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Comparative Analysis of Zoom Technology and Instructional Videos over Classroom Learning System on Polytechnic Students Learning Computer Science Courses

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Abstract: Zoom is a video conferencing tool that allows individuals to meet and collaborate productively just like physically face to face, even when they can't meet in-person. This makes remote meetings more human. This is essential for users to feel and stay connected. Zoom cloud and instructional videos are platforms that are widely used for learning. This study compared the academics performance of experimental and control group students of National Diploma I and II (ND I and II) enrolled in java programming language, web technology and computer application packages for sciences as a computing courses in the school of applied sciences, department of Computer Science and Science Laboratory Technology at Kebbi State Polytechnic, Dakingari. The population of the study comprised of forty two (42) students participated as experimental group and forty five (45) as control group in all the three (3) selected courses. Therefore, a total of eighty seven (87) students participated in the study. Data were collected using 20 items essay test questions with reliability coefficients of 0.76 and analysed with SPSS-V21 using independent sample t-test after eight (8) weeks of continuous treatment. The study were guided by one (1) research question and one (1) null research hypotheses (Ho) at significance alpha value .05. The groups were exposed to pretest before the actual commencements of the treatments. The result of the posttest revealed that, there were no significant differences between the experimental and control group students' performance that learned java programming language and web technology with t(28) = 1.606, p-val = .119, df = 28, mean difference (MD) = 11.933, 95% Confidence Interval (CI) = [-3.284628, 27.151294] and t(7.567) = -1.801, p-val = .112, df = 7.567, mean difference (MD) = -16.857 and 95% Confidence Interval (CI) = [-38.66137, 4.94709] respectively while there is significant different in the academic performance of students that learned computer application packages for sciences with t(41) = 3.479, p-val = .001, df = 41, mean difference (MD) = 21.348 and 95% Confidence Interval (CI) = [8.95460, 33.74106]. The researchers concluded that there is no significant difference between the experimental and control group students that learned java programming language, web technology and computer application packages for sciences using zoom technology and instructional videos and others using traditional (classroom) method in the polytechnics learning system.

Keywords: Zoom technology, Instructional videos, Classroom, Website, YouTube, Computing courses, Students, Polytechnic.

I. INTRODUCTION

Teaching and learning in the classroom is a complex and multifaceted social experience. With so many things happening at the same time, students and teachers have to interpret and process these events at great speed. Teaching is not a one-way communication. Because students influence the process as much as teachers. Teachers play a very important role in creating a meaningful classroom environment for their students, but ultimately it is each student's social and psychological activity that determines what they learn and reaction. How each student perceives, interprets, processes, and understands classroom activities, rather than what teachers do, is the most important factor in determining the educational outcomes that student achieves.

Teaching and learning processes are rapidly becoming technology-driven, with the integration of digital learning using online learning platforms to facilitate instructional delivery. The google classroom learning platform is one of the most effective ways to improve student engagement in an online learning environment (Noah & Gbemisola, 2020).

Distance learning is a familiar and widely accepted form of learning due to technological advances and convenience of learning opportunities. Many students choose remote mode over conventional method because it gives them more flexibility in their work and family relationships. Still there were many challenges to keeping students engaged and

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making distance learning as effective as learning on-campus. Also, most distance learners choose to study and interact with academics outside of normal working hours, challenging their work-life balance. Online support tools such as zoom allow students and academics to connect through virtual tutorials from any convenient location, which is an effective use of technology to improve student engagement and their success rate while minimizing the inconvenience of after-hours commitments for academics (Sayem, Taylor, Mcclanachan, & Mumtahina, 2017).

Videos unavoidably surround our lives with the help of wireless network services (WiFi) the growing production of smartphones and tablets such as android tablets and iPads, the acts of capturing and sharing videos on social networks i.e. Facebook, Twitter are just a touch away and had never been so easy (Ting, 2013). This study investigated the effect of using zoom technology and instructional videos over classroom (face-to-face) learning system on computing courses in the polytechnic.

II. RELATED WORKS

The effect of real-time video distance learning using zoom on learners' English reading comprehension. The study determine the effectiveness of zoom video lectures and consider supplementing this with a survey of learners regarding their opinions and satisfaction with zoom video lectures. A control and experimental group were formed and two performance tests and questionnaires were administered. Research has shown that zoom video lectures have a positive impact on learners' English reading comprehension. According to survey results: 'Increased interest in and willingness to learn', 'self-directed learning', 'active interaction', 'ease of access' and 'ease of information retrieval' were found satisfied by the learners. At the same time, the survey was also revealed that some learners were dissatisfied with zoom video lectures because of 'mechanical errors or defects', 'poor sound quality' and 'need to add custom functions for efficient teaching' as discussed in (Kim, 2020). Ting (2013) conducted a study to understand students' perceptions on the implementation of video projects into English classes. The data was provided by 35 foundation students of a private university in Selangor. At the beginning of the semester, participants were assigned to create a short, teenage-themed video clip with the students themselves in the lead roles.

