

Efficacy of Integrated Teaching Method in Biology Classroom.

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Abstract

The study aimed at exploring the efficacy of integrated teaching method in Biology classroom. Three research questions and three null hypotheses guided the study. The design of the study was quasi-experimental, specifically the non-randomized control group design. A total of 180 SS1 students which were randomly sampled from the population of 1, 356 senior secondary one (SSI) Biology students were involved in the study. An instrument Biology Achievement Test (BAT) was used for data collection. The BAT was validated by experts and its reliability was established and found to be 0.86. Mean and standard deviation were used to answer the research questions while Analysis of covariance (ANCOVA) was used in testing the null hypotheses at 0.05 level of significance. The results show that integrated teaching method enhanced achievement in Biology. Gender was not significant on student overall achievement using integrated teaching method and traditional teaching method. It was recommended that integrated teaching method should be adopted as an effective strategy for teaching Biology. Teacher professional development programs should introduce the strategy in their teaching methods to be used in classes. Science Teachers Association of Nigeria (STAN) should organize workshops, seminars and conferences on the integrated teaching method for science teachers for the acquisition of skills by students which enhances academic achievement.

Keywords: Efficacy and integrated teaching method.

Introduction

Biology as the science of life is offered in all Senior Secondary Schools in Nigeria and attracts the greatest patronage of both sciences oriented and Arts based students. Biology is an experimental science that needs a lot of practical work for its understanding. According to Ezenduka & Umeobieri, (2017) students who carry out practical works intelligently and are guided judiciously by the teachers can study theoretical Biology with better understanding and remember the related Biology concepts and reactions more easily by associating them with the practice which has been experienced. This can be made possible by using the integrated teaching methods.

‘Integrated’ as viewed by Geddes and Grosset, (2007) is to make whole or become complete, to bring parts together into whole. Integrated teaching method is a method of teaching in which theory and related practical work are taught simultaneously. In other words, integrated Teaching Method basically refers to the method of teaching where various styles are used in teaching theory with relevant and related practical laboratory work (Abugu, 2014). Using integrated teaching method by teachers provide more meaningful learning experiences to the learners as stated by Okoro, 2011. The knowledge of science is always made meaningful by integrating teaching methods (Integrated teaching methods) that is, the use of theory and practical at the same time to compliment the cognitive knowledge acquired (Nwagbo, 2017). Mandor, (2002) identified major causes of failure in science as being related with the use of only

conventional teaching methods (lecture). Here, the information flow is unidirectional, making learners to be less active in the learning process; limit the amount of student's participation, hence are not adequate for teaching hands-on skills and maintaining student's interest in the learning process. The sole use of conventional teaching method leads to students' massive academic failure (Okoye, 2014). As a result of this, Adeoye and Alayande (2009) states that when conventional methods are not combined with practical activities, the teaching of sciences especially biology are bound to be perceived as difficult by students leading to failure in Biology as a subject.

Students' failure in Biology could be attributed to lack of exposure to theory and practical work at the same time. Thus, there is need for integrated teaching method since this involves series of hands-on and minds-on activities of both teachers and students (Igbonekwu, 2012). This paper therefore explored the use of integrated teaching method to teach 'food substances' in Biology.

Purpose of the study

The purpose of this study is to explore the efficacy of integrated teaching method in the teaching of Biology in secondary schools.

Research questions

Three research questions guided the study:

1. What are the mean achievement scores of students taught Biology using integrated teaching method (ITM) and those taught using traditional teaching method (TTM)?
2. What are the mean scores of male and female students in Biology using integrated teaching method (ITM) and traditional teaching method (TTM)?
3. What is the interaction effect of methods and gender on students' achievement in Biology?

Hypotheses

1. There is no significant difference in the mean achievement scores of students taught Biology using integrated teaching method and those taught using traditional teaching method.
2. There is no significant difference in the mean scores of male and female students in Biology using integrated teaching method (ITM) and traditional teaching method (TTM).
3. There is no significant interaction effect of methods and gender on students' achievement in Biology.

