



**Effects of Hands-On Approach on Performance in Evolution ... (Yahaya & Yahaya, 2021)**

## **Effects of Hands-On Approach on Performance in Evolution Concepts among Secondary School Students in Gusau Educational Zone Zamfara State**

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### **Abstract**

This study investigated the effects of hands-on approach on students' performance in evolution among concrete and formal reasoning ability Senior Secondary II (SS2) students in Zamfara State. The study was guided by one objective, one research question and one null hypothesis. Sixty (60) SS2 students were selected using the simple random sampling technique from a population of six hundred (1642) SS2 students who offer biology. This study adopted the pretest, posttest quasi experimental research design involving two groups one experimental and the other control. The students in the experimental group were taught evolution concept using hands-on approach (HOA) while the control group were taught the same concept using lecture method. One instrument tagged: Evolution Performance Test (EPT) duly validated by experts with a reliability coefficients of  $r = 0.85$  respectively was used to collect data. The research question was answered using descriptive statistics while the hypothesis was tested at 0.05 level of significance using the t-test. The result obtained from data analysis showed that students in experimental group performed significantly better than those in control group. Based on the findings, it was recommended that biology teachers should employ the use of HOA in teaching their students. In addition, the Zamfara State Ministry of Education should conduct seminars and workshops for teachers of science-based subjects to sensitize and train them to use HOA.

**Keywords:** Hands-On Approach, Performance, Evolution Concepts



## Introduction

Education is the totality of life experiences that people acquire, and which enables them to cope with diverse satisfaction from living in the world. (Law, 2016) The role of science to technological development of any nation cannot be over emphasized. Economic strength of a nation is always assessed in term of its performance in science and technology (Funke, 2012; Gappi, 2013; Yabo, 2016). In view of its importance, the Federal Government of Nigeria emphasized the teaching of science and technology in all institutions as contained in the National Policy on Education (FRN, 2014).

Biology serves as a prerequisite to the study of medicine, pharmacy, agriculture among others. Biology concepts according to Martina-ivie (2015) can sometimes be difficult particularly when describing ideas that are abstract or cannot be fully comprehended by learners for the first time. Evolution is an aspect of the biology syllabus that senior secondary students at SS2 must study. However, it is considered as abstract in nature and difficult to understand which has resulted in poor performance among students (John & Ademola, 2014).

The problem of poor performance in science subjects including Biology has persisted over the years (Mohammed, 2012; Obanya, 2012; Ishaya & Abubakar, 2017). This observation has evoked much research efforts aimed at evolving means of re-addressing the situation. Science education researcher like Keenan and Meenan, (2014) attributed the poor performance in science including Biology to problems such as low morale of students, poor preparation of teachers, overcrowded classroom, inadequacy of laboratory, poor attitude of students to work, gross underfunding and inadequacy of rewards for excellence in science teaching and learning. However, with all the problems associated with poor performance, efforts are being made to find solutions to the recurring failure rate among science students. One of such efforts is on the issue of instructional methods which has attracted a lot of researchers (Abdullahi, 2007; Yabo, 2015).

Teaching methods otherwise called instructional methods are many and varied. According to Sanyin and Adebayo (2011), teaching method is described as interplay of activities whose combined effect enhances the accomplishment of specific instructional objectives. They enumerated some commonly used teaching methods as lecture, tutorial methods. All these methods aim at enhancing teaching and learning leading to the attainment of specific instructional objectives. Predominant instructional method used in teaching at all levels of education, is through the use of lecture method. Lecture method on the other hand has been reported by Obanya (2012), to be ineffective in science instruction. The use of lecture method entails a one-way flow of communication from the teacher to the students. It is teacher-centred or teacher dominated approach. Most of the talking is carried out by the teacher while the students remain as passive listeners taking down notes. Hence is referred to as didactic approach or talk and chalk method. Consequently, there is the need to employ an alternative and effective method of instruction in the mode of Hands-On Approach (HOA) becomes imperative.

