

## Impact of Learning Activity Package on Students' Achievement and Retention Among Senior Secondary School Biology Students in Zaria, Kaduna State

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### Abstract

The study investigated the Impact of Learning Activity Package on students' Achievement and Retention Among Senior Secondary School Biology Students in Zaria, Kaduna State. Three research questions and three null hypotheses guided the study. The study employed the Quasi-Experimental Design of the Pre-test & Post-test Non-equivalent Group Design. The population of the study consisted of 1,640 SS II biology students. Two co-educational schools were selected through purposive sampling for the study, and the sample comprised 130 students from intact classes (Experimental = 60 and Control = 70). The instrument for data collection was titled, Biology Performance Test and Retention Ability (BPTRA) with a reliability coefficient of 0.78. The data gathered from the test administered was analyzed using mean, standard deviation, and t-test statistical analysis. The results revealed that there is significant difference between the effects of the learning activity package on students' achievement in Biology in senior secondary schools in Zaria, there is no significant difference between the effects of the learning activity package on students' retention in Biology in senior secondary schools in Zaria, Kaduna State and there is no significant difference between the mean academic performance scores of male and female students taught biology concept using Learning Activity Package. The study concludes that the findings unequivocally underscore the effectiveness of the Learning Activity Package in enhancing students' achievement in Biology, aligning seamlessly with the principles of constructivist learning theories. The researchers recommend that given the significant difference in students' achievement, it is recommended to further explore and optimize instructional strategies embedded in the Learning Activity Package, among others.

**Keywords:** Learning, Activity Package, Retention, Biology & Achievement

### Introduction

In Nigeria, the study of science is of so great importance, that a lot of emphasis has been laid on the teaching and learning of science with the major aim of science education, as contained in the National Policy on Education, being to equip the students to live effectively in this modern age (FRN, 2014). This can be achieved by the inculcation in the learners the

necessary scientific skills and attitudes. The inculcation of scientific skills and attitudes in students can only be achieved through the proper teaching of the various science subjects. These include Biology, Chemistry, Physics, Mathematics, Health Science, Agriculture, among others. Biology as one of the science subjects, when properly taught, will help the students to solve personal and societal problems. Therefore, the knowledge of Biology helps to question superstitions, know the function of the various parts of the body, enables one to understand oneself, maintain good health practices such as the use of clean water, good sanitation, balanced diet, the need to vaccinate, among others (Umoke, & Nwafor, 2014). The importance of Biology as a secondary school subject can be further illustrated by the fact that a candidate must obtain a credit pass in it, for admission into any Nigerian University to study such important science-based courses as Medicine, Pharmacy, Biochemistry, Microbiology, Food Technology, among others. Various teaching methods are used by teachers in the teaching of Biology aimed at bringing about meaningful learning. These include lecture method, demonstration method, discovery, project, inquiry among many others. The most commonly used is the lecture method. This is mostly employed by most science teachers because of some of its advantages which include the fact that it can be used to cover a large content area at a time and the students are given the same content at the same time. Another major advantage is that it can be used to teach a large class which is a prominent feature in most Nigeria secondary schools.

Lecture method can be very useful in teaching when used in conjunction with other methods especially for the purpose of introducing the topic. Despite all these advantages, the lecture method employed in the teaching of biology and other sciences has some flaws, which might be one of the causes of the poor achievement in the sciences. Alabi (2018), the lecture method is mainly teacher – centered, with the students being consistently passive and contents are taught as absolute knowledge. This method had failed in the recognition of the uniqueness of the inquiry-based nature of science and the learner's individuality. Furthermore, it does not facilitate the development of reasoning skills and processes in the students. These, among other reasons had not enhanced learning in students and thus had led to poor achievement of students in the sciences.

Retention according to Ajani, (2019), is a direct correlate of positive transfer of learning. This means that high retention may lead to high achievement which is a factor of many variables such as interval between learning and retrieval, intervening experiences, specific subject involved, teaching strategies/methods used, and environmental situations, among others. Evidence from researches showed that there is no consistency on the variables that may lead to the students retaining more of what they have learnt. In a separate studies carried out by Eze (2017) Nnadi (2018) and Ajani, (2019), showed that there were no significant differences between the pupils mean post achievement and retention scores. However, other studies carried out by Vygotsky (1978), (2018) and Udeji (2020) showed that

the methods employed in teaching science led to student's high retention and achievement. These findings suggest that there is need to carry out more studies to clarify issues related to achievement and retention as it concerns methods of teaching used in teaching. Since there is no consensus on the effect of methods on students' retention and achievement, there is need to investigate a learner centered activity oriented method and its effect on achievement and retention. Learner centered activity oriented method may include the use of a Learning Activity Package. A Learning Activity Package is a student – centered, activity-oriented teaching strategy where the teacher acts as a facilitator of learning, guiding the students through a series of activities and problems, which may help learners to achieve highly.

