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Comparing Video-Textual and Audio PowerPoint Computer-Assisted Instruction on Students' Performance in Computer Studies

[*1]Ndukwe, P.E., & [2]Eraikhuemen, L.
[1]Department of Computer Science, Federal University of Education, Zaria
[2]Department of Curriculum and Instructional Technology, University of Benin, Benin City.

[*]**Corresponding author email:** eberepndukwe@gmail.com

Abstract
The Study was on the relative efficacy of Video-textual (VT) and Audio-power point (ATPP) Computer-Assisted Instruction (CAI) on students' academic performance in Computer Science Education. The population of the study comprised 487 NCE II Computer Studies I students (182- males and 305 females), 2022/23 academic session from the eight Colleges of Education in the South-South zone, Nigeria. Intact classes from 3 colleges with sample size of 77(26 males and 51 females), were selected from the targeted population by purposive with consideration to availability of internet and other required facilities. Simple Random Sampling (SRS) was used to place them into experimental and control groups by balloting (assigning number). A validated instrument tagged Computer Studies Education Performance Test (CSEPT) with reliability coefficient of 0.80 estimated using Kuder Richardson Formula 20 was used which was 40 multiple choice questions guided with table of specification covering Computer Studies I course topics of approved NCCE minimum standard,2020. The experimental groups were taught Computer topics using VT-CAI for experimental group1, ATPP-CAI for experimental group2, while the control group were taught using the lecture method (LM). The study was guided by two hypotheses and two research questions. The hypotheses were tested using the analysis of covariance (ANCOVA) at 0.05 level of significance (ATPP-CAI mean gain=21.07, $F(2,73) = 15.780$, $p=000$). ATPP-CAI students performed better than those of VT- CAI and LM. Those of VT-CAI also outperform LM students. Based on the result, it was recommended that ATPP-CAI should be integrated into the teacher training programme as a teaching method to improve students' performance in Computer Studies I. Also, the National Commission for the Colleges of Education (NCCE) should adopt and promote ATPP-CAI as a teaching method.

Keywords: Computer Assisted Instruction, Video-Textual, Audio PowerPoint, Academic Performance, Students

Introduction

Computer Studies is a compulsory course offered in Nigerian Colleges of Education (COE) by all students so as to expose the students to knowledge and rudiments of computer thereby preparing students to meet the challenges of the changing world adequately. It is offered as Computer Studies I in NCE I and Computer Studies II in NCE II. For the purpose of this study, Computer Studies I was employed and the students taught using Computer Assisted Instruction. Computer Assisted Instruction (CAI) is a term associated with the use of computer to deliver instructions. Elaborately, it is any kind of instruction administered through computer in an education setting with inclusion of drills and practices, tutorial, simulation via stand-alone computers and learning activities. There are many types of CAI used for computer instruction among students across all level of education. Hence, two types of CAI: The VT-CAI and ATPP-CAI which are recent innovations became imperative for the delivery of Computer Studies I instructions to students regardless of age or level (Ndukwe, 2024). The VT-CAI incorporates video and text to aid in learning; it is the integration of videos into lessons. Video instruction is a growing strategic teaching approach in many modern classrooms that can benefit students by foster comprehension, cognitive ability and skill acquisition. Hansh (2015) reported that this recent development in the field of learning involving video, centers on building rapport and motivation of learners. Gambari (2018) added that via video instruction, verbal and non-verbal information can be transmitted with the combination of audio and visual materials.

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It is noted that when video is combined with other conventional medium, learning in students can be improved (Ikwuka, 2019). Consequently, VT-CAI as used in this study incorporated video and text for better learning outcome thereby engaging learners and creating rapport with the teacher towards enhanced interest and academic performance. The ATPP-CAI on the other hand uses audio supported with textual displays that is, audio-visual integration with slides to support learning and enhance students' academic performance. Academic performance is the measurement of students' achievement across various academic subjects. It is the extent to which a student, teacher or institution has attained their short or long-term educational goal. Generally, the academic performance of College of Education (COE) students in General Studies Education (GSE) courses has been poor over the years; studies such as (Olanipekun, 2015; Ogunniyi, Akerele & Awoyemi, 2021) lamented on the poor academic performance of students in GSE courses which mostly point at the method of instructional delivery which is the lecture method. Eze, Ezenwafor and Molokwu (2015) maintained that students' poor academic performance can be linked to methods of teaching adopted by the teachers which is always teacher-centered in an attempt to cover more grounds and this in turn creates frustration, learning difficulties and in-active participation of students. There is therefore the need for teachers to make prompt and timely decisions of choosing instructional strategy that is powered by technology that would be capable of enhancing students' academic performance.

