
EFFECTS OF VIRTUAL CLASSROOMS ON ACADEMIC ACHIEVEMENT AND RETENTION AMONG UNIVERSITY STUDENTS OF AGRICULTURAL EDUCATION IN NORTH-CENTRAL NIGERIA

Y. D. Gotom*; M. E. Ikehi (PhD); & F. M. Onu (Prof)

Department of Agricultural Education, University of Nigeria, Nsukka

*Correspondence: gotyus@gmail.com

Abstract

The study explored the effects of virtual classrooms on academic achievement and retention among university students of Agricultural Education in North-Central Nigeria (NCN). Quasi-experimental research design was adopted for the study. Four research questions and two hypotheses guided the study. The population for the study consisted of 172 students of Agricultural Education in three universities in NCN. Purposive sampling was used in selecting the three universities in NCN. Cognitive Achievement Test on Fishery (CATF). The CATF contains 50 multiple choice questions (MCQ). The CATF were subjected to face and content validation by three experts. The reliability of the instruments was determined using Kuder-Richardson formula 20 (KR-20) technique was used for CATF which revealed an index of 0.79 coefficients. Mean was used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the null hypotheses at 0.05 level of significance. Findings revealed that there was significant difference in the students mean achievement in fishery where Google Classroom showed more effect than in Zoom. The agricultural education students' retention in Google Classroom and control group improved slightly after some time and agricultural education students exposed to Zoom improved slightly while that of control group dropped after some time. The study recommended that virtual classroom should be included in the curriculum of Agricultural Education by National Universities Commission (NUC) to help in instructional delivery.

Keywords: Academic Achievement, Google Classroom, Retention, and Virtual Classrooms

Introduction

Institutions like the universities are considered important in the society for human capital and national development through intellectual growth, product development, problem solving in research. Academic activities in the universities need to be free from any disruption to imparting meaningful knowledge and skills to the students as members of the society. Teachers and students are both affected negatively when disruptions occur in the academic activities such as the COVID-19. In such circumstances, universities have to find a way of working remotely using the tools offered by the online environment for sustaining, motivating and improving students' learning. It is important that in the current technological dispensation, universities consider other ways of reaching out to students when academic calendar disruptions occur, to cover the curriculum even when restrictions to social gatherings are

enforced. Such learning content can be delivered through online platforms like Zoom and Google Classrooms using the virtual classroom features.

A virtual classroom is an imitation of a traditional classroom using communication gadgets to facilitate the teaching-learning process without converging in a physical location. Maanvizi, et al. (2020) defined virtual classroom as an online learning method that is carried out through the internet, providing communication for both nearby and distance learners with features simulating face-to-face engagements. In the view of Racheva (2018), virtual classroom is defined as an online learning environment that allows for live interaction between teacher and learners as they participate in learning activities. Virtual classroom in the context of this study is an online interactive environment accessed with computers (laptop or phone, etc) by teacher(s) and learners for learning tasks and instructional delivery. The virtual classroom is made accessible for teaching and learning through the use of Google Classroom.

Google Classroom is one of the virtual platforms used for the teaching-learning process. Google Classroom is a free web service developed by Google for schools that aims at creating, distributing and grading assignments and interactions shared between teachers and students (Okmawati, 2020). The Google Classrooms can be academic applied in two ways, including synchronous, real-time online learning, whereas asynchronous learning is anytime learning (Ranjan, 2020). In this study, Google Classroom is considered an important web space designed to enhance learning activities. Of these two modes mentioned above, this study is on the fully online presentation. Apart from the Google Classroom adaptable for classroom instructions, Zoom is another platform that can be used for pedagogy.

Zoom is a social media platform that facilitates the presentation of content between individuals or groups. Zoom offers the ability to communicate in real time with geographically dispersed individuals through computer, tablet, or mobile devices (Archibald, et al., 2019). Zoom is a videoconferencing service operating on a cloud platform that allows users to connect with others who are using the service at a defined timeframe (Lacoma, 2020). Zoom in this study is a dedicated cloud-based videoconferencing platform that connects users for interactions and can be used for online teaching, discussions and presentations to learners. Zoom online platform was used in this study as it has been used successfully in conferences and classroom instructions to redirect students' interest to learning.

