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EFFECTIVENESS OF CONSTRUCTIVIST INSTRUCTIONAL MODEL ON SECONDARY SCHOOL STUDENTS' RETENTION IN COMPUTER STUDIES IN ANAMBRA STATE, NIGERIA*

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Abstract

This study was designed to investigate the effectiveness of constructivist instructional model on secondary school students' retention in computer studies in Anambra State. It was a quasi-experimental study that utilized pre-test, post-test, post-test non-equivalent control group design. The population of the study consists of all co-educational public senior secondary (SS2) students that offer computer studies in 2019/2020 academic year in Anocha Local Government Area (L.G.A) of Anambra State. Four out of 10 schools were selected as a sample, where one school each was used as experimental and control group. The experimental groups were taught using constructivist instructional model (CIM) while the control groups were taught using traditional instructional model (TIM). Intact classes were used for both groups. Instruments used for the study was Number System Retention Test (NSRT) with the reliability co-efficient of 0.79. Two research questions were raised and answered descriptively using mean and standard deviation. Two hypotheses were formulated and tested at 0.05 level of significance. Analysis of covariance (ANCOVA) was used in analyzing the data collected. The findings of the study revealed that CIM promotes high retention ability of learners. Based on the findings, it was recommended that CIM should be used in teaching computer studies in schools.

Key words: *CIM; Retention; Computer studies.*

1. Introduction

Teaching computer studies focuses more on instructional activities that would transmit content knowledge in the curriculum to learners. The teaching and learning of computer studies need to be proactive and relevant to the context that we live in today so that learners are better prepared for long life learning, preparation for

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responsible citizenry, occupation in the world of work and preparing learners for the changes and challenges in the present and the future (Okekeokosisi & Okigbo, 2019). It is essential that teaching computer studies which is an aspect of vocational, science and technology education (VSTE) nurtures and supports high order thinking skills, inquiry skills, critical thinking skills, creativity and problem solving. Learning computer studies is complex. This is due to its content which includes abstractions, calculations, difficult ideas, laws and theoretical entities that cannot be seen or handled. As a matter of fact, much of computer studies learning are concerned with understanding largely invisible process that cannot be easily observed as they may be too small, too slow or on too large at scale (Wishart, 2014). This is why we need to teach computer studies in a way that ensures that students could understand these processes through interactive instructional model. Thus, Okereke (2010) indicates that no instructional model (IM) is error free, but any instructional model has to consider students' needs, knowledge, experience, interest and interaction with learning environment. Hence, the need for the present study.

Constructivism learning theory is derived from constructivist. The theory is described as a process of knowledge construction as an active rather than a passive one. It is a theoretical position which holds that knowledge should not be imbibed by the learners' minds but a socially constructed by the learners through interaction with text, learning environment, instructional materials, dialogue or physical experiences (Driver & Bell; Thenjiwe & Boitumelo in Ongowo, Indoshi & Ayere, 2015). The theory presents learners as the ownership of the instructional problem while the teacher is seen as the coach or the facilitator. Learners are also seen as those that generate knowledge by integrating new information and experiences into their prior knowledge (Okekeokosisi & Okigbo, 2013). Thus, constructivist instructional model (CIM) is viewed as learner-centred instruction rather than teacher-centred. The review of literature exposed the model as an activity-centred model of instruction. The model provides opportunity for active involvement of learners in the teaching process. Computer studies instruction and learning requires active participation of learners in the process. This study sets out to employ constructivist instructional model on students' retention in computer studies.

Retention is the noun form of the verb "retain". Stuz in Anamezie (2018) defined retain as "keep", "continue to have or hold" or "keep in place". Bichi (2002) explained that retention as the ability to store and remember things experienced or learned by an individual at a later time. It entails ability to recall facts and figures in memory or recognize what has been learnt. Ochonnogor (2007) stressed that retention can be measured through verbal recall of learnt materials and explained that concepts learnt assist in reflective thinking and that retained concepts can be used in creative way to solve new problems. Thus retention is associated with achievement because when a learner is able to remember and exhibit whatever he / she has earlier learned by making the same level of achievement after a period of time, it implies retention.

