

Effect Of Ethnobiology Instructional Approach On Academic Achievement Of Secondary School Students In Biology In Onitsha Education Zone

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Abstract: *The study determined the effect of ethnobiology instructional approach on secondary school students' achievement in biology in Onitsha Education Zone of Anambra state. Two research questions guided the study and three hypotheses were tested at 0.05 alpha level. Quasi-experimental design was adopted. The population of the study was 5,322 senior secondary two (SS2) students offering biology in Onitsha Education Zone out of which a sample size of 184 students was drawn. The instrument for data collection was Biology Achievement Test (BAT) validated by three experts from the Department of Science Education and Department of Educational Foundations, from Nnamdi Azikiwe University, Awka. The reliability of BAT was established using Kuder-Richardson Formula 20 to be 0.91. Research questions were answered using mean and standard deviation and analysis of covariance was used to test the null hypotheses. The result of the study showed that students taught using EIA had higher mean gain achievement scores in biology than those taught using lecture instructional approach. The findings of the study revealed that there was a significant difference between mean achievement scores of students taught chemistry using EIA and lecture instructional approach in favour of EIA. It was therefore recommended among others that secondary school biology teacher should adopt the use of EIA in teaching biology as a way of helping students connect what they are learning to already existing knowledge and realities around them.*

Keyword: *ethnobiology, achievement, biology, academic, secondary*

I. INTRODUCTION

In the past, Biology, as a school subject was popular among science and non-science students. The spate of poor achievement among students who enrol for Biology at external examination such as West African Senior School Certificate Examination (WASSCE) has continued to deter students from the subject. According to the Chief Examiner, only 33.37 to 35.66% passed at credit level among students who sat for Biology from 2007-2012 with a population range of 1, 238, 163 to 1, 646, 150. 51.73% of the students passed at credit level from 2013-2016, despite the increment in the number of those who enrolled for biology. Despite the increment, the percentage number of students who passed at credit level from 2013-2016, from 2016 to 2019, there was a notable increase in

the percentage number of students who passed at credit level but the difference between each year with particular focus on the population of the students who enrolled for the examination, was not significant. In 2020 and 2021 there were no notable changes in students' achievement as compared to the previous year. A lot of factors have been implicated for the poor academic achievement of students in Biology.

According to Akachukwu and Okoli (2021), students' poor achievement in Biology is as a result of lack of constant practical activities which are often not done until examination periods, poor and inadequate laboratory facilities and lack of necessary learning and instructional resources. Other implicated factors according to Ezenwabachili and Okoli (2021) include; the inadequate number of teachers and students' interest and attitude to science. However, Udegbe

and Okoli (2022) reported that, the most common factor responsible for students' poor achievement in Biology as implicated by many researchers is the lecture method or teacher-centred instructional approaches used by Biology teachers.

The lecture method often referred to as "chalk and talk" method, involves direct instruction by the teacher whose primary role is to pass knowledge to students and conduct testing and assessment (Idah, 2018). The term according to Ejiofor and Osuafor (2019) refers to the teaching using chalk and board for teachers; pen and paper for students and may involve the teacher using such methods such as demonstration using examples, question and answer methods among others. Lecture method involves a teacher, a brick-and-mortar facility (usually a school) and a group of students that gather together at this facility during specific periods of the day to learn from the teacher(s). It may also include paper based assignments and exams. It involves direct instruction by the teacher whose primary role is to pass knowledge to the students. Activities in the lecture method as used in the classroom often involving face-to-face interaction between teachers and students in a class, where students passively receive information and replicate the information in an examination. Lecture method has proved effective for covering large content material characteristic with the subject of Biology. It is also good for teaching large classes of students but affords the students little opportunity to interact, get actively engaged and take responsibility for their own learning (Nwigwe & Osuafor, 2019). Lecture method with a combination of other methods during instructional process could improve achievement of students.

