



Enhancing Biology Concept Using Animated and Static Infographic Medium on Retention and Performance among Federal University of Education, Zaria Students

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ABSTRACT

This study revealed the enhancement of NCE (Nigerian Certificate in Education) Biology students' academic performance using Animated and Static Infographic Medium in Federal University of Education, Zaria. The study employed a quasi-experimental, non-randomized pre-test-post-test group design involving 158 NCE III biology students. The experimental groups engaged Animated and Static Infographic Medium activities for a period of six weeks. Data were collected using the AIEGC and SIEGC Performance Test (EGCPT), a 40 -item multiple-choice assessment, and analyzed using mean, standard deviation, and t-test. Results indicated that AIEGC and SIEGC Computer Based learning significantly enhanced students' academic performance, retention ability and also that the treatments are gender friendly. The Animate Infographics group achieved a higher mean post-test score ($M = 17.41$) compared to the Static Infographics group ($M = 14.99$), with a statistically significant effect ($p < 0.05$). Gender differences were negligible, with males slightly outperforming females, suggesting equal benefits for both genders. The study recommends that university authorities should send staff for conferences, seminar and workshops periodically to become accustomed to the innovative teaching like computer-based instructions among others.

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INTRODUCTION

The development and effectiveness of ICT tools such as smartphones, projectors, computers, digital technologies in education have affected the human endeavor positively in shaping the modern world Rehman *et al* (2021). There are a lot of changes in the pedagogies of the 21st century which are dependent on its effectiveness and efficiency (John., Ali & Chike, 2025). ICT has transformed education and other sectors by changing how we live, work, communicate interact with each other. ICT also have transformed the ways students learn and how teachers disseminate their instructions. Prendes *et al* (2021) said that technologies facilitate contents comprehension and foster skill development by creating a real-world experience through digital

devices. Teaching and learning experience are enhanced through the use of ICT tools such as computers interactive whiteboard, educational software, Simulation Softwares such as Edmodo, it also fosters personalized learning which gives the students room to be responsible for their own learning and making them more engaging and effective. Through ICT the teachers are capable of creating interactive lessons and also monitor students' progress academically (Ogunsola *et al* ,2021).

Infographic simply mean a visual representation of information or data examples (charts or diagram, graphs and other visuals) that makes complex data or concepts easier to understand. Infographics are used to make more complex or abstract topics easy and clear with

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contents more comprehensive to students. it can be used whenever you need to communicate information quickly or impact knowledge. infographics features, such as symbols and images, attractive colors, sound design, short diagrams or charts, and texts encouraged learners to understand effectively information and concepts delivered through them (Basco 2020)

Infographics have been used to swiftly communicate a message, make enormous volumes of data easier to understand, show data patterns and linkages, and track changes in variables over time (Basco, 2020). Infographics are comprised three main components: content elements (texts, facts, references, statistics, etc.), visual elements (graphics, maps, colors, icons, signs, etc.), and knowledge (Noh, Fauzi, & Jing, 2017 and Basco,2020). Infographics are designed to convey information quickly and effectively, making them a popular tool for representing statistics, facts, summaries, or comparisons. As graphic tools, they are intended to help students learn and retain the information acquired through visual representations, perceive the relationship between selected pieces of information in graphic format, and connect abstract concepts and principles to concrete representation (Mohammed and Daif-Allah, 2023).

The attraction of infographics seems to be inherent within their nature, since people are drawn to the visualizations, colours, and images of the infographics itself. Damyanov and Tsankov (2018). They described infographics as a modeling method that created conditions for advancing various cognitive skills, encompassing explanation, interpretation, evaluation, analysis, and conclusion. Alrwele (2017) investigated the effectiveness of infographics on students' academic achievement and explored students' perceptions of the impact of infographics. The results revealed that the experimental group significantly performed better than the control group. An infographic can transfer knowledge about a topic faster and more effectively than pure text; however, this condition depends on the quality and presentation of the infographics. Feldman, *et al.*, (2022) added that infographics facilitate the association and creation of mental

representations of words that help improve learning and memory performance in both children and adults.

Biology is a science subject that concerned with the study of living organisms, its environment and interactions with one another. It is a compulsory and also a basic requirement for admission into tertiary institutions for science students (Okwo and Tawtigyas,2012 & Fati *et al.*,2020). Certain concepts in Biology, like Pollution, evolution, aspects of Ecology, Genetics, and Central Nervous System contains some abstract topics which students finds difficult to comprehend. Brooks *et al.*, (2021) stated that learning of abstract biological concepts needs hands on activities and innovative teaching strategies for proper understanding. In many situations, these topics are not taught effectively in a way that students can profoundly benefit from the process, hence students get discouraged. Timothy (2021) reports that the achievement of students and attitudes toward Biology has been a great concern for researchers because learning outcomes over the years have not been satisfactory. Noh, Fauzi, and Jing (2017) opined that infographics features, such as symbols and images, attractive colors, sound design, short diagrams or charts, and texts encouraged learners to understand effectively information and concepts delivered through them.

