

Practical Teaching Method and Performance of Colleges of Education ICT Students in Volta Region, Ghana

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Abstract The study investigated the effects of demonstration teaching method on performance of Colleges of Education ICT students with different learning styles (active/reflective, sensing/intuitive, visual/verbal, and sequential/global) in Volta Region. Quasi - experimental design was adopted, specifically the pre-test, post-test non-equivalent control group design was used. Sample size of 168 level 200 students drawn from two randomly sampled Colleges of Education in the Volta Region of Ghana was used. To direct the study, two research questions were formulated, and two null hypotheses. Frequency count, mean and standard deviation were used to answer questions from the study while analysis of covariance (ANCOVA) was used to test the hypotheses. The researcher adopted Two instruments tagged ICT Performance Test (ICTPT) and Index of Learning Styles Questionnaire (ILSQ) from Felder and Solomon (2004) to collect data. The instruments used were both subjected to face and content validity. The reliability co-efficient of test-retest was computed using Pearson Product Moment Correlation coefficient. The result of this was a reliability co - efficient of 0.84 for CPT. The ILSQ was used for the identification of students' learning styles. The internal consistency for each of the learning styles were determined with Cronbach Alpha the result of which a reliability index of 0.88 for active/reflective, 0.82 for sensing/intuitive, 0.85 for visual/verbal, and 0.79 for sequential/global learning styles. The findings revealed that there was no significant difference in the mean scores of students taught ICT using practical method. A significant difference was however found to exist in the academic performance of ICT Major students with different learning styles using demonstration and lecture, method. Based on the research findings, it is recommended that ICT teachers identify students' learning styles and use teaching strategies that support them, among others.

Keywords: practical method, learning styles, performance, information and communication technology

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1. Introduction

Science and Technology have been recognized as the instrument for nation building, hence every nation craves for advancement in Science and Technology. The state of Science and Technology in Ghana is has become a matter of great interest to many stake holders in the country. The concern comes about as a result of the increasing realization that Ghana and all other developing countries are relying on science and Digital technology as the backbone to drive their agenda for socio-economic development. Towards this end, there has been a lot of calls for the revamping of ICT education in particular and technology education as a whole to meet acceptable benchmarks. Thus, there has been a lot of pragmatic activity by the Ministry of Education and the Ghana Education Service in the recent past to satisfy this national desire. However, the existence of this desire points to the

fact that there are challenges facing Technology education in Ghana that is calling for attention for improvement.

Information and Communication Technologies (ICT) refers to technologies that provide access to information through telecommunications [1]. This includes the Internet, wireless networks, cell phones, and others simply referred to as digital technologies. According to [2] Digital technologies are electronic tools, systems, devices and resources that generate, store or process data. Well known examples include social media, online games, multimedia and mobile phones. Information Technology, and is pronounced "I.T." It refers to anything related to computing technology, such as networking, hardware, software, the Internet, or the people that work with these technologies. Many companies now have IT departments for managing the computers, networks, and other technical areas of their businesses. IT jobs include computer programming, network administration, computer engineering, Web development, technical support, and many other related occupations. Since we live in the

"information age," information technology has become a part of our everyday lives. That means the term "IT," already highly overused, is here to stay [1]. Science is an organized body of knowledge in form of concepts, laws, theories and generalizations. [3] defined Science Education as the study of the connection between Science as a discipline and the application of educational principles to comprehend Science teaching and learning in the classroom. Therefore, Science Education equips students with certain basic knowledge, skills and attitudes needed for future work in Science and Science related fields.

ICT as a subject area has to do the study and use of digital technology and how it may be used. It is one of the core subjects studied in Ghana under the new basic school curriculum through to the tertiary level of education in Ghana. The aim of Teaching includes the need to impact knowledge to learners and many more. Teaching of ICT requires making necessary provisions for students' active involvement during the teaching-learning process, so that learners will be able to connect scientific concepts and theories with real purposes and practices in the world. Teaching methods are different means through which learners can be guided to acquire knowledge during the process of teaching. Appropriate teaching methods enable learners to have grasp of concepts being taught. One of such methods considered in this study is demonstration. Demonstration teaching method involves the use of instructional materials to show learners how a task is performed and the necessary skills for performing that given task. In this study, effect of practical method on ICT students with different learning styles in selected colleges in the Volta Region of was investigated.