Academic achievement according to Berkley and Chang (2022) refers to the extent to which a student, teacher or institution has attained the short or long-term educational goals. It describes academic outcomes that indicate the extent to which a student has achieved their learning objectives (Inyang, 2022). Achievement is often measured through a standardized or teacher made test and often denote a students' grade in an examination or test. To improve students achievement, there is a unanimous agreement among researchers and authors that teacher must adopt innovative teaching methods that centre instruction on the students. One of the commonest instructional approaches known to aid teachers link learning to reality and what the students know already is ethnobiology based instructional approach.

Ethnobiology according to International Society of Ethnobiology (ISE, 2018) is the study of the intricate interactions that exist between living beings and cultural systems in both past and present cultures. The concept ethnobiology and ethnobiology instructional approach is not a common one and is rarely used among biology teachers. Ethnobiology instructional approach as used in the present study simply involves the employment of indigenous or traditional materials, knowledge, and practices in the teaching of Biology concepts. The Ethnobiology classroom involves the teacher detailing the indigenous knowledge students have that have relevance or is related to the Biology concept being taught and using tradition materials to drive home the learning of that concept. Indigenous knowledge can provide further perspectives on nature and help us to reflect the nature of

science. It offers rich contexts to initiate learning and connect science education with more holistic worldviews needed for promoting sustainability. The approach engages the students by allowing them to present indigenous perspectives to the concept, giving room for knowledge reconstruction through dismissal of misconceptions and connecting scientific knowledge to cultural practices. Although, the approach of Ethnobiology as an instructional approach is not commonly explored among teachers and investigated by researchers, it bears potential benefits for students depending on their school location.

Location is simply the geographical position where a school is sited (Konyefa and Okigbo, 2021). Although, there are hardly any agreed indices for determining rural and urban locations, rural locations often denote areas that are open and spread out with a small population. Urban locations on the other hand as Konyefa and Okigbo puts it, are areas that consists of both living and working areas and have high population. Suburban areas are areas that are mainly residential area with a larger population than rural areas. The geographical location of school results into a number of problems including; poor attendance, resulting in low achievement, increases of dropout rate, and amplifies a host of social problems that may affect learning of Biology. While some studies have shown positive influence, others have shown negative influence of school location on the students' learning outcome or achievement.

PURPOSE OF THE STUDY

The purpose of the study was to determine the effect of Ethnobiology instructional approach on academic achievement, retention and interest of secondary school students in Biology in Onitsha Education Zone of Anambra state. Specifically, the study determined the:

- ✓ difference between the mean achievement scores of students taught Biology using Ethnobiology instructional approach (EIA) and those taught using lecture method (LM).
- ✓ difference between the mean achievement scores of urban and rural students taught Biology using EIA and LM.
- ✓ interaction effect of instructional approaches (EIA and LM) and location on students' achievement in Biology.

RESEARCH QUESTIONS

The following research questions guided the study:

- ✓ What is the difference between the mean achievement scores of students taught Biology using Ethnobiology instructional approach (EIA) and those taught using lecture method?
- ✓ What is the difference between the mean achievement scores urban and rural students taught Biology using EIA and LM?

HYPOTHESES

The following null hypotheses were tested at 0.05 level of significance:

- ✓ There is no significant difference between the mean achievement scores of students taught Biology using

Ethnobiology instructional approach (EIA) and those taught using lecture method.

- ✓ There is no significant difference between the mean achievement scores of urban and rural students taught Biology using EIA and LM.
- ✓ There is no interaction effect of instructional approaches and location on students' achievement in Biology.

II. METHOD

The study adopted quasi-experimental research design. Specifically, the pretest-posttest non-randomized control group design of 2x2x2 factorial background was used. The area of the study is Onitsha Education Zone of Anambra State. The population of the study is 5,322 SS2 students offering Biology in Onitsha Education Zone of Anambra state. The sample size for the study is 184 SS2 students offering Biology in Onitsha Education Zone of Anambra state. The sample was drawn using a multi-stage sampling procedure.