The researcher used Window Movie Maker to edit the raw video captured by my camcorder. After completing the video project, the students submitted a reflection journal entry to the blog. The English learning voyage. These responses were qualitatively analysed and grouped into five themes: implementation of the video project, failure during production, satisfaction after completing the video, factors that contributed to the success of the video project and relevance of video projects to language learning. Sayem et al. (2017) determined the effectiveness of using zoom technology to deliver evening tutorial sessions to improve the success of students studying foundation engineering units remotely at regional university, while maintaining a manageable academic load. The researchers further explained that virtual zoom tutorials improved student satisfaction and reduced instructor workload by about 25%. Offering zoom tutoring sessions online has greatly reduced the number of questions and answers posted on moodle, easing the academic burden. This was achieved without reducing student involvement or changing the distribution of grades. According to Noah and Gbemisola (2020), google classroom offers both teachers and students a true platform for using digital technology tools for student engagement in the online environment. The platform facilitates active learning and allows students to access learning materials anytime, anywhere. The platform helps both students and teachers connect and collaborate, create assignments, grade students, and post learning materials. Similarly, students can ask questions about areas they do not understand. In this way, the advantages of this platform can be used to achieve the quality of teaching and learning processes at all levels of education during the pandemic.

Several researches have been carried out using instructional videos or videos clips. Some of these researches are examined below:

The impact of lectures with video clips on student learning compared to traditional teaching methods. The results show that video based teaching materials are at least as effective as traditional lectures. The researchers collected data during 1, 2, and 3 week follow-ups (Nikopoulou-smyrni & Nikopoulos, 2010).

The R&D with ADDIE development model consists of analysis, design, development, implementation, and evaluation to explore and validate student interest in developing PowToon-based learning videos that support flipped classroom strategies. Their study uses descriptive analysis techniques by using a questionnaire instrument to calculate validation scores, interests and proportions of student responses. Researchers presented the difference between before and after using videos for learning and how videos increase student engagement (Herawati, Sulisworo, & Fayanto, 2019). Similarly, a quasi-experimental non-equivalent pre-test and post-test study design to test the effects of video clip enrichment on 8th grade academic performance.

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The academic performance of the two groups was assessed using 30-item multiple-choice test produced in the study. The confidence factor for the test is 0.74. Data were treated with mean, standard deviation, and ANCOVA (analysis of covariance) at the 0.05 significance level. Also, the learner's experience in learning Earth and Space Science was enhanced by video clips using entries from journal notes and scheduled interviews after lessons and post-tests were administered. They found that learners who were taught earth and space sciences enriched with video clips achieved "extremely satisfactory" academic performance (Pumbaya & Pumbaya, 2019).

III. RESEARCH QUESTION

This study attempted to answer the research question:

What are the effect of using zoom technology and instructional videos over classroom (traditional) learning system on computing courses?

IV. RESEARCH METHODOLOGY

A. Research Design

This study used a quasi-experimental approach to answer research question (RQ) by using experimental and control group. The experimental students are taught the selected computer science courses using zoom technology and instructional videos while control students taught same using conventional method. Before the actual commencements of the treatments a pretest was conducted to both groups in order to assess their level of computing programming skills, text reading and understanding. A zoom technology were used for the online lectures delivery and a system (website) was developed and hosted online to view the uploaded instructional videos from the YouTube. Eight (8) weeks of continuous treatment was conducted, at the end the two groups underwent a posttest. Collected data were analysed using mean, standard deviation and t-test statistics to find significance differences in academic performance between the groups.

B. Selected Computer Science Courses for the Study

The following computer science courses were selected:

i. Course I: Java Programming Language
ii. Course II: Web Technology
iii. Course III: Computer Application Packages for Sciences

C. Participants and Sampling

In this study, students of National Diploma I and II (ND I and II) Computer Science and Science Laboratory Technology (SLT) from Kebbi State Polytechnic, Dakingari were selected.

i. In course I (Java Programming Language), availability of laptops and smart phones (such as android and iPhones) were considered for selecting experimental students which were called experimental group, fifteen (15) National Diploma I (ND I) students of Computer Science were selected as experimental group. Java programming languages were taught using zoom technology and instructional videos were recorded during online lectures with zoom and open broadcaster software (OBS) were used to make the instructional videos which were uploaded on the YouTube channel and linked to the developed hosted system. Fifteen (15) students were also selected from the same class as control group they were taught same using the conventional (classroom) approach.