Successful learning takes place by selecting the best interactive approach in terms of learning styles appropriate for the individual students. This is because every learner has a different style of learning. It is the task of the instructor to identify these individual styles and the suitable approaches to teaching that suit each individual learners' preferred styles with the aim of improving the teaching and learning processes. In the words of [4] and [5] there are different styles students learn. Some of these are (Visual / Verbal, Active / Reflective, Sensing / Intuitive, and Sequential / Global modes of learning). By doing something, and working with others, active learners retain and better understand knowledge. Reflective learners are learning by reasoning and working alone. Sensing learners have a preference for learning facts while intuitive learners tend to explore opportunities and relationships. Sensors also like solving problems through well-established methods. Visual learners make meaning from what they see-images, graphs, flow charts, timelines, films and so on. The verbal learners get more out of words and prefer explanations written and spoken. In linear stages, sequential learners tend to get understanding. Global learners usually to learn in big leaps, processing information almost randomly without making correlations, while sequential learners tend to pursue solutions along clear step-by-step paths. In this research, we explored the impact of practical teaching method and performance of colleges of education ICT students with different learning styles in Volta Region, Ghana.

[6] defined performance as a thing that someone has done successfully using personal effort and skills.

Academic performance refers to the knowledge obtained, or skills developed from school subjects. This is usually determined by test scores or marks assigned by the teacher [7]. There are conflicting reports in literature concerning effect of practical teaching method on students' performances. The effect of practical teaching method on ICT students' performance with different learning styles was investigated in this study.

1.1. Statement of the Problem

Most ICT teachers know that students are processing knowledge and interpreting it differently. Nevertheless, the inability of the teachers to recognize individual differences between the students during the teaching and learning process can lead to poor student academic performance. Studies conducted have identified some important factors that lead to the abysmal performance of the students in mathematics, ICT and science. The chief examiners report by the Institute of Education, University of Cape Coast (UCC) points to the fact that the poorest scores in the first semester examinations in the year 2013/2014 academic year was in Mathematics. Inadequately-resourced science and computer laboratories, inadequate trained and professional science teachers, availability of practical ICT textbooks, ineffective teaching methods are some of the reported factors leading to the low performance in these fields [8]. [9] have posited that these factors may be termed as school factors. There however is a neglected variable, learning styles.

There is therefore the need to strike a delicate balance between successful ICT teaching/instructional methods and the individual learning styles of the students (Visual/Verbal, Active/Reflective, Sensing/ Intuitive, and Sequential/Global). Achieving this balance will culminate in all students probably being taught in their preferred way, and consequently leading to effective teaching and learning in the subject area. This idea influenced the researcher to seek an investigation into the effect of practical teaching method of on the performance of the ICT students with different learning styles in selected Colleges of Education in Ghana.

1.2. Aim and Objectives of the Study

The study investigated the effect of practical teaching method on the performance of ICT students with different learning styles in selected Colleges of Education, Volta Region, Ghana. The specific objectives were to:

- 1) Compare the effect of practical teaching method on ICT performance of students with different learning styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive and Sequential/Global).
- 2) Determine the mean difference in the performance of male and female students with different learning styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive and Sequential/Global) taught ICT concepts using practical and lecture methods.

1.3. Research Questions

Two research questions were raised and answered in this study.

- 1) What is the effect of practical teaching method on ICT performance of students with different learning styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive and Sequential/Global learning styles)?
- 2) What is the mean difference in the performance of male and female students with different learning styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive and Sequential/Global) taught ICT concepts using practical, and lecture methods?

