EFFECT OF CONSTRUCTIVIST PEDAGOGY ON PERFORMANCE IN BIOLOGY AMONG SECONDARY SCHOOL STUDENTS IN KOGI STATE

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Abstract
Constructivism is a teaching-learning paradigm that empathised how the learner construct his own knowledge based on experience which is unique to the individual. In this paper, attempt has been made to investigate the effect of constructivist pedagogy on student's performance of senior secondary (SS II) students in transport system biology. Two schools were randomly selected out of the fifteen in Ankpa Local Government Area of Kogi State, infact classes were used. In each class used forty six students of equal number of male and female were used for the experimental and control group respectively design was used. The students in the experimental group ere taught tissues and transport system in living organisms through the use of constructivist pedagogy (CP) while students in the control group were taught the same concept using the conventional methods (CM). The instrument used for data collections was the Biology Achievement Test (BAT. Data collected were analyzed using mean, standard deviation and t-test unrelated sample. The result of the study revealed that students taught through the CP performed better than those taught through the CM. It was also establish that the male students performed better than the female students. Based on the findings, it is recommended that biology teachers should be trained on the use of CP as an innovative approach aimed at improving performance in biology. Workshops and seminars should be organized from time to time to enable biology teachers embrace the strategy in teaching.

Keywords: Constructivist, Pedagogy, Performance, Biology.

Introduction

The key question regarding education today is how to improve the teaching and learning process (Bregant, 2014). Sentiments abound on the need to improve performance in science generally (Talbot-Smith, Abell, Applefon, & Hanusain, 2013). In Kenya, conventional teaching method which is marked by teacher lecturing dominates classroom practices (Amollo, 2005). Even though popular, the conventional teaching method has generated mixed thoughts (negative and positive).Wingate, Andon, & Cogo, (2011) argued that the conventional methods as applied in Australia encourage passive learning. As found by Amollo (2005), the method is characterized with poor time management; content overload, is less innovative and is inconsistent in delivery resulting in confusion, boredom and reduced motivation on the part of students. Here in Nigeria, the conventional teaching method equally dominates the classroom. Particularly in biology at the senior secondary school lev this method continue to produce mediocre results. Constructivism is a learning theory based

on active learners. It is a theory that emphasises knowledge construction based on the learner's prior knowledge. The theory holds that learners will not be able to solve any given problem easily without relevant prior knowledge and skills. According to Savin & Wilkie (2004); constructivist learning helps to promote collaboration among students, between students and the teacher, and between students and the home. In effect, the method cultivates in the students diversified thinking capability necessary for biology teaching and learning.

According to Ogunkunle (2006), adopting instructional practices that engage students in the learning process is a prominent feature of active learning. The importance of students engagement is widely accepted and there is considerable evidence to support the effectiveness of student's engagement in a broad range of learning outcomes.

Analysis of the literature suggests that students must do more than just listen. They must read, write, discuss, and engage in problem solving. Through such activities, they can engage in higher order thinking tasks such as analysis, synthesis and evaluation (Bnwell & Eidson, 1991).

It is the light of this that this paper has outlined an experimental study on the constructivist approach to teaching and learning as it affects performance of students in biology. The study is intended to prove the differences in achievements of two groups when exposed to constructivist pedagogy and the conventional methods respectively in two different schools in Ankpa Local Government Area.

Statement of the Problem

One of the most effective ways of achieving learner-centered education system is through constructivist paradigm. There is still little knowledge concerning the way in which this method involving learners could be applied in Nigerian schools. At the senior secondary school level, knowledge construction in biology is very essential. This can meaningfully be achieved through the use of constructivist approach of teaching. Hence, the present study is aimed at examining the effectiveness of constructivist approach on academic achievement in biology at the secondary school level.

Aim and Objectives of the Study

The aims of this study was to find out the effect of constructivist pedagogy (CP) on students performance in biology at the senior secondary school level.

Specifically, the objectives of the study are:-

1. To determine whether students taught transport system in biology using constructive pedagogy CP will perform better than their counterparts taught through the conventional methods.
2. To determine whether there will be difference in performance based on gender using the CP approach (CM).

   students taught transport system in biology using CP approach.

Hypotheses

The following hypotheses were formulated at 0.05 level of significance which guided the study

1. There is no significant difference in students' performance in transport system in biology using CP and CM.
2. There is no significant difference in performance of male and female

Study Design

The design of the study is pre-test, post-test, non-equivalent control group of quasi-experimental design. The table below represents the mode:-

Table 1

Group	Pre-test	Treatment	Post-test
E_1	O_1	X	O_3
E_2	O_2		O_4

Population

The population of the study consists of all the SS II biology students (1,722) in 19 secondary schools in Ankpa Local Government Area of Kogi State.

Sample and Sampling Techniques

Intact classes were used from each of the two schools that were sampled for the study. Random sampling was carried out to collect the two schools by tossing the coin. 46 students were used from each of the schools to form the experimental and the control groups respectively. The schools were co-educational in order to take care of gender.

Instrument for Data Collection

The instrument used for data collection was the Biology Achievement Test {BAT}. This instrument consisted of forty multiple choice test items initially drawn from West African School Certificate (WASC) and National Examination Council (NECO) past questions covering the basic concepts of tissues and transport system in living organisms. These items were finally reduced to 30 items after validation; the items were considered reliable as their psychometric properties had already been pre-determined as per their sources.

In addition to the instrument, treatment manuals in form of lesson plans were also prepared to cover the topic of choice for both experimental and the control group.