In learning materials are broken into small steps that are arranged sequentially from known to unknown and in an increasing order of difficulty. This suggests that learning activity package calls for individualized student attention. In solving the students' problems of poor achievement and retention in Biology, there is the need to shift from the conventional methods of teaching sciences to a more innovative method - a method that should seek for a way of making teaching more precise, while at the same time adjusting both the objective and methods of learning to the needs and characteristics of the individual learners. This innovative method must enable each student to work at his own pace thus accommodating both the fast and slow learners. In this method, the goals of the subject matter must be spelt out very well that students can arrive at the same goals independently along some avenue other than the one provided by the teacher. This calls for an individualized type of instruction.

## Statement of the Problem

The persistent poor achievement of students in Biology as revealed by both research results and WAEC Chief Examiners' Reports calls for concern especially for teachers of Biology that enroll larger number of students. The problem has to a large extent been attributed to ineffective teaching method employed by the teachers – especially lecture teaching method which is teacher-centered. Consequently, there is felt need to improve on the teaching and learning of Biology by exploring the use of some innovative learner centered teaching–learning methods, since it is believed that meaningful learning may be as a result of active participation by students. Although, many studies had been carried out on some innovative methods, like Programmed Instruction and Computer Assisted Instruction methods. Findings have shown that they are student centered and can also enhance learning and achievement, but the problem of large class and non-availability of computer systems in most Nigerian classes has made their practicability nearly impossible.

Despite the fact that Biology and other science related subjects are important to human progress; students still perform poorly in them. The low performance as reported in various science tests is evident in most science subjects in general. This is pointed out by the report of the Registrar, Joint Admission and Matriculation Board (2018) who indicated that the

performance of candidates in the University Matriculation Examination (UME) over the last three years has shown a steady decline. This is an indication of low retention of what is taught and subsequently poor achievement. A statistical table of West African Senior School Certificate Examination (May/June) from 2017 – 2019 illustrated the student low performance in biology for three consecutive years.

Therefore, there is still the need to investigate other innovative child-centered method that is affordable, readily available as well as flexible, combining both package learning and practical activities (i.e. minds – on and hands – on). Such a method should enable the teacher to easily diagnose the problems of the individual learner and allows the learners to evaluate themselves, receiving immediate knowledge of result. This calls for the trial of another individualize method such as Learning Activity Package among senior secondary schools in Zaria, Kaduna State.

## **Purpose of the Study**

The purpose of this study is to examine the effect of Learning Activity Package on Students' Achievement and Retention among Senior Secondary Schools Biology students in Zaria, Kaduna State. The specifically, the study sought to:

1. Determine the effect of the learning activity package on students' achievement in Biology in senior secondary schools in Zaria, Kaduna State.
2. Examine the effect of the learning activity package on students' retention in Biology in senior secondary schools in Zaria, Kaduna State.
3. Investigate the effect of learning activity package as a teaching strategy on academic achievement of students based on gender in Zaria, Kaduna State.

## **Research Questions**

1. What is the mean performance scores of students taught using Learning Activity Package and those taught using conventional strategy in Biology in senior Secondary Schools in Zaria, Kaduna State?
2. What is the retention ability of students taught using Learning Activity Package in Biology in senior Secondary Schools in Zaria, Kaduna State?
3. What is the difference in the mean academic performance scores of male and female students taught biology concept using Learning Activity Package only?

## Null Hypotheses

The following hypotheses, which were tested at 0.05 level of significance, were formulated to guide the study:

- H0<sub>1</sub>:** There is no significant difference between the effects of the learning activity package on students' achievement in Biology in senior secondary schools in Zaria, Kaduna State.
- H0<sub>2</sub>:** There is no significant difference between the effects of the learning activity package on students' retention in Biology in senior secondary schools in Zaria, Kaduna State.
- H0<sub>3</sub>:** There is no significant difference between the mean academic performance scores of male and female students taught biology concept using Learning Activity Package.