1.4. Hypotheses

Two null hypotheses tested at 0.05 level of significance were formulated in this study.

Ho₁: There is no significant effect in the mean scores of students with different learning styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive and Sequential/Global) taught ICT concepts using practical teaching method.

Ho₂: There is no significant difference in the mean scores of male and female students with different learning styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive and Sequential/Global) taught ICT concepts using practical and lecture methods

2. Methodology

The design of the study was Quasi - experimental. This design utilizes the non - randomized pre-test and post- test groups. Intact classes were used in order not to disrupt the classes. The sample for the study consisted of 168 level 200 ICT students in the selected colleges of education in the Volta Region, Ghana. Purposive random sampling was used to select two colleges that have similar characteristics in the Volta Region. Simple random sampling technique (balloting without replacement) was used to select two classes from each of the selected colleges in the Volta Region. The two colleges selected were named experimental and control groups.

Two instruments tagged ICT Performance Test (ICTPT) and Index of Learning Styles Questionnaire (ILSQ) were used for data collection. ICTPT items were fifty multiple choice ICT questions selected from UCC ICT past questions. The ICT concepts in the test were on the topic Number Systems (Binaries and Hexadecimals) and Excel functions & formulae. ILSQ was adapted from [10], consisted of 44 items with options A and B. Changes were made in some of the items to reflect the cultural background of the students. The ILSQ was used to determine individual student's learning styles on the first week and numbers were assigned on their scripts for easy identification. The instruments were validated by two

lecturers in the department of measurement and evaluation and two lecturers in Maths and ICT Department. The internal consistency for each of the learning styles was determined using Cronbach Alpha which gave a reliability index of 0.88 for active/reflective, 0.82 for sensing/intuitive, 0.85 for visual/verbal, and 0.79 for active/reflective sequential/global learning styles.

The treatment lasted for 6 weeks. Pre-test was administered to both experimental and control groups on the first week before treatment. ICTPT was administered again as Post-test to all the groups after re-shuffling the questions. Lesson notes on demonstration and lecture methods were given to the regular ICT teachers in both schools used as experimental and control groups, The ICT teachers were used as research assistants after being trained by the researcher for two weeks on how to teach the students based on learning styles using demonstration and lecture teaching methods.

3. Results

The scores obtained were analyzed using frequency counts mean and standard deviations for the research questions. The hypotheses were tested at 0.05 level of significance using ANCOVA.

Research Question One: What is the effect of demonstration teaching method on ICT performance of students with different learning styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive and Sequential/Global learning styles)?

Table 1 shows that students with active/reflective learning styles had a pre-test mean score of 19.00 with standard deviation of 5.34 and a post-test mean score of 65.46 with standard deviation of 10.07 which yielded a mean gain of 46.46. Students of visual/verbal learning style had a pre-test mean score of 18.70 with standard deviation of 4.01 and a post-test mean score of 63.70 and standard deviation of 11.65 on CPT which gave a mean gain of 45.00. For the sensing/intuitive learning styles, the pre-test and post-test mean scores on CPT were 15.17 and 60.35 with standard deviation of 3.94 and 9.01 respectively thus yielding mean gain of 45.18. Finally, sequential/global learners reported a pre-test mean score of 13.27 with standard deviation of 4.60 and a post-test mean score of 59.26 with standard deviation of 8.56 and mean gain of 45.99 on CPT. On the basis of the mean gain values, it was shown that demonstration teaching strategy had the highest effect on active/reflective learners, followed by sequential/global learners and then sensing/intuitive learners. The result further revealed that demonstration teaching strategy had the least effect on visual/verbal learners.

Table 1. Mean Scores and Standard Deviation of Students with Different Learning Styles (Sensing/Intuitive, Active/Reflective, Visual/Verbal and Sequential/Global) Taught ICT Concepts using Practical method.