Statement of the Problem

The major aim of introducing computer studies as General Studies Education course in Nigerian Colleges of Education is to ensure all admitted NCE students undergo learning on computer and information technology so as to be knowledgeable in the recent world technology reforms in computer, information and communication technology. Students taught General studies in NCE level were found to be operating on poor performance level which according to several authors, has to do mostly with method used in learning. Though none of the studies researched on Computer Studies I in COE but the percentage cumulative results obtained by Computer Studies I students at FCE, Omokua from 2018 to 2022 sessions were fluctuating results of 56%, 54%, 49% and 53% which shows that academic performance is not encouraging. Lecture method has so much permeated COE which is teacher centred method of teaching; as such create poor and in-active participation of students. Recent innovations powered by technology using computer can empower learning just as CAI that is student centred, and several forms of CAI can be utilized in learning. Several studies like Eze et al, 2015, Achuonye, 2019 and Ikwuka, 2022, have been conducted on CAI and academic performance of which certain researchers claim CAI is an effective tool for learning while the level of efficacy of CAI regards to Video-Textual and Audio Power Point have different views by several authors like Efiong and Ekpo, 2016; Anigbo and Orie, 2018; Gambari, 2018; Ikwuka et al 2022. This work therefore looked at relative efficacy of VT and ATPP Computer Assisted Instruction on students' performance in Computer Studies I.

Objective of the Study

The objectives of the study are as follows:

1. determine the academic performance of students when taught computer studies I using VT-CAI, ATPP-CAI and Lecture method (LM).
2. determine the academic performance of male and female students when taught computer studies I using VT-CAI, ATPP-CAI and Lecture method (LM).

Research Questions

The study answered the following research questions:

1. what is the difference in the performance mean scores in computer studies I among students when taught using VT-CAI, ATPP-CAI and LM?
2. Is there a difference in the performance mean scores in computer studies I among students when taught using VT-CAI, ATPP-CAI and LM?

Hypotheses

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

1. there is no significant difference in the academic performance mean scores in computer studies I among students taught using VT-CAI, ATPP-CAI and LM.
2. There is no significant difference in the academic performance mean scores in Computer Studies I between male and female students taught using VT-CAI, ATPP-CAI and LM.

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Material and Methods

An instrument, Computer Studies Education Performance Test (CSEPT) was used for the study; CSEPT was developed by the researcher based on the Computer Studies I course content with reference to the NCCE approved minimum standard, 2020 (See Table 1) with a 40-item multiple choice objective test, validated by five experts experienced in computer studies I including a doctor in measurement and evaluation with reliability coefficient of 0.80 estimated using Kuder Richardson Formula 20.

Table 1: Table of Specification for CSEPT

Objective/ Content	Weight 100%	Knowledge 30%	Comprehension 30%	Application 22.5%	High Order Thinking 17.5%	Total
Computer System and Meaning	20(8)	3(1,2,3)	2(4,5)	2(7,8)	1(6)	8
Computer History and Development.	15(6)	2(9,10)	2(11,12)	1(14)	1(13)	6
Computer Classifications	20(8)	2(15,16)	3(17,18,19)	2(20,22)	1(21)	8
Computer Components/Parts	17.5(7)	2(23,24)	3(26,27,28)	1(29)	1(25)	9
Application Software	20(8)	2(32,33)	2(34,35)	2(36,37)	2(30,31)	6
Computer Application Areas	7.5(3)	1(38)	1(39)	1(40)	-	3
Total	100(40)	12	13	9	6	40

The study adopted the quasi-experimental research design which employed the pretest-posttest, non-equivalent control group design. The population comprised 487 (182- males and 305 females) NCE II Computer Studies I students admitted for the 2022/2023 academic year in the Nigerian Colleges of Education of the South - South Zone with a sample 77 (26 males and 51 females) selected by purposive method. The participating students were placed into three groups by simple random sampling (SRS). The groups are VT-CAI (experimental group 1), ATPP-CAI (experimental group 2) and LM (control group). All three groups were taught the same computer studies I concepts for eight (8) weeks. Table 2 is the sample distribution for the study

Table 2: Sample Distribution by Method and Sex for the Study

Method	Male	Female	Total
VT-CAI	11	17	28
ATPP-CAI	06	18	24
LM	09	16	25
Total	**26**	**51**	**77**

From Table 2, the sample of 77 students comprised of 26(33.8%) male students and 51 (66.2%) female students. In addition, the respective groups were (VT-CAI 28, 36.4%), ATPP-CAI (24, 31.2%) and LM (25, 32.5%).

