taught with YouTube videos.

Research Question 2
What are the differences in the mean achievement scores of male and female students taught Economics using Google classroom?

Table 3
Pre-test and Post–test Mean Scores of Male and Female Students Economics using Google Classroom and in the Achievement Test

Gender	N	Pretest $\bar{x}$	SD	Posttest $\bar{x}$	SD	Mean Gain
Male	11	27.63	8.09	67.64	7.37	40.01
Female	16	29.75	6.10	66.25	8.45	36.50

*N = Number of students, $\bar{x}$= Mean   and SD = Standard Deviation

The result presented on Table 3 shows that the male group had a pretest mean achievement score of 27.63 with a standard deviation score of 8.09 and a posttest mean achievement score of 67.64 with a standard deviation score of 7.37. The difference between (mean gain) the pretest and posttest for male group is 40.01. The female group had a pretest mean achievement score of 29.75 with a standard deviation score of 6.10 and a posttest mean achievement score of 66.25 with a standard deviation of 8.45. The difference between (mean gain) the pretest and posttest mean score for the female group is 36.50. For each of both male and female, the posttest achievement mean was greater than the pretest achievement means with male group having higher mean gain. This shows that Google classroom appears to have improved the achievement score of both the male and the female students.

Hypothesis 2
Ho_2: There is no significance difference in the mean achievement score male and female students   taught Economics using Google classroom.

Table 4: Analysis of Covariance (ANCOVA) of the Significant Difference in the Mean Achievement Scores of Male and Female Students Taught Economics using Google Classroom

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1060.169[a]	2	530.084	22.481	.000
Intercept	2263.958	1	2263.958	96.014	.000
Pretest	1047.640	1	1047.640	44.430	.000
Gender	71.449	1	71.640	3.030	.095
Error	565.905	24	23.579		
Total	122160.000	27			
Corrected Total	1626.074	26			

The result in Table 4 shows that an F-ratio of 3.030 with associated probability value of 0.095 obtained with respect to the difference in the mean achievement scores of male and female students taught Economics using Google Classroom (GC). Since the associated probability (0.095) was greater than 0.05 set as the level of significance and criterion for taking a decision, the null hypothesis (Ho_2) was not rejected. Based on this, it was therefore concluded that there was no significance difference in the mean achievement scores of male and female students taught Economics using Google Classroom.

Research Question 3
What are the differences in the mean achievement scores of male and female students taught Economics using YouTube videos?

Table 5
Pre-test and Post–test Mean Scores of Male and Female Students Economics using YouTube Videos and in the Achievement Test

Gender	N	Pretest $\bar{x}$	SD	Posttest $\bar{x}$	SD	Mean Gain
Male	15	28.67	7.20	61.33	10.87	32.66
Female	23	28.52	8.76	61.65	12.46	33.13

*N = Number of students, $\bar{x}$= Mean   and SD = Standard Deviation

The result presented on Table 3 shows that the male group had a pretest mean achievement score of 28.67 with a standard deviation score of 7.20 and a posttest mean achievement score of 61.33 with a standard deviation score of 10.87. The difference between (mean gain) the pretest and posttest for male group is 32.66. The female group had a pretest mean achievement score of 28.52 with a standard deviation score of 8.76 and a posttest mean achievement score of 61.65 with a standard deviation of 12.46. The difference between (mean gain) the pretest and posttest mean score for the female group is 33.13. For each of both male and female, the posttest achievement mean was greater than the pretest achievement means with the female group having slightly higher mean gain. This shows that YouTube videos appear to have improved the achievement score of both the male and the female students.

Hypothesis 3
Ho$_3$: There is no significance difference in the mean achievement score male and female students taught Economics using YouTube videos.