SUBJECTS		Pre-test		Post-test		Mean gain
Experimental Group 1	n	\bar{X}	SD	\bar{X}	SD	
Demonstration (Learning Styles)						
Active/ Reflective (A/R)	26	19.00	5.34	65.46	10.07	46.46
Visual/Verbal(V/V)	20	18.70	4.01	63.70	11.65	45.00
Sensing/Intuitive (S/I)	17	15.17	3.94	60.35	9.01	45.18
Sequential/ Global(S/G)	22	13.27	4.60	59.26	8.56	45.99
Total	85	16.54	4.47	62.19	9.08	45.51

However, it was also revealed from the table that, the total mean difference of all the students with different learning styles (Active / Reflective, Visual / Verbal, Sensing / Intuitive, Sequential / Global) taught ICT concepts using demonstration teaching strategy was **45.51**. This implied that demonstration teaching strategy had a positive effect on performance of students with different learning styles in ICT.

Research Question Two

What is the mean difference in the performance of male and female students with different learning styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive and Sequential/Global) taught ICT concepts using demonstration and lecture methods?

Table 2 shows that out of the 168 male and female students with different learning styles (73 male students and 95 female students) taught ICT concepts using demonstration and lecture 38 male students with different learning styles were sampled in practical method. 12 are Active/Reflective with mean score of 62.46 and standard deviation of 10.07, 9 are Visual/Verbal with mean score of 61, 80 and standard deviation of 11.64, 7 are Sensing/Intuitive with mean score of 59.45 and standard deviation of 9.01 while 10 are Sequential/Global. with total mean score of 54.26 and standard deviation of 8.56. The total mean score of male students with different learning styles, taught ICT concepts using practical method was **59.44**.

Forty-seven (47) female students with different learning styles were sampled in practical method. 14 are Active/Reflective with a mean score of 66.70 and standard deviation of 11.65, 11 learners were Visual/Verbal with mean score of 56.26 and standard deviation of 8.56, 10 learners were Sensing/Intuitive mean score of 57.60 and standard deviation of 8.63 while 12 learners were Sequential/Global with mean score of 60.00 and standard deviation of 10.15. **60.14** is the total mean score of female students with different learning styles, taught ICT concepts using practical method.

Thirty-five (35) male students with different learning styles were sampled in lecture strategy. 8 are Active/Reflective with mean score of 42.78 and standard deviation of 7.55, 13 are Visual/Verbal with mean score of 45.16 and standard deviation of 10.66, 9 are Sensing/Intuitive mean score of 41.17 and standard deviation of 8.63 while

7 are Sequential/Global with mean score of 43.50 and standard deviation of 8.68. The total mean score of female students with different learning styles, taught ICT concepts using Guided-inquiry strategy was **43.15**.

48 female students with different learning styles were sampled in Lecture. 11 learners were Active/Reflective with a mean score of 39.17 and standard deviation of 7.36, 10 learners were Visual/Verbal with mean score of 44.17 and standard deviation of 10.57, 13 are Sensing/Intuitive mean score of 40.82 and standard deviation of 8.44 while 14 are Sequential/Global with mean score of 37.88 and standard deviation of 8.59. The total means score of female students with different learning styles, taught ICT concepts using lecture strategy was **40.51**. This implies that the female students with different learning styles in the two groups performed better than their male counterparts based on their higher mean scores.

Hypotheses

Ho₁: There is no significant effect in the mean scores of students with different learning styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive and Sequential/Global) taught ICT concepts using demonstration teaching method.

Table 3, showed that there was a significant difference in the mean performance scores of students with different learning styles (Sensing/Intuitive, Active/Reflective, Visual/Verbal and Sequential/Global) taught ICT concepts using practical method. The summary of ANCOVA in Table 3 shows that the calculated F - value at 3,80 degree of freedom is 2.88 at 0.041 is less than (<) 0.05 Alpha level. This means that the F - value is significant. (F (3, 80) =2.879 (0.041) <.05). Therefore, the null hypothesis that there is no significant effect in the mean scores of performances in ICT concepts of students with different learning (Active/Reflective, Visual/Verbal, Sensing/Intuitive and Sequential/Global) who were taught using demonstration teaching strategy is rejected and the alternative accepted. This implies that there is a significant effect of treatment on students with different learning styles taught ICT concepts using practical method.