The choice of Google Classroom and Zoom for this study was because of the features embedded in them. Zoom has features for real-time display of learning content while Google Classroom has both real-time and anytime features that are suitable for pedagogy. The Zoom

application has two versions namely, free and paid versions. The free version accommodates up to 100 students as participants while the paid version account accommodates between 500 to 1000 students in one meeting (Laksana et al., 2023). Like Google Classroom, Zoom is easy to use, has quality video and sound, clear communication, neatly arranged features, easy to find options, they enhance practical presentations through live videos, allow presentation of files, present file that can be sent to students, and lecturers can schedule lecture time and duration. In addition, Google Classroom helps teachers to manage the creation and collection of students' assignments in a paperless environment with the support of Google Docs and Drive apps (Janzen, 2014). The Google Classroom and Zoom applications were effective in classroom interactions between lecturer(s) and students in teaching practical courses such as fisheries in universities. Hence, the need to use Google Classroom and Zoom as teaching platforms to ascertain their effectiveness on whether or not capture and sustain learners' attention and lead to improved academic achievement.

Academic achievement refers to the output of a learner in a learning situation for a defined period. Maskova and Kucera (2021) opined that academic achievement represents performance outcomes that indicate the extent to which a person has accomplished specific goals that were the focus of activities in the instructional environment, especially in schools such as colleges and universities. According to Steinmayr et al. (2022), academic achievement represents performance outcomes that indicate the extent to which a person has accomplished specific goals, especially in schools, colleges, and universities. Academic achievement in the context of this study refers to the performance attained in the intellectual domain carried out at various stages of learning in the universities, as concerns agricultural education students. Academic achievement can be rated among learners based on their degree of retention.

Retention refers to the quantum of what is learnt and recalled after a short or a considerable period. Retention is the ability to retain information presented in either short-term or long-term memory (Valderama & Oligo, 2021). The information retained in the mind is referred to as memory, while the ability to recall or recognise what was learnt is known as retention. Haynie (2012) stated that retention of learning is measured in two ways namely, the initial test and the delayed retention test. The initial test is employed during instructions or immediately after the instruction, whereas the delayed retention test is administered at a later time, like two or more weeks after instruction. Both tests are administered to measure retained knowledge in individual learners. Knowledge retention and academic achievement may vary from one individual to another. Disawat and Mahapoonyanont (2025) asserted that retention

capability in learners can be improved upon through proper teaching and learning among students of Agricultural Education.

Agricultural Education, in the view of Gotom et al. (2023), is defined as the art and science of communicating the skills in cultivating and improving crops and livestock for man's use. Agricultural education entails the use of scientific knowledge in the teaching and learning of food production through the acquisition of knowledge in crop production, livestock management, soil and water conservation for industrial and human development (Adeosun et al., 2020). In the context of this study, Agricultural Education is a course offered by learners in institutions of higher learning with main contents on cultivating crops, livestock, business management and how to impact attitude, skills and knowledge to learners. Agricultural education as an area of specialization taught to students in universities and colleges of education can be taught in virtual classrooms. Features in virtual classrooms could also be used to determine the effects of such teaching on academic achievement and retention among agricultural education students in universities.

Universities are higher institutions saddled with the mandate of producing graduates within the span of four to six years in the liberal arts and sciences degrees. According to Alemu (2018), universities are a higher learning institution that brings men and women to a high level of intellectual development in arts and sciences, diverse professional disciplines and promotes high-level research. It is a source of universal knowledge and highly skilled human power development for professions. However, the smooth running of these citadels of learning in most African countries, including Nigeria and specifically in North-Central Nigeria, is often affected by negative national/regional health, social, religious and political issues. Most of the time in the university's academic calendar, disruptions occur in the form of socio-religious crises and other challenges like the COVID-19 pandemic. The scenarios disrupt the academic calendar, make the students stay away from school, and lead to social unrest among others. It requires an alternative approach to keep the students and teachers engaged in academic activities irrespective of disruptions. Such an alternative instructional approach is the use of virtual learning, which this study sought to explore. This study thus explored the effectiveness of virtual classrooms for teaching and learning of agricultural education in North-Central Nigeria.

Statement of the Problem

The frequent religiously, culturally and politically induced violence in the north-central region leading to protests and subsequent closure of schools and forceful vacation of students and staff from school premises for safety of life and properties often puts the implementation

of the school curriculum on hold while schools of other regions continue their academic session. Upon resumption, which can be after a brief or long stay at home, the school management often speeds up the teaching and learning activities to catch up with other schools, and most times to the detriment of quality learning process of the students. Upon resumption of activities in these institutions, multiple admission sets are granted to accommodate all students who qualified for admission during the inactive period of the universities. These incidences and more affect the academic activities to a large extent by crippling lectures, seminar presentations, examinations, suspension of teaching and research practical and other academic activities in the universities. The multiple admission could put more stress on the lecturers when the carrying capacity is stressed beyond limit leading to burnout and inefficiencies among staff of the university.