Table 6: Analysis of Covariance (ANCOVA) of the Significant Difference in the Mean Achievement Scores of Male and Female Students Taught Economics using YouTube Videos

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	3724.639[a]	2	1862.320	48.540	.000
Intercept	1844.673	1	1844.673	48.080	.000
Pretest	3723.716	1	3723.716	97.056	.000
Gender	2.259	1	2.259	.059	.810
Error	1342.834	35	38.367		
Total	148916.000	38			
Corrected Total	5067.474	37			

The result in Table 6 shows that an F-ratio of 0.059 with associated probability value of 0.810 obtained with respect to the difference in the mean achievement scores of male and female students taught Economics using YouTube Videos (YV). Since the associated probability (0.810) was greater than 0.05 set as the level of significance and criterion for taking a decision, the null hypothesis (Ho$_3$) was accepted. Based on this, it was therefore concluded that there was no significance difference in the mean achievement scores of male and female students taught Economics using YouTube Videos as we have it in Google Classroom.

Research Question 4
What is the interaction effect of educational technology (method) and gender on the differences in the mean achievement scores of students taught Economics?

Table 7
Mean and Standard Deviation of the Interaction Effect of Educational Technology (method) and Gender on the Mean Achievement Scores of Students in Economics.

Variables			Pretest		Posttest		
Method	Gender	N	x̄	SD	x̄	SD	Mean Gain
Google Classroom	Male	11	27.64	8.09	67.64	7.37	40.00
	Female	16	29.75	6.10	66.25	8.45	36.50
YouTube Videos	Male	15	28.67	7.20	61.33	10.87	32.66
	Female	23	28.52	8.76	61.65	12.45	33.13

*N = Number of students, x̄= Mean   and SD = Standard Deviation

The result presented in Table 7 shows the interaction between method and gender on the mean achievement scores of students in Economics. Result shows that the male group had a pretest mean of 27.64 with a standard deviation of 8.09 and a posttest mean of 67.64 with a standard deviation of 7.37. The difference between (mean gain) the pretest and posttest for male group is 40.00. The female group had a pretest mean of 29.75 with a standard deviation of 6.10 and a posttest mean of 66.25 with a standard deviation of 8.45. The difference between (mean gain) the pretest and posttest mean for the female group is 36.50. For each of the two groups, the posttest achievement mean were greater than the pretest achievement means with the male group having higher mean gain. This is indicative that Google classroom appears to have improved the achievement score of both male and female students. Result in Table 7 also shows that the male group taught with YouTube videos educational technology had a pretest mean of 28.67 with a standard deviation of 7.20 and a posttest mean of 61.33 with a standard deviation of 10.87. The difference between the pretest and posttest mean for male group was 32.66. The female group had a pretest mean score of 28.52 with a standard deviation score of 8.76 and a posttest mean of 61.65 with a standard deviation of 12.45. The difference between the pretest and the posttest mean for the female group was 33.13. For each of the two groups, the posttest mean score were greater than the pretest means scores. The female group in the YouTube videos group gained more scores than their

male counterpart; this means there was an interaction between method and gender on students` achievement in Economics.

Hypothesis 4
Ho$_3$: There is no significant difference in the interaction effect of educational technology (method) and gender on the differences in the mean achievement scores of students taught Economics.
Table 8: Analysis of Covariance (ANCOVA) of the Significant Interaction Effect of Educational Technology (Method) and Gender on the Difference in the Mean Achievement Scores of Students Taught Economics

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	5147.356[a]	4	1286.839	38.845	.000
Intercept	4128.132	1	4138.132	124.613	.000
Pretest	4692.437	1	4692.437	141.647	.000
Method	432.423	1	432.423	13.053	.001
Gender	41.310	1	41.310	1.247	.269
Method * Gender	68.930	1	68.930	2.081	.154
Error	1987.659	60	33.128		
Total	271076.000	65			
Corrected Total	7135.015	64			

The result in Table 8 shows that an F-ratio of 2.081 with associated probability value of 0.154 was obtained with respect to the interaction effect of method and gender on students` achievement scores in Economics. Since the associated probability (0.154) was greater than 0.05 level of significance set as the criterion for taking a decision, the null hypothesis (Ho$_4$) was accepted. Thus, the conclusion drawn was that there is no significant interaction effect of educational technology (method) and gender on the mean achievement scores of students in Economics.