Several studies have been undertaken to ascertain factors' that could enhance or hamper learners' retention ability especially in the science and VSTE. Ogbonna

(2007) investigated the effect of two constructivist instructional models (CIM) on JSS2 students' achievement and retention in numbers and numeration. The findings affirmed that CIM fosters students' high achievement and retention in mathematical content than conventional teaching method. Also on the problem of retention, Okekeokosisi (2012) asserted that CIM fosters learners' retention since learners are actively involved in the learning process. Similarly, Okekeokosisi and Okeke (2015) contended that for learners improvement in learning rests on the principles of learning by doing. Therefore, retention depends mainly on instructional model adopted by the teacher.

Gender has become a contemporary focus to most researchers because gender factor has powerful effect on students' retention in teaching-learning. Over the years, gender phenomenon has been evaluated from different perspectives in terms of how they affect teaching-learning of students. Thus, Dave-Ugwu and Nwosu (2018) referred gender as all the characteristics of man and woman, which a particular society has determined and assigned each sex. Ezeh (2013) describes gender as personality traits, attitudes, behaviours, values, relative power, influence, roles and expectation (feminity and masculinity) that society ascribes to two sexes on a differential basis. In the context of teaching-learning, it implies roles that are related to male and female issues. In this study, it concerns male and female retention in computer studies. Okafor (2007) is of the view that gender discrimination should not affect teaching-learning of students for their retention.

Furthermore, application of instructional model that would make learners actively participate in learning process is necessary for teaching to be effective. When students interact with the learning experiences, their minds will be captured as well as retain concept taught or learned. Therefore, the study tries to find out the effectiveness of constructivist instructional model on students' retention in computer studies.

2. Statement of the Problem

The study is motivated by the fact that students do not retain for long or understand what they are taught in computer studies. It could be that students are not actively involved in the learning process. The type of learning that does not encourage active participation of students lacks interest or stimulation. It neither encourages students' experiences nor extend their experience. There is also evidence of persistent average retention of learners in computer studies content materials according to available WASSCE May / June 2014 to 2019 Chief Examiners' Report. The study intends to investigate CIM effect on retention of students in computer studies.

3. Purpose of the Study

The purpose of the study was to investigate effectiveness of constructivist instructional model on students' retention in computer studies. Specifically, the study seeks to determine the following:

1. Difference in the mean retention scores of students taught computer studies using constructivist instructional model (CIM) and those taught with traditional instructional model (TIM)

2. Difference in the mean retention scores of male and female students taught computer studies using CIM.

4. Research Questions

The study sought to provide answers to the following questions:

1. What is the difference between the mean retention scores of students taught computer studies using CIM and those taught using TIM?
2. What is the difference between the mean retention scores of male and female students taught computer studies using CIM?

5. Hypotheses

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

$H0_1$: There is no significant difference in the mean retention scores of students taught computer studies using CIM and those taught with TIM.

$H0_2$: There is no significant difference in the mean retention scores of male and female students taught computer studies using CIM.

6. Method

This study employed quasi-experimental design specifically; the pre-test, post-test, post-test non-equivalent control group design was used. The study was carried out in Anocha Local Government Area (L.G.A) of Anambra State, Nigeria. The population of the study was made up of all co-educational public senior secondary (SS2) students that offer computer studies in 2019/2020 academic year in Anocha L.G.A. The L.G.A was used because it is the second L.G.A that has the highest number of co-educational secondary schools in the state (PPSC, Awka, 2020). Purposive sampling technique was used to select only 11 co-educational public secondary schools out of 16 public secondary schools in the L.G.A. 10 co-educational public secondary schools were selected out of the 11 schools due to the fact that the school had no computer studies teachers. Based on this, the students could not offer the subject in external examination. Pre-test was given to the 10 schools on general computer studies knowledge before the treatment commenced. The test was to determine their performance in computer studies knowledge. Scores obtained from the pre-test given were analyzed using ANOVA and Scheffe's test to select four schools that were found to be equivalent in terms of performance. An intact class of SS2 was used from each of the schools selected for the study. The selected schools were tagged experimental and control groups. Hence, the sample size used for the study was 160 students composed of 32 male SS2 students and 48 female SS2 students. The choice of SS2 computer studies students was based on the fact that they have been exposed to the subject for almost one year. The students were taught computer studies in their Junior secondary school as Basic science and technology and had chosen to offer computer studies in WASSCE. Besides, they were not involved in any external examination as it was with the case of the SS3 students.

