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Constructivist Instructional Strategy and Students' Academic Achievement in Computer Studies in Abia State, Nigeria

OSONDU, Stella Ifeoma*
Department of mathematics, computer science Institute of ecumenical education, Enugu, Nigeria

Original Research Article

***Corresponding author**
OSONDU, Stella Ifeoma

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Abstract: The study investigated effect of Constructivist Instructional Strategy on Secondary Students' Academic Achievement in Computer Studies in Abia State, Nigeria. The study employed a non-equivalent control group quasi experimental design. The sample for the study comprised of seventy (70) Senior Secondary School class II (SS II) students drawn from two co-educational secondary schools in Umuahia Education Zone of Abia State, Nigeria. Two research questions and two null hypotheses tested at 0.05 level of significance guided the study. Computer Studies Achievement Test (CSAT) with a reliability coefficient of 0.70 using KR-20 was adopted for this study. The instrument was duly validated. Mean, Standard Deviation and ANCOVA statistic was used to answer the research questions and test the research hypotheses respectively. The results revealed that mean achievement scores of secondary school students taught Computer Studies using Constructivist Instructional Strategy was higher than the mean achievement scores of those taught Computer Studies using lecture method of instruction. Male students taught Computer Studies using Constructivist Instructional Strategy obtained higher mean score than female students. Again, there is a significant difference in the mean scores of students taught Constructivist Instructional Strategy and those taught using lecture methods. The recommendations among others are:- Since many teachers do not have constructivist backgrounds, workshops, seminars and conferences should be organized by Ministry of Education and administrators of secondary schools to enlighten teachers and improve their knowledge and skills on the use of constructivist based approach for improving students' achievement and interest in Computer Studies; All teacher Education institutions in the federation should include in the teacher curriculum the rudiments of constructivist based instructional approach (scaffolding, fading, thinking skills and collaborative work). When a teacher possesses a sound knowledge of constructivist based approach, it induces in the teacher confidence and a high capacity to deliver the content of his/her subject matter.
Keyword: Computer Studies, Constructivist Instructional Strategy and Students' Academic Achievement.

INTRODUCTION

The primary purpose of teaching at any level of education is to bring a fundamental change in the learner [1]. To facilitate the process of knowledge transmission, teachers should apply appropriate instructional strategy that best suit specific objectives and level exit outcomes. In the traditional approach, many teachers widely adopt teacher-centered approach to impart knowledge to learners comparative to student-centered approach. Presently, questions about the effectiveness of teaching methods on student learning have consistently raised considerable interest in the thematic field of educational research [2]. As an educator, the researcher has always been fascinated by the relationship between teaching methods and students' academic achievements; especially when it comes to applications in the context of 21st century education. It seems that there is something in teaching that opens the gate of learning. It is true that successful learning depends on various factors that are not all teacher-related, but the methods that a teacher uses continue to play an important role in student's learning and in their academic achievements. The challenges that educators face in the 21st century are so diverse that using better teaching methods is more crucial now than ever before.

Moreover, research on teaching and learning constantly endeavour to examine the extent to which different instructional strategy enhance growth in student learning. Quite remarkably, regular poor academic performance by the majority students is fundamentally linked to application of ineffective instructional strategy by teachers to impact knowledge to learners [3]. Substantial research on the effectiveness

of instructional strategies indicates that the quality of teaching is often reflected by the achievements of learners. According to Ayeni [4], teaching is a process that involves bringing about desirable changes in learners so as to achieve specific outcomes. In order for the strategy used for teaching to be effective, Adunola [3] maintains that teachers need to be conversant with numerous teaching strategies that take recognition of the magnitude of complexity of the concepts to be covered.

Despite the needs for adjustment, lecturing method and demonstrating method which are based on behavioural learning theories are still the main teaching/learning strategies employed for implementing the curriculum in schools. Teachers are set as the only active participant in the class while students are made observers or admirers throughout the class. Oranu [5] said the methods are content driven and certainly not learner-centered. These methods referred to as conventional methods which are predominantly used in teaching Computer Studies in schools cannot achieve the best desired for the learners. These conventional methods of teaching may also account for poor performance of vocational education at public examinations [6]. This could be responsible for the poor performance of Computer Studies students at both internal and public examinations.