Students are admitted and trained in universities to impart useful knowledge, attitudes, values and skills for the world of work. To achieve these aims, an enabling environment is required in the universities despite disruptions in the university's academic calendar from time to time. In vocational education courses like the Agricultural Education, practical manuals on fisheries for example are made available to give a guide to lecturers on how to teach the content to students practically. Virtual reality can display simulations on how practical activities are carried out for learners to see, are being considered and useful in imparting knowledge, skills and attitudes to students in universities. Such can be better seen in the face of recurrent disruptions like global pandemic, national security challenges across Nigeria. Regionally, socio-religious crises as in the northern part of Nigeria and agitations in south eastern lead to declared "sit-at-home" which adversely affected the region both academically, socially and economically. These issues threaten the safety and security of lives and property of university teachers and students. The use of virtual classrooms hastens syllabus coverage, sustains the implementation of the academic calendar during disruptions and improves the ratings of the university as they become more technologically inclined for instructional delivery. Despite the usefulness of virtual classrooms, their utilization in teaching vocational agricultural education in North-Central universities in Nigeria has not been fully explored. The current study, therefore, hopes to provide empirical evidence on the effects of virtual classrooms on the academic achievement and retention among agricultural education students, as a prerequisite for policy change in the adoption and use of the technology for instructional delivery in the region and beyond.

Research Questions

The study answered the following research questions:

1. What is the effect of google classroom on the academic achievement of agricultural education students in universities in North-Central Nigeria?
2. What is the effect of zoom on the academic achievement of agricultural education students in universities in North-Central Nigeria?
3. What is the effect of google classroom on the retention of agricultural education students in universities in North-Central Nigeria?
4. What is the effect of zoom on the retention of agricultural education students in universities in North-Central Nigeria?

Research Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

1. the effect of Zoom and Google Classroom on the academic achievement of agricultural education students among the universities in north-central does not differ significantly
2. the effect of Zoom and Google Classroom on the retention of agricultural education students among the universities in north-central does not differ significantly

Methodology

Quasi-experimental design was adopted for the study due to the intact classes. The study was conducted in North-Central Nigeria which is made up of six states including Benue, Kogi, Kwara, Nasarawa, Niger, Plateau, and the Federal Capital Territory (FCT) Abuja. The population of the study was 172 of 2nd year undergraduates. Experimental group of 93 undergraduates used Google classroom and 42 used Zoom while 37 control group. However, with fishery as a course of study in the region, fish-related subjects for better production, and improvement in protein intake against malnutrition in infant babies, children, nursing and pregnant mothers during and after crises. For this reason, the study focused on North-Central Nigeria that was prone to crisis. Fisheries is one of the contents of the Agricultural Education curriculum, which is taught to 2nd year undergraduate students in the first semester to provide a pre-requisite knowledge and skills in breeding, stocking, and feeding, among other management practices in fish farming.

A structured questionnaire containing 50 multiple-choice questions (MCQ) was administered to respondents online for the study. The instrument was subjected to both face and content validation by three experts, two from the Department of Agricultural Education and one from Computer and Robotics Education, University of Nigeria, Nsukka. To determine

the reliability coefficient of the Cognitive Achievement Test on Fishery, CATF, a test-retest reliability technique was carried out using Kuder-Richardson formula 20 (KR-20). The index of temporal stability of the CATF coefficient value was 0.79. The intervention was preceded by pre-test across three universities. Two universities for experimental groups (Google Classroom & Zoom) while control group for the third university. After the pre-test, the manual developed by the researcher on Fishery was presented to the students for a period of 10 weeks and immediately followed by a post-test to the three categories of classes. Subsequently, retention test was administered two weeks after the post-test to ascertain the level of retention among the 2nd year students from the three universities. All the analyses were done using the Statistical Package for Social Sciences (SPSS v27). Specifically, mean was used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the null hypotheses at 0.05 level of significance.

Results

Research Question one: What is the effect of Google Classroom on the academic achievement of agricultural education students of universities in North-Central Nigeria?