The instrument for data collection was Biology Achievement Test (BAT). BAT is made of 50 multiple choice objective test items with four response options lettered A-D on the concepts of classification of plants, digestive system, modification of feeding habits in organisms and transport system 1. The questions were taken from West African Examination Council (WAEC) past question papers on the selected concepts. The content coverage on each concept was drawn using a Table of Specification. BAT, BIS and lesson plans, the objectives of the study, score of the study, research questions and hypotheses were validated by three experts. Two of the experts are lecturers in the Departments of Science Education while the other one is from the Department of Educational Foundations, Nnamdi Azikiwe University, Awka. The reliability of BAT was established using Kuder-Richardson Formula 20 (KR-20) to be 0.91.

The treatment was conducted in two phases. The first phase was to train the research assistants who are the regular Biology teachers in the schools that were used in the study. The second phase was for the treatment using Ethnobiology instructional approach. Those in the control group were taught using lecture method. Before the commencement of the training, the instruments were administered as pretest in the first week without any feedback or corrections.

The treatment involved the use of locally sourced instructional materials that are common to the traditions of the immediate communities of the students. For the topic on classification of plants, some of the plants mentioned were provided especially those found in the community of the students or that have any traditional significance and scientific connotations. In teaching digestive systems and feeding habit, the digestive systems of animals and their set of teeth, mandibles or mouth parts, found in the community and traditional settings was used as instructional materials. The materials were provided by the students and where there is any need of financial support, the researcher provided the money for the purchase of the material.

Generally, the classes began with the introduction of the topic with in-depth review of the objectives of the instruction. In each step of the lesson, the teacher briefly explained the

learning material contents using the traditional materials for illustration, demonstration or explanations. The teacher then called on the students to give a presentation of any indigenous knowledge or practices that are related to the concept explained by the teacher. The presentation constituted mainly the knowledge held by students of the uses of the plants, their spiritual significant, medicinal and nutritional values and other such traditional knowledge such as traditional stories and proverbs. After the presentation, the teacher deduced the scientific relevance and connotation of their presentation, thereby relating the indigenous knowledge held by students or their traditional practices to the science being taught. Where no particular scientific relevance can be deduced from the presentation or indigenous knowledge, the teacher can dismiss them as misconceptions while presenting the proper knowledge.

The teacher then summarized the important points in the lesson drawing their attention to contents of the lesson. At the end of the lesson, the teacher used some questions to evaluate the students' learning and understanding of the learning materials. For the first lesson, the teacher after the pretest gave students the content of learning so as to study and inquire from their parents and elders any cultural practices or indigenous knowledge held by the community that are related to the concepts. They also acquired within the time given before the lesson the necessary local instructional materials that are of scientific relevance and related to the concepts or as demanded by the teacher and their local names and uses. The same process was taken for each lesson/topic until the end of the lesson. Students were grouped for the assignments and tasked to each ensure that the group assignment is done as any student can be called to make the presentation on behalf of the group.

The control group was taught the same content using lecture method. It involved simple presentation using illustrations, explanations and questioning. Students were given the chance to ask questions and demand explanations to clarify their misunderstanding. Standard textbook drawing and pictures were used as instructional aids. Students were given assignments on topic. BAT was administered before the commencement of the treatment as pretest. The scores of the students in the pretest were not given to them and no revisions on the test or corrections were given. After the treatment, the posttest was administered on the following week, after a revision exercise has been done.

The research questions were answered using mean and standard deviation while the hypotheses will be tested at 0.05 level of significance using Analysis of Covariance (ANCOVA). The decision rule was to reject null hypothesis where Probability value (p-value) is less than or equals the level of significance ($P \leq 0.05$) and not to reject null hypothesis where P-value is greater than 0.05 ($P > 0.05$).