ii. Course II (Web Technology), National Diploma II (i.e final year students of Diploma Computer Science). The class contained fourteen (14) students which were divided into seven (7) each based on their interest about the two (2) groups, seven (7) are selected as experimental group as well as other seven (7) as the control group taught web technology using zoom technology and instructional videos while others in the classroom.

iii. Course III (Computer Application Packages for Sciences), National Diploma I (ND I) students of Science Laboratory and Technology were randomly selected. Twenty (20) students were taught using zoom technology and instructional videos as experimental group and twenty three (23) were taught using traditional method as control group. The population of the study comprised forty two (42) students participated as experimental group and 45 as control group in all the three (3) selected courses. Therefore, a total of eighty seven (87) students participated in the study.

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D. Data Collection

For all the three (3) computing courses, a 20 items essay test questions which has a reliability coefficients of 0.76, indicating that it was reliable to assess the academic performance of the experimental and control groups at the end of the treatments. The test was conducted as an instrument to collect data for the study. The students from both groups were expected to score a maximum of hundred (100) marks.

E. Data Analysis

The Data collected in the three courses were analysed using independent sample t-test in Statistical Package for Social Sciences version 21 (SPSS-V21).

F. Research Hypotheses

Ho: There is no significant difference in the performance of experimental group taught computer science courses using zoom technology and instructional videos and control group taught using classroom (traditional) approach.
The hypotheses were tested at .05 level of significance difference

V. ZOOM TECHNOLOGY AND INSTRUCTIONAL VIDEOS

Zoom technology provide live online training or instructions to the audience. All the online classes using zoom were recorded and uploaded on the YouTube channel. A website was developed in order to embed the instructional videos from the channel using videos embedding links. The front-end of the website was developed using HTML, JAVASCRIPT and CSS scripting language and the back-end developed using MySQL database while PHP programming language was used to communicate instructional videos between the YouTube channel and the system front-end and to display the students information from back-end to the front-end.

The experimental students were asked by the researchers to create account in the website in order to access the instructional videos. Therefore, the experimental groups can participates in the online lectures using zoom technology and also view the uploaded instructional videos using the developed system (website) which can be downloaded or view online using their computers or mobile phones at their leisures. Fig. 1 and 2 depicts our zoom connections and lectures, Fig. 3 display the uploaded videos on the YouTube channel and Fig. 4 and 5 display the instructional videos on the developed system.