Multiple classification Analysis (MCA) was used in Table 4 to determine the variance of the dependent variable that was attributed to the influence of independent variable (Teaching strategy - Demonstration) based on their different learning styles.

Table 2. Mean scores and Standard Deviation (SD) of Male and Female Students with Different Learning Styles (Sensing/Intuitive, Active/Reflective, Visual/Verbal and Sequential/Global) Taught ICT Concepts Using Demonstration, and Lecture methods

Gender	Learning Style	Demonstration			Lecture		Lecture SD
		n	\bar{X}	SD	n	\bar{X}	
Male	A/ R	12	62.46	10.07	6	42.78	7.55
	V/V	9	61.80	11.64	13	45.16	10.66
	S/I	7	59.45	9.01	9	41.17	8.63
	S/ G	10	54.26	8.56	7	43.50	8.68
		38	59.44	11.05	35	43.15	8.82
Female	A/ R	14	66.70	11.65	11	39.17	7.36
	V/V	11	56.26	8.56	10	44.17	10.57
	S/I	10	57.60	8.63	13	40.82	8.44
	S/ G	12	60.00	10.15	14	37.88	8.59
		47	60.14	9.55	48	40.51	8.83
Total		85			83		168

Table 3. Analysis of Covariance (ANCOVA) On Mean Scores of Students With Different Learning Styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive And Sequential/Global), Taught ICT Concepts Using Practical method.

Source	Sum of Squares	df	Mean Square	F	Sig.	Decision at p< .005
Corrected Model	7292.657 ^a	4	1823.164	58.534	.000	S
Intercept	7746.293	1	7746.293	248.700	.000	S
Pre Test	6730.633	1	6730.633	216.092	.000	S
Learning Styles	269.024	3	89.675	2.879	.041	S
Error	2491.767	80	31.147			
Total	354497.000	85				
Corrected Total	9784.424	84				

Table 4. Multiple Classification Analysis (MCA) Of The Mean Scores of Students with Different Learning Styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive and Sequential/Global), Taught ICT Concepts Using Practical method.

Grand Mean = 40.24	n	Unadjusted		Adjusted for independent	
Variable + category		Dev'n	Eta	Dev'n	Beta
Teaching Strategies			19		21
Demonstration	85	7.80		1.44	
Learning Styles					
Sensing/Intuitive	17	1.17		1.08	
Active/Reflective	26	0.76		0.87	
Visual/Verbal	20	1.00		1.00	
Sequential/Global	22	0.90		0.95	
Multiple R =.20					
Multiple R. Square =.04					

Table 4 shows that the Multiple Regression Index (R) was 20, while the Multiple Regression Square Index (R²) was 0.04. This implies that 4% of the total variance in students' performance in ICT is attributable to the influence of learning styles and teaching strategy (Teaching strategy - Demonstration).

To find the direction of significance, the performance scores were subjected to Least Significance Difference (LSD) for a post hoc analysis in Table 5 below.

Post-hoc analysis in Table 5, revealed that the mean difference between active/reflective and visual/verbal learning styles was 1.598, between active/reflective and Sensing/Intuitive learning styles was 0.771, while between active/reflective and Sequential/Global learning styles was 3.92.

The mean difference between Visual Verbal and Active/Reflective learning styles was 1.598, between Visual Verbal and Sensing/Intuitive learning styles was 2.369, while between Visual Verbal and Sequential/Global

learning styles was -2.322.

The mean difference between Sensing/Intuitive and Active/Reflective learning styles was -.771, between Sensing/Intuitive and Visual.Verbal was -2.369,, while between Sensing/Intuitive and Sequential/Global learning styles was -4.691*.

The mean difference between Sequential/Global and Active/Reflective was 3.920*, between Sequential/Global and Visual. Verbal was 2.322, while between Sequential/Global and Sensing/Intuitive was 4.691*.