The instrument for the study tagged Number System Retention Test (NSRT) developed by the researchers was used for data collection. NSRT consists of 50

items, 5 option multiple choice objective tests developed for the study. Learners were meant to choose the correct answer from the option letter A-E respectively. The items in the instrument were adopted from WASSCE past question papers. WASSCE past questions were used because the questions were already standardized. The instrument was subjected to validation by experts in science education and measurement and evaluation. The instrument was validated in terms of clarity of instruction, proper wordings of the items, appropriateness and adequacy of the items in addressing the purposes of the study.

The reliability of NSRT was determined using Kuder Richardson's Formula 20 (KR-20). The choice of KR-20 is influenced by the fact that it is best used in multiple choice items with right and wrong answers (Nworgu, 2015). A reliability co-efficient of 0.79 was obtained. The researchers trained regular computer studies teachers from experimental and control schools with their lesson plans for one week on how to use CIM as research assistant; using the following features respectively; simulation, demonstration, use of instructional cards, problem solving, adaptation, collaboration, planned repetition and evaluation (experimental lesson plan), telling, recitation, memorization, planned repetition and narrating (control lesson plan). After the training, research assistants embarked on the teaching.

The two groups were taught eight lesson topics on the theme number system using constructivist instructional model (CIM) and traditional instructional model (TIM) respectively. The teaching was done by their regular class teachers using their regular lesson periods and applying the model specified (CIM and TIM).

Before the teaching commenced, pre-test was administered to learners in the sampled schools. After the pre-test was administered to sampled schools, only experimental group were taught number system using CIM. The question papers were retrieved from the research subjects (both experimental and control groups) since the items in the pre-test were re-organized and used as post-test. After the treatment which lasted for four weeks, the post-test was administered to both groups (achievement test). The scripts were marked, scored and collated. Furthermore, after two weeks of administering achievement test to the subjects, the same items were re-shuffled for the second time. This second time re-shuffled items were administered to the subjects as post post-test that determined the retention level of students. Their scripts were marked, scored and collated. The research questions were answered using descriptive statistics like mean and standard deviation while the hypotheses were tested at 0.05 level of significance using analysis of covariance. In taking decision, reject the null hypotheses if the probability value (P-value) is less than or equal to significant value of 0.05 ($P \leq 0.05$); otherwise, do not reject the hypotheses.

7. Results

Results were presented in tables according to research questions and hypotheses.

Table 1. Mean Retention Scores and Standard Deviation Scores of the CIM and TIM

Post-test

Groups	**N**	**Ẍ**	**SD**
CIM	80	73.58	8.60
TIM	80	52.63	6.80
Mean Difference		20.95	

The mean retention score and standard deviation for the CIM groups were 73.58 and 8.60 respectively. Those of the TIM groups were 52.63 and 6.80 for mean retention score and standard deviation respectively. There is a mean difference of 20.95 in favour of the CIM group. This implies that the CIM group retained more than the TIM group.

Table 2. Mean Retention Scores and Standard Deviation Scores of the CIM by gender

Post-test

Groups	**N**	**Ẍ**	**SD**
Male	32	29.43	3.44
Female	48	44.15	5.16
Mean Difference		-14.72	

From Table 2, the difference in the mean retention scores of students by gender is -14.72 while the SD of the gender post-test retention scores shows no disparity. Furthermore, the SD post-test revealed that the treatment with CIM by gender was able to bring the participant scores closer to mean than before the treatment.

