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EFFECT OF COMPUTATIONAL TEACHING STRATEGY ON STUDENTS INTEREST AND PERFORMANCE IN PHYSICS IN SENIOR SECONDARY SCHOOLS IN GWAGWALADA AREA COUNCIL, ABUJA

ORJI, NWOKEDIRIOHA ONYEMAECHI (PhD)

&

IREPITA, SIMEON (PhD)
Department of Science and Environmental Education
University of Abuja, Abuja, Nigeria
E-mail: onyemaechi.orji@uniabuja.edu.ng

Abstract

This study investigated the effect of computational teaching strategy on students' interest and academic performance in physics in senior secondary schools in Gwagwalada Area Council, Abuja. The study was anchored on four (4) null hypotheses formulated. The quasi-experimental design was adopted for the study. Participants of the study comprised of seventy (70) students selected from two schools sampled within the Area Council. Two instruments titled, Physics Interest Assessment Scale (PIAS) and Physics Performance Scale (PPT) were used for data collection. PPT was constructed in a multiple-choice format with twenty (20) objective test items with four (4) options A,B,C and D while PIAS was constructed in a four- point likert scale format with options – Strongly Agree, (SA), Agree, (A), Disagree, (D), and Strongly Disagree, (SD) for rating of 4,3,2, and 1 respectively. The t-test statistic was used for testing the formulated hypotheses at 0.05 level of significance. The study revealed that students taught physics using the computational teaching strategy perform better than those taught using the conventional method. Also, interest of those taught physics with computational teaching strategy were boosted as a result of the treatment without gender bias. Based on the findings of the study, it was recommended that essential computer teaching materials should be provided for schools to enhance the use of computational teaching strategy, and teachers should be trained on effective use of computational teaching strategy.

Keywords: computational teaching strategy, senior secondary students, interest, academic performance, physics.

Introduction

The problem of teaching and learning is gaining attention of many scholars and researchers for many decades now. Questions such as what should be the best method of teaching have continued to bug the minds of various scholars. With the high rate of technological advancement, there is a massive shift from the traditional methods to more technologically inclined methods. Among these technological-based teaching strategies is computational strategy.

Computational teaching strategy (CTS) was developed from computational thinking (CT), a term applied to describe the increasing attention on students' knowledge development about designing computational solutions to problems, algorithmic thinking, and coding which focused on skills children develop from practicing programming and algorithms, and enables the development of qualities such as abstract thinking, problem solving, pattern recognition, and logical reasoning (Angeli, 2019).

CTS as an ICT-based teaching strategy, is directly linked to how efficient the way people process information in order to acquire knowledge or to solve problems, regardless of the position the individual assumes in the society (Katie, 2018). It is an advanced teaching technique aimed at improving thinking and problem solving skills of learners beyond the classroom four walls. It allows teachers to ensure that their students are learning to think in a way that will allow them to access and understand their digital world, primes students for future success (Huttner, 2018). As a students-centered teaching strategy, it is suitable for teaching and learning of science-based subjects such as physics and social sciences subjects.

Physics is a natural science that involves the study of matter and its motion and behaviour through space and time, along with related concepts such as energy and force. As one of the most fundamental scientific disciplines, the main goal of physics is to understand how the universe behaves. This really means that physics is about asking fundamental questions and trying to answer them by observing and experimenting (Adegoke, 2010). Undoubtedly, to evaluate these goals, academic performance of students is a major yardstick.

Academic performance is the ability of student to study and remember facts and being able to communicate his/her knowledge orally or in written form even in an examination condition (Kpolovie, Joe &Okoto, 2014). It is a yardstick for measuring effectiveness of teaching and learning in every student. However, this is influenced by many factors including communication, availability of learning facilities, guidance, family stress, and students' interest (Irfan&Shabana, 2012). Among these, students' interest stand-out as it is a component of the present study.

Interest is generally considered to be the product of interactions between an individual and his or her environment. Interest in academic domains (i.e., academic interest) is usually characterised by stable individual trends and attitudes towards academic subjects, which may yield deep engagement in learning and thus high academic performance (Wu, Zheng, Li &Guo, 2019). Gender is one of the moderating variables common to studies relating to students' interest and academic performance.