Results

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Hypothesis One: There is no significant difference in the academic performance mean scores in Computer Studies I among students taught using VT-CAI, ATPP-CAI and LM.

Table 3: Descriptive statistics for pretest - posttest scores of students taught using VT-CAI, ATPP-CAI and LM

Methods	N	Pretest		Posttest		
		Mean(X)	Std. Deviation	Mean	Std. Deviation	Mean Gain
VT-CAI	28	7.36	2.959	20.89	6.838	13.53
ATPP-CAI	24	7.54	4.791	28.63	7.228	21.07
LM	25	10.36	3.498	17.20	7.831	6.84
Total	77	8.39	3.977	22.10	8.583	13.41

Table 3 shows the pretest (Mean = 8.39, SD = 3.977) and posttest mean = 22.10, 13.41 with VT-CAI pretest mean = 7.36 and posttest (Mean = 20.89, SD = 6.838) with a mean gain of 13.53. The ATPP-CAI group had pretest (Mean = 7.54, SD = 4.791) and posttest mean = 28, 21.07. In addition, LM group had pretest (Mean = 10.36, SD = 3.498) and posttest (Mean = 17.20, SD = 7.831) with a mean gain of 6.84. Clearly, ATPP-CAI group performed best, followed by the VT-CAI group. The LM Group had the least academic performance. The observed mean difference with ANCOVA is in Table 4.

Hypothesis Two: There is no significant difference in the academic performance mean scores in Computer Studies I between male and female students taught using VT-CAI, ATPP-CAI and LM.

Table 4: ANCOVA Analysis for Students performance when taught using VT-CAI, ATPP-CAI and LM

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1701.102[a]	3	567.034	10.619	.000
Intercept	5322.058	1	5322.058	99.667	.000
Pretest	38.237	1	38.237	.716	.400
Method	1685.235	2	842.618	15.780	.000
Error	3898.067	73	53.398		
Total	43220.000	77			
Corrected Total	5599.169	76			

The F-value for method effect in Table 4 is 15.780 with df = (2, 73) and a p-value .000 < 0.05 showing significance. So, hypothesis 3, which states that there is no significant difference in the academic performance mean scores in Computer Studies I among students taught using VT-CAI, ATPP-CAI and LM was rejected. It was concluded that there is a significant effect of method on students' academic performance in Computer Studies I. However, to determine where the difference lies, a post-hoc analysis was conducted. This was reported in the Pairwise Comparisons (See Table 5).

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Table 5: Post-hoc Analysis of the Direction of Difference in the Methods of Instruction (Bonferroni)

Dependent Variable: Posttest						
(I) Instructional Methods	**(J) Instructional Methods**	**Mean Difference (I-J)**	**Std. Error**	**Sig.[b]**	**95% Confidence Interval for Difference[b]**	
					Lower Bound	**Upper Bound**
VT-CAI	ATPP-CAI	-7.697*	2.033	.001	-12.679	-2.715
	LM	4.264	2.121	.144	-.933	9.461
ATPP-CAI	VT-CAI	7.697*	2.033	.001	2.715	12.679
	LM	11.961*	2.182	.000	6.614	17.308
LM	VT-CAI	-4.264	2.121	.144	-9.461	.933
	ATPP-CAI	-11.961*	2.182	.000	-17.308	-6.614

Based on estimated marginal means

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

b. Adjustment for multiple comparisons

Table 5 revealed two significant differences. Post hoc analysis indicated these differences to be between ATPP-CAI and VT-CAI methods (Mean Diff = 7.697, p = .001, 95% CI [2.715, 12.679] and between ATPP-CAI and LM methods (Mean Diff = 11.961, p = .000, 95%CI [6.614, 17.308]. The direction of difference showed ATPP-CAI group outperformed all followed by VT-CAI, LM was the least.

Research Question Two: Is there a difference in the performance mean scores in computer studies I among male and female students when taught using VT-CAI, ATPP-CAI and LM?