This implies that Sequential/Global learning style was the most effective in facilitating students' performance in ICT when taught with demonstration. This was seconded by sensitive/intuitive, followed by Visual/Verbal learning while active/reflective style was the least effective in facilitating students' performance in ICT when taught with demonstration. Hence, demonstration is the most effective instructional strategy for ICT students with Sequential/Global learning styles.

Table 5. Result of Least Significant Difference (LSD) Post Hoc Test For Multiple Comparison Of Learning Styles On The Mean Scores Of Students With Different Learning Styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive And Sequential/Global), Taught ICT Concepts Using Practical method

(I) LEARNING STYLE FOR DEMONSTRATION	(J) LEARNING STYLE FOR DEMONSTRATION	Mean Difference (I-J)	Std. Error	Sig ^a	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Active/Reflective	Visual Verbal	-1.59	1.669	.341	-4.919	1.723
	Sensing/Intuitive	.77	1.764	.663	-2.739	4.282
	Sequential/Global	-3.92*	1.628	.018	-7.160	-.679
Visual Verbal	Active/Reflective	1.59	1.669	.341	-1.723	4.919
	Sensing/Intuitive	2.37	1.845	.203	-1.302	6.040
	Sequential/Global	-2.32	1.724	.182	-5.754	1.110
Sensing/Intuitive	Active/Reflective	-.77	1.764	.663	-4.282	2.739
	Visual. Verbal	-2.37	1.845	.203	-6.040	1.302
	Sequential/Global	-4.69*	1.805	.011	-8.282	-1.100
Sequential/Global	Active/Reflective	3.92*	1.628	.018	.679	7.160
	Visual .Verbal	2.32	1.724	.182	-1.110	5.754
	Sensing/Intuitive	4.69*	1.805	.011	1.100	8.282

H₀₂: There is no significant difference in the mean scores of students with different learning styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive and Sequential/Global) taught ICT concepts using practical method and those taught using lecture method.

Table 6, showed that there was there is a significant difference in the performance of students with different learning styles (Sensing/Intuitive, Active/Reflective, Visual/Verbal and Sequential/Global) taught ICT using practical method and those taught using lecture strategy. The summary of ANCOVA in Table 3 shows that the calculated F - value at 3, 163 degree of freedom is 1.105 at 0.022 is less than (<) 0.05 Alpha level. This means that the F - value is significant. ($F(3, 163) = 1.105(0.022) < .05$). Therefore, the null hypothesis that there is no significant difference in the mean scores of students with different learning styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive and Sequential/Global) taught ICT concepts using practical method and those taught using lecture strategy is rejected and the alternative accepted. This implies that there is a significant effect of treatment on students with different learning styles taught ICT concepts using practical method and those taught using lecture strategy.

Multiple classification Analysis (MCA) was used in Table 7 below to determine the variance of the dependent variable that was attributed to the influence of independent

variable (Teaching strategy - guided inquiry) based on their different learning styles.

Table 7 shows that the Multiple Regression Index (R) was 44 while the Multiple Regression Square Index (R²) was .0,09. This implies that 9% of the total variance in students' performance in ICT is attributable to the influence of learning styles and teaching strategies (Demonstration and Lecture).

To find the direction of significance, the performance scores were subjected to Least Significance Difference (LSD) for a post hoc analysis in Table 8.

Post-hoc analysis in Table 8, revealed that the mean difference between active/reflective and visual/verbal learning styles was 1.939, between active/reflective and Sensing/Intuitive learning styles was 4.988, while between active/reflective and Sequential/Global learning styles was 1.493.

The mean difference between Visual.Verbal and Active/Reflective learning styles was -1.939 between Visual. Verbal and Sensing/Intuitive learning styles was 3.049, while between Visual. Verbal and Sequential/Global learning styles was -.446.