Kuta *et al* (2024) examined the Effects of Computer Assisted Instruction with Animation of Biology Students' Achievement in Niger State (Post Covid-19 Remedy for teaching and learning). This study revealed that CAI with animation enhanced the achievement of students in biology better than normal classroom instruction and it also revealed that CAI with animation improved the achievement of the Masculine and Feminine students in Biology.

STATEMENT OF THE PROBLEM

The learning problems in Evolution and Genetics concept faced by students have been attributed to several factors such as the abstract nature of the course, lack of effective teaching method and learning approach that require memorization of abstract concepts (Gambari,

Yaki, Gana & Ughovwa, 2014). The evolution concept in itself is an abstract although the theory of biological evolution is a fundamental framework in biology. It explains the diversity of life, and helps us understand how and why populations change over time. Students often view evolution as a purposeful, goal-driven process rather than the accumulation of natural events and have difficulty grasping of evolutionary trends (Kampourakis, 2014, Elijah, Lynn & Jason, 2015 and Cattley & Novick, 2016). This could be due to the complex nature of the concepts in addition to the methods of teaching by most Biology teachers.

Students failed due to ineffective teaching methods used by teachers to teach such abstract concepts. These problems if left unattended to will affect Biology-related fields. However, different methods and approaches were used by different researchers such as the use of an interactive whiteboard, concept map, and peer-led guided instruction to solve the problem, not much information is known about static and animated infographic medium. Despite the importance of infographics to transform contents into images to make students understand difficult concepts easily, their use remains underutilized in the study area.

As a result of these, NCE III Biology students continue to struggle with understanding the Course, Evolution and Genetics (Bio 323). There has been a persistent decline in students' interest and performance in Biology, according to the past records from the examination office of the Department of Biology. The records have not been satisfactory, the study intends to enhance biology concept using static and animated infographic medium on retention and academic performance among NCE III students of Federal University of Education, Zaria

Research Questions

The following research questions guided the study:

1. What are the mean academic performance scores of students taught of Biology Concept using static and animated infographics in Federal University of Education Zaria?

2. What is the mean retention ability scores of students taught of Biology Concept using static and animated infographics Federal University of Education Zaria?
3. Is there any gender difference in the academic performance mean scores of male and female students taught of Biology Concept using Static and Animated infographics Federal University of Education Zaria?

Research Hypotheses

The following null hypotheses will be tested in this study at 0.05 level of significance

HO₁: There is no significant difference in the academic performance mean scores of Biology students exposed to Static and Animated infographics on Evolution and Genetics concept in Federal University of Education Zaria

HO₂: There is no significant difference in the retention ability mean scores of Biology students exposed to Static and Animated infographics on Evolution and Genetics concept in Federal University of Education Zaria.

HO₃: There is no significant difference in the academic performance male and female students taught of Biology Concept using Static and Animated infographics Federal University of Education Zaria.

METHODOLOGY

A quasi-experimental research design was adopted in which three research questions and three null hypotheses guided the study. The population of the study comprised of 1541 students in the Department of Biology. The sample of 158 students were randomly selected. 79 students were assigned to experimental group 1 and another 79 students to experimental 2. A reliability Coefficient of 0.78 for Animated Infographics of the Evolution and Genetics Concept (AIEGC) and 0.86 for Static Infographics of the Evolution and Genetics Concept (SIEGC) as determined through Pearson's correlation coefficient was obtained in a pilot test. The

instrument of the study includes Animated Infographics of the Evolution and Genetics Concept (AIEGC), Static Infographics of the Evolution and Genetics Concept (SIEGC) and Evolution Genetics Performance Test (EGCPT). The Model were carefully developed using the acronym ADDIE model, which stands for Analysis, Design, Development, Implementation, and Evaluation. Which was adapted and modified from (John., Ali & Chike, 2025).

The first step involved identifying the learning goals, and then the structure was carefully crafted according to the specific guidelines laid out in NCE III syllabus of the Department of Biology. Secondly, the design phase involved planning the visual and textual content for each infographic. For the animated infographics, writing a clear and engaging script was necessary.

Static Infographics of the Evolution and Genetics Concept (SIEGC) is an unmovable visual representation about the various components and processes involved in Evolution,

Variation, Adaptation, Competition and Survival of the fittest (EVACS) as in the course (Bio 323). The last phase was the evaluation and assessment of Evolution Genetics Biology Performance Test (EGCPT) which contains Forty (40) multiple-choice questions based on the scheme of work were used for data collection (Pretest, Posttest and Post post Test).