Table 1: Pre-test and Post-test Mean achievement scores of agricultural education students exposed to Google Classroom and those exposed to control

Group	N	Pre-test		Post-test		Mean Difference
		X	SD	X	SD	
Google classroom	93	35.44	3.013	79.81	7.752	44.37
Control	37	35.35	2.497	45.24	3.570	9.89

Note: N = Number of Respondents, X= Mean, SD = Standard deviation

Result in Table 5 shows the pre-test and post-test mean achievement scores of Agricultural Education students exposed to google classroom had mean achievement score of (X = 35.44, SD = 3.013) at pre-test and a mean achievement score of (X=79.81, SD = 7.752) at post-test, while those who were exposed to control group had mean achievement score of (X=35.24, SD = 2.497) at pre-test and a mean achievement score of (X=45.24, SD = 3.570) at post-test. The pre-test and post-test mean difference were 44.37 and 9.89 for students exposed to google classroom and control group respectively. The results suggest that google classroom wamkijmkij6qs more effective in improving students' achievement in fishery than the control group.

Research Question Two: What is the effect of zoom on the academic achievement of agricultural education students in universities in North-Central Nigeria?

Table 2: Pre-test and Post-test Mean achievement scores of agricultural education students exposed to zoom and those exposed to control

Group	N	Pre-test		Post-test		Mean Difference
		X	SD	X	SD	
Zoom	42	35.62	3.253	66.19	4.020	30.57
Control	37	35.25	2.497	45.24	3.570	9.89

Note: N = Number of Respondents, X= Mean, SD = Standard deviation.

Result in Table 2 shows the pre-test and post-test mean achievement scores of agricultural education students exposed to zoom had mean achievement score of (X=35.62, SD = 3.253) at pre-test and a mean achievement score of (X=66.19, SD = 4.020) at post-test, while those who were exposed to control group had mean interest score of (X=35.24, SD = 2.497) at pre-test and a mean achievement score of (X=45.24, SD = 3.570) at post-test. The pre-test and post-test mean difference were 30.57 and 9.89 for students exposed to zoom and control group respectively. The results suggest that zoom was more effective in enhancing students' achievement in fishery than the control group.

Hypothesis one: the effect of Zoom and google classroom on the academic achievement of agricultural education students among the universities in north-central does not differ significantly.

Table 3: Analysis of Covariance (ANCOVA) of the mean achievement scores of agricultural education students exposed to zoom, google classroom, and control:

Tests of Between-Subjects Effects

Dependent Variable: Post Achievement

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	32182.489 ^a	3	10727.496	275.521	.000	.831
Intercept	3455.734	1	3455.734	88.756	.000	.346
PreAch	108.665	1	108.665	2.791	.097	.016
METHODS	32040.759	2	16020.380	411.461	.000	.830
Error	6541.139	168	38.935			
Total	858720.000	172				
Corrected Total	38723.628	171				

a. R Squared = .831 (Adjusted R Squared = .828)

Note: df= Degree of Freedom, F= F-ratio, Sig.= Significant/probability value.

Table 3 shows ANCOVA of the difference in the mean achievement scores of agricultural education students exposed to zoom and those exposed to Google classroom. The

result shows that an f-ratio of $F(1, 171) = 411.461, p < .05, \eta^2_p = .830$ was obtained. Since the associated probability value of 0.000 is less than 0.05 level of significance at which the result is being tested, the null hypothesis four (H_{04}) which states that the effect of Zoom and google classroom on the academic achievement of agricultural education students among universities in north-central does not differ significantly therefore is rejected. Moreover, the effect size of ($\eta^2_p = .830$) indicates that 83 percent variation in the achievement scores of agricultural education students in fishery is due to difference between interventions. Hence, the conclusion drawn was that the effect of Zoom and google classroom on the academic achievement of agricultural education students among universities in north-central differ significantly. Consequently, a post hoc test was conducted using Sheffe's test. The result is shown in the Table 4.

Table 4: Post Hoc Test of Significant Difference between the mean achievement scores of agricultural education students exposed to Zoom, Google classroom and control
Multiple Comparisons

Dependent Variable: Post Achievement

Scheffe						
(I)	(J) METHODS	Mean Difference	Std. Error	Sig.	95% Confidence Interval	
METHODS		(I-J)			Lower Bound	Upper Bound
Google Classroom	Zoom	13.62*	1.166	.000	10.74	16.50
	Control Group	34.56*	1.219	.000	31.55	37.57
Zoom	Google Classroom	-13.62*	1.166	.000	-16.50	-10.74
	Control Group	20.95*	1.414	.000	17.45	24.44
Control Group	Google Classroom	-34.56*	1.219	.000	-37.57	-31.55
	Zoom	-20.95*	1.414	.000	-24.44	-17.45

Based on observed means.