According to Haury and Rillero (2015), HOA is an instructional strategy which promote teaching students how to assess and use information rather than just directly transferring information have become a subject of discourse. Teaching methods based on a constructivist teaching approach within a student's-centered learning environment have been widely accepted and advocated for. This is because active learning which can be placed within the constructivist approach. Hands-on learning simply means



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learning by doing. It is a student-centered approach to learning which provides learner with ample opportunities of taking control of their learning. It combines active learning with concrete experiences abstract concepts and reflection in an effort to engage learners in the classroom Salami and Egiethua (2012). When HOA is used, biology students and teachers learning experience of some difficult and abstract concepts in evolution would be concretized. Participating fully in the learning process is prerequisite if deep and real understanding and use of knowledge are aimed at. The process of concretizing learners' learning experience in evolution concept using hands-on approach would enable them to have an imprint of those new difficult/abstract concepts in evolution would serve as hangers, previous knowledge or foundation for building subsequent behavioral objectives in evolution studies. If the lesson is made learner centered, the present knowledge (entry behaviour) of students should be used as a criterion for teaching new concepts. There is the possibility that when learners are exposed to evolution through practical and field work (hands-on). Maximum learning gains would be achieved.

Studies such as Salami and Egiethua (2012), and Owji, MehrAfsha and Ostovar (2013) reported that the HOA improves students' performance in biology. These research reveal a difference between students exposed to the HOA and those exposed to the traditional methods such as lecture. However, other reports show no difference statistically between students exposed to the HOA and the lecture method (Palaniappan, 2009).

Annual report of examination results by West African Examination Council (2020) showed that students' performance in biology was very unsatisfying as contained in (Table 1). This is because though Biology is not a core curriculum subject in the senior secondary but because of the stipulation that students must offer one of the science subjects, according to the new curriculum of 2015/2016 hence, it is preferred by most students. The results obtained by candidates have been abysmal and do not justify the popularity as observed by researchers (Aremu, Salami & Ishola, 2012; Yabo, 2015). The statistics of performance in Biology Senior Secondary Certificate Examination (SSCE) from 2016-2020 revealed a poor percentage score at credit level in grade 1-6.

Generally, the performance in biology within a period of 5 years have been abysmal. Despite the increasing number of candidates over the year under review, the percentages of candidates with credit pass and above is below 47% for the whole year under review. Consistent poor performance of students in Biology at SSCE leaves one in doubt about the effectiveness of the teaching method popularly used by biology teachers. The use of talk and chalks methods of teaching leads to memorization of facts and concept, which has not proven to be effective for all reasoning abilities. The use of hands-on strategy (HOA) has been advocated by researchers, such as Ekon (2013) and Aremu (2013) that the use of hands-on learning strategy enhances academic performance and retention in science subjects at SS level.

**Objective of the study**

The objective of this study is to determine the effects of Hands-On Approach (HOA) on academic performance of students in evolution concepts.

**Research Question**

What is the difference between the academic performance of students taught evolution concepts using HOA and those taught using lecture method?



## Hypothesis

There is no significant difference between the academic performance of students taught evolution concepts using HOA and those taught using lecture methods.

## Methodology

This study adopted pretest, posttest quasi experimental research design which involves two groups; experimental and control groups. The two groups were pre-tested to determine the equivalence in ability. The test result was not significant. The experimental group were treated using HOA while the control group were taught the same concept using lecture method. At the end of the six weeks' treatment period (12 sessions), a posttest was administered to both groups of students to evaluate the effectiveness of the treatment in academic performance in evolution.

The population for this study constitutes all the public Senior Secondary Schools II students in Zamfara Educational Zone. There are six (6) public senior secondary school in Zamfara. The total population of students in these schools stood at 1642 at the time of this research. The names of the six schools in the Zone were coded in pieces of paper from two schools were selected using simple random sampling. The same procedure was carried for placement into experimental and control groups. The experimental group had a total population of 30 students while the control group had a total of 30 students. Hence the total number of subjects in the two schools was 60. This is in accordance with central limit theorem by (Mills & Airasan, 2009) who proposed 30 as minimum sample size for an experimental study.

