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ENHANCING SECONDARY SCHOOL STUDENTS' ACADEMIC PERFORMANCE IN BIOLOGY THROUGH CUES AND PROMPTS INSTRUCTIONAL SCAFFOLDING

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ABSTRACT

This study examined on enhancing secondary school students' academic performance in Biology through cues and prompts instructional scaffolding. The study adopted the quasi-experimental pre-test, post-test control group design. Two purpose of study, two research questions and two research hypotheses guided the study. The population for the study were all the senior secondary school class two (SS 2) students in Ogidi education zone in Anambra state. The sample consisted of 120 SS 2 (59 males & 61 females) Biology students drawn from two secondary schools in the study area. Multistage sampling technique involving different technique at each stage was used. First, purposive sampling technique was used to select 26 co-educational schools from the 40 schools from Idemili North, Oyi and Idemili South. Coeducational schools were purposively selected to take care of the gender variable in the study. The schools were stratified into idemili North, Oyi, and Idemili south where they are located. From the local governments, random sampling technique was used to select two local government areas. From the local government areas selected, one school from each was selected at random making a total of two schools which were used in the study. The instrument for data collection was named Biology Achievement Test (BAT) adapted by the researchers from West Africa Examination Council (WAEC) past questions from (June 2018-June 2020). BAT comprised of 25 item questions. The reliability of BAT was tested using Kuder Richerson 20 and the value obtained was .75 indicating that the instrument was reliable. Data obtained were analysed using mean, standard deviation for the research questions and Analysis of Covariance (ANCOVA) for hypotheses. The result showed that cues and prompts instructional scaffolding enhances students' academic performance in Biology than the conventional method of teaching, male students exposed to cues and prompt instructional scaffolding academically performed better than their female counterpart but there is no significant difference in academic performance on gender. From the findings it was concluded among others that cues and prompts instructional scaffolding is effective for enhancing senior secondary school students' achievement in Biology. From the conclusion recommendations were made.

Keywords: Biology, Instructional scaffolding, Cues and Prompts

Introduction

Biology is a branch of science that deals with living organisms and their vital processes. Biology encompasses diverse fields, including botany, conservation, ecology, evolution, genetics, marine biology. Medicine, microbiology, molecular biology, physiology and zoology. Arsal (2019) opined that Biology is anything that existed, still and yet to exists. Opara (2019) asserted that the

word living (life) makes Biology to have so much importance to humanity. Importance of Biology to humanity includes studying about life. Secondly it provides an in-depth, scientific understanding of how all living and nonliving organisms interact with each other. Third, it gives insights into how diverse life forms are. That is the more reasons why secondary school students in Nigeria are mandated to register it in all secondary school senior certificate examination (Opara, 2019). Despite of all this importance accorded to Biology in humanity; there exists low levels of Biology performance attainment of students at secondary school level of the educational system in the country.

Over the years Opara (2018), Njoku and Nwagbo (2020) Usman and Mandulili (2019) in their different studies have indicated that academic performance of students who enroll in Biology has not been encouraging. The poor performance of students in science subjects, particularly Biology, has assumed a serious dimension as reported by West African Examinations Council (WAEC) Chief Examiner's report (2018-2020). The Chief Examiner's Report showed that the raw mean score of the 667,412 students who registered for Biology was 43.0 with a standard deviation of 15.36 for 2018. In the 2019 examination, their raw mean score was 36.0 and standard deviation of 15.62. in 2020 the raw mean score was 41.1 and standard deviation is 14.99. from 2018-2020, the students' mean score in Biology was below 50% indicating continuous poor performance.