RESULTS

Research Question One:

What are the mean academic performance scores of students taught of Evolution and Genetic Concept using Static and Animated Infographics in Federal University of Education Zaria

To answer research question one, post-test scores of experimental groups generated from Evolution and Genetics Concept Performance Test (EGCPT) were subjected to descriptive analysis. The mean scores and standard deviation of the statistics is presented in Table 1.

Table 1: Mean and Standard Deviation of Post-test Scores of NCE III Biology Students in the Experimental Groups

Groups	N	Mean	Std. Deviation	Mean Difference
AIEGC Exp.1	79	17.41	6.17	2.42
SIEGC Exp.2	79	14.99	4.92	

The result in Table 1 showed that differences exist in the mean performance scores of NCE III biology students when taught Evolution and Genetics concept using Animated Infographics (AIEGC) and Static Infographics (SIEGC). Mean scores of 17.41 and 6.17 were obtained with a mean difference of 2.42 in favour of students in the Animated Infographics (AIEGC) group. The table revealed that NCE III biology students exposed to Animated Infographics (AIEGC) performed better than their counterparts taught same concepts using Static Infographics (SIEGC). To determine whether the mean difference is significant or not, hypothesis one was tested at $\alpha \leq 0.05$ as presented in Table 2.

Null Hypothesis One:

There is no significant difference in the mean academic performance scores of NCE III Biology Students taught Evolution and Genetics concept using Animated Infographics (AIEGC) and those taught the same concept using Static Infographics (SIEGC).

To test null hypothesis one, the post-test scores obtained from EGCPT (Table 1) for both Animated Infographics of the Evolution and Genetics Concept (AIEGC) and Static Infographics of the Evolution and Genetics Concept (SIEGC) groups were subjected to an independent sample t-test statistic at $\alpha \leq 0.05$. Summary of the analysis is presented in Table 2.

Table 2: Independent Samples t-test Analysis of Mean Performance Scores between Animated Infographics of the Evolution and Genetics Concept (AIEGC) and Static Infographics of the Evolution and Genetics Concept (SIEGC)

Group	N	Mean	Std. Dev.	df	t	p	Remark	Decision
AIEGC	79	17.41	6.17	156	2.67	0.01	Significant	HO ₁ Rejected
SIEGC	79	14.99	4.92					

Significant at $p \leq 0.05$ level

Research Question Two:

What is the difference between the retention mean scores of students taught Evolution and Genetics Concept using Animated (AIEGC) and those taught the same concept using Static Infographics (SIEGC)?

To answer research question two, post post-test scores of NCE III biology students in the Animated Infographics (AIEGC) and Static Infographics (SIEGC) groups generated from EGCPT were also subjected to descriptive analysis for the mean and standard deviation scores. Summary of the analysis is presented in Table 5.

Table 3: Post Posttest Retention Ability Mean Scores of NCE III Biology Students in the Experimental Groups

Group	N	Mean	Std. Deviation	Mean Difference
AIEGC	79	16.04	5.62	1.51
SIEGC	79	14.98	4.11	

Table 3: revealed that difference exist in the retention ability of NCE III biology students taught Evolution and Genetics Concepts using Animated infographic and those taught using Static Infographics. The AIEGC group had a higher mean retention score of 16.04 compared to that of the SIEGC group who had 14.98 with mean difference of 1.51. The mean difference is in favour of AIEGC group. In order to find out if the difference is significant, the data was further subjected to an independent samples t-test at $\alpha \leq 0.05$.

Null Hypothesis Two:

There is no significant difference between the retention mean scores of NCE III biology students taught Evolution and Genetics Concepts Using Animated and Static infographic respectively.

To test null hypothesis two, the post posttest scores of NCE III biology students in the experimental groups obtained from EGCPT were subjected to independent samples t-test analysis at $\alpha \leq 0.05$ level of significance. Summary of the statistics is presented in Table 4.