The error term is Mean Square (Error) = 39.348.

*. The mean difference is significant at the .05 level.

Result on Table 4 shows that the students exposed to Google classroom had a mean achievement gain score of 13.62 over those exposed to Zoom and a mean gain score of 34.58 over those exposed to control. This result implies that Google classroom was more effective in enhancing agricultural education students' achievement in fishery than Zoom. Further, result shows that the difference between Google classroom and Zoom on the mean achievement scores of agricultural education students in fishery is significant. This is because the probability value of 0.000 obtained is less than 0.05 set as level of significance. Results further show that the difference between Google classroom and control on the mean achievement scores of agricultural education students in fishery is significant. This is because the probability value of

0.000 obtained is less than 0.05 set as level of significance. Inference drawn is that the effect of Zoom and google classroom on the academic achievement of agricultural education students among universities in north-central is significant in favour of Google classroom.

Research Question Three: What is the effect of google classroom on the retention of agricultural education students in universities in North-Central Nigeria?

Table 5: Pre-test and Post-test Mean retention scores of agricultural education students exposed to google classroom and those exposed to control

Group	N	Pre-test		Post-test		Mean Difference
		X	SD	X	SD	
Google classroom	93	79.81	7.752	80.80	7.236	0.99
Control	37	45.24	3.570	43.20	4.252	-2.00

Note: N = Number of Respondents, X= Mean, SD = Standard deviation.

Result in Table 5 shows the pre-test and post-test mean retention scores of agricultural education students exposed to Google classroom had mean retention score of (X= 79.81, SD = 7.752) at pre-test and a mean retention score of (X=80.80, SD = 7.236) at post-test, while those who were exposed to control group had mean retention score of (X=45.24, SD = 3.570) at pre-test and a mean retention score of (X=43.24, SD = 4.252) at post-test. The pre-test and post-test mean difference were 0.99 and -2.00 for students exposed to Google classroom and control group respectively. The results suggest that agricultural education students' retention exposed to Google classroom improved slightly after some time but declined for those exposed to control after some time.

Research Question Four: What is the effect of zoom on the retention of agricultural education students in universities in North-Central Nigeria?

Table 6: Pre-test and Post-test Mean retention scores of agricultural education students exposed to zoom and those exposed to control

Group	N	Pre-test		Post-test		Mean Difference
		X	SD	X	SD	
Zoom	42	66.19	4.202	67.00	3.755	0.81
Control	37	45.24	3.570	43.24	4.252	-2.00

Note: N = Number of Respondents, X= Mean, SD = Standard deviation.

Result in Table 6 shows the pre-test and post-test mean retention scores of agricultural education students exposed to zoom and those exposed to zoom had mean retention score of (X=66.19, SD = 4.020) at pre-test and a mean retention score of (X=67.00, SD = 3.755) at post-

test, while those who were exposed to control group had mean retention score of ($X=45.24$, $SD = 3.570$) at pre-test and a mean retention score of ($X=43.24$, $SD = 4.252$) at post-test. The pre-test and post-test mean difference were 0.81 and -2.00 for students exposed to zoom and control group respectively. The results suggest that agricultural education students' retention exposed to zoom improved slightly after some time while that of those exposed to control dropped after some time.

Hypothesis Two: the effect of Zoom and google classroom on retention of agricultural education students among the universities in north-central does not differ significantly.

Table 7: Analysis of Covariance (ANCOVA) of the mean retention scores of agricultural education students exposed to zoom, Google classroom and control

Tests of Between-Subjects Effects						
Dependent Variable: Retention						
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	42976.925 ^a	3	14325.642	3427.650	.000	.984
Intercept	69.105	1	69.105	16.534	.000	.090
PostAch	5343.784	1	5343.784	1278.590	.000	.884
METHODS	222.363	2	111.181	26.602	.000	.241
Error	702.145	168	4.179			
Total	870872.000	172				
Corrected Total	43679.070	171				

a. R Squared = .984 (Adjusted R Squared = .984)

Note: df= Degree of Freedom, F= F-ratio, Sig.= Significant/probability value.