Okolocha and Nwaukwa (2020) maintained that factors suspected to be responsible for poor academic performance among secondary school Biology students includes' lack of teaching material, lack of teachers' knowledge of the subject matter, parental background, extrinsic motivation, anxiety, interest, attitude, self-concept and regular use of conventional method like lecture method (LM) expository method (EM). Similarly, Etokerem and Okwelle (2019) opined that factors responsible for Biology students' low academic performance in senior secondary school certificate examinations are lack of use innovative teaching method. Based on this fact, it becomes necessary for teachers to apply innovative teaching methods and strategies to aid students to acquire the knowledge of Biology in most efficient way. One of such innovative strategies is instructional scaffolding.

Instructional scaffolding is a teaching strategy that derives its source from Lev Vygotsky socio-cultural theory and the notion of zone of proximal development. Instructional scaffolding is therefore regarded as a metaphor that is used as a framework to describe the type of assistance offered by a teacher or peer to support learning (Lipscomb, Swamson & West, 2004). Some of instructional scaffolding used in teaching include: scaffolding tools, such as cue cards, analogies, and models; teacher modeling, use of prompts, thinking aloud and conversational scaffolds. All the scaffolds are individually important and unique and can be used together or individually in teaching science and Biology. This study explored the strategy of cues and prompts.

Cues and prompts as a scaffold can be referred to as a support given by the teacher in order to clarify and strengthen meaningful learning. According to Ugwumba and Kodjo (2015), instructional cues and prompts are secondary stimuli which function as guides to response by way of perception or action to situation. Cues and prompts are techniques

which the teacher uses to trigger the students to act in a given direction towards the problem at hand. It is an aid the teacher gives to the students which enables them call upon their previous knowledge or act in a particular direction which will enable them on their own find solution to obstacles in their learning goal or task.

Ugwumba and Kodjo (2015), opined that cues and prompts scaffolding improved the achievement of students in physics. Nzewi and Ibeneme (2011) found out that cues and prompts questions as instructional scaffolding has more positive effect in enhancing and facilitating students' performance. According to Nzewi and Ibeneme, cues and prompts questioning made it possible to relate the new knowledge to what the students' already know thereby reducing students' dependent on rote memorization, the students became more motivated and interested in the task and this led to high achievement. Similarly, Omiko (2015) reported that there is no significant effect of cues and prompts scaffolding method used on gender, as both performed well.

Muhammad (2014), Nbina and Avwiri (2014) in their separate studies observed there is no significant difference between mean academic performance scores of male and female students taught Chemistry using cues and prompt scaffolding method of teaching. More so, Usman and Mandulili (2019) observed that students taught Biology using cues and prompt scaffolding method of teaching in Northern Kaduna metropolis academically performed better than those taught Biology using traditional method of teaching. The authors further asserted there was no significant differences in academic achievement between male and female students taught Biology using cues and prompt scaffolding method of teaching.

With the researchers' points of views as reviewed on the importance of cues and prompt scaffolding method of teaching in different location of studies in other subjects other Biology and even the one done in the subject in Northern Kaduna there is need to see if this innovative teaching method can help students academic performance in other locations in Nigeria. Secondly, with poor academic performance of students in Biology in recent years between 2018-2020 there is need to see and work on how to improve secondary school students' academic performance in Biology subject because the subject is very important to humanity both in area of health and other areas. On this note the researchers investigated on enhancing secondary school students' academic performance in Biology through cues and prompts instructional scaffolding.

Research Questions

The following research questions guided the study:

1. What is the effect of cues and prompts instructional scaffolding on the academic performance of students in Biology when compared to that of those taught using conventional teaching method?
2. What is the effect of cues and prompts instructional scaffolding and conventional teaching method to gender on the academic performance of male and female students?

Hypotheses

The following null hypotheses were tested at .05 level of significance.

1. There is no significant difference in academic performance between

students taught Biology using cues and prompts scaffolding and those taught using conventional teaching method.

2. There is no significant difference in academic performance between male and female students taught Biology using cues and prompts scaffolding.