Table 6: Mean and Standard Deviation of Pretest-Posttest Scores with Different Instructional Methods on Sex

Sex	N	Test	Mean	Std. Deviation	Mean Gain
Male	26	Pretest	7.54	3.890	14.73
		Posttest	22.27	8.665	
Female	51	Pretest	8.82	3.988	13.20
		Posttest	22.02	8.626	
Total	77	Pretest	8.39	3.977	13.71
		Posttest	22.10	8.583	

Table 6 showed gains in the students mean scores based on sex when exposed to different instructional methods. Male pretest (Mean = 7.54, SD= 3.890) and posttest (Mean = 22.27, SD = 8.665) with a 14.73 mean gain over the female counterpart with a pretest (Mean = 8.82, SD = 3.988) and a posttest (Mean = 22.02, SD = 8.626) with a mean gain of 13.20. To test if there was a significant main effect of sex on students' academic performance in Computer Studies I among those taught with different instructional methods due to mean score difference at pretest, the ANCOVA statistics was used (Table 7).

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Table 7: ANCOVA of Difference in performance of students by Sex, taught using VT-CAI, ATPP-CAI and LM

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	16.050[a]	2	8.025	.106	.899
Intercept	7439.338	1	7439.338	98.603	.000
Pretest	14.977	1	14.977	.199	.657
Sex	.184	1	.184	.002	.961
Error	5583.119	74	75.448		
Total	43220.000	77			
Corrected Total	5599.169	76			

The F-value for sex effect in Table 7 is 0.002, df = (1, 74) and p-value = .961. .961 is higher than 0.05 so, no significance difference. Therefore, hypothesis two, was retained. Hence, it can be concluded that sex has no significant effect on students' academic performance in Computer Studies I.

Discussion

The findings of the study showed the ATPP-CAI group performed best while the VT-CAI performed better than the LM group. Hence, there was a difference in academic performance among students taught Computer Studies I with VT-CAI, ATPP-CAI and LM. The difference was found to be significant when the Analysis of Covariance (ANCOVA) was computed. The finding indicates that the use of CAI enhances students' academic performance in Computer Studies I. This result corroborates with Samaila et al (2016), Busari et al (2016) and Eyo (2018) who reported a significant difference in favour of CAI when compared with LM in regard to students' academic performance. In addition, the treatment given to the experimental groups produced positive effects as shown by the higher and highest mean scores. The reason for this could be the change in the mode of instruction from teacher-centered (LM) to student-centered (VT-CAI and ATPP-CAI). This is in consonant with the findings of (Sharma, 2017; Falalu & Atadoga, 2018; Eyo, 2018). The study revealed two significant differences in post hoc; those taught with ATPP-CAI had highest relative efficacy compared with VT-CAI while LM was the least. This implied that those who were taught with ATPP-CAI performed higher than those taught with VT-CAI and LM being the least. This tallied with the findings of (Efiong & Ekpo, 2016; Anigbo & Orie, 2018; Gambari, 2018; Umoru & Nguwap, 2021) who found in their respective studies that students exposed to CAI had relatively higher scores compared to students exposed to LM. With regard to gender, the study revealed that there was no significant difference in the academic performance mean scores in Computer Studies I between male and female students taught using VT-CAI and ATPP-CAI. The finding is in line with (Nwanne & Agommuoh, 2017; Anigbo & Orie, 2018, Ndukwe, Eraikhuemen & Daner,2023) who found no significant difference in academic performance of students irrespective of gender when taught using CAI. This makes CAI irrespective of the form a gender friendly method of teaching and learning. However, the study is contrary to the findings of Muchiri (2018) and Abdulkareem (2022) who found that male students outperform the female students when taught using CAI. Moreover, a study by Ekundayo (2022) revealed that female students performed better than their male counterpart when exposed to CAI. Hence, variations of findings exist depending on the students.

Conclusion

From the study, it was observed that COEs students who were taught Computer Studies I with ATPP-CAI performed best, followed by the VT-CAI group while the LM group had the least academic performance. The implication was that ATPP-CAI is most effective with VT-CAI following. The LM produced the least performance among students taught the same computer concepts. The study also found that CAI is a gender friendly method of instruction capable of producing similar academic performance among students when exposed to it. This follows because CAI is student-centered, motivates and allows for hands-on experience among students. These positioned the CAI as an innovation that could enhance students' academic performance in computer science education.

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Recommendations

Based on the findings and conclusion, the following recommendations were made:

1. Computer Studies I teachers should be encouraged to adopt CAI packages such as the VT-CAI and ATPP-CAI at the COEs for enhanced academic performance in the course.
2. Teachers should be trained and updated for the change that technology has brought about in instruction delivery especially on the use of ATPP- CAI.
3. The National Commission for Colleges of Education should include CAI as an effective teaching strategy in its policy through the minimum standards for COEs.

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