## Methodology

The research design for the study is Quasi-Experimental Design of the Pre-test & Post-test Non-equivalent Group Design. The population of the study consisted of SS II biology students from 15 senior secondary schools in Zaria, Kaduna State with a total population of 1,640. Two co-educational schools were selected through purposive sampling for the study, and the sample comprised 130 students from intact classes (Experimental = 60 and Control = 70). The control group teaching preceded the experimental treatment procedure. For this study, one instrument was used for the purpose of data collection- a 20-item multiple-choice objective test titled "Biology Performance Test and Retention Ability (BPTRA)". Two science education experts validated the instrument. Test and re-test method was used to determine reliability. The instrument was administered to 30 students in another school within the study area and analyzed using Pearson Product Moment Correlation. The reliability coefficient index obtained was 0.78.

The researcher administered a pre-test to the students in experimental and control groups respectively using the Biology Performance Test and Retention Ability (BPTRA) before the commencement of the treatment. The pre-test scores served as a basis for comparing students in Biology performance test before treatment. The treatment was carried out for a period of six weeks. The experimental group was taught using the learning activity package, while the control group were taught using the conventional method by the researcher. After two weeks, a post-test was administered to both the experimental and the control groups. The scripts were collected, marked, scored, and recorded to make comparison between the groups. The data gathered from the test administered was analyzed using mean, standard deviation, and t-test statistical analysis.

## Results

**Null Hypothesis 1:** There is no significant effects of the learning activity package on students' achievement in Biology in senior secondary schools in Zaria.

**Table 1: t-test analysis on the mean difference of mean performance scores of students taught using Learning activity package strategy and those taught using conventional strategy in Biology in senior secondary schools in Zaria, Kaduna State**

Group	Mean	SD	Df	t-cal.	Sig.
Experimental	24.73	2.92	128	11.95	.003
Control	17.18	3.07			

Source: (Field survey, 2023)

Table 1 examines the differences in the mean performance scores of students taught biology concept in senior secondary schools in Zaria, Kaduna State, using learning activity package teaching strategy and those taught conventionally. Because of the sig, the null hypothesis was rejected. A value of .003 is considered less significant at the 0.05 level. Thus, in Biology at secondary schools in Zaria, Kaduna State, there is no discernible difference in the mean performance scores of students taught Biology concept using learning activity package teaching strategy and those taught using a conventional method.

**Null Hypothesis 2:** There is no significant effects of the learning activity package on students' retention in Biology in senior secondary schools in Zaria, Kaduna State.

**Table 2: t-test analysis on the mean difference between mean performance scores and the retention ability test of students taught Biology concept using Learning Activity Package strategy in Biology in senior secondary schools in Zaria, Kaduna State**

Variable	Mean	SD	Df	t-cal.	Sig.
Post test	24.73	2.92	58	.987	.185
Retention	24.97	3.06			

Source: (Field Survey, 2023)

The difference in the post-test and post-post-test mean performances of students taught the concept of Biology in senior secondary schools in Zaria, Kaduna State utilising learning activity package teaching technique, is displayed in Table 2. Because the sig. a value of .185 is more than the 0.05 significance level, so the null hypothesis is retained. This indicates no discernible difference between the retention ability scores of students taught the concept of Biology utilising learning activity package teaching techniques in Biology in senior secondary schools in Zaria, Kaduna State.

**Null Hypothesis 3:** There is no significant mean difference in the academic performance scores of male and female students taught biology concept using Learning Activity Package.

**Table 3: Summary of t-test statistics on difference in the Academic Performance of Male and Female Students when Exposed to Learning Activity Package**

Study Groups	N	Mean	Std. Dev	Df	t-cal	P	Decision
Male	37	20.23	4.71	58	0.02	0.98	Not Significant
Female	23	20.26	4.91				

**Not Significant at  $p > 0.05$**

The summary of the independent samples t-test in Table 3 shows a p-value of 0.98 was obtained which is greater than p value  $\leq 0.05$  set for acceptance or rejection of the hypothesis. This is an indication that there is no significant difference in mean academic performance of male and female students exposed to learning activity package. Thus, the hypothesis which stated that there is no significant difference between the mean academic performance scores of male and female students taught biology concept using Learning Activity Package is retained. This implies that teaching biology concepts using learning activity package improves the academic performance of both male and female students taught biology concepts thereby making the teaching method gender friendly.

### **Discussion of Findings**

Based on the data presented, analyzed, and interpreted, the researchers were able to come out with the following findings.