Research Method

The design adopted for the study was quasi– experimental research design. The population consisted all the S S 2 Biology students in Ogidi education zone. the sample consists of 120 SS 2 Biology students drawn from two secondary schools in the study area. Multistage sampling technique involving different technique at each stage was used. First, purposive sampling technique was used to select 26 co-educational schools from the 40 schools from Idemili North, Oyi and Idemili South. Coeducational schools were purposively selected to take care of the gender variable in the study. The schools were stratified into idemili North, Oyi, and Idemili south where they are located. From the local governments, random sampling technique was used to select two local government areas. From the local government areas selected, one school from each was selected at random making a total of two schools. One school which comprised of 57 students (male 27 and female 30) was used as experimental group who were taught Biology using cues and prompt scaffolding teaching method while one school which comprised of 63 (male 32 and female 31) students was used as control group whom were taught Biology concept using conventional teaching method. Data collected from this sample was used for analysis.

The instrument for data collection was named Biology Achievement Test (BAT) adapted by the researchers from West Africa Examination Council (WAEC) past questions from (June 2018-June 2020). BAT is made up of section A and B. Section A contained the personal information of the participants such as name of school, sex, date of examination. The section B contained 25 items which were multiple choice items with option lettered A-D. To ensure the reliability of the instrument, the twenty-five (25) test was administered to a group of twenty students in Aguata education zone which is outside the place of the study. The results were subjected to Kuder 20 Richardson. A mean coefficient of .75 was obtained indicating that the instrument was reliable. The date obtained from the pretest and post-test were analyzed using mean, standard deviation for research questions and Analysis of Covariance (ANCOVA) to test the hypotheses.

Presentation of Results

The results of this study were presented in line with the research questions and the hypotheses as follows.

Research Question 1: What is the effect of cues and prompts instructional scaffolding on the academic performance of students in Biology when compared to that of those taught using conventional teaching method?

Table 1: Mean Performance Scores of Students taught Biology with Cues and Prompts Scaffolding and those taught withExpository Method

Group	N	Pretest mean	Posttest mean	Gained Mean	Pretest SD	Posttest SD
Experimental	57	39.26	62.60	18.17	17.09	18.17
Control	63	37.10	43.13	6.03	16.46	16.43

Table 1 shows that students taught with cues and prompts scaffolding have mean score of 62.60 in their post-test while those taught using conventional method had a mean of 43.13. The experimental group had gain mean score of 18.17 while the control group had gain mean score of 6.03. Also, while the use of cues and prompts instructional scaffolding increased the spread of scores from 17.09 to 18.17, the conventional method slightly reduced score variation among students from16.46 to 16.34.

Research Question 2: What is the effect of cues and prompts instructional scaffolding and conventional teaching method to gender on the academic performance of male and female students?

Table 2: Mean Performance Scores of Male and Female Students taught Biology with Cues and Prompt Instructional Scaffolding

Group	Gender	N	Pretest mean	Posttest mean	Gained Mean	Pretest SD	Posttest SD
Exp.	Male	27	40.41	65.93	25.52	15.29	15.16
	Female	30	38.23	59.60	21.37	18.76	20.00
Control	Male	32	35.82	42.09	6.27	16.54	16.99
	Female	31	38.42	44.19	5.77	16.00	15.84

Table 2 shows that the performance of male and female students exposed to cues and prompts scaffolding. Male students had a mean of 65.93 and a mean gain of 25.52 while female students had the mean of 59.60 and mean gain of 21.37. There was slight reduction in the spread of scores for the male from 15.29 to 15.16 while among the females, the spread of scores increased from 18.76 to 20.00. Male students taught using conventional teaching method had a mean of 42.09 and a mean gain of 6.27 while female students had the mean of 44.19 and mean gain of 5.77.

Hypothesis 1: There is no significant difference in academic performance between students taught Biology using cues and prompts scaffolding and those taught using conventional teaching method.