Method

The design for the study was quasi-experimental. Specifically, the study applied non-equivalent control group design. The design is considered appropriate for the study because intact classes was used to avoid disruption of normal class lessons and to control extraneous variables. The population of the study is one thousand three hundred and fifty-six (1,356) Senior Secondary one (SSI) Biology Students in Obollo-Afor education zone of Enugu State. A sample-size of one hundred and eighty (180) senior secondary one (SSI) Biology students was drawn out of the population. Ninety-two (92) students were in the experimental group while eighty-eight (88) students were in the control group. Purposive random sampling technique was used in selecting six out of twenty co-educational secondary schools in Obollo Education Zone. This is because the researchers needed schools with well-equipped science laboratory and experienced Biology teachers. Three co-educational secondary schools were used for the experimental group while the remaining three schools were used for the control group. Co-educational secondary schools were used to enable the researchers study gender differences taking place in the classroom environments where integrated and traditional teaching methods were used respectively. These students were

purposely selected from six co-educational secondary schools in Obollo-Afor Education Zone through simple random sampling technique without replacement.

Training Procedure for Teachers

The teachers selected for this study were given training on how to integrate two or more teaching methods in their teaching. The training lasted for five (5) days in the three selected secondary schools as mentioned above for the experimental group. A maximum of 80mins was spent on each day.

Day one: The first day was used for opening ceremony. There was a formal introduction of the program and the purpose of the study. The researchers introduced the Biology concepts and topics to be covered by the study.

Day two: The use of integrated teaching method for teaching Biology concepts and topics was highlighted by the researchers to the teachers that will handle the integrated teaching method while those teachers that will teach using the traditional teaching method requires no training.

Day three: Using the lesson plan for integrated teaching method prepared by the researchers, the teachers were trained on how to use the lesson plan to teach Biology concepts and topics to be covered by the study. There was a question and answer session for the teachers.

Day four: Teachers practice teaching with integrated teaching method. At the end of the training, the research assistants were reminded about the major requirements for the study which includes the following: lesson plan and other instructional materials.

Day five: The researchers went through the prepared lesson note on integrated teaching method with the experimental group teachers. After the training, the teachers exposed to integrated teaching method were asked to teach the experimental groups while the teachers who were to teach Traditional teaching method were asked to teach the control group without undergoing any pre-training.

The Biology Achievement Test (BAT) developed by the researchers was used to collect data for the study. The BAT instrument has two parts namely; Parts A and B. Part A contains relevant personal details of the students. Part B of the instrument contains 30 validated multiple choice Biology objective test drawn from past West African Examination Council (WAEC) questions. The test items were based on the main topic of this study 'food substances'. The sub-topics are classes of food and balanced diet. Each item or question has four (4) response options lettered A-D. The instrument was trial tested on SSI students from Nsukka Education Zone which is outside the study area to avoid bias. The internal consistency reliability co-efficient was determined using Kuder Richardson formula ($k-20$) on the scores of students obtained from the trial testing and the reliability coefficient was found to be 0.86. The instrument was administered as pre-test to both experimental and control groups before the treatment commenced. The experimental group was taught using integrated teaching method while the control group was taught using lecture traditional method of teaching. Then, the pre-test was rearranged and used as post-test six weeks after the application of the treatment. The samples of the lesson plans used for both experimental and control groups are presented as Appendix 1 of this report.

Results

The results of the study are presented in tables 1-3 as shown below: The research questions were answered using mean and standard deviation respectively.

Table 1: Mean and standard deviation of pre and post-test Biology achievement test (BAT) scores of the experimental and control groups.

| Group | Pretest Mean | SD | Posttest Mean | SD | Mean Gain |
|--------------|---------------------|-----------|----------------------|-----------|------------------|
| Experimental | 10.88 | 2.59 | 22.16 | 16.97 | 6.09 |
| Control | 12.20 | 2.62 | 18.77 | 13.08 | 0.88 |

Table 1 shows that students taught with integrated Teaching Method (ITM) had a mean achievement score of 22.16 with standard deviation of 16.97 while students taught with Traditional Teaching Method (TTM) had a mean achievement score of 18.77 with a standard deviation of 13.08. Hence students taught using Integrated Teaching Method had a mean achievement gain of 6.09 over students taught using Traditional Teaching Method with 0.88 mean achievement gain. The SD shows that the variation in the individual scores of the female students (Experimental group) is higher than the variation in the individual scores of the males (control group)