Table 3. ANCOVA Results of students' retention scores with regards to instructional model

Source of variance	**Df**	**SSX**	**SSY**	**SSXY**	**SSYX**	**MSSYX**	**F.cal**
Between groups	1	119.68	-17.57	5.048 ^{X10}	10785114.06	10785114.06	
Within groups	158	296950.32	-10774017	-11150730.08	-10773980.33	-68189.75	158.16
Total	**159**	**297070**	**163771**				

The data presented on Table 3, in which the scores were obtained from the mean retention test instrument, the F-calculated which is 158.16 is greater than the F-critical at 3.91 of 150 degree of freedom. The null hypothesis thus, shows that there is no significant difference in the mean retention scores of students taught computer studies using CIM, and those taught with TIM is rejected. This implies that there is significant difference between the mean retention scores of computer studies students in both groups in favour of the CIM group.

Table 4. ANCOVA Results of students' retention scores by Gender

Source of variance	Df	SSX	SSY	SSXY	SSYX	MSSYX	F.cal
Between groups	1	-190.71	-6666.05	-16380.46	1391227.98	1391227.98	0.02
Within groups	78	-195.09	-7487.49	-17487.49	1155674.06	90142576.68	
Total	**79**	**-1105.8**	**-1107.05**				

In Table 4, the scores were obtained from the mean retention test instrument of the CIM group; the F-cal which is 0.02 is less than the F-crit at 4.21 of 27 degree of freedom. The null hypothesis that the mean retention scores of male and female students taught with CIM do not differ significantly is accepted. This implies that there is no significant difference between the mean retention scores of male and female students taught with CIM.

8. Discussion

The analysis of the retention scores summarized in Table 1 obtained from the retention scores of both groups showed that computer studies students taught with CIM expressed high level of retention in computer studies than those taught with traditional instructional model (TIM). This result agrees with the famous Chinese proverb which goes thus "what I hear I forget, what I see I remember, what I do I understand". This simply indicates that CIM has a positive effect on students' retention in learning computer studies. In the same vein, this result further authenticates the findings of Okeke (2009) and Okekeokosisi and Okigbo (2015) whose reports revealed that learners taught through CIM retained better than those taught with TIM. Also, Ochonnogor (2007) and Anamezie (2018) all made cases for the adoption of instructional models that promote learners' active involvement in instructional process so as to enhance learners' retention.

Furthermore, gender influence on the mean retention scores of students taught computer studies using CIM can be viewed from the mean difference. Thus, it showed that CIM group had not portrayed any difference in the mean retention test. By implication, CIM did not have any gender effect on students' retention in computer studies. Besides, computer studies students should be encouraged to manipulate computer laboratory equipment they work with. These help to boost their

retention in learning computer studies; notwithstanding the gender. This tallies with the findings of the study carried out by Obiekwe (2008) that CIM approach was more effective in facilitating students' retention in ecological concept; gender notwithstanding. Agbi's (2004) work also listed some of the strength of laboratory method (which is one of the constructivist instructional model) of teaching. Agbi further expresses that it provides students with concrete learning experiences that thus reinforce theoretical learning. Hence, students tend to retain more information because of active involvement and it provides opportunity for development of skills (manipulative visual) which are learned more early by practice. In other words, when students are actively involved in teaching-learning process, more energy is liberated towards such and it finally leads to high retention level.

9. Conclusion

Constructivist instructional model is the teaching model that upholds the principle of learning by doing. When this model is applied in computer studies, it aids high retention of concepts. Moreover, the retention of students who learn under the model of instruction does not depend on gender.

10. Recommendation

Consequent upon the findings of this study, the following recommendations have been deemed necessary:

1. CIM and other activity-oriented instructional model should be used in teaching computer studies in schools
2. CIM is gender insensitive. Therefore, it should be employed in instructing students in computer studies

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