The consequence of using these approaches in teaching Computer Studies in secondary schools is that, students might lose interest in learning the subject and they cannot apply it in new situations. Negative attitude would be projected but this can be reduced or eliminated by using the approach that will project and engage the student's participation. There is no gainsaying that prominence must be given to Computer Studies teaching in schools. It must be rich and elaborate enough to provoke the love and academic interest of students. In pursuance of this, it is imperative to consider the teaching approach that will have impact on the students' academic achievement and interest in Computer Studies in the schools. Ogwo [7] stated that contemporaneous teaching is perceived as a range of activities aimed at assisting the learners acquire knowledge, attitudes, values, habits and basic skills.

The focus in teaching and learning should be on the individual's active construction of knowledge [8]. The essential core of constructivist is that learners actively construct their own knowledge and meaning from their experiences [9]. Constructivist learning is based on students' active participation in problem-solving and critical thinking regarding a learning activity which they find relevant and engaging. Students' constructs their own knowledge by testing ideas and approaches based on their prior knowledge and experience, applying these to a new situation, and integrating the new knowledge gained with pre-existing intellectual constructs.

According to Kerka [10] the vocational education, (Computer Studies inclusive) teacher's role is not to set tasks but to organize experiences that will allow learners develop their own knowledge and understanding. Okoro [11] opined that students learn more when they supply answers to questions rather than when the answers are supplied to them. This increases the involvement of the students and makes the teaching more interesting and effective. The constructivist based approach is considered a veritable tool for shifting technology teaching from conventional to problem solving scenarios. Many teaching methods that are in use have not adequately catered for students to critic thinking skills and their construction of knowledge in which if constructivist based approach is used, therefore allowing students to participate actively in the classroom and knowledge construction.

The constructivist approach to teaching and learning is based on a combination of a subset of research within social psychology. The underlying principle is that an individual learner must actively build knowledge, skills and that information exists within these built constructs rather than in the external environment.

Constructivism is a psychological epistemology which argues that humans generate knowledge and meaning from their experience. Constructivism is an instructional strategy not a theory. Essentially, it is an instructional strategy or metaphor of how people learn or how learning takes place [12, 13]. It justifies the putting together of new ideas by interpreting new experiences in light of prior knowledge so that the new ideas come to make sense to the learner [13]. The strengths of constructivism lie in the construction of knowledge and what that means for students and teachers. Since knowledge cannot be transferred from one individual to another like a commodity, the role of the teacher as knowledge giver in the classroom becomes moot. Educators must accept the fact that knowledge is constructed in action and must be constructed by individual knower; instruction must be student-dominated where teachers function as facilitators.

Baker & Piburn [14] further claim that knowledge is built in social contexts; pedagogy must encourage student-to-student interactions and collaboration. It is a well-known fact that knowledge construction is strongly influenced by prior experience and learners make sense of the world by synthesizing new experiences into what they have previously come to understand in their daily life [15-17]. In other words each learner must construct meaning for oneself and

that the only learning that can take place is that which is connected to the individual's already-existing knowledge, experiences, or conceptualizations [18]. This implies that learning involves negotiation and interpretation. According to Von Glasersfeld [12], what children learn is not a copy of what they observe in their immediate environments but comes from the result of their own thinking, reflection and processing information.

A constructivist instructional strategy suggests that "as we experience something new, we internalize it through our past experience or knowledge constructions we have previously established" [19, 16]. The primary job of a teacher is to enable children to think out-of the-box by making their own connections that result in valid internalized meanings unique to them. In this case, the teacher leads the children through exploratory activities that enable them to investigate on their own and come to their own conclusions as to what is happening in the immediate environment [20]. Penner [21] argues that, "learning activities must begin by considering the role of student current knowledge, how knowledge is constructed, and the role of the activities in building knowledge" (p. 3). In other words, individuals construct their own new understandings through the interactions of their existing experiences with whatever they come into contact with, making learning a social activity which engages the teacher as facilitator, mentor, and co-explorer who encourages learners to question, challenge and formulate their own ideas and conclusions [15,17]. The general consensus among educators is that what a person knows is not a function of detached observation but rather created through interaction with their world view towards knowledge and reality are subjective in nature [22-25].