The mean difference between Sensing/Intuitive and Active/Reflective learning styles was -4.988, between Sensing/Intuitive and Visual. Verbal was -3.049, while between Sensing/Intuitive and Sequential/Global learning styles was 3.495.

Table 6. Analysis Of Covariance (ANCOVA) On the Mean Scores Of Students With Different Learning Styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive And Sequential/Global) Taught ICT Concepts Using Practical method And Those Taught Using Lecture Strategy

Source	Sum of Squares	Df	Mean Square	F	Sig.	Decision at p< .005
Corrected Model	8527.899 ^a	4	2131.975	13.730	.000	S
Intercept	7689.235	1	7689.235	49.518	.000	S
Pre Test	8391.507	1	8391.507	54.041	.000	S
Learning Style	514.859	3	171.620	1.105	.022	S
Error	25310.934	163	155.282			
Total	516196.000	168				
Corrected Total	33838.833	167				

Table 7. Multiple Classification Analysis (MCA) Of the Mean Scores of Students with Different Learning Styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive and Sequential/Global) Taught ICT Concepts Using Practical Method and Those Taught Using Lecture Strategy

Variable + Category	N	Unadjusted		Adjusted for independent	
		Dev'n	Eta	Dev'n	Beta
Teaching Strategies			40		41
Demonstration	85	7.80		1.44	
Lecture	83	5.91		1.05	
Learning Styles					
Sensing/Intuitive	39	1.12		1.06	
Active/Reflective	43	1.02		1.01	
Visual/Verbal	43	1.02		1.01	
Sequential/Global	43	1.02		1.01	
Multiple R =.44					
Multiple R. Square =.09					

Table 8. Result of Least Significant Difference (LSD) Post Hoc Test For Multiple Comparison Of Learning Styles On The Mean Scores Of Students With Different Learning Styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive and Sequential/Global) Taught ICT Concepts Using Practical method And Those Taught Using Lecture Strategy

(I) Learning Style	(J) Learning Style	Mean Difference -(I-J)	Std. Error	Sig. ^A	95% Confidence Interval For Difference ^a	
					Lower Bound	Upper Bound
Active/Reflective	Visual/Verbal	1.939	2.723	.477	-3.438	7.316
	Sensing/Intuitive	4.988	2.805	.077	-.552	10.527
	Sequential/Global	1.493	2.706	.582	-3.850	6.837
Visual/Verbal	Active/Reflective	-1.939	2.723	.477	-7.316	3.438
	Sensing/Intuitive	3.049	2.757	.270	-2.395	8.493
	Sequential/Global	-.446	2.690	.869	-5.758	4.866
Sensing/Intuitive	Active/Reflective	-4.988	2.805	.077	-10.527	.552
	Visual/Verbal	-3.049	2.757	.270	-8.493	2.395
	Sequential/Global	-3.495	2.763	.208	-8.951	1.962
Sequential/Global	Active/Reflective	-1.493	2.706	.582	-6.837	3.850
	Visual/Verbal	.446	2.690	.869	-4.866	5.758
	Sensing/Intuitive	3.495	2.763	.208	-1.962	8.951

The mean difference between Sequential/Global and Active/Reflective was -1.493 between Sequential/Global and Visual/Verbal was 446, while between Sequential/Global and Sensing/Intuitive was 3.495.

This implies that active/reflective learning styles was the most effective in facilitating students' performance in ICT when taught with practical method and lecture strategy. This was seconded by sequential/global styles followed by Visual/Verbal and sensitive/intuitive learning style which are of the same pace. Hence, practical method is the most effective instructional strategy for ICT students with active/reflective learning styles and Sequential/Global learning styles while lecture strategy is the most effective instructional strategy for visual / verbal learning styles.

H₀₃: There is no significant difference in the mean scores of male and female students with different learning styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive and Sequential/Global) taught ICT concepts using demonstration and lecture methods.