Validation of Instrument

The Biology Achievement Test (BAT) prepared by the researcher was given face and content validity by two experts (one in biology and the other in measurement and evaluation) from Kogi State College of Education, Ankpa. Their observations, corrections and modifications reduced the forty test items to thirty.

Experimental Procedure

The resident teachers who served as research assistants were earlier trained in the use of the treatment manuals which comprised lesson plans designed on the constructivist model and the conventional approach respectively. Students in the experimental group were taught using the constructivist approach while the students in the control group were taught using the conventional method.

Before the treatment the students in both the experimental group and the control group were pretested. The result of the test served as the base line data for the study. The experiment lasted four weeks and was conducted in the normal school's lesson period. At the end of the treatment period, the two groups were also given a post test and the two sets of scores obtained from the exercise served as the basis for comparing their level of achievement in biology.

Method of Data Collection

The data was collected in three phases:

Phase 1: This consisted of the pre-experimental stage in which the BAT was administered as a pre test to determine the initial knowledge possessed by the students in biology. The pre-testing was simultmently carried out for both the experimental and the control group.

Phases 2: This consisted of the experimental stage in which the experimental groups was taught using the treatment manuals prepared in accordance to the constructivist teaching while the control group was treated using mammals prepared in the usual conventional method. The experimental period lasted four weeks.

Phase 3: This consisted of the post-experimental stage in which the BAT was re-administered on both the experimental and control groups immediately after the treatment was over in order to determine student's achievement in Biology.

Methods of Data Analysis

The data collected was analysed using elementary statistical computations including mean, standard deviation and t-test.

Results and Discussion

The analysis was carried out using both descriptive and inferential statistics. The hypotheses were tested at 0.05 level of significance. In the determination of the effect of constructivist pedagogy, the data was analysed taking into consideration the overall performance in BAT. The gender difference in performance in biology was also analysed taking into consideration the post-test scores of BAT.

Table 2: Pre-test mean, SD and T-value of scores on BAT for the two groups

TEST	GROUP		SD	DF	T-VALUE
Biology Achievement Test (BAT)	**Experimental (MN=46)**	**17.06**	**7.02**	**90**	**1.29**
	Control (N= 46)	**15.28**	**7.27**		

From table 2: above, the mean scores in biology for the experimental and the control groups were 17.06 and 15.28 respectively while the SD values for the two groups were 7.02 and 7.29 respectively. Furthermore, the t- value obtained from the BAT score was 1.29. The t- value is less than the table value of 1.98 at 0.05 level of significance. It therefore implies that there is no significant difference between the experimental group and the control group in their performance in biology. Both groups were therefore almost equal as far As the pre-test was concerned.

In order to confirm the intervention effect of the constructivist pedagogy in biology, the post-test results on BAT scores for both groups were computed as shown in table 3 below.

Table 3: Post-test mean, SD and t- value of scores on BAT for the two groups.

TEST	GROUP		SD	DF	T-VALUE
Biology Achievement Test (BAT)	Experimental (N = 46)	35.02	7.24	90	8.69
	Control (N = 46)	23.65	8.05		

From Table 3 above, the experimental groups performed better with a mean score of 35.02 than the control group with a mean score of 23.65 after treatment. The t-test was also applied to conform whether both groups really differed in their

performance in biology. The t- test values of 8.69 was found to be statistically significant at the 0.05 level indicating that there was really a significant difference in students performance in biology when taught using CP and CM approach. The hypothesis which states that there is no significant difference in student's performance in biology when taught using CP and CM was rejected. The results therefore showed that the use of CP had significantly improved the students' performance in transport system as compared to the CM approach. In consideration of the second hypotheses with regard to gender, table 4 below was computed to explain the difference.

Table 4: Post-test mean, SD and T-valve of scores on BAT for the male and female students for CP.

TEST	GROUP		SD	DF	T-VALUE
Biology Achievement Test (BAT).	Male (23).	33.05		44	7.25
	Female 23).	22.26			

From Table 4: above, the male student's performed better than their female counterparts with the mean score of 33.05 and 22.26 respechrely. The t-test was equally applied to ascertain whether both groups differed in their performance. The t-value of 7.25 was found to be statistically higher than the table value of 1.98 at the 0.05 level of significance. It therefore implied that there was a significant difference in the performance of the male and female students using CP in transport system in biology. The null hypothesis was therefore rejected and the alternative hypothesis was upheld.

Summary of Results

The following are the major findings in the study:

1. The use of constructivist pedagogy (CP) in teaching biology in more productive than the conventional method (CM).
2. A significant gender difference was recorded in favour of the male students when the CP approach was used.

Conclusion

In this study, it is found that the constructivist approach to teaching is more effective and fruitful than the conventional method. This is probably due to the fact that it motivates students better to their learning as it involves experiments, practical examples, as well as cooperative activities making it much more interesting. In the present dispensation, the conventional method which dwell heavily on transacting knowledge from the head of the teacher to the head of students cannot cope with the challenges of modern science and technology education. There is therefore the urgent need to reform our present teaching practices in order to develop true knowledge and understanding of science (Biology inclusive). The constructivist framework provides and encourages the learner to reflect and question their own understanding via active learning processes.

Recommendations

From the finding of the study, the following recommendations are made.

1. Teacher Education programmes needs to be reviewed to prepare teachers in

the application of innovative approaches for effective teaching and learning.

2. Curriculum Planners need to be involved in incorporating the constructivist strategy for effective framework for the attainment of intended learning outcomes.

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