A typical constructive classroom environment is tasks oriented and designed to enhance hands-on and minds-on learning for all students similar to those encountered in the real world. This type of learning environment should focus on authentic tasks similar to what people see in every day practice similar to on-the-job experiences that would benefit all students [8, 24].

A constructivist teacher would have his or her classroom focus on real life problem solving, problem-based learning (PBL), independent investigation, and the pursuit of personal interests, simulation, discussion collaborative learning, think-pair share, and the utilization of higher-order thinking skills. Research studies in cognition, authentic learning, and student engagement support claims that student-centered teaching is a beneficial teaching strategy for all students, including students with special needs [15, 24]

Purpose of the study

The purpose of the study is to determine the effect of Constructivist Instructional Strategy on students' achievement in Computer Studies at Senior Secondary School level. Specifically, the study sought to determine:-

- The effects of constructivist learning instructional strategy and conventional lecture method on students' achievement in Computer Studies.
- The effect of constructivist instructional strategy on male and female students in Computer Studies achievement test.

Research Questions

The following research questions guided the study:

- What is the effect of constructivist instructional strategy and lecture method on Computer achievement test?
- What is the effect of constructivist instructional strategy on Computer Studies achievement test of male and female students?

Hypotheses

Two null hypotheses were tested at 0.05 level of significance:

- There is no significant difference in the mean scores of students taught using constructivist instructional strategy and those taught using lecture methods.
- There is no significant difference in the mean scores of male and female students taught using the constructivist instructional strategy.

METHOD

The research design for the study was nonequivalent control group quasi-experimental research design consisting of treatment and control groups respectively. The design was considered appropriate for the study because intact classes were used instead of randomly composed samples. One of the intact classes (n=35) was for experimental group and the other (n=35) was for the control group. 70 senior secondary two (SS2) students out of 297 from two co-educational secondary schools in Umuahia Education Zone of Abia State participated in the study. The SS2 students were used because they are supposed to have covered much of their curriculum and have gathered enough experiences in Computer Studies. Pre-tests were given to determine the equality of the two groups. Treatment group was exposed to constructivist instructional strategy, while the control group was exposed to the conventional teaching method.

Experimental procedure

The instrument used for data collection was Computer Studies Achievement Test (CSAT) constructed by the researcher based on the Computer

Studies topics; Computer Software, Word processing and Electronic spreadsheet using Ms Excel taught was part of SS II Computer Studies curriculum. The instrument was validated by one lecturer in Measurement and Evaluation and one in Department of Computer and Robotic Education of University of Nigeria, Nsukka using test blue print approach. The reliability coefficient of the test was found to be 0.70 using KR-20. The data collected with the instrument were analyzes using mean statistic and research hypotheses tested using ANCOVA statistic.

The regular Computer Studies class teachers were used for the study in both experimental and control groups. Before the experiment in each of the sampled schools, the students' terminal examination scores were used to stratify the students into ability group (high, middle and low). Then, groups of mixed abilities were formed in the class. Training was given to the Computer Studies teacher who took the experimental group using constructivist instructional strategy, while the Computer Studies teacher who took the control group was not training on the use of the constructivist instructional strategy. The lecture method was used in the control group without stratifying the students. The experimental class teacher was given note of lesson prepared by the researcher while the researcher vetted the lesson plan prepared by the Computer Studies teacher in the control group to ensure that the teacher did not deviate from the procedures of instructions commonly used by Computer Studies teachers. Computer Studies achievement test (CSAT) was used for both pre-test before treatment and post-test after treatment. The treatment consisted of teaching the selected Computer Studies concepts of Computer Software, Word processing and Electronic spreadsheet using Ms Excel using computers with relevant computer softwares and ICT gadgets. This involved teaching the Computer Studies concepts through the use of computers with relevant computer softwares and ICT gadgets to create opportunity for students to answer questions explore with creative thinking construct their own knowledge, concretize learning, providing opportunities for students to practice with the ICT gadgets. The control group was taught the same topics using lecturing method. The teaching lasted for 4 weeks. Each teacher in the experimental and control schools completed the teaching following the stipulated guidelines. Immediately after the completion of the teaching, the CSAT was again administered to the students (after reshuffling) as post-test and scores were recorded.