III. RESULTS

RESEARCH QUESTION 1: What is the difference between the mean achievement scores of students taught Biology using ethnobiology instructional approach (EIA) and those taught using lecture method (LM)?

| Group | N | Pretest Mean | Pretest SD | Posttest Mean | Posttest SD | Gained Mean |
|-----------------|----|--------------|------------|---------------|-------------|-------------|
| EIA | 91 | 26.54 | 5.81 | 75.15 | 9.33 | 48.61 |
| LM | 93 | 29.49 | 3.52 | 62.43 | 7.20 | 32.94 |
| Mean Difference | | 2.95 | | 12.72 | | 15.67 |

Table 1: Mean Achievement Scores of Students taught Biology using Ethnobiology Instructional Approach (EIA) and Lecture method (LM)

Table 1 reveals that the students taught Biology using EIA has pretest mean retention score of 26.54 and posttest mean achievement score of 75.15 with gained mean achievement score of 48.61, while those in the control group taught with lecture method has pretest mean achievement score of 29.49 and posttest mean score of 62.43 with gained mean 32.94. Students taught Biology using EIA had less homogeneous scores in their posttest (9.33) than those taught using LM (7.20). The difference between the mean gained achievement scores of the students is 15.67 in favour of EIA.

RESEARCH QUESTION 2: What is the difference between the mean achievement scores urban and rural students taught Biology using EIA and LM?

| Method | Location | N | Pretest Mean | Pretest SD | Posttest Mean | Posttest SD | Gained Mean |
|--------|----------|----|--------------|------------|---------------|-------------|-------------|
| EIA | Urban | 44 | 26.02 | 5.21 | 74.48 | 11.80 | 48.46 |
| | Rural | 47 | 27.02 | 6.34 | 75.79 | 6.27 | 48.77 |
| LM | Urban | 53 | 29.92 | 3.93 | 62.87 | 6.05 | 32.95 |
| | Rural | 40 | 28.93 | 2.82 | 61.85 | 8.54 | 32.92 |

Table 2: Mean Achievement Scores of Urban and Rural Students taught Biology using EIA and LM

Table 2 reveals that the urban students taught Biology using EIA has pretest mean achievement score of 26.02 and posttest mean achievement score of 74.48 with a gain in mean scores of 48.46 while the rural students have pretest mean achievement score of 27.02 and posttest mean achievement score of 75.79 with a gain in mean scores of 48.77. Table 3 also reveals that the urban students taught Biology using LM has pretest mean achievement score of 29.92 and posttest mean achievement score of 75.79 with a gain in mean scores of 32.95 while the rural students have pretest mean achievement score of 28.93 and posttest mean achievement score of 61.85 with a gain in mean scores of 32.92.

HYPOTHESIS 1: There is no significant difference between the mean achievement scores of students taught Biology using ethnobiology instructional approach (EIA) and those taught using lecture method.

| Source | SS | df | MS | F | Sig. | Decision |
|-------------------|-----------------------|-----|-----------|---------|------|----------|
| Corrected Model | 7548.484 ^a | 4 | 1887.121 | 27.023 | .000 | |
| Intercept | 22359.483 | 1 | 22359.483 | 320.178 | .000 | |
| pretest | 39.645 | 1 | 39.645 | .568 | .452 | |
| Method | 7102.156 | 1 | 7102.156 | 101.700 | .000 | Sig. |
| Location | .971 | 1 | .971 | .014 | .906 | Not Sig. |
| Method * Location | 51.174 | 1 | 51.174 | .733 | .393 | Not Sig. |
| Error | 12500.381 | 179 | 69.835 | | | |
| Total | 889049.000 | 184 | | | | |

Corrected Total 20048.864 183

Table 3: ANCOVA Test of Significance of Difference between the Mean Achievement Scores of Students taught Biology using EIA and LM

Table 3 shows that there is a significant main effect of the treatment on students' achievement in Biology, $F(1, 179) = 101.700, P = 0.000 < 0.05$. Therefore, the null hypothesis is rejected meaning that there is a significant difference between the mean achievement scores of students taught Biology using ethnobiology instructional approach (EIA) and those taught using lecture method in favour of EIA.