Table 3: Ancova on Effects of Cues and Prompt Instructional Scaffolding and Conventional Methods on Performance in Biology

Source of variation	SS	Df	MS	F	P-value
Corrected Model	39691.316[a]	4	9922.829	170.653	.000
Intercept	6096.772	1	6096.772	104.853	.000
Pretest	27709.800	1	27709.800	476.554	.000
Gender	159.622	1	159.622	2.745	.100
Method	9212.813	1	9212.813	158.442	.000
Gender * Method	121.468	1	121.468	2.089	.151
Error	6686.809	115	58.146		
Total	375555.000	120			
Corrected Total	46378.125	119			

Table 3 shows that there was a significant main effect of the treatment on the performance of students in Biology F (1, 119) = 158.442, P<0.05. Therefore, the null hypothesis was rejected. Thus, there is significant difference in academic performance between students taught Biology using cues and prompts scaffolding

and those taught using conventional teaching method.

Hypothesis 2: There is no significant difference in academic performance between male and female students taught Biology using cues and prompts scaffolding.
Table 3 also shows that there was no significant main influence of gender on the performance of students in Biology F (1, 119) = 2.745, P>0.05. Therefore, null hypothesis two was not rejected. Thus, there is no significant difference in academic performance between male and female students taught Biology using cues and prompts scaffolding.

Discussion of Findings

From the finding of the study, it is obvious that cues and prompts instructional scaffolding significantly improved the performance of students exposed more than those exposed conventional teaching method. Using cues and prompts instructional scaffolding helped the students in understanding the learning task properly and to use the initiatives to fashion out appropriate strategy most significant to them to solve their academic task. It made them to fully participate in the study and more motivated to learn and which resulted in the improvement of their performance.

The finding of the study is in line with Ugwumba and Kodjo (2015) that cues and prompts scaffolding improved academic performance of students in physics. Similarly, the finding is line with Usman and Mandulili (2019) who observed that students taught Biology using cues and prompt scaffolding method of teaching in Northern Kaduna metropolis academically performed better than those taught Biology using traditional method of teaching. Also, Nzewi and Ibeneme (2011) found out that cueing questions as instructional scaffolding has more positive effect in enhancing and facilitating students' achievement. According to them, cue questioning made it possible to relate the new knowledge to what the students' already know thereby reducing students' dependent on rote memorization, the students became more motivated and interested in the task and this led to high achievement.

The study proved that male students taught Biology concept using cues and prompts instructional scaffolding performed better than their female counterpart but there is no significant difference in academic performance between male and female students taught Biology using cues and prompts scaffolding. This report is in consonance with Omiko (2015) who observed that there is no significant effect of cues and prompts scaffolding method used on gender, as both performed well. More so, the finding is line with Muhammad (2014), Nbina and Avwiri (2014) in their separate studies observed there is no significant difference between mean academic performance scores of male and female students taught Chemistry using cues and prompt scaffolding method of teaching. The no significant difference in academic performance on gender could be that cues and prompts instructional scaffolding helped the students in understanding the learning task properly and to use the initiatives to fashion out appropriate strategy most significant to them to solve their academic task.

Conclusion

Cues and prompts instructional scaffolding significantly improved the academic performance of students more than that of those not exposed to it. Also, gender

had no significant influence on the academic performance of student taught with cues and prompts instructional scaffolding. Therefore, cues and prompts instructional scaffolding is effective for enhancing senior secondary school students' achievement in Biology.

Recommendations

From the findings of the study and the implications of the findings, the following recommendations were made:

1. Biology teachers should integrate cues and prompts scaffolding into the teaching of perceived difficult topics in secondary school Biology. This will go a long way in diffusing the abstractness of most difficult Biology concepts.
2. School authorities should make adequate provision of time and resources which will enable Biology teachers to effectively use innovative strategies and methods such as cues and prompts instructional scaffolding.
3. The government should encourage and sponsor teachers of Biology for in-service training, conferences and seminars that will give them opportunity to learn and get acquainted with innovative teaching methods such as instructional scaffolding.

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