RESULTS

Research Question 1: What is the effect of constructivist instructional strategy and conventional method on Computer achievement test?

Table-1: Mean and standard deviation for the experimental and control group

Group	N	Pre-Test		Post-Test		Mean Achievement Gain
		$\bar{x}$	SD	$\bar{x}$	SD	
Experimental	35	19.429	2.405	43.343	3.235	23.914
Control	35	18.343	1.846	23.971	3.460	5.628

Result presented in table 1 indicates that the experimental pretest and posttest mean scores are 19.429 and 43.343 with standard deviation scores of 2.405 and 3.235 respectively. Also, the control group has pretest and posttest mean scores as 18.343 and 23.971 with standard deviation scores of 1.846 and 3.460 respectively. The mean achievement gain for the treatment group was 23.914 while the mean gain in the control group was 5.628. This implies that the experimental group performed in achievement test better than the control group.

Research Question 2: What is the effect of constructivist instructional strategy on Computer Studies achievement test of male and female students?

Table-2: Mean and standard deviation for the experimental and control group across the sex

			Pretest		Post test		Mean Achievement gain
Groups	Sex	N	$\bar{x}$	SD	$\bar{x}$	SD	
Experimental	Male	15	19.846	1.625	43.385	2.755	23.539
	Female	20	19.182	2.771	43.318	3.551	24.136
Control	Male	13	18.600	1.920	24.333	3.244	5.733
	Female	22	18.150	1.814	23.700	3.672	5.550

Result in Table 2 indicates that the pretest mean score and standard deviation score for the experimental male and female are 19.846 and 1.625; 19.182 and 2.771 respectively. Similarly, the post test mean scores and standard deviation scores for the experimental male and female groups are 43.385 and 2.755; 43.318 and 3.551 respectively. Also, the pretest mean scores and standard deviation scores for the

control male and female are 18.600 and 1.920; 18.150 and 1.814 respectively. Also, the post test mean score and standard deviation scores for the control male and female are 24.333 and 3.244; 23.700 and 3.672 respectively. The mean achievement gain for male and female in the treatment group are 23.539 and 24.136 respectively. In the control group the gains are 5.733 and 5.550 respectively for male and female. However, there were no tangible differences in their performances.

Hypotheses

$Ho_{1=}$ There is no significant difference in the mean scores of students taught using constructivist instructional strategy and those taught using conventional method.

Table 3: Analysis of Covariance (ANCOVA) on of students' Achievement in Computer Studies taught using constructivist Instructional Strategy and those taught with using conventional teaching method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision
Corrected Model	6567.288[a]	2	3283.644	288.536	.000	Significant
Intercept	1018.502	1	1018.502	89.496	.000	
Pretest	.373	1	.373	.033	.857	
Method	6184.105	1	6184.105	543.402	.000	
Error	762.484	67	11.380			
Total	86626.000	70				
Corrected Total	7329.771	69				

The result in table 3 indicates that F (543.402) is significant at 0.000 for the methods, at 1 and 69 degree of freedom (DF). This is because 0.000 is less than 0.05 significant level set for the hypothesis. However, H_{O1} is not upheld. There is significant difference in the mean scores of students taught using constructivist instructional strategy and those taught using conventional method.

$Ho_{2:=}$ There is no significant difference in the mean scores of male and female students taught using the constructivist instructional strategy.

