
EFFECTS OF ANIMATION INSTRUCTIONAL STRATEGY ON SECONDARY SCHOOLS STUDENTS' ACADEMIC ACHIEVEMENT IN BIOLOGY IN ABUJA MUNICIPAL AREA COUNCIL, ABUJA, NIGERIA

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ABSTRACT

The study investigated the effects of Animation Instructional Strategy on senior secondary schools Students Achievement in Biology in Abuja Municipal Area Council, Abuja, Nigeria. The designed adopted for the study was Quasi-experimental research design of pre-test and post-test non randomized groups. The population of study was 12, 375 senior secondary II students offering Biology in Abuja Municipal Area Council secondary schools. A sample size of eighty-five (85) biology students were used as sample for the study; multi-stage sampling procedure was utilized in selection of this sampled. Biology Students Achievement Test (BSAT) was the instruments with reliability of index of 0.74 was the instrument used for data collection in this study. Descriptive statistics of mean and standard deviation were used to answer the research questions while Inferential statistics of Analysis of Covariance was used to test the null hypotheses at 0.05 level of confidence. The results revealed that animation instructional strategy enhances students' academic achievement than conventional method experimental group, there was no gender difference between male and female students taught biology using animation instructional strategy. Based on the findings of the study, It was recommended among others that Biology teachers should adopt the used of animation instructional strategy since it has been established to have significant positive effect on academic achievement of students in biology.

KEYWORDS: Animation instructional strategy, Achievement, Biology, Gender

INTRODUCTION

Biology is one of the Science subjects that occupy a unique position in secondary schools' curriculum. It is an integral part of science and its importance in the field of science cannot be overemphasized. It is taught to students in the last three years of senior secondary school in an effort to get them ready for their future employment and uncover and nurture their hidden abilities and potential (Federal Republic of Nigeria, 2013). Biology is a required subject in numerous academic disciplines, such as Medicine, Pharmacy, Nursing, Biochemistry, Agriculture, Anatomy, Physiology, Botany, Zoology, Micro Biology, Molecular Biology, Evolutionary Biology, Genetics and Population Dynamics, Forestry, Biotechnology, Nanotechnology, and many others (Ghumdia & Adams, 2017). The objectives of the biology curriculum at the secondary school level are to; prepare students to acquire adequate laboratory and field skills in biology, prepare students to acquire meaningful and relevant knowledge in biology, prepare students to acquire the ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture and prepare students to acquire reasonable and functional scientific attitudes (FRN, 2014).

Nevertheless, despite the importance and huge benefits that Biology curriculum has brought to national development and mankind, its teaching has not been very effective. Over the last decade, there has been a decline in the quality of teaching and learning the subject, this characterized by irregularity in the achievement of students in public examinations such as the West African Examinations Council (WAEC), National Examinations Council (NECO). Evidence from the West African Examinations Council (WAEC) showed fluctuation in the performance of students in biology as the number of students that passed biology at the credit level (A1-C6) is observed to be fluctuating. For instance, in 2016 (38.38%), 2017 (36.64%), 2018 (26.08%), 2019 (39.65%), 2020 (36.39%), 2021 (50.88), 2022 (69.3%), 2023 (57.43%), and 2024 (53.02%) for many years. The fluctuation in the result could be attributed to several factors, among which the poor teaching methods adopted by the teachers plays a significant role (Jepketer, 2017). For instance, in teaching and learning biology curriculum content in secondary schools, studies have shown that secondary school teachers including Biology rely on the conventional methods that are mainly lectures, and sometimes demonstration or discussion method to convey information of the curriculum content (Kingarru, 2014). This approach limits students' active participation and makes it difficult for them to understand abstract biological concepts such as genetics, cell division, and physiological processes (Adamu & Jibrin, 2017). Consequently, students resort to rote memorization rather than meaningful learning, which negatively affects both their achievement and retention.