There is significant difference between the effects of the learning activity package on students' achievement in Biology in senior secondary schools in Zaria, Kaduna State. The observed significant difference in the effects of the Learning Activity Package on students' achievement in Biology aligns with the potential of interactive and engaging teaching methods to positively impact academic performance. This finding resonates with the research of Anderson and Krathwohl (2021), who emphasize the effectiveness of active learning strategies in enhancing student understanding and retention of complex concepts. The Learning Activity Package, designed to foster active participation, may have contributed to a deeper comprehension of biological concepts, leading to the significant difference in achievement scores. Furthermore, the results align with the principles of constructivist learning theories, as discussed by Piaget (1970) and Vygotsky (1978), highlighting the importance of hands-on activities in promoting meaningful learning experiences. The significant difference in achievement scores suggests that the Learning Activity Package effectively facilitated a more interactive and participatory learning environment, positively impacting students' understanding and application of Biology concepts.

There is no significant difference between the effects of the learning activity package on students' retention in Biology in senior secondary schools in Zaria, Kaduna State. The absence of a significant difference in the effects of the Learning Activity Package on students' retention in Biology indicates that, while the approach may enhance immediate understanding, its impact on long-term retention may not be markedly different from traditional methods. This finding aligns with the work of Mayer (2018), who emphasizes the importance of instructional methods that promote both understanding and retention. It suggests that, while the Learning Activity Package may be effective in the short term, additional reinforcement strategies may be necessary for sustained retention over time.

Additionally, this result underscores the complex nature of retention, influenced by various factors such as reinforcement, practice, and cognitive processes. Future studies could explore complementary strategies or modifications to the Learning Activity Package to enhance its effectiveness in promoting long-term retention of Biology concepts.

Hypothesis three revealed that there is no significant difference in mean academic performance of male and female students exposed to learning activity package. The absence of a significant difference in mean academic performance scores between male and female students using the Learning Activity Package challenges traditional gender-related stereotypes in academic achievement. This finding is consistent with the research of Hyde and Mertz (2019), who argue against the existence of substantial gender differences in mathematical and scientific abilities. The Learning Activity Package's inclusive and interactive nature may have contributed to a balanced learning environment, fostering equal opportunities for both male and female students to excel in Biology. Moreover, this result aligns with the principles of gender-inclusive pedagogy advocated by Sadker and Sadker (2014). It suggests that instructional approaches that encourage active participation and hands-on learning can mitigate gender-based disparities in academic performance.

## Conclusion

In conclusion, the findings unequivocally underscore the effectiveness of the Learning Activity Package in enhancing students' achievement in Biology, aligning seamlessly with the principles of constructivist learning theories. While the approach may not exhibit a significant variance in promoting long-term retention, it serves as a valuable foundational platform for initiating further investigations into strategies aimed at sustaining knowledge retention over extended periods. This opens avenues for refining instructional approaches to strike a balance between immediate understanding and enduring retention.

Furthermore, the absence of discernible gender-based differences in academic performance implies that the Learning Activity Package fosters a more inclusive and equitable



learning environment. This observation aligns harmoniously with contemporary research, challenging conventional gender-related stereotypes in academic achievement. The Learning Activity Package, with its interactive and participatory nature, appears to contribute to dismantling barriers, ensuring equal opportunities for both male and female students to excel in Biology.

The practical implications of these results for educators are substantial, emphasizing the tangible benefits of integrating interactive and participatory approaches, exemplified by Learning Activity Packages, into Biology instruction. This not only enhances immediate understanding but also contributes to a more engaging and inclusive learning atmosphere. Looking ahead, future research endeavors can capitalize on these findings by delving deeper into the optimization of instructional methods. The exploration of nuanced strategies for achieving a delicate balance between short-term comprehension and long-term retention becomes a paramount consideration, especially in diverse learning contexts. In essence, the culmination of these findings provides a robust foundation for advancing pedagogical practices, encouraging continuous innovation in the pursuit of enhancing both immediate academic achievement and enduring knowledge retention within the dynamic landscape of Biology education.

## Recommendations

Based on the findings, several recommendations can be deduced to enhance the implementation of the Learning Activity Package in Biology education in senior secondary schools in Zaria, Kaduna State:

1. Given the significant difference in students' achievement, it is recommended to further explore and optimize instructional strategies embedded in the Learning Activity Package.
2. While the Learning Activity Package may not show a significant difference in promoting long-term retention, it is advisable to incorporate reinforcement strategies into the curriculum.
3. Despite the absence of significant gender-based differences in academic performance, educators should remain vigilant in promoting an inclusive and equitable learning environment.

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