Gender differences have been found as a result of anxiety and examination stress, level of self-efficacy and, willingness to adopt risk-taking strategies in preparation for exams, among others (Uduosoro, 2012). Gender is distinct from "sex" and refers to socially constructed and not biologically defined characteristics of human being. It refers to the social construction of what is considered male and female based on socio-cultural norms and power (Okafor&Arinze, 2012). It is the concern of this study to investigate the effect of computational teaching strategy on students' interest and performance in physics in Gwagwalada Area Council, Abuja.

Statement of the Problem

Physics teachers in senior secondary schools are often confronted with the fact that there are more failures in the subject than expected (Ejezie, 2018). This failure may be traced to many and varied factors some of which include: environmental factors, parental factors, students factors (including learner's interest, and attitudes), teachers factor (the teachers' attitudes; their methods of instruction and the manner of presentation of the subject matter to the learners) - which mostly are lecturing, questioning and answering, explanation of procedures and note giving (Eze, 2016).

The methods being used are not practically oriented and teachers in general make little effort to relate the concept taught and the examples used to real life, especially within the context of the students' own lives and environment.

WAEC statistics between 2010 and 2018 for students' performance in physics revealed it was in 2016 that more than 70% of the students that sat for physics pass at credit level, others are below as shown in Table 1

Table 1: Performance in Physics (2010 – 2018)

Percentage	2010	2011	2012	2013	2014	2015	2016	2017	2018
Pass	51.27	63.94	68.74	46.77	60.76	59.45	76.23	48.26	47.83
Fail	48.73	36.06	31.26	53.23	39.24	40.55	23.77	51.74	52.17

Source: Bada and Akinbobola (2017), Akanbi, Omosewo and Oyong (2018)

The problem of students' poor academic performance in physics is not solely with the subject, but a lack of interest and positive attitude towards physics (Ejezie, 2018). From existing investigation, there is a clear point to the fact that conventional method of teaching the subject has failed, to some extent, in dealing effectively with the problem of poor academic performance (Dajal& Umar, 2019). It has also failed to enable the learners to understand and appreciate the learning of physics (Ejezie, 2018). Hence, the need for ICT-based instructional strategy, that is, learners-centered and inquiry-based in nature such as computational teaching strategy. Therefore, the present study is an investigation into the effectiveness of computational teaching strategy on students' interest and academic performance in physics in Gwagwalada Area Council, Abuja. Gender factors are also examined.

Purpose of the Study

The primary objective of this study is to investigate the effect of computational teaching strategy on students' interest and performance in physics. The specific objectives of the study are:

i. To investigate whether differences exist in the mean interest scores of senior secondary school students taught physics using the computational teaching strategy and those taught using the conventional method.
ii. To investigate whether differences exist in the mean performance scores of senior secondary school students taught physics using the computational teaching strategy and those taught using the conventional method.

In pursuance of the study, the following hypotheses were formulated and will be tested at 0.05 level of significance

H_{01}: There is no significant difference in the mean interest scores of senior secondary school students taught physics using the computational teaching strategy and those taught using the conventional method.

H_{02}: There is no significant difference in the mean performance scores of senior secondary school students taught physics using the computational teaching strategy and those taught using the conventional method

Research Design

The quasi-experimental design was adopted for the study. The quasi-experimental design identifies a comparison group that is as similar as possible to the treatment group in terms of baseline (pre-intervention) characteristics (Howard &Shagun, 2014). Adoption of the design is based on the fact that it offered less rigorous experimental control as compared to the true experimental design (Okafor& Ile, 2014).

Population of the Study

Population of the study comprised of the entire students in senior secondary schools in Gwagwalada Area Council, Abuja. The Area council housed (11) public and forty-three (43) private senior secondary schools with an estimated students' population of three thousand nine hundred and sixty-four (3,964) for 2020/2021 academic session (FCT Secondary Board, 2019).

Sample Size and Sampling Procedure

The study focused on public senior secondary schools only because atmosphere of public and private schools in the Area Council are incomparable. This was based on one of the facts of selecting research sample, homogeneity. Two senior secondary schools – Government Day Secondary School, Gwagwalada, and Government Secondary School, Zuba - were randomly selected using the simple random sampling technique. These formed the experimental and control groups. Intact classes of thirty-five (35) students from each sampled school were used as sample size. Hence, sample size of the study comprised of seventy (70) students.