HYPOTHESIS 2: There is no significant difference between the mean achievement scores of urban and rural students taught Biology using EIA and LM.

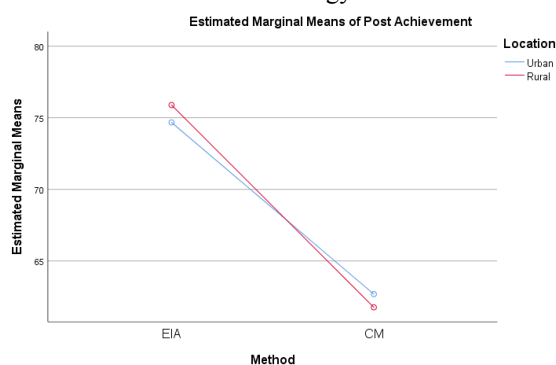
Data relating to Hypothesis 2 is contained in Table 3.

Table 3 also shows that there is no significant main influence of location on students' achievement in Biology, $F(1, 179) = 0.014, P = 0.906 > 0.05$. Therefore, the null hypothesis is not rejected meaning that there is no significant difference between the mean achievement scores of urban and rural students taught Biology using EIA and LM.

HYPOTHESIS 3: There is no significant interaction effect of instructional approaches (EIA and LM) and location on students' achievement in Biology.

Data relating to Hypothesis 3 is contained in Table 3.

Table 3 further shows that there is no significant interaction of instructional approaches and location on students' achievement in Biology $F(1, 179) = 0.733, P = 0.393 > 0.05$. Therefore, the null hypothesis is not rejected meaning that there is no significant interaction effect of instructional approaches (EIA and LM) and location on students' achievement in Biology.



Covariates appearing in the model are evaluated at the following values: Pretest Achievement = 28.03

Figure 1: Plot of interaction effect of approaches (EIA and LM) and location on students' achievement in Biology

The plot of interaction effect of instructional approaches and location on students' achievement in Biology is not significant and disordinal. This shows that the instructional approaches have different effects on achievement of students on different conditions, for example, the effect of the approach on students' achievement changed when location was consideration. Thus, the instructional approaches are location sensitive. Rural students taught Biology using EIA had higher mean achievement score than urban students whereas urban students taught using LM had higher mean achievement score than rural students.

IV. DISCUSSION

The finding of the study showed that there is a significant difference between the mean achievement scores of students taught Biology using ethnobiology instructional approach (EIA) and those taught using lecture method in favour of EIA. The discrepancy favour of ethnobiology instruction arises from the point that nearly every classroom is culturally diverse. Thus, integrating cultural and indigenous knowledge or adoption of locally instructional materials allowed the students to examine complex, dynamic interactions between human and natural systems which in turn enhanced their intellectual merit and broadened their understanding. Ethnobiology draws on many areas of inquiry, from biology and ecology, to indigenous studies, anthropology, geography, pharmacology, nutrition, linguistics, history and philosophy and thus, exposes the students to learning by integrating an already existing cognitive structure that makes the learning material more meaningful.

It is heartening to witness the growing recognition of the historic and existing interaction of various cultures with their classroom and the extent to which these interactions shaped learning. Thus, ethnobiology increasingly promotes synergism between science and the world views of the students, helping them to eliminate scientific misconception, modifying existing knowledge to make them more compatible with science and linking the learning materials to everyday life. These learning experiences makes learning materials easily understandable to the students, and as well make them actively engaged in the learning process, thereby resulting in improved achievement in biology.

The findings of the study is in line with the findings of Unodiaku (2013) that that the ethno-mathematic teaching material usage was effective in enhancing students' achievement in mensuration with particular reference to volumes of cylinder and hemisphere. The findings of the study lend credence to the findings of Adekunle (2017) that significant main effect of treatment was recorded on cognitive achievement in science with ethnoscience instruction group performing better than the control group. The findings of the study support the findings of Idah (2018) that ethnochemistry approach to teaching was found to be significantly more effective in enhancing achievement of students in chemistry as well as activating their interest in the learning of the subject than the lecture-demonstration method. The findings of the study is related to the findings of Abumchukwu, Eke and Achugbu (2021) that that there was significant difference in the mean achievement scores of the students in favour of ethnochemistry instructional strategy and gender had no significant influence of students' achievement.