Table 4: Independent t-test Analysis of Mean Retention Scores for NCEIII Biology Students in the Experimental and Control Groups

Group	N	Mean	Std.De.	df	t	p	Remark	Decision
AIEGC	79	16.04	5.60	156	6.45	0.00	Sig.	Ho ₂ Rejected
SIEGC	79	14.98	4.11					

Significant at $\alpha \leq 0.05$ level

Table 4 revealed that there is significant difference between the mean retention ability scores of NCE III biology students in the Animated Infographics (AIEGC) and Static Infographics

(SIEGC), $t(156) = 6.45$, $P = 0.00$ which is less than 0.05 level of significance. The Animated Infographics (AIEGC) and Static Infographics (SIEGC) groups recorded mean scores of 16.04 and 14.98 respectively. Therefore, the null

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hypothesis which stated that there is no significant difference between the retention mean scores of NCE III biology students taught Evolution and Genetics Concept using Animated Infographics (AIEGC) and Static Infographics (SIEGC) is hereby rejected. This implies that students' scores at post posttest exposed to Animated Infographics of the Evolution and Genetics Concept (AIEGC) was found to be more effective in improving students' retention ability in Animated Infographics (AIEGC) and Static Infographics but in favour of AIEGC.

Research Question Three:

Is there any gender difference in the academic performance mean scores of male and female students taught of Biology Concept using Animated and Static Infographics in Federal University of Education Zaria?

To answer research question three post-test scores of NCE III biology students in the Animated Infographics (AIEGC) and Static Infographics (SIEGC) groups generated from EGCPT were also subjected to descriptive analysis for the mean and standard deviation scores. Summary of the analysis is presented in Table 5.

Table 5: Mean and Standard Deviation of Post-test Scores of Male and Female Students in the Experimental Groups

Group	N	Mean	Std. Deviation	Mean Difference
AIEGC				
Male	43	13.61	3.42	1.43
Female	36	12.18	3.10	
SIEGC				
Male	40	12.55	3.36	0.44
Female	39	12.21	3.11	

The mean difference is in favour of male in AIEGC group. In order to find out if the difference is significant, the data was further

subjected to an independent samples t-test at $\alpha \leq 0.05$ in table 6.

Table 6: Independent Samples t-test Analysis of Mean Performance Scores between Male and Female Students in Animated (AIEGC) and Static Infographics (SIEGC)

Group	N	Mean	Std. Deviation	Df	t	P-value
AIEGC						
Male	43	13.61	3.42	1	-0.26	0.00
Female	36	12.18	3.10			
SIEGC						
Male	40	12.55	3.36	1	-0.28	0.00
Female	39	12.21	3.11			

Table 6 revealed that significant difference exists between the performance mean scores of male and female NCE III biology students in the experimental groups. (AIEGC) $t(79) = -0.26$, $p = -0.33$, and (SIEGC) $t(79) = -0.28$, $P = -0.033$ which is less than 0.05 level of significance. The male and female NCE III biology

students recorded mean scores of (AIEGC) 13.61 & 12.18 and (SIEGC) 12.55 & 12.21 respectively. The difference in mean was in favour of male NCE III biology students. Therefore, the null hypothesis which stated that there is no significant difference in the mean academic performance scores of male and female NCE III Biology Students taught

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evolution and Genetics Concept using Animated and Static Infographics is thus rejected. This implies that performance scores of male and female students in both experimental were improved after the treatment.

DISCUSSION OF FINDINGS

The finding of this study revealed that infographic has a positive effect in enhancing the academic performance of NCE III Biology students in the concept taught. The data generated from the research work indicated a significant enhancement in the students' performance academically, indicating the effect of infographics as a teaching tool. Mohammed and Daif-Allah, (2023) said that the combination of brain-based learning strategies with different infographic types (static vs animated) significantly affected students' test scores in information concepts, suggesting that the effectiveness of each format can vary based on the instructional approach.

The present study revealed that whether animated or static, visual representation enhances students' performance. The study supported the work of Kuta *et al* (2024) which reveals that, CAI with animation enhanced the achievement of students in Biology better than normal classroom instruction and it also revealed that CAI with animation improved the achievement of the Masculine and Feminine students in Biology. The study is also in accordance with the similar work done by John., Ali & Chike, (2025), which indicated that there is no significant difference in the achievement scores between male and female Biology students after they were exposed to static and animated infographics on the human digestive system.

CONCLUSION

The study concludes that animated and static infographic enhanced the academic performance of NCE III Biology students in Federal University of Education, Zaria. These may be because the audio-visual representation of information with features, such as symbols and images, attractive colors, sound design, short

diagrams or charts. Also, the treatment is gender friendly.

RECOMMENDATIONS

Based on the findings from the study, the following recommendations were made:

1. Lecturers should use brain-based learning strategies in teaching Biology more than lecture method since animated and static infographics has proved effective in enhancing students' academic performance.
2. The university authorities should send staff for conferences seminar and workshops periodically to become accustomed to the innovative teaching like computer-based instructions.
3. Biology Educators should continue using inclusive, hands-on approaches that engage all students regardless of gender.
4. Educational institutions should establish and maintain ICT Centers as open-air laboratories to provide students with computer-based learning opportunities.

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