One instrument tagged: Evolution Performance Test (EPT). EPT comprised forty (40) objective test with four distractors (a, b, c d) developed by the researcher on ecology. Each item on the instrument was scored 2.5 marks to give a total of 100 marks. The face and content validation of EPT was carried out by three experts in the Science Education Department, Ahmadu Bello University, Zaria who are senior lecturers with Ph.Ds. To ascertain the reliability of EPT, the test-retest method was used in line with Tuckman (1975), who proposed the minimum interval of two weeks or more. The result of the test was correlated using Pearson Product Moment Coefficient which gave a rho value of 0.85 as the reliability index. This means that EPT is reliable for data collection for the study. The research questions asked was answered using the descriptive statistics of mean and standard deviation scores while the hypothesis was tested using the t-test at  $p \leq 0.05$  level of significance.

## Results

### Research Question

What is the difference between the academic performance of students taught evolution concepts using HOA and those taught using lecture method?

**Table 1: Descriptive Statistics on the Performance of Experimental and Control Groups in Evolution Concepts**

Group	N	Mean	Std. Deviation	Mean Difference
Experimental	30	61.00	7.08	28.36
Control	30	32.64	8.33	



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Table 1 reveals the mean score of students' academic performance between experimental and control group respectively were 61.00 and 32.64. Their respective standard deviations are 7.08 and 8.33. The mean difference between the groups in favour of the experimental group was found to be 28.36. Clearly, the experimental group taught using the HOA performed better.

### Hypothesis

There is no significant difference between the academic performance of students taught evolution concepts using HOA and those taught using lecture methods.

**Table 2: Summary of t-test Analysis for Performance of Experimental and Control Groups in Evolution Concepts**

Group	N	Mean	SD	df	t-value	P-value	Remark
Experimental	30	61.00	7.08	58	2.68	0.001*	S
Control	30	32.64	8.33				

\*Significant at  $P \leq 0.05$

Table 2 shows the t-test analysis for performance between the experimental and control group in evolution concepts. The table reveals that there is significant difference between the performance of experimental group and control group as the p-value of 0.001 is less than the stated value of 0.05 ( $t = 2.68$ ,  $p < 0.05$ ) alpha level of significance. Therefore, the null hypothesis which states there is no significant difference between the academic performance of students taught evolution concepts using HOA and those taught using lecture methods is therefore rejected.

### Discussion of Findings

The results from this finding shows that there is a significant difference between the academic performances of students taught evolution concepts in experimental group than those in control. This was evidenced by the higher score and mean difference between the two groups in favour of the HOA group. This finding supports Salami and Egiethua (2012); and Owji, MehrAfsha & Ostovar (2013) but negates the findings of Palaniappan (2009) who found that there was no significant difference between performance of experimental group and control group. The reason for this performance could also be attributed to the constructivist enabled environment created by the HOA which the lecture method is handicapped of. Students are active participants with the HOA and are able to achieve much.

### Conclusion

Biology should be taught in an environment that involves the learner making meaningful inputs such as the prescribed by the constructivist. The HOA is such a strategy that fits in and creates the need leaning experience where learners can gain from. The study show that students taught evolution concepts achieved higher when HOA was used as a medium of instruction for senior secondary biology students. Consequently, the HOA is a strategy that can be used to enhance students' learning experiences and performance in biology especially when teaching concepts like the evolution which they find confusing and frustrating learning.





## Recommendations

The following recommendation was made:

Teachers should be advised by the ministry of education to adopt the approach in teaching biology. Zamfara state ministry of education should conduct seminars and workshops for teachers of science-based subjects to sensitize and train them to use hands-on learning strategy.

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