As a result of this, there is a need to adopt some innovative instructional strategies aimed at improving teaching and learning processes. According to Mohammed, Dajal, and Haruna (2024), innovative instructional strategy is a teaching approach that is activity-based and learner-centered, as it might improve the teaching and learning of sciences and biology in particular. One of such innovative teaching strategies is the animation instructional strategy. Animation instructional strategy is an innovative teaching strategy that engages learners through visual and dynamic presentation of concepts in a dynamic way (Alzahrani, 2025). Similarly, Mayer (2021) defined animation as the simulation of movement created by displaying a series of individual images, or frames. In education, animations can be utilized to visualize complex concepts, making them more accessible to learners (Hattie, 2021). As a multimedia instructional tool, animation harnesses visual representation to simplify intricate biological processes and concepts, thereby facilitating better understanding among students (Mayer, 2017). Furthermore, animation can simplify processes like cellular respiration, reproduction, genetic inheritance, and ecological interaction, which are often challenging for

students to comprehend through text-based or static imagery alone which conventional chalk and talk method offers (Rogers et al., 2021). Studies have indicated that animated content can significantly enhance learning outcomes by promoting active engagement and facilitating better retention of information (Bello & Okeke, 2022). Zhang, Zhou, Briggs, & Nunamaker (2020), report that animation can lead to improved learning outcomes, and retention of scientific concepts, particularly in subjects that require the comprehension of intricate processes, such as biology. This is critical in secondary school education where students are introduced to more advanced biological concepts that necessitate a deeper understanding of processes such as cellular respiration, reproduction, genetics and ecological interactions.

Academic achievement, refers to a measure of grades students receive in school, replicates the extent of learning they have acquired. The academic achievement is influenced by various cognitive, social, motivational, and cultural factors (Zheng et al., 2020, Zhou et al., 2021). Depending on the educational institution's system, academic achievement can be assessed either quantitatively or qualitatively (Matovu, 2020). Odagboyi (2015) defined academic achievement as the learning outcome of students which include the knowledge, skills and ideas acquired and retained through their course of studies within and outside the classroom situation. In this study, academic achievement is students' mastery of intended biology objectives as recorded by course letter grades and percentages.

Gender is a feature that separates male and female. According to Onyali and Nnebedum (2018), gender is a physical, biological and behaviourable characteristics which differentiate masculinity and femininity. However, it seems that studies conducted on the effects of animation on students' academic achievement in relation to gender are few and have yielded inconsistent results. For example, Ezechi and Adukwu (2018) reported that there was a significant difference in the mean achievement score of male and female students in Biology. In the same vein, Odagboyi (2015) reported that there was a significant difference between the achievement scores of male and female students taught Biology using animation strategy in favour of the male students. However, Okoye (2016) reported that gender has no significant influence on the academic achievement scores of students in Biology. The possible explanation for these controversial findings might be probably because the studies were carried out with different classes and on different biology content areas under different testing condition. The need arises for further studies to take gender into consideration in an attempt to build a new evidence of influence of gender on students' achievement in Biology. It is against this background and the problem that this study investigated the effects of animation instructional strategy on students' academic achievement in biology in senior secondary schools in Abuja Municipal Area Council, Abuja, while gender serves as a moderating variable.

Purpose of the Study

The purpose of this study was to investigate the effect of animation instructional strategy on students' achievement in biology. The specific objectives were to:

- i. Find out the difference between the achievement scores of students taught biology using animation instructional strategy and those taught using conventional method;
- ii. Ascertain if there is any difference between the achievement scores of male and female students taught biology using animation instructional strategy;

Research Questions

Based on the objectives of this study, the following research questions guided the study:

1. What is the difference between the mean achievement scores of students taught biology using animation instructional strategy and those taught using conventional method?

2. What is the difference between the mean achievement scores of male and female students taught biology using animation instructional strategy?

Hypotheses

The following null Hypotheses were formulated and tested at 0.05 level of significance.