Table-4: Analysis of Covariance (ANCOVA) on male and female students taught Computer Studies using constructivist instructional strategy

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision
Corrected Model	412.862[a]	2	206.431	2.000	.143	Not Significant
Intercept	144.803	1	144.803	1.403	.240	
Pretest	402.174	1	402.174	3.896	.053	
Gender	29.679	1	29.679	.287	.594	
Error	6916.909	67	103.237			
Total	86626.000	70				
Corrected Total	7329.771	69				

Again in table 4, it shows F (0.287) is not significant at 0.594 for the gender (male and female) at 1 and 69 degree of freedom (df). This is because 0.594 is more than 0.05 significant earlier set for hypothesis. Therefore, the hypothesis H_{O2} was upheld. That is there is no significant difference between the male and female mean score on CSAT.

FINDINGS

From the results of the data analyses, it was found that:

- Students' taught Computer Studies using constructivist instructional strategy recorded higher achievement than those taught using conventional method. There is a significant difference between the mean achievement scores of the experimental and control groups.
- Male students recorded higher achievement than their female counterparts in control group while the females recorded higher achievement in the experimental groups. Though, there were no tangible differences in their performances. There is no significant difference in Computer Studies achievement between male and female students taught using constructivist instructional strategy

DISCUSSION

The findings revealed in table I indicated that students taught using constructivist instructional strategy performed better than those taught using lecture method. The result is in line with Jong [26] the

constructivist teaching group outperformed the traditional teaching group in academic achievement. Bhattacharjee [27] opined that the most significant of constructivist instructional strategy is shift of the focus of pedagogical design away from instruction and toward the design of learning environments that are learner-centered, knowledge-centered, assessment-centered, and community centered. Constructivism shifts emphasis from teaching to learning; focuses on knowledge construction, not reproduction; helps students develop processes, skills and attitudes; individualizes and contextualizes students‟ learning experiences; considers students‟ learning styles; uses authentic tasks to engage learners; provides for meaningful, problem-based thinking; requires negotiation of meaning, reflection of prior and new knowledge; extends students beyond content presented to them.

In the case of gender, the ANCOVA result reveals that there is no significant difference between the male and female students mean score on CSAT. The result agrees with Ogundola, Popoola and Oke [28] whose research on the effect of constructivist instructional approach on teaching practical skills to mechanical related trade students in Western Nigeria Technical Colleges, found a significant difference between the students taught with constructivist teaching approach and those in the control group. But no significant difference exists between male female students exposed to the constructivist strategy.

CONCLUSION

The study revealed that students taught using constructivist instructional strategy performed better in Computer Studies achievement test than those taught using lecture method. Both gender showed improvement in the subject. However, male students had greater achievement than female students. Differences in cognitive style, interest and motivation between boys and girls might be the causes of the difference in their achievements. Finally, the study reveals that constructivist instructional strategy has a significant and positive impact on teaching and learning of Computer Studies. Teachers should replace traditional teaching strategies with innovative ones in their lessons.

RECOMMENDATIONS

This paper makes many recommendations for those who opposed constructivist principle. They are:-

- Since many teachers do not have constructivist backgrounds, workshops, seminars and conferences should be organized by Ministry of Education and administrators of secondary schools to enlighten teachers and improve their knowledge and skills on the use of constructivist based approach for improving students' achievement and interest in Computer Studies.
- Government and Administrators must equally make funding available for the purchase of all necessary facilities and to train teachers across all secondary schools and encourage the support of non-teaching staff to make constructivist teaching a reality, no matter one's opinion on constructivism.
- Computer Studies teachers should adopt the use of the constructivist based approach, namely: scaffolding, fading, thinking skills and collaborative work to the teaching of the subject
- Government at all level should consider review of curriculum for Computer Studies with a view to incorporate constructivist based approach into the teaching of Computer Studies
- Students should always be allowed to participate actively and interact freely with the teacher and their colleagues in the classroom to improve interpersonal intelligence and development in Computer Studies.
- All teacher Education institutions in the federation should make a room for complete mastery of the use of constructivist based approach by prospective teachers. These institutions should include in the teacher curriculum the rudiments of constructivist based instructional approach (scaffolding, fading, thinking skills and collaborative work). When a teacher possesses a sound knowledge of constructivist based approach, it induces in the teacher confidence and a high capacity to deliver the content of his/her subject matter.

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