V. CONCLUSION

The findings of this study showed that students taught Biology using EIA had significantly higher achievement scores than those taught using LM. It is concluded that EIA is an effective instructional approach for enhancing students' achievement in Biology.

VI. RECOMMENDATIONS

The following recommendations are made based on the findings of the study:

- ✓ Secondary school biology teacher should adopt the use of EIA in teaching biology as a way of helping students connect what they are learning to already existing knowledge and realities around them.
- ✓ Seminars and workshops should be organised for biology teachers in secondary schools on how to use EIA effectively in the teaching and learning of biology.

REFERENCES

- [1] Abuchukwu, A.A., Eke, J.A. and Achugbu, C.N.J. (2021). Effects of ethnochemistry instructional strategy on secondary school students' achievement in chemistry in Onitsha education zone. *African Journal of Science, Technology and Mathematics Education (AJSTME)*, 6(1), 121-128.
- [2] Adekunle, F.R. (2017). The Impact of ethnoscience instruction on cognitive achievement in science. *International Journal of Education and Learning*, 6(2), 33-42.
- [3] Akachukwu, E.E. and Okoli, J.N. (2021). Effects of interpretation construction-based instructional strategy on students' achievement in ecological concepts in Onitsha education zone. *International Journal of Education and Evaluation*, 7(1), 10-18.
- [4] Berkley, C. and Chang, L (2022). Is your memory normal? WEB MD website. Retrieved from <http://www.webmd.com/alzheimers/features/is-your-memory-normal>. on 2/2/2022.
- [5] Ejiolor, M.A. and Osuafor, A.M. (2019) Effect of problem-based learning on achievement of secondary school computer studies students in Nnewi education zone. *International Journal of Innovative Research and Advanced Studies, IJIRAS*, 8(6), 93-97.
- [6] Ezenwabachili, C.G. and Okoli, J.N. (2021). Effect of flip classroom and think-pair-share instructional strategies on students' retention in Biology in Enugu education zone. *International Journal of Education and Evaluation*, 7(3), 70-79.
- [7] Idah, N.N. (2018). Effect of ethnochemistry teaching approach on secondary school students' achievement and interest in chemistry in Enugu state. Unpublished dissertation, University of Nigeria, Nsukka.
- [8] International Society of Ethnobiology (ISE). (2018). Who we are. Reteieved from: <http://www.Ethnobiology.net/about>. in 18/03/2022
- [9] Inyang, H. (2022). School location and students' academic performance in Biology. Retrieved from <https://projectkings.com.ng/2022/03/21/school-location-and-students-academic-performance-in-Biology/>
- [10] Konyefa, B.I. and Okigbo, E.C. (2021). Effect of ethnochemistry instructional approach on secondary school students' achievement in chemistry in Bayelsa

- state. *International Journal of Education and Evaluation*, 7(5), 1-11.
- [11] Nwigwe, E. C., and Osuafor, A. M. (2019). Effects of constructivist-based instructional model on secondary school students' academic achievement in mathematics in Enugu education zone. *UNIZIK Journal of STM Education*, 3(1), 76–90.
- [12] Udegbe, S. I. and Okoli, J.N. (2022). Self-efficacy, study habit and attribution style as predictors of senior secondary school students' achievement in Biology in Ogidi education zone. *African Journal of Science, Technology and Mathematics Education*, 8(1), 91-98.
- [13] Undiaku, S. (2013). Effect of ethno-mathematics teaching materials on students' achievement in mathematics in Enugu state. *Journal of Education and Practice*, 4(23), 70-77.

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