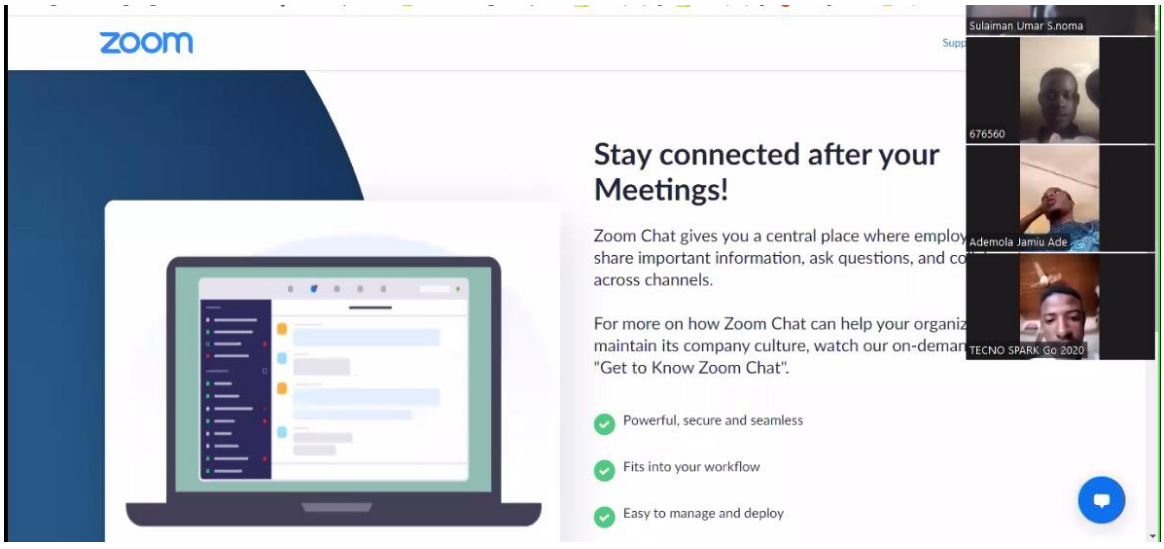

FIG. 1: ZOOM USERS CONNECTIONS

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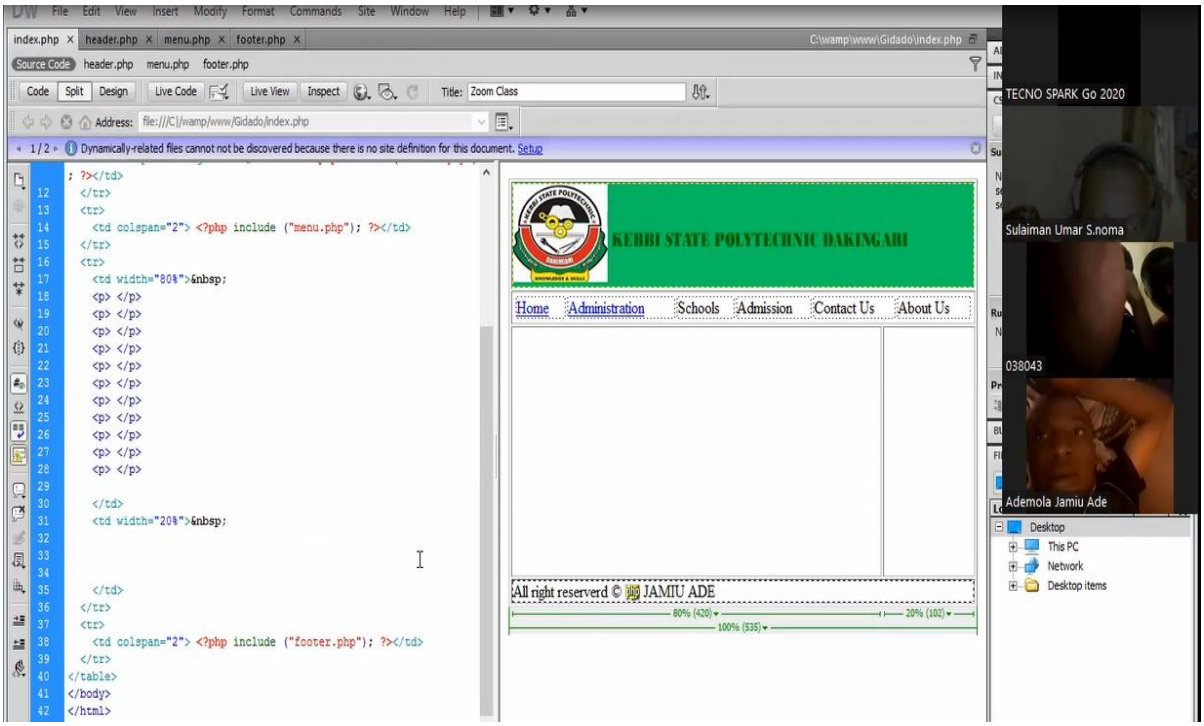