Table 2: Mean and standard deviation of pre and post Biology achievement test scores of males and females taught food substances using integrated teaching method.

| Group (Gender) | Pretest Mean | SD | Posttest Mean | SD | Mean Gain |
|-----------------------|---------------------|-----------|----------------------|-----------|------------------|
| Male | 11.32 | 2.62 | 16.96 | 5.79 | 5.64 |
| Females | 11.85 | 2.77 | 26.87 | 18.87 | 6.95 |

Table 2 answered research question 2; this shows that females taught with integrated teaching method had a mean score of 26.87 with standard deviation of 18.87 while the males taught with integrated teaching method had a mean score of 16.96 with standard deviation of 5.79. Therefore, the female students performed better than the male students using integrated teaching method. Hence, female students taught Biology using integrated teaching method had 6.95 mean achievement gain over male students with mean achievement gain of 5.64. The SD shows that the variation in the individual scores of the female students is higher than the variation in the individual scores of the males.

Table 3: Interaction effect of methods and gender on students' achievement in Biology. (Tests of between-subjects effects).

| Source | Type III sum of squares | Df | Mean Square | F | Sig |
|----------------------|-------------------------|-----|-------------|--------|------|
| Corrected Model | 8644.404 ^a | 4 | 2161.101 | 20.088 | .000 |
| Intercept | 765.146 | 1 | 765.146 | 7.112 | .009 |
| Pre-test | 799.632 | 1 | 799.632 | 7.433 | .007 |
| Treatment | 2146.821 | 1 | 2146.821 | 19.955 | .000 |
| Gender | 2896.379 | 1 | 2896.379 | 26.922 | .000 |
| Treatment* Gender | 4261.870 | 1 | 4261.870 | 39.615 | .000 |
| Error | 13447.819 | 125 | 107.583 | | |
| Total | 76971.000 | 130 | | | |

Table 3 shows that the calculated value of F (19.955) for the effect of treatment in Biology had an approximate probability value of 0.000. Since this probability value is less than the 0.05 level of significance, the null hypothesis was rejected meaning that there is a significant difference on students taught Biology using Integrated Teaching method than students taught Biology using Traditional Teaching Method. For H02, the calculated value of F (26.922) for the effect of gender on students' achievement in Biology had an approximate probability value of 0.000. Hence, the null hypothesis was rejected since the probability value is less than 0.05 level of significance. This shows that there is a significant difference on students taught Biology using Integrated Teaching Method than students taught Biology using Traditional Teaching Method. For H03, the calculated value of F (39.615) for the interaction effect of methods and gender on students' achievement in Biology had a probability value of 0.000; the null hypothesis was equally rejected since the probability value is less than 0.05 level of significance. This shows that there is a significant difference on students taught Biology using Integrated Teaching Method than students taught Biology using Traditional Teaching Method.

Discussion

The findings reveal that the use of integrated teaching method in the teaching of Biology has significant effect on students' achievement more than the use of Traditional Teaching Method. The students taught food substances using integrated teaching method achieved significantly better than those taught the same concept using traditional teaching method. Gender had no significant effect on students taught food substances using integrated teaching method. This therefore implies that the teaching learning strategy used as the treatment enhanced or promoted the achievement of students in Biology. According to Okoli and Mbonu, (2017), any teaching which does not promote the development of students' understanding, insight and which does not develop the habits of thought and action are not be effective. The researcher observed that integrated teaching method

helps students become familiar with both practical and theory aspect of Biology which enhances students' psychomotor skills.

Recommendations

Based on the findings of this study, the following recommendations and conclusion are made:

- There is a necessity for teachers to make use of teaching strategies that are innovative in nature for effective teaching of Biology. This will enable students construct meaning from their experiences thereby promoting students' academic achievements.
- Authors of Biology text books should illustrate the application of Integrated Teaching Method as a method of teaching in their texts. This will help both teachers and students to become used to the method so as to improve interest, retention and achievement in Biology.
- Workshops/seminars should be organized for serving Biology teachers. This will enable them learn how to use the Integrated Teaching Method in the teaching of Biology.
- Teacher training institutions should include Integrated Teaching Method in their Biology method course content. This will ensure the training of the pre-service Biology teacher on the use of Integrated Teaching Method.

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