Table 7 shows ANCOVA of the difference in the mean retention scores of agricultural education students exposed to zoom and those exposed to Google classroom. The result shows that an f-ratio of $F(1, 171) = 26.602$, $p < .05$, $\eta^2_p = .231$ was obtained. Since the associated probability value of .000 is less than 0.05 level of significance at which the result is being tested, the null hypothesis five (H_{05}) which states that the effect of Zoom and google classroom on retention of agricultural education students among universities in north-central does not differ significantly therefore was rejected. Moreover, the effect size of ($\eta^2_p = .241$) indicates that 24.1 percent variation in the retention scores of agricultural education students in fishery is due to difference between interventions. Hence, the conclusion drawn was that the effect of Zoom and google classroom on retention of agricultural education students among universities in north-central does not differ significantly. Consequently, a post hoc test was conducted using Sheffe's test. The result is shown in the table below:

Table 8: Post Hoc Test of Significant Difference between the mean retention scores of agricultural education students exposed to Zoom, Google classroom and control

Multiple Comparisons						
Dependent Variable: Retention						
Scheffe						
(I) METHODS	(J) METHODS	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound Upper Bound	
Google Classroom	Zoom	13.80*	1.112	.000	11.05	16.54
	Control Group	37.55*	1.163	.000	34.68	40.42
Zoom	Google Classroom	-13.80*	1.112	.000	-16.54	-11.05
	Control Group	23.76*	1.349	.000	20.43	27.09
Control Group	Google Classroom	-37.55*	1.163	.000	-40.42	-34.68
	Zoom	-23.76*	1.349	.000	-27.09	-20.43

Based on observed means.

The error term is Mean Square (Error) = 35.775.

*. The mean difference is significant at the 0.05 level.

Result on Table 8 shows that the students exposed to Google classroom had a mean retention gain score of 13.80 over those exposed to Zoom and a mean retention gain score of 37.55 over those exposed to control. This result implies that Google classroom was more effective in supporting agricultural education students' retention in fishery than Zoom. Further, result shows that the difference between Google classroom and Zoom on the mean retention scores of agricultural education students in fishery is significant. This is because the probability value of 0.000 obtained is less than 0.05 set as level of significance. Results further show that the difference between Google classroom and control on the mean achievement scores of agricultural education students in fishery is significant. This is because the probability value of 0.00 obtained is less than 0.05 set as level of significance. Inference drawn is that the effect of Zoom and google classroom on the academic retention of agricultural education students among universities in north-central is significant in favour of Google classroom.

Discussion of Findings

The data presented in Table 1 provided answer to question one. The finding revealed that the google classroom was more effective in improving students' achievement in fisheries than the control group. This indicates that google classroom provided a platform for treatment (lecture) that improve on the students' achievement than control group that did not present treatment. The finding is corroborated by Okeke, et al., (2022) who showed that the google classroom had a significant positive effect on students' achievement in Mathematics. This

means that students' achievement in Mathematics improves when taught using google classroom. Similarly, Aji and Khan (2019); and Sanitchai and Thomas (2018) found that active engagement in virtual classroom (google classroom) results in improved academic achievement.

The data presented in Table 2 provided answer to research question six. The finding revealed that zoom was more effective in enhancing students' achievement in fishery than the control group. The finding is similar to the submission of Basher (2017) showed that there was statistically significant difference in the result between the experimental (Google Classroom) and control groups where Google Classroom outcome was high with a mean of 39.00 against 32.16 for control group. The finding is also supported by report of a study done by Huang, et al., (2021) which showed that the google classroom group had higher average learning satisfaction and academic achievement scores than that of control group. Nonetheless, this difference did not rise to the level of statistical significance with the effect size (E.S.) of 0.37-0.46.

Table 3 presented data analysis of hypothesis one. The finding revealed that the effect of Zoom and google classroom on the academic achievement of agricultural education students among universities in north-central differ significantly. The finding of this study was in conformity with the findings of Basil, Umakalu and Nwangwu (2022) which concluded that the effect of google classroom on students' academic achievement in database management was higher than the main effect of zoom app and statistically significant. The finding is supported by empirical studies of Jimoh, et al. (2022) which revealed that treatment had a significant effect on Mathematics students' achievement.