FIG. 2: ONLINE LECTURES USING ZOOM TECHNOLOGY

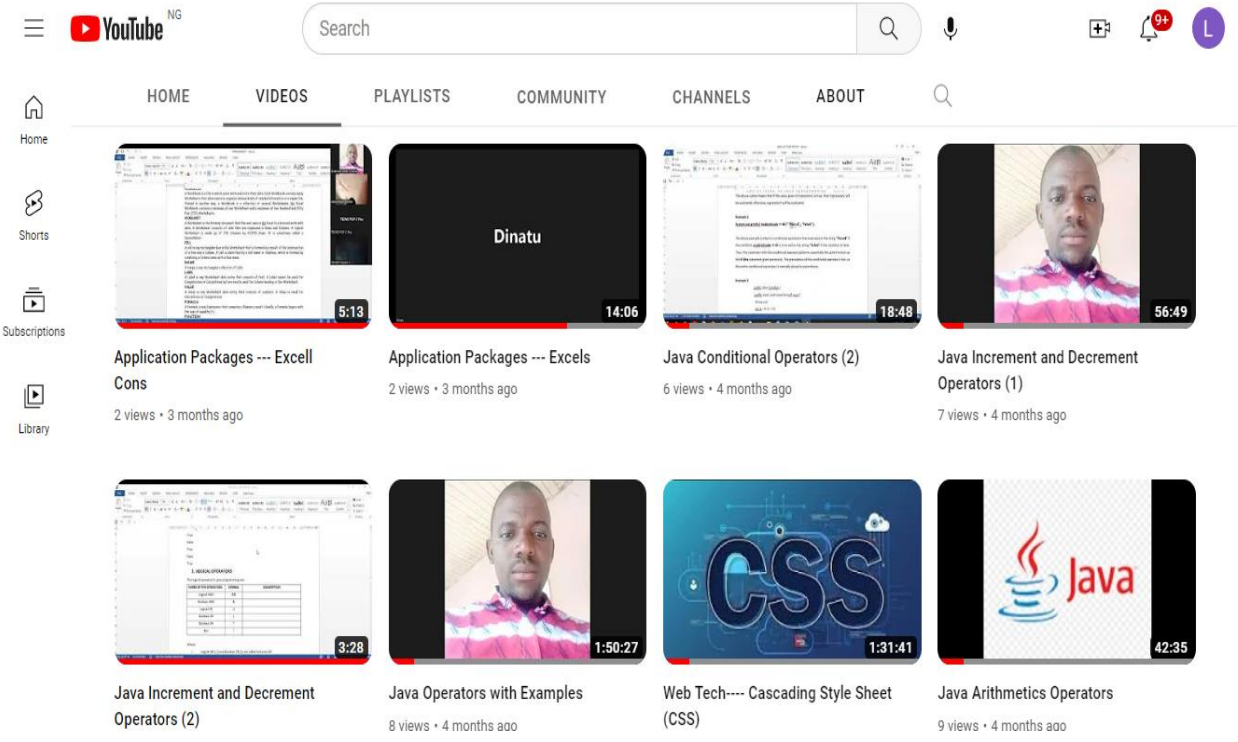

Fig. 3: Uploaded instructional videos on YouTube channel

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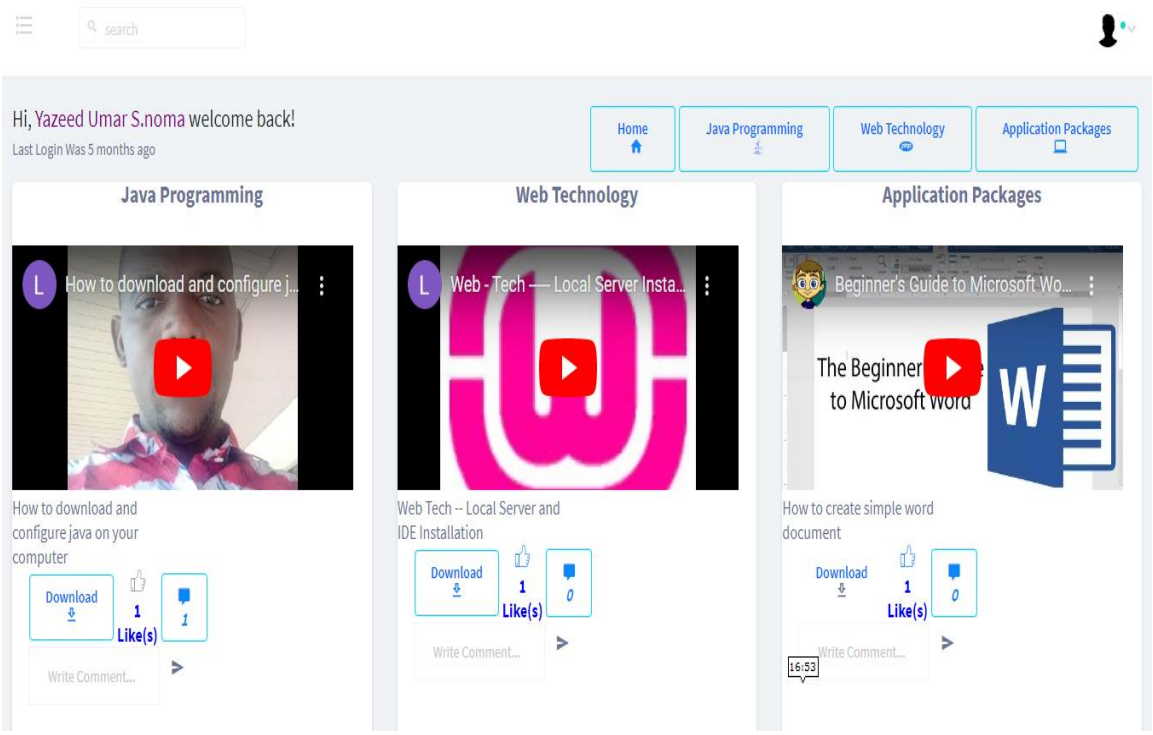

Fig. 4: Displaying instructional videos on the website.