Table 9 showed that there was no significant difference in the performance scores of male and female students with different learning styles (Sensing/Intuitive, Active/Reflective, Visual/Verbal and Sequential/Global) taught ICT concepts using demonstration and, lecture teaching methods. The summary of ANCOVA in Table 3 shows that the calculated F - value at 3, 238 degree of freedom is .599 at 0.617 is greater than (\geq) 0.05 Alpha level. This means that the F - value is not significant. ($F(3, 242) = 2.059 (0.617) \geq 0.05$). Therefore, the null hypothesis that there is no significant difference in the performance of male and female students with different learning styles (Sensing/Intuitive, Active/Reflective, Visual/Verbal and Sequential/Global) taught ICT concepts using demonstration, guided-inquiry, and lecture teaching strategies was therefore accepted at 0.05 level of significant and the alternative rejected. This implies that there was no significant effect of treatment on male and female students with different learning styles taught ICT concepts using demonstration, and lecture teaching methods.

Table 9. Analysis of Covariance (ANCOVA) On the Mean Scores Of Male and Female Students (Gender) With Different Learning Styles (Sensing/Intuitive, Active/Reflective, Visual/Verbal and Sequential/Global) Taught ICT Concepts Using Demonstration, and Lecture methods

Source	Sum of Squares	Df	Mean Square	F	Sig.	Decision at p< .005
Corrected Model	13343.627 ^a	8	1667.953	11.001	.000	S
Intercept	14370.644	1	14370.644	94.786	.000	S
Pre-test	11390.852	1	11390.852	75.132	.000	S
Gender	590.186	1	590.186	3.893	.050	S
Learning Style	1053.351	3	351.117	2.316	.076	NS
Gender * Learning Style	272.247	3	90.749	.599	.617	NS
Error	36083.677	135	151.612			
Total	867279.000	168				
Corrected Total	49427.304	167				

4. Summary of the Findings

- There was significant effect of demonstration teaching method on ICT Achievement of students with different learning styles (Active/Reflective, Visual/Verbal, Sensing/Intuitive and Sequential/Global learning styles)
- Active/reflective learners taught ICT concepts using Practical method had a higher mean score than other type of learning styles
- Visual/verbal learners taught ICT concepts using lecture method had a higher mean score than other type of learning styles
- The female students with different learning styles taught ICT concepts in all the groups using demonstration, and lecture teaching methods had the highest mean scores than their male counterparts.
- There was a significant difference in the performance of students with different learning styles (Sensing/Intuitive, Active/Reflective, Visual/Verbal and Sequential/Global) taught ICT concepts using demonstration and lecture methods
- Multiple classification analysis in Table 4 showed 4% of the total variance of students' performance in ICT was as a result of the influence of demonstration teaching method
- Post-hoc analysis in Table 5 revealed that demonstration teaching strategy is the most effective for ICT students with sequential / global, learning styles.

5. Conclusion

1. The study showed that the students with different learning styles taught ICT concepts using demonstration teaching method had the highest mean scores while those students with different learning styles taught ICT concepts using Lecture teaching method had the least mean scores
2. Active/reflective learners taught ICT concepts using Practical method had a higher mean score than other type of learning styles
3. There was a significant difference in the mean scores of students taught ICT concepts using demonstration and lecture strategies
4. The significant difference in the mean scores of learning styles for ICT students show that the eight (8) learning styles must be adopted by teachers for academic excellent and to ensure that all learners are carried along in the learning place.

6. Recommendations

The following recommendations are made sequel to the findings, from the study:

- 1) Teachers should identify the learning styles of their students and use appropriate teaching method that will concise with the learning styles for effective teaching and learning to take place in ICT classrooms.
- 2) Workshops and seminars should be organized for ICT teachers to update their knowledge and familiarize themselves with the index of learning style questionnaire for possible use in order to identify their students' learning styles with a view to incorporate them into appropriate instructional strategy during lesson.
- 3) Curriculum planners for senior secondary school ICT should design the curriculum in such a way that will benefit students with multiple learning styles.
- 4) Educators and instructional designers need to build courses and programs that will be of benefit to students of multiple learning styles.

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