Table 4 presented a post hoc test of significant difference between mean achievement scores of agricultural education students exposed to zoom, google classroom and control. Inference was drawn that the effect of Zoom and google classroom on the academic achievement of agricultural education students among universities in north-central is significant in favour of google classroom. The finding is in tandem with the research carried out by Amadi and Anekwe (2023) showed that though, the two apps had positive effects, google classroom had a higher positive effect on the students' academic achievement than zoom app. On the contrary, Sari, Yin and Zakariya (2024) revealed that the students' academic achievement using google classroom, zoom, and control group does not differ significantly.

The finding on research question seven in Table 5 shows the pre-test and post-test mean retention scores of agricultural education students exposed to Google classroom improved slightly after some time but declined for those exposed to control after some time. The pre-test

and post-test mean difference were 1.47 and 0.71 for students exposed to google classroom and control group respectively. The finding is in tandem with the research carried out by Khalafi, Fallah and Sharif-Nia (2024) in a study showed that the mean scores of acquisitions and retention of knowledge in the intervention group were significantly higher than those in the control group. Okeke, et al. (2022) also revealed that the google classroom had a significant positive effect on students' achievement in Mathematics. This implies that students' achievement would improve when google classroom is used in teaching Agricultural Education.

Table 6 provided answer to research question three. The results suggest that agricultural education students' retention exposed to zoom improved slightly after some time while that of those exposed to control dropped after some time. The pre-test and post-test mean difference were 0.81 and -2.00 for students exposed to zoom and control group respectively. This indicates that the retention rate in zoom is higher than in control group. The finding is concord with the finding of Jimoh, et al. (2022) revealed that zoom application (experimental group) was more effective than control (conventional method) in the retention of Mathematics. The finding revealed that the intervention had a significant effect on the retention of students in Mathematics. Similarly, finding is in line with the report of the study done by Khalafi, Fallah and Sharif-Nia (2024) which showed the mean scores of acquisitions and retention of knowledge in the experimental group was significantly higher than that of the control group.

Table 7 presented data analysis of hypothesis two. The conclusion drawn was that the effect of Zoom and google classroom on retention of agricultural education students among universities in north-central does not differ significantly. The finding concurs with the finding of Basheer, Kulu and Tanko (2025) revealed that data collected from pre-test and post-test scores does not significantly differ in improving students' academic achievement when virtual classroom (google classroom & zoom) were used. This is in line with findings of Smith and Brown (2022), reported that virtual classrooms improve retention through interactive apps.

Table 8 presented a post hoc test of significant difference between mean retention scores of agricultural education students exposed to zoom, google classroom and control. This result implies that Google classroom was more effective in supporting agricultural education students' retention in fishery than Zoom app and control group. Furthermore, result shows that the difference between Google classroom and Zoom on the mean retention scores of agricultural education students in fishery is significant. The finding is supported by empirical studies of Jimoh, et al. (2022) revealed that there was significant difference in the mean

retention scores of students taught Mathematics using zoom app, google classroom and control group. Thus, google classroom and zoom app were more effective than control group in learning of Mathematics. The finding is in agreement with the result of the study done by Osakwe et al. (2023) which revealed that a significant difference in mean retention scores between the experimental groups (google classroom & zoom app) and control group favoured the google classroom.

Conclusion

The study was conducted to determine platforms that can be used in the face of disruptions. This study was prompted by the fact that virtual classrooms have the tendency of bridging the gap in delivering the contents of course outline in the face of disruptions. The desire to adopt google classroom and zoom by Agricultural Education students and lecturers to encourage them use in teaching and learning among the universities for improved learning, easy delivery of lectures without converging in a physical class, early and better coverage of course outlines. The researcher found out that in the face of disruptions such as crises, pandemics (COVID-19) and tight schedules among lecturers when school resumes after crisis or ASUU strike, the google classroom or zoom can be used in delivering lectures, conducting tests and disseminating information to students by course lecturers. This study has succeeded in determining the effects of virtual classrooms on academic achievement and retention among Agricultural Education students of universities in North-Central Nigeria.

Recommendations

1. Google classroom should be adopted in delivering lectures and other learning contents among lecturers and students in Nigerian universities.
2. Zoom which gives a wide coverage should be encouraged in delivering lectures, workshops and conferences to improve students' achievement in fisheries among lecturers and students in the Nigerian universities.
3. The use of google classroom should be enforced in delivering courses with both theory and practice like Agricultural Education by Nigeria universities Commission (NUC) due to the wide margin in retention among agricultural education students revealed in this study.

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