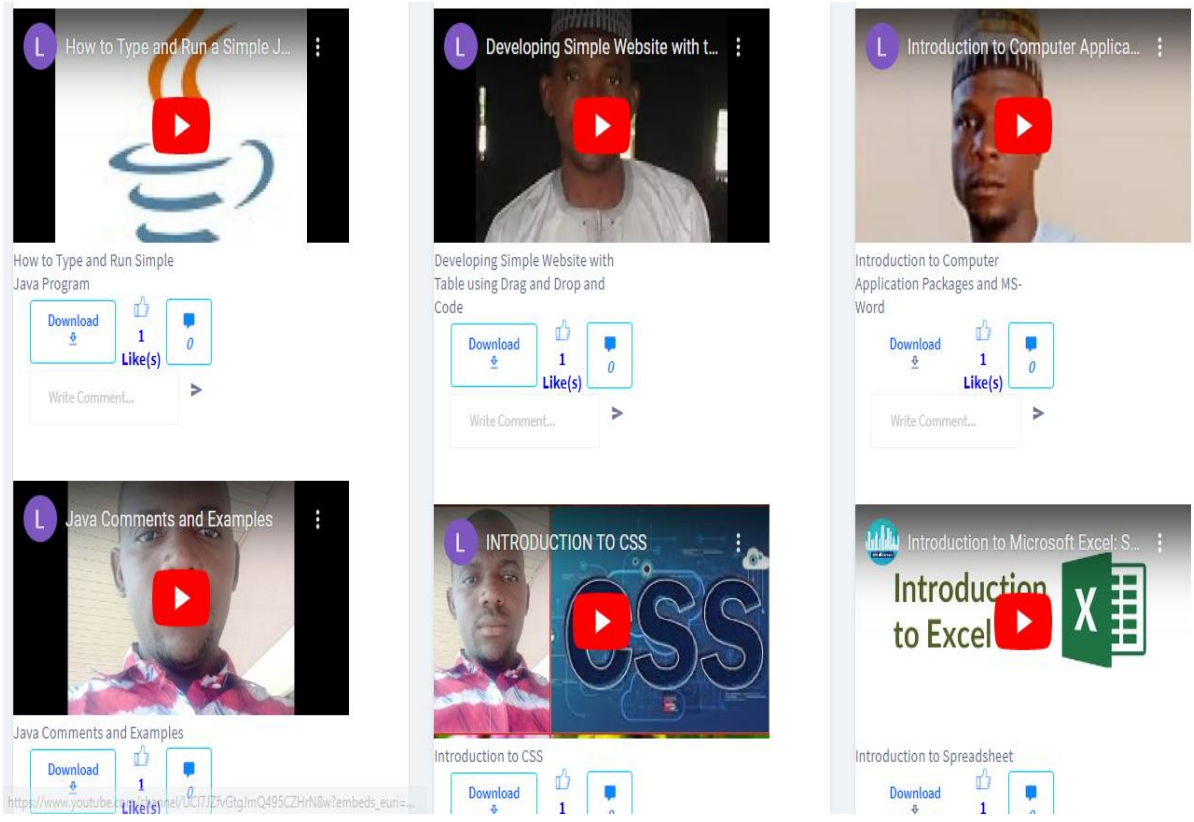

Fig. 5: Displaying instructional videos on the website.

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VI. DATA ANALYSIS, RESULT AND DISCUSSIONS

An attempt to divulge the significance difference between experimental and control group students that learned java programming language, web technology and computer application packages for sciences using zoom technology and instructional videos for the experimental group and classroom (conventional) lectures for the control group. The post-test to both groups was performed one (1) week after the eight (8) weeks of continuous treatment. Therefore, independent sample t-test was performed to compare the mean, standard deviation and the calculated p-values were compared with the alpha value .05 as specified in the study. Table 1, 2 and 3 presented the result of the two (2) groups of students.

A. COURSE I: JAVA PROGRAMMING LANGUAGE

Table 1: Posttest result on java programming language course

Test	Group	N	Mean	Std.	df	MD	t-test-val	p-val	Decision
Java_Post_Test	EG_ZOOMandVIDEOS	15	43.600	21.523	28	11.933	1.606	.119	
	CG_CLASSROOM	15	31.667	19.096					ACCEPTED

NOTE: EG = Experimental Group; CG = Control Group; N = Numbers of participant; Std. = Standard Deviation; df = Degree of Freedom; MD = Mean Difference; t-test-val = T test value; P-val = Probability Value.

An independent sample t-test was conducted to compare the effectiveness of learning java programming language using zoom technology and instructional videos and others using classroom approach. The result in table 1 shows that there were no significant differences between the two groups t(28) = 1.606, p-val = .119, df = 28, mean difference = 11.933 and 95% Confidence Interval (CI) = [-3.284628, 27.151294]. The mean and standard deviation score for the zoom technology and instructional videos students (experimental group M = 43.600, Std = 21.523) was higher than classroom students (control group M = 31.667, Std = 19.096). Since the p-val of .119 is greater than alpha value of .05 (p-val = .119 > alpha value = .05). Hence, the null hypotheses (Ho1) was supported and draw the conclusion that there is no significant difference between the two groups of students for learning java programming language using zoom technology and instructional videos and others using traditional method as a computing course in the polytechnics.