Instrumentation

Two instruments titled: Physics Interest Assessment Scale (PIAS), and Physics Performance Test (PPT) were used for data collection. PPT was constructed in a multiple-choice format with 20 objective test items with four (4) options A, B, C, and D while PIAS was constructed in a four-point Likert scale format with options – "Strongly Agree" (SA), "Agree" (A), "Disagree" (D), and "Strongly Disagree" (SD) for rating of 4, 3, 2, and 1 respectively.

The instruments were subjected to reliability test which resulted in indices of 0.76 and 0.79 for PIAS and PPT respectively. Judging from the reliability indices, it implied that the instruments are reliable enough for the objective of their construction.

In furtherance of the study, participants in both experimental and control groups were taught for eight (8) weeks. Prior to the treatment, PPT were administered with the aim of ascertaining entry level of the participants. After the treatments, both PIAS and PPT were administered to the groups simultaneously in their various schools. This was aimed at establishing the effect

of the treatments (computational and conventional teaching methods) on participants' interest and performance in physics.

Data Analysis and Results

The hypotheses were tested using t-test statistics at 0.05 level of significance.

Hypothesis One: There is no significant difference in the mean interest scores of senior secondary school students taught physics using the computational teaching strategy and those taught using the conventional method.

Table 1: Summary of Results for Test of Hypothesis One

Group	Item	$\bar{x}$	SD	df	t-value	t-crit.	Decision
Control	35	2.23	1.79	68	15.06	1.74	**Rejected**
Experimental	35	3.13	2.68				

From the table above, the t-test (t-value) of the test was 15.06 while the t-test table value (t-crit.) at degree of freedom of 16 was 1.76. Since the t-crit. value is less than the t-value level at significance of 0.05, the null hypothesis one was rejected. This implied significant difference in the mean interest scores of senior secondary school students taught physics using the computational teaching strategy and those taught using the conventional method in the favour of experimental group.

Hypothesis Two: There is no significant difference in the mean performance scores of senior secondary school students taught physics using the computational teaching strategy and those taught using the conventional method

Table 2: Summary of Results for Test of Hypothesis Two

Group	N	$\bar{x}$	SD	df	t-value	t-crit.	Decision
Control	35	58.46	3.77	68	22.36	2.30	**Rejected**
Experimental	35	81.29	4.71				

From the table above, the t-test (t-value) of the test was 22.36 while the t-test table value (t-crit.) at degree of freedom of 68 was 2.30. Since the t-crit. value is less than the t-value level of significance of 0.05, the null hypothesis two was rejected. This implied significant difference in the mean performance scores of senior secondary school students taught physics using the computational teaching strategy and those taught using the conventional method in favour of experimental group.

Discussion and Recommendations

This study revealed difference in the mean interest scores of participants of the study in favour of those exposed to the computational teaching strategy were better than their counterparts that were not expose to the same strategy. This implies that computational teaching strategy boosted students' interest in physics. This finding agrees with the findings of Akintade (2017) disclosed effect of computer assisted instruction (branch of computational teaching strategy) on students' achievement in addition to interest as well as attitude towards latitude and longitude in Ogun State, Nigeria.

Regarding effect of computational teaching strategy on academic performance of students in physics which is the focus of hypothesis two, this study revealed better mean performance scores of senior secondary school physics students that were exposed to the computational teaching strategy than their counterparts that were not exposed to this strategy. Hence, computational teaching strategy has significant effect of senior secondary students' performance in physics.

This finding is consistent with the findings in Olorukooba, Sani and Suleiman (2016) which disclosed significant effect of computational teaching method on students' performance in qualitative analysis concept of chemistry in senior secondary schools of Zaria Education Zone, Kaduna State-Nigeria.Sedega, Mishiwo, Fletcher, Kofi and Awudetsey (2017) also disclosed effect of computer aided instruction (CAI), a component of computational teaching strategy, on the academic achievement of senior high school (SHS) students in mathematics.

In addition, the finding agrees with the findings of Suleman, Hussain, Ud- Din and Iqbal (2017) which revealed a positive effects of computer-assisted instruction (CAI), aspect of CTS, on the academic achievement of secondary school students in physics. Also, Nja, Cornelius-Ukpepi and Orim (2019) which disclosed a superb effect of computational teaching strategy on students' academic performance in science. CTS could be recommended for use in secondary schools as a panacea to students poor academic performance in physics.

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