IV. Findings and Discussion

As shown on Table 1, there is different between the mean achievement scores of the two groups of people taught Economics (Experimental 1/ Google classroom and Experimental 2/ YouTube videos). The analysis revealed that students taught using Google classroom performed significantly better in Mathematics for Economics Achievement Test than their counterparts who were taught with YouTube videos. Result in table 2 further confirmed this finding by indicating statistically significant effect of YouTube instructional package on students` achievement in Economics. The F – cal of 11.465 with the probability value of 0.001 which was significant at 0.05 level of confidence testifies the result. This implies that the efficacy of the two educational technologies (methods) with regards to academic achievement in Economics is not the same. In other words, the students` achievement using Google classroom appears better than with the YouTube videos method. This study was in line with the finding of Shahinaz [27], whom finding show that there were significant differences in between Google classroom application group and the controlled groups in the post measurement of the teaching efficiency of lesson planning, lesson execution, level of evaluation and academic achievement in computer test.

The data on Table 3 has shown that there is a slight difference between the mean achievement scores of male and female student taught Economics using Google classroom. As shown on table 4, the F – cal of 3.030 over the observed probability value of 0.095 which was significant at 0.05 level of confidence testifies the result. The male students score was slightly higher than the female students score with the male students having higher mean gain over the female students. This finding is in line with Adigun, et al [28] whom findings revealed that gender as a factor does not have a significant influence on students achievement in computer. The result of this study is at variance with Ajai and Imoko [29] in Nigeria, where part of the findings established significant difference in favour of males and another part in favour of females.

The data on Table 5 has shown that there is a slight difference between the mean achievement scores of male and female student taught Economics using YouTube videos. As shown on table 6, the F – cal of 0.059 over the observed probability value of 0.810 which was significant at 0.05 level of confidence testifies the result. The female students score was slightly higher than the male students score with the female students having higher mean gain over the male students. The findings of this study was in line with Buzzetto-More [30] findings which show that gender has no impact on the perceived value of YouTube in teaching and learning, has both male and female students perceived the use of YouTube positively as an enhancement to teaching and learning.

It has been established in this study (Table 8) that there is no significant interaction effect of method and gender on the mean scores in the post Mathematics for Economics Achievement Test of students taught Economics, Table 8 testify to the result with F – cal of 2.081 over the observed probability value of 0.154. This

finding is in consonance with Israel [31] who found no interaction effect between educational technology (method) and gender.

V. Conclusions

From the foregoing findings, and discussion it could be concluded that students taught Economics using Google classroom performed excellently than those students taught Economics using YouTube videos. This shows that Google classroom was more effective than the YouTube videos in students` achievement in Economics while the male group taught Economics using Google classroom mean achievement score was slightly higher than their female counterpart but was not statistically significant. The case was reverse in YouTube videos has the female group taught Economics using YouTube videos had a slightly higher mean achievement score than the female group but was also not statistically significant. Finally, there was no significant interaction effect of educational technology (method) and gender on the mean achievement scores of the students.

VI. Recommendations

The study therefore made the following recommendations:
- As the use of Google classroom and YouTube videos have been found effective in promoting Lagos and Ogun State colleges of education students` achievement in Economics and also since Google classroom teaching strategy is relatively new Nigeria, it should be emphasized and integrated into the Economics curriculum of teachers training in tertiary institutions, so as to popularized the use among the teachers more especially in area of educational technology application.
- In view of the established efficacy of Google classroom and the fact that most of the serving colleges of education teachers may not be familiar with its use, the government and stakeholders in both Economics education and special needs education should organize intensive workshop and seminars on the use of modern teaching techniques such as the Google classroom amongst others for the in – service teachers. This will help to enhance their competence especially in the choice and the use of the various innovative educational technologies.

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