B. COURSE II: WEB TECHNOLOGY

Table 2: Posttest result on web technology course

Test	Group	N	Mean	Std.	df	MD	t-test-val	p-val	Decision
WebT_Posttest	EG_ZOOMandVIDEOS	7	14.929	8.482	7.567	-16.857	-1.801	.112	
	CG_CLASSROOM	7	31.786	23.270					ACCEPTED

NOTE: EG = Experimental Group; CG = Control Group; N = Numbers of participant; Std. = Standard Deviation; df = Degree of Freedom; MD = Mean Difference; t-test-val = T test value; P-val = Probability Value.

The p-val of levene's test as calculated in the posttest result of the web technology course is .008, which is less than .05 (p-value of levene's test < .05 i.e. p very small), that tells us to look at the "equal variances not assumed" row for the ***t*** test and corresponding confidence interval in the independent sample t-test result of the WebT_Posttest. As shows in table 2 the p-val of the t test is .112 which means the groups did not differ significantly, t(7.567) = -1.801, df = 7.567 and 95% Confidence Interval (CI) = [-38.66137, 4.94709]. The mean and standard deviation for the experimental students (M = 14.929 and Std = 8.482) was not statistically significantly different than the control students with (M = 31.786 and Std = 23.270). Even though the mean of the students that learned web technology using traditional method were descriptively higher than that of zoom technology and instructional videos for learning same course, the statistical significant different would not be concluded using that. Therefore, since p-val of .112 is greater than chosen significance alpha value .05, so we accept the null hypotheses and conclude that there is no statistical significance difference between the two groups of students for learning web technology as a course. The finding do not support the idea that learning web technology using traditional (classroom) method is much effective than learning same using zoom technology and instructional videos.

C. COURSE III: COMPUTER APPLICATION PACKAGES FOR SCIENCES

Table 3: Posttest result on computer application packages for sciences course

Test	Group	N	Mean	Std.	df	MD	t-test-val	p-val	Decision
ApplP-Posttest	EG_ZOOMandVIDEOS	20	59.000	24.081	41	21.348	3.479	.001	
	CG_CLASSROOM	23	37.652	15.810					REJECTED

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NOTE: EG = Experimental Group; CG = Control Group; N = Numbers of participant; Std. = Standard Deviation; df = Degree of Freedom; MD = Mean Difference; t-test-val = T test value; P-val = Probability Value.

In table 3 p-val of .001 is less than our chosen significance alpha value of .05 (.001 < .05), the null hypotheses in this case was rejected and conclude that there is significant differences between the two groups on the post-test in favour of the experimental group with (M = 59.000 and Std = 24.081). Therefore, students that learned computer application packages using zoom and instructional videos scored significantly higher than students in the control group whose learned the packages using traditional system with (M = 37.652 and Std = 15.810). The mean difference (MD) = 21.348 and 95% confidence interval of the difference between the two groups were CI = [8.95460, 33.74106] for lower and upper intervals respectively. Equal variances was assumed from the levene's test for equality of variances since the F value = 3.015 and Sig (p-value) = .090.