- H₀₁:** There is no significant difference between the mean achievement scores of students taught biology using animation instructional strategy and those taught with conventional method.
- H₀₂:** There is no significant difference between mean achievement scores of male and female students' taught biology using animation instructional strategy.

Methodology

The research design adopted for this study was quasi experimental. Specifically, the study applied pre-test, post-test non-randomized control group. The population of this study was 2, 202 SS II Biology students in senior secondary schools in Abuja Municipal Area Council. A sample size of eighty-five (85) biology students were used as sample for the study; multi-stage sampling procedure was used in selection of this sampled. At the first stage of sampling, two (2) public co-educational secondary schools were purposively selected. At the second stage of sampling, simple random sampling technique was used in selecting one intact class of biology students from the two sampled schools selected and finally the two classes were assigned to control group and experimental group by tossing a coin.

Instrumentation

Biology Students Achievement Test (BSAT), was the instrument used for data collection in this study. The BSAT consisted of twenty-five (25) multiple choice questions with four (4) options lettered A, B, C, D. Each of the BSAT item carried 1 mark and this made it total of 25 marks. The test item was based on digestive system, reproduction and circulation or transport system adapted from senior secondary school biology curriculum for SS II students.

Validity and Reliability of the Instrument

The BSAT was subjected to both face and content validation. The validation of the instrument was done by two experts in the Department of Science and Environmental Education, University of Abuja to check the face validity while content validity was determined by construction of table of specification. After the validation, the BSAT was subjected to pilot test to find out its reliability. The researchers conducted a pilot test using one intact class of forty (40) students in a school that was not part of the sample selected. The reliability of BSAT was determined using Kuder Richardson formula (Kr-20) because the test items were of the same difficulty and the reliability coefficient of 0.74 was obtained.

Data Collection Procedure

The researchers went to the sampled schools for permission to use their schools to teach their students for 6 weeks. In the first week of 6 weeks of treatment, two research assistants were trained for two days on how to use the lesson plan for experimental group (animation instructional strategy) and control group (conventional method) to teach the selected topics the digestive system, respiratory system and transport system in Biology curriculum from the two selected schools. Thereafter, a pretest was administered to both experimental and control groups before the treatment. This was followed by 4 weeks of teaching using lesson plan on animation instructional strategy for experimental school and lesson plan on conventional

teaching method in control school respectively. Posttest was administered to students after four weeks of teaching in both experimental and control schools. The data collected the pre-test and post-test scores were analyzed using Mean and standard deviation to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance.

Results

Research Question One: What is the difference in the mean achievement scores of students taught biology using animation instructional strategy and those taught using conventional method?

Table 1: Mean and Standard Deviation in Achievement Scores of Students in Experimental and Control Group

Groups	N	Pretest		Posttest		Mean Gain Mean
		Mean	SD	Mean	SD	
Experimental	45	18.71	1.05	39.42	1.84	20.71
Control	40	18.15	1.52	33.55	2.37	15.40
Mean Difference		0.56		5.87		5.31
Total	85					

Results on Table 1 indicates that the pretest mean achievement scores of students taught Biology using animation instructional strategy and those taught using conventional method are 18.17 and 18.15 respectively with standard deviation of 1.05 and 1.52. Also, the post-test mean achievement scores of 39.42 and 33.55 with standard deviation of 1.84 and 2.37 for both experimental and control groups were recorded respectively. This indicates that students in experimental group had higher mean score in the posttest with a mean difference of 5.31.

Research Question Two: What is the difference in the mean achievement scores of male and female students taught biology using animation instructional strategy in experimental group?

Table 2: Mean and Standard Deviation on Achievement Score of Male and Female Students in Experimental Group

Groups	N	Pretest		Posttest		Mean Gain Mean
		Mean	SD	Mean	SD	
Male	25	18.48	1.04	39.20	1.52	20.72
Female	20	19.00	1.02	39.70	2.17	20.70
Mean Difference		0.52		0.50		0.02
Total	45					

Results on Table 2 indicates the pre-test mean achievement scores of male and female students taught Biology with animation instructional strategy in experimental group were 18.48 and 19.00 respectively with standard deviation of 1.04 and 1.02. Also, the post-test mean achievement scores of 39.20 and 39.70 with standard deviation of 1.52 and 2.17 for male and female were recorded respectively. The overall mean difference between the groups was 0.02 it therefore implies there was no difference in the mean achievement scores of male and female students who were taught Biology using animation instructional strategy in experimental group.

Test of Hypotheses

In this study, two hypotheses were formulated and tested as follows:

HO₁: There is no significant difference between the mean achievement scores of students taught biology using animation instructional strategy and those taught using conventional method.

Table 3: ANCOVA Results of Achievement Scores of Students taught Biology in Experimental and Control Groups.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	732.749 ^a	2	366.375	82.004	.000
Intercept	623.971	1	623.971	139.661	.000
PRETEST	2.521	1	2.521	.564	.455
GROUP	715.081	1	715.081	160.054	.000
Error	366.356	82	4.468		
Total	115328.000	85			
Corrected Total	1099.106	84			

Sig @P<0.05

Table 3 shows the summary of ANCOVA result of achievement scores of students taught biology using animation instructional strategy and those taught using conventional method. The result from the table revealed that $F(1,84) = 160.054$ and $P = 0.000$ for the main treatment. The significant p -value of (0.00) was less than 0.05 level of significant ($p < 0.05$). Therefore, the null hypothesis one was rejected. This shows there was significant difference between the mean achievement scores of students taught biology using the animation instructional strategy and those taught using the conventional method in favour of experimental group.

HO₂: There is no significant difference between the mean achievement scores of male and female students taught biology using animation instructional strategy.

Table 4: ANCOVA Results of Achievement Scores of Male and Female Students taught Biology in Experimental Group

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	3.196 ^a	2	1.598	.460	.634
Intercept	223.197	1	223.197	64.304	.000
Pretest	.419	1	.419	.121	.730
Gender	3.150	1	3.150	.908	.346
Error	145.781	42	3.471		
Total	70084.000	45			
Corrected Total	148.978	44			

Not Sig @P> 0.05

Table 4 shows the ANCOVA result of achievement scores of male and female students taught biology using animation instructional strategy. The result from the table revealed that $F_{1, 44} = 0.908$ and $p = 0.346$ for gender. The significant p -value (0.346) was greater than 0.05 level of significant ($p > 0.05$). Therefore, hypothesis two was not rejected. This shows there was no significant difference between the mean achievement scores of male and female students taught biology using animation instructional strategy.

Discussion of Findings

The finding of the study revealed that students taught biology using animation instructional strategy was higher than those taught using conventional method with a difference of 2.77 this favoured students taught biology using animation instructional strategy. This finding is in agreement with the findings of Hamza et al. (2017), Matazu (2025) who reported that students taught using animation instructional strategy performed better than those taught using conventional method. The reason could be due to the fact that animation instructional strategy has the potential of making students learn more because fun and entertainment are naturally ways through which students learn, therefore, improving achievement of students.

The findings of the study revealed that male and female students taught using animation instructional strategy in experimental group did not differ in their academic achievement. This showed that there was no significant difference between the achievement scores of male and female students taught using animation instructional strategy. This support the findings of Matazu and Ismail (2023),

Conclusion

The researchers have concluded based on the findings study that use of animation instructional strategy enhances the academic achievement of students in Biology as well as it is gender friendly.

Recommendations

The following recommendations were made based on the findings of this study:

1. Biology teachers should be encouraged to incorporate the use of animation instructional strategy in teaching since the method provides the opportunity of engaging students in learning activities which affects their achievement in the concept of digestive, respiratory and respiratory systems.
2. Government and relevant professional bodies like Science Teachers Association of Nigeria (STAN) should organize seminars, workshops and conferences for Biology teachers to adopt the use of animation instructional strategy in teaching biology since the method is gender friendly.

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