



# Effect of 5 Step Constructivist-Based Instructional Model on Student's Interest in Biology

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## ABSTRACT

Research has shown that secondary school students perform poorly in subjects including biology. A number of reasons have been adduced as being responsible for the ugly trend, among which are the ineffective teaching methods adopted by the teachers. Consequently, conscientious efforts targeted towards classroom delivery methods that guarantee a shift from teacher-centered to student-centered approach, where students are involved in thinking and doing things themselves, have been made. One of such student-centered approaches is the 5 step constructivist-based instructional model. This model advocates for problem solving learning environment, where the learner constructs and reconstructs knowledge, based on their experiences. The study was carried out in Anambra State. Three hundred and eighty-five senior secondary one biology students formed the sample for the study. The reliability of BII was obtained using Cronbach Alpha and reliability co-efficient of 0.81 was obtained. The data obtained was analyzed using mean and standard deviation. The result of the data analysis showed amongst others that the 5 step constructivist-based instructional model facilitate meaningful learning and interest of students. Findings also revealed that constructivist based enable students to construct their own learning by manipulating and interacting with their learning environment, thus abstract concepts in biology will be easily mastered. Recommendations were also made.

## INTRODUCTION

Biology, the science of life and one of the core science subjects offered in senior secondary school in Nigeria has as its major objective, enabling students to acquire proper scientific understanding of the working of human body and be able to apply such scientific knowledge in their everyday life. It is the key to economic, intellectual, sociological human resources development and wellbeing of any society (Ezuike and Ayo Vaughan, 2020). At this formative level, most of the biology concepts/topics are abstract and difficult to understand by the learner (Okoli, 2013; Okoye, 2018; Agbo, 2018; Ihejiamazi et al., 2018). There is therefore the need to capture and maintain the interest of students in learning biology at the senior secondary school level. This will help to ensure continuous

availability of students in expected number who take important professions such as medicine, pharmacy, dentistry, food science, agriculture, science education engineering, environmental studies etc.

Interest is an individual's behavioural tendency to be attracted towards a certain class or classes of activities. It is a source of motivation which drives people to do what they want to do when they are free to choose (Okoro, 2012). The strength of a person's attitude is his interest. Interest promotes intrinsic motivation which has been shown to drive and sustain student's engagement in a particular task. It is a state of curiosity about something. Ezeliora (2013) maintained that student's interest in learning science could be achieved by science teachers through careful choice of the most appropriate teaching methods. Interest, an aspect of effective domain is a construct

that has to do with ones readiness to like or dislike something. It is an important variable in learning process because one becomes eager to learn what one is interested in. Bakare (1991) states that interest is useful in predicting the success and the satisfaction which an individual is likely to obtain from engaging in certain activities now and in future. Ezeliora (2013) specifically notes that the conventional lecture method commonly used in teaching in Nigeria is boring and uninteresting. Interest could be aroused in an individual by activity that tends to satisfy the individual's needs (Adu, 2018). The teacher assumes that all the students in the class have the same entry behaviour or that they know little or nothing. He/she stands in front of the class and delivers lessons. Students work individually and are assessed individually. Only the best students are rewarded which force students to work against each other so as to be the best. The conventional method renders students passive while the teacher gets the monopoly of the teaching-learning activities. The student's interest in the lesson becomes very minimal. The appropriate teaching approach if used by the biology teacher can overcome such events as lack of drive, timidity, self-imposed, isolation, poor previous experience etc, that hinder interest in the students. The five step constructivist-based instructional model encourages students to collaborate and be more productive argues that learners do not passively acquire knowledge but actively construct meaning through their interpretative interactions with an experience in the world (Ihuarulam, 2012). It is activity-based, student-centered and interactive learning strategy which upholds the view that knowledge should be constructed by the learner through active mental developmental processes (Ekon, Asuguo & Udo, 2017). As an important subject required for creativity, sustainable development and nation building, biology at the foundation level of senior secondary school should be taught using effective instructional approach capable of arresting and maintaining high interest among students irrespective of sex. This research work sought to investigate the effect of 5 step constructivist-based instructional model on student's interest in biology. The work was guided by two research questions and two null hypothesis.

### Purpose of the Study

The purpose of this study was to determine the effect of constructivist-based instructional model on student's interest in biology. Specifically, this study determined;

- The mean interest scores of students taught biology using CBM and those taught using CTM.
- The mean interest scores of male and female students taught biology using CBM.

### Research Questions

The following research questions were raised;

- What are the mean interest scores of students taught biology using CBM and those taught using CTM?
- What are the mean interest scores of male and female students taught biology using CBM?

### Hypotheses

The following null hypotheses tested at .05 level of significance guided the study.

- There is no significant difference in the mean interest scores of students taught biology using CBM and those taught using CTM.
- There is no significant difference in the mean interest scores of male and female students taught biology using CBM.

## METHOD

### Research Design

The quasi-experimental, non-equivalent pre-test, post-test control group research design was used for the study. The population of the study was senior secondary one biology students in Anambra State. Co-educational schools in the zone were used in the study. This is to ensure that subjects, male and female students are equally involved in the experiment since sex was an important variable of the study.

Purposive random sampling technique was used to select twelve out of one fifty co-educational school in the six education zones of Anambra State of Nigeria. The schools were randomly assigned to experimental and control groups. The design is diagrammatically shown below.

Group	No of Students	Pre-Test	Research Condition	Post-Test
I	176	Pre-test on biology interest inventory.	Taught using 5 step constructivist-based instructional model.	Post-test on biology interest inventory.
II	209	Pre-test on biology interest inventory.	Taught using conventional teaching method	Post-test on biology interest inventory.

## Instrument for Data Collection

Biology interest inventory (BII) constructed by Bakare interest inventory was used for data collection. The instrument was face validated by five experts from Chukwuemeka Odumegwu Ojukwu University Uli. Their comments and suggestions of the experts were incorporated in building the final draft of the instrument. The instrument was pilot tested on twenty SS1 biology students of a co-educational school not included in the sample for the study. The result was used to determine the internal consistency of the instrument using Cronbach's alpha reliability coefficient. The internal consistency was 0.81.

## Experimental Procedure

The class teachers for the experimental group were trained on how to implement the 5 step constructivist teaching model based on the following step:

- Step 1: The teacher interact with the students to identify the student's prior knowledge of the topic.
- Step 2: The students were divided into three groups and are given materials to explore and manipulate with guided instructions.
- Step 3: The students gathered together and discussed their observations and findings based on the activities performed.
- Step 4: Here the teacher discover through discussions questioning and answering techniques whether the students were still holding on the preconceived belief.
- Step 5: The learner discussed the concepts confidently and applied the knowledge outside classroom settings, for the control groups, the teacher taught using conventional teaching lesson plan prepared by the researcher. The experiment lasted for six weeks.

## Control of extraneous variables

The following steps were taken to control extraneous variables that might constituted a threat to the validity of the findings of the study.

### Hawthon effect

This is the effect that students felt that they are being used for an experiment. Awareness by the students that they were being studied could affect their performances. To control this effect, the normal time allotted for biology on the time table was used in all sessions and the lessons were taught by their regular biology teachers. The pre-test and post-test were administered as part of the normal continuous assessment for the subject.

### Teacher Variable

To ensure conformity to experimental procedure, experimental conditions and the effective implementation, the researcher prepared lesson plans for the experimental groups and control groups. He discussed extensively the lesson plans and experimental conditions with the teachers. The teachers were not allowed to have access to the instrument beforehand.

### Method of Data Analysis

The data collected were analyzed using mean, standard deviation and analysis of covariance (ANCOVA).

## RESULT

The results were presented according to the research questions in table 1 and 2 while the tests of the hypothesis were presented in table 3 and 4.

**Research question 1:** What are the mean interest scores of students taught biology using CBM and those taught using CTM?

**Table 1: Mean interest and standard deviation scores of students taught biology using constructivist-based instructional model and those taught using conventional model.**

Teaching Approach	N	Mean	SD	N	Mean	SD
CBM	176	136.39	12.58	176	137.31	11.27
CTM	209	133.14	4.74	209	135.62	5.11

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Table 1 showed the pre-test and post-test mean interest scores of students taught biology using constructivist-based instructional model to be 136.39 and 137.31 with standard deviation of 12.58 and 11.27, while students taught biology using conventional teaching model had pretest and posttest mean interest scores as 133.14 and 135.62 with standard deviation of 4.74 and 5.11 respectively.

There was a difference in mean interest score of students taught biology using CBM and those taught using CTM in favour of those taught with CBM.

**Research question 2:** What is the mean interest scores of male and female students taught biology using CBM?

**Table 2: Mean interest and standard deviation scores of male and female students taught biology using constructivist-based instructional model.**

Teaching Approach	Gender	Pre-Test			Post-Test			Mean Gain Score
		N	Mean	SD	N	Mean	SD	
CBM	Male	73	133.77	13.82	73	135.79	4.41	2.02
	Female	103	131.25	11.50	103	136.93	12.12	5.68

Table 2 showed the pretest and post-test mean interest scores of male students taught biology using CBM to be 133.77 and 135.79 with standard deviation of 13.82 and 4.41 respectively which the female students had pre-test and post-test mean scores of 131.25 and 136.93 with standard deviation of 11.50 and 12.12 respectively. The male students had a mean

gain score of 2.02 while the female students had mean gain score of 5.68. This shows a difference in mean gain score in favour of female students.

**Hypothesis 3:** There is no significant difference in the mean interest scores between students taught biology using CBM and those taught using CTM.

**Table 3: Analysis of Covariance of Students Mean Interest Scores in Biology**

Source	SS	Df	Ms	F	P
Pre-Test <sup>a</sup>	111.59	1	111.59	1.54	.215
Group	1063.59	1	1063.59	14.69	.000
Error	27644.73	382	72.36		
<b>Total</b>	<b>7035135.00</b>	<b>384</b>			

In table 3: The mean interest scores of secondary school students taught biology using constructivist-based instructional model and those taught using conventional model.  $F = 14.69$ , the obtained p-value (.000) is less than the stipulated level of significance

(.05). The null hypothesis of no significant difference between the two groups was rejected.

**Hypothesis 4:** There is no significant difference in the mean interest scores between male and female students taught biology using CBM.

**Table 4: Analysis of Covariance of Male and Female Students Mean Interest Scores in Biology**

Source	SS	Df	Ms	F	P
Pre-Test <sup>a</sup>	49.35	1	49.35	.66	.415
Group	338.979	1	338.97	4.56	.033
Error	28369.35	382	74.26		
<b>Total</b>	<b>7035135.00</b>	<b>385</b>			

The analysis in table 4 showed that there is a statically significant difference in mean interest scores of male and female students taught biology using constructivist-based instructional model and those taught using conventional model.  $F = 4.56$  and the obtain p-value (.033) is less than the stipulated level of significance (.05). The null hypothesis of no significant difference between the two groups was therefore rejected.

supportive guidance that is mediated by tools. In this way, interest and transfer of knowledge is enhanced.

The finding is in line with studies by Nwagbo and Chikelu (2011), Nasr and Asghor (2011), Oludipe (2012), Okeke Osi and Okeke (2015) who found that constructivist-based teaching improves student's interest in biology. This according to them might be due to opportunity to interact and create cognitive conflict among students.

## DISCUSSION OF THE FINDINGS

The findings of this study showed that the students taught biology using five step constructivist-based instructional model perform better and female students are more interested than male students. Constructivist model facilitate meaningful learning and interest of biology students. This suits the findings Bello and Abimbola (2012) that Dewey's Cognitive and social theory is very necessary in the interest of science materials. According to them, instruction is most efficient when students engage in activities within

## CONCLUSION

Based on the results obtained in the study, and the discussion following thereafter, it was therefore concluded that the five step constructivist-based instructional model enable students to construct their own learning, by manipulating and interacting with their learning environment, seemingly abstract concepts in biology will be easily demystified and mastered. This will make students less dependent on rote-learning.

## Recommendation

Based on the results of the study, the following recommendations were made;

1. Since the five step constructivist-based instructional model has been found to facilitate meaningful learning and interest of students, biology teachers should be encouraged to employ its use in the teaching of all science subjects and biology in particular.
2. Teachers should engage students in constructivist classes, since it improved and accommodate students with different intelligent level.

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