VII. COMPARING THE POSTTEST RESULTS FOR THE THREE SELECTED COURSES.

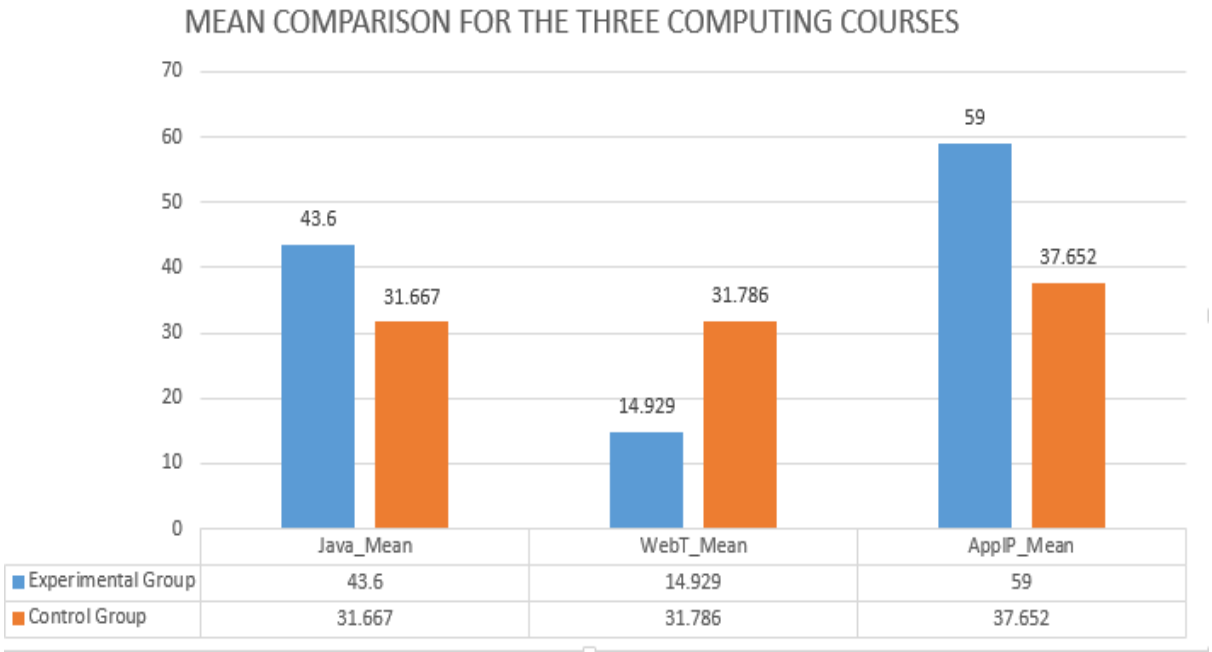

Fig. 1: Mean distributions for the three computing courses

Table 4: Posttest results of the three computing courses

S/n	Computing Courses	Group	P-Value Comparison Against Alpha Value (.05)	Null Hypotheses Decision	Level of Significance
1.	Java Programming Language	EG_Java CG_Java	P-val = .119 .119 > .05	Accepted	No Significance Difference
2.	Web Technology	EG_WebT CG_WebT	P-val = .112 .112 > .05	Accepted	No Significance Difference
3.	Application Packages	EG_ApplP CG_ApplP	P-val = .001 .001 < .05	Rejected	There is Significance Difference

NOTE: EG_Java = Experimental Group Java; CG_Java = Control Group Java; EG_WebT = Experimental Group Web Technology; CG_WebT = Control Group Web Technology; EG_ApplP = Experimental Group Application Packages; CG_ApplP = Control Group Application Packages.

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Fig. 1 shows the mean score distributions of the experimental and control group students for the three (3) selected computing courses. The mean scored for the experimental group in java programming language and application packages were higher than that of the control group with 43.6, 59 for EG_Java, EG_ApplP and 31.667, 37.652 for CG_Java, CG_ApplP respectively while the mean scored for the control group in web technology were 31.786 which is higher than the corresponding experimental group with 14.929. Therefore, experimental students that learned selected computing courses using zoom technology and instructional videos scored higher mean when compared to others that learned using classroom (traditional) system with higher occurrence of two (2) for the experimental group and one (1) for the control group.

Table 4, indicated the null hypotheses decision, level of significances and compared the p-values as against alpha-value of the three (3) independent sample t-test presented in Table 1, 2 and 3. Since the calculated p-values of the experimental and control students participated in learning java programming language and web technology courses are greater than the alpha-value .05, p-val = .119 (.119 > .05) and p-val = .112 (.112 > .05) and the null hypotheses decision were accepted respectively while for that of the application packages p-val = .001 (.001 < .05) the null hypotheses were rejected. Finally, out of three (3) selected computer science courses in this study and the null hypotheses was failed to be rejected after the independent sample t-test in the two (2) courses, we drawn a conclusion that no significance difference on the polytechnic students that learn those computing courses using zoom technology and instructional videos and others using classroom approach.

VIII. RECOMMENDATIONS

The researchers provided the following recommendations:

i. It is recommended that zoom cloud technology should be considered as an effective educational instructional platform.
ii. Instructional videos should also be considered as a way of learning in today educational system.
iii. Distance or online learners should not be discriminated.
iv. Classroom learning approach should not be the only option for teachers/lecturers and students to facilitate and receive instructions.

IX. CONCLUSION

From the study, although there were some initial challenges due to lack of experience and skills in using zoom for online meetings, the experimental students were able to use the zoom technology and also access the website developed for the instructional videos.

Even though the mean scores by the two (2) groups are relatively varies for the three (3) selected computing courses and the null hypotheses was failed to be rejected after the independent sample t-test on the two (2) courses in the study. Therefore, we concluded that there were no significant differences between the experimental and control group students that learned java programming language, web technology and computer application packages for sciences using zoom technology and instructional videos and others using traditional (classroom) method in the polytechnics system. Finally, all two groups and students from other departments asked researchers